

Foundations of Doula Care: Supporting Birth and Family Transitions

Foundations of Doula Care: Supporting Birth and Family Transitions

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Contents

Acknowledgements	vii
About This Book	viii

Chapter 1: Orientation

1.0 Orienting to Doula Studies	2
1.1 College Policies & Student Support	3
1.2 Academic Integrity & Artificial Intelligence	7
1.3 Policies	16

Chapter 2: Historical Contexts of Reproduction

2.0 Chapter Introduction	19
2.1 Arrival and Orientation: Defining Reproduction	20
2.2 Reading the Signs: Language & Vocabulary of Reproductive Care	24
2.3 Ancient Paths: Anthropology & Ancestral Ways of Being	36
2.4 From Community to Institution: Colonization, Industrialization and the Medicalization of Birth	50
2.5 The Fork in the Trail: Reproductive Healthcare Systems & Virtual Support for Clients	64
2.6 Many Trails, One Map: Feminism, Reproductive Justice & Intersectionality	71
2.7 Under the Microscope: Abortion Care, Law & Access in Canada	91
2.8 Every Story Is Cultural: Diversity, Cultural Safety, and Doula Practice	98
2.9 Roots Beneath the Trail: Indigenous Reproductive Justice	106
2.10 Gaining Perspective: Assisted Reproductive Technologies and Diverse Family Building	116
2.11 From History to Advocacy: Black Birthing Experiences and Reproductive Justice	121

Chapter 3 Anatomy and Physiology

3.0 Orienting: Uniting the Pack	131
3.1 Building Block of Life: Basic Biochemistry, Cells and Reproduction, Tissues	148
3.2 Rivers and Currents: Cardiovascular System	165
3.3 Communication: Nervous System	180
3.4 Nourishment: The Digestive System	195
3.5 The Power of Breath: The Respiratory System	204
3.6 Filtration & Balance: The Urinary System	214
3.7 The Body's Invisible Orchestra: The Endocrine System	225
3.8 Reproductive Systems	244
3.9 The Body's Defence: The Immune System	262
3.10 The Tree of Life: The Placenta	277
3.11 The Passageway: The Pelvis	293

3.12 The First Food: Lactation and the Mammary Glands	308
3.13 Sitting With it: Physiological Adaptations to Pregnancy	323
3.14 Development and Inheritance: Genetics, Embryology, and Diversity	342
3.15 Physiology of Labour	363
Appendix: Anatomy & Physiology Exam Review	388
Appendix: Case Studies	389
Video Transcripts	397
References	402
Version History	410

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About This Book

Accessibility Statement

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The web version of this resource has been designed to meet [Web Content Accessibility Guidelines 2.0](#), level AA. In addition, it follows all guidelines in [Appendix A: Checklist for Accessibility](#) of the [Accessibility Toolkit – 2nd Edition](#).

In addition to the web version, additional files are available in a number of file formats, including PDF, EPUB (for eReaders), and MOBI (for Kindles).

If you are having problems accessing this resource, please contact us at oyer@fanshawec.ca.

Please include the following information:

- The location of the problem by providing a web address or page description
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CHAPTER 1: ORIENTATION

Chapter Outline



[1.0 Orienting to Doula Studies](#)

[1.1 College Policies & Student Support](#)

[1.2 Academic Integrity & Artificial Intelligence](#)

[1.3 Policies](#)

1.0 Orienting to Doula Studies



Learning Objectives

At the end of this chapter, learners should be able to:

- Describe what a doula is
- Identify the expectations of the student-teacher relationship
- Distinguish between the three AI policies
- Recall the resources available to them

Chapter Introduction

Welcome to Fanshawe's Doula Studies program! This learning resource is intended to support your learning as a central repository of concepts and frameworks. Is not a replacement for reading materials.

Fanshawe College, School of Nursing values our students and collaborative relationships with students, families, partners, and the community. This document provides general guidelines that will assist students in understanding what is expected of them and how faculty will support students throughout their educational journey.



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1.1 College Policies & Student Support

1.1.1 Fanshawe College Policies

Fanshawe has developed a number of policies and procedures to guide the decision-making for groups around the college. View some of the student-focused policies below.

- [Student Code of Conduct \(A130\)](#)
- [Academic Integrity \(A136\)](#)
- [Accommodation of Applicants & Students with Disabilities \(A101\)](#)
- [Post-Secondary Academic Calendar \(A102\)](#)
- [Evaluation of Student Learning \(A131\)](#)
- [Course Grade System \(A112\)](#)
- [Academic Standing \(A105\)](#)
- [Student Academic Appeals \(A128\)](#)
- [Academic Withdrawl & Termination \(A106\)](#)
- [Recognition of Prior Learning \(A124\)](#)

View all the [Fanshawe College Policies](#).

1.1.2 Student Support

Video: Here for You

Video: “[Fanshawe Student Success – Here For You](#)” by [Fanshawe College](#) [0:35] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

Who Can Help?

Fanshawe College has a diverse network of supports to help you during your time at Fanshawe and beyond. Sometimes identifying the right person or the right resource can be challenging, and if you are under stress, it can be even harder.

Throughout this book, look for videos and contact information that will help you identify important resources who are here to support you.



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Key Contacts

- Professors/Faculty
- [Academic Advisor](#)
- [Career and Employment Services](#)
- [Financial Aid](#)
- [Fanshawe Library Learning Commons: Peer Tutoring](#)

How Do I Contact My Professors?

Your Professor is *always* the expert on what is expected from you in your class work.

- Going to class allows you to ask questions, share ideas with others, and build your peer and professor network! However, if you are learning online or have questions after class time, your professor should be your first point of contact. This will mean learning how to effectively use your Fanshawe College email to ask good questions and regularly checking your email to get answers.

While you may have friends at Fanshawe who have taken the same course or program as you, they are not the one who will be grading your work. Regular, professional communication with your professor will be important.

How Do I Contact My Academic Advisor?

Your **Academic Advisor** supports your journey through the Fanshawe College system.

- They are the experts when it comes to providing advice on dropping a course, your schedule, changing programs, how to communicate with your professors and can connect you with people to help you with your job search, questions about international visa, work permits, parking, security, etc.
- Identifying your academic advisor and reaching out for help will demonstrate your commitment to your

Questions About: assignments, quizzes, due dates, group work, missed classes, etc.

Your professor for each class is the course expert – see each course site on Fanshawe Online for professor's email contact information

Questions about schedules, co-op, dropping a course, changing programs, fees, counselling, peer tutor, etc.

Your academic advisor. Your advisor will be based on your program, so you will have to [check the Fanshawe College website](#), look for your program and find the appropriate contact person

How to be Successful Going Forward

- Make a list of all your professors, their office hours, when they are available to connect and how to contact them. This information should be on your course page for each class.
- Use the link at the end of this chapter to identify YOUR academic advisor for YOUR program and their email address. Check their online booking portal to see how to book an appointment.
- If you are on campus, [review the map of Fanshawe College](#) to see where you can find your classrooms and other important places, or if you are an online student, identify your professors' office hours.
- Check your Fanshawe Online email and look up how to create an auto signature.
- Review the elements of your course sites for all classes so you can identify your classmates and their email addresses (Go to Communications – Classlist).

Video: Community and Connection – Fanshawe Institute of Indigenous Learning

Video: "[Community and Connection](#)" by [Fanshawe Institute of Indigenous Learning](#) [11:18] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

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1.2 Academic Integrity & Artificial Intelligence

1.2.1 Academic Integrity



Reflect

- What is Academic Integrity and academic honesty?
- Why is understanding the Academic Integrity Policy so important as a college student?

Academic Integrity and Dishonesty

At most educational institutions, “academic integrity” means demonstrating and upholding the highest integrity and honesty in all the academic work that you do. In short, it means doing your own work and not cheating, and not presenting the work of others as your own.

The following are some common forms of academic dishonesty prohibited by most academic institutions: Refer to the college’s [Maintaining Academic Integrity website](#).



Cheating

Cheating can take the form of looking over someone’s shoulder during an exam or any forbidden sharing of information between students regarding an exam or exercise.



Deception

Deception is providing false information to an instructor concerning an academic assignment. Examples of this include giving a dishonest excuse when asking for a deadline extension or falsely claiming to have submitted work.



Fabrication

Fabrication is the falsification of data, information, or citations in an academic assignment. This includes making up citations to back up arguments or inventing quotations.



Plagiarism

Plagiarism, as defined in the 1995 Random House Compact Unabridged Dictionary, is the “use or close imitation of the language and thoughts of another author and the representation of them as one’s own original work” (Emory University, 2022, para. 4). In an academic setting, it is seen as the adoption or reproduction of original intellectual creations (such as concepts, ideas, methods, pieces of information or expressions, etc.) of another author (whether an individual, group, or organization) without proper acknowledgement. This can range from borrowing a particular phrase or sentence to paraphrasing someone else’s original idea without citing it. Today, in our networked digital world, the most common form of plagiarism is copying and pasting online material without crediting the source.

Video: Plagiarism

Video: “[Plagiarism and You](#)” by [The Learning Portal / Le Portail d'Apprentissage](#) [5:41] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

Common Forms of Plagiarism

According to “The Reality and Solution of College Plagiarism,” created by the Health Informatics department of the University of Illinois at Chicago (n.d.), there are ten main forms of plagiarism that students commit:

- Submitting someone else’s work as their own.
- Taking passages from their own previous work without adding citations.
- Rewriting someone’s work without properly citing sources.
- Using quotations, but not citing the source.
- Interweaving various sources together in the work without citing.
- Citing some, but not all, passages that should be cited.
- Melding together cited and uncited sections of the piece.
- Providing proper citations, but failing to change the structure and wording of the borrowed ideas enough.
- Inaccurately citing the source.
- Relying too heavily on other people’s work. Failing to bring original thought into the text.

As a college student, you are now a member of a scholarly community that values other people’s ideas. In fact, you will routinely be asked to reference and discuss other people’s thoughts and writing in the course of producing your own work. That’s why it’s so important to understand what plagiarism is and the steps you can take to avoid it.

Avoiding Plagiarism

Below are some useful guidelines to help you avoid plagiarism and show academic honesty in your work:

- Quotes: If you quote another work directly in your work, cite your source.
- Paraphrase: If you put someone else’s idea into your own words, you still need to cite the author.
- Visual Materials: If you cite statistics, graphs, or charts from a study, cite the source. Keep in mind that if you didn’t do the original research, then you need to credit the person(s) or institution, etc. that did.

The easiest way to make sure you don’t accidentally plagiarize someone else’s work is by taking careful notes as you research. If you are doing research on the Web, be sure to copy and paste the links into your notes so you can keep track of the sites you’re visiting. Be sure to list all the sources you consult.

Lastly, if you’re in doubt about whether something constitutes plagiarism, cite the source or leave the material out. Better still, ask for help. Use the college’s [Library Learning Commons APA Citation Guide](#) to learn more about APA citation. Taking the time to seek advice is better than getting in trouble for not attributing your sources. Be honest about your ideas, and give credit where it’s due.



Consequences of Plagiarism

In the academic world, plagiarism by students is usually considered a very serious offence that can result in punishments such as a failing grade on the particular assignment, the entire course, or even being expelled from the institution. Individual instructors and courses may have their own policies regarding academic honesty and plagiarism; statements of these can usually be found in the course syllabus or online course description.



Academic Integrity Defined

Fanshawe College defines '**Academic Integrity**' as '*holding oneself and others accountable for performing academic work both honestly and ethically*'.

Developing and demonstrating **Academic Integrity** is something that Fanshawe faculty and staff expect of each other; it's something that Fanshawe College expects of its students, and it's certainly something that employers and recruiters will expect of Fanshawe graduates.

If you're able to hold yourself and others accountable for performing 'academic' work both honestly and ethically, then you'll be able to hold yourself and others accountable for performing 'professional' work both honestly and ethically when you're out in the workplace in the industry of your choice.

If you can develop and demonstrate Academic Integrity while you're a student at Fanshawe, you'll be able to further develop and demonstrate **Professional Integrity** when you become an employee or an entrepreneur after graduation.

Academic Integrity is important for the following FIVE reasons:

1. It ensures fairness in the education that students pursue,
2. It ensures fairness in the academic work that students complete,
3. It ensures fairness in the grades that students earn,
4. It protects the value of your credentials, and
5. It protects the reputation of your academic institution.

Please consider the key guiding principles when asked about academic integrity: *fairness*, *value*, and *reputation*.

Video: Academic Integrity and Avoiding Plagiarism

This video contains information that will help you achieve and maintain Academic Integrity by avoiding plagiarism. Please see additional videos below for more information.

Video: "[Academic Integrity and Avoiding Plagiarism](#)" by [Fanshawe Academic Integrity](#) [4:20] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

Other Resources

- [Academic Integrity course\(opens in new tab\)](#) in FanshaweOpen
- Attend an [Academic Integrity workshop\(opens in new tab\)](#) with the Library Learning Commons

Videos

- [Academic Integrity & Assignments](#)
- [Academic Integrity & Evaluations](#)
- [Academic Integrity & Online Learning](#)



To learn more, review the book: [Academic Integrity at Fanshawe](#).



Apply Your Knowledge

Activity Description

1. A student has an assignment to complete; they need to watch a video and answer four questions in their own words. Rather than answering the questions in their own words, the student copies four paragraphs from two different websites and pastes each of the paragraphs into their Word document as their responses to the four questions. The student did not include citations or reference information for either of the two different websites. **Has an Academic Offence occurred?** (True/False)
2. A student incorporates someone else's thoughts in their own words into their assignment to show that they have conducted research and consulted sources, but doesn't put these sentences in quotation marks or add citations at the end of them. **Has an Academic Offence occurred?** (True/False)
3. A student has an assignment to complete, and they need to build a spreadsheet that will calculate the costs of a construction project. Rather than build their own spreadsheet, the student finds a construction costs spreadsheet online, adds their numbers to the cells, and submits the spreadsheet as their own academic work. **Has an Academic Offence occurred?** (True/False)
4. A student is retaking a course and has to complete and submit an assignment that they had completed and submitted for marks when they previously took the course. Instead of consulting with the Course Instructor or redoing the assignment, the student submits the previously completed and submitted assignment to be marked again. **Has an Academic Offence occurred?** (True/False)
5. Student A receives a text message from Student B, who is asking a number of questions because they are struggling with an assignment that is due tomorrow. Rather than answer Student B's questions, Student A sends Student B an email with a copy of their completed assignment as an attachment. Student B receives Student A's email, downloads Student A's completed assignment, and then submits Student A's assignment as their own academic work. **Has an Academic Offence occurred?** (True/False)
6. A student slept in and missed the psychology test that they were supposed to write online at 8am. In a panic, the student emails their Course Instructor requesting to be able to write the missed test at a rescheduled time because they had a Doctor's appointment that morning. The Course Instructor responds to the student's email and requests a note from the student's Doctor to verify that the student had an appointment that morning. The student doesn't have a Doctor's note and is unable to obtain a legitimate note from their Doctor because they didn't actually have an appointment that morning. In a panic again, the student creates a document on their computer and sends it to their Course Instructor as though it were a legitimate Doctor's note. **Has an Academic Offence occurred?** (True/False)
7. A student recently joined a Facebook group of students in their marketing class. Four days before their next assignment is due, everyone in the Facebook group receives a message from someone offering to complete the assignment for \$75.00. The student who recently joined has been feeling overwhelmed by all of the assignments that they're working on and agrees to pay for a completed assignment because it will save them time, even though it will cost them money. A completed

- assignment is sent to the student, and they submit it as though it was an assignment that they had completed on their own. **Has an Academic Offence occurred?** (True/False)
8. A student is writing a computer coding test online and notices that they're able to open additional browser tabs to access websites because LockDown Browser is not being used. The student is unsure of which function to add to their code so they open another browser, access a website, copy five lines of code that someone posted to that website, and paste those five lines of code into their test. The student then closes the additional browser tab and continues to write the remainder of their computer coding test on their own. **Has an Academic Offence occurred?** (True/False)
 9. A student obtains a copy of another student's assignment, and they know that they can't submit it as their own academic work because Turnitin will match the assignment with the other student's previously submitted assignment. In order to make use of the assignment that the student obtained from another student, the student copies and pastes each of the sentences into a spin bot and replaces the words from the other student's sentences with the words that the spin bot has suggested. The student then copies and pastes the manipulated and disguised sentences into another document and submits the altered version of the other student's assignment as their own academic work. **Has an Academic Offence occurred?** (True/False)
 10. Students in a social work class have a two-part assignment to complete; each student is expected to individually assess a scenario from the perspective of a social worker and from the perspective of a client. The Course Instructor is expecting each student to submit an individually completed assignment. Two of the students in the class are roommates, and they decide to split up the assignment so that one of them writes the perspective of the social worker while the other writes the perspective of the client. The students share their written perspectives with each other so that they both have both of the perspectives that they need to complete their assignments. While marking the assignments, the Course Instructor notices that both students have submitted identical assignments. **Has an Academic Offence occurred?** (True/False)
 11. A student has to write an essay for their history course, but the essay is due tomorrow, and they don't have enough time to do the research that's required. The student goes to the Course Hero website and searches for essays that were completed by students who took the history course in the past. They find an essay that addresses the topic that they were planning to research and write about, and that includes some in-text citations as well as a references list. The student downloads the essay, replaces the other student's name with their own, and then submits the essay as if it were their own academic work. **Has an Academic Offence occurred?** (True/False)
 12. A student is writing an online test, and LockDown Browser is being used, so the student is not able to open additional browser tabs or new windows to search for answers to test questions. The student is struggling with the short-answer section of the test, so they use the browser on their phone to conduct Google searches for answers to test questions. **Has an Academic Offence occurred?** (True/False)
 13. A student is writing an open-book test online. The instructions for the test indicated that students would be permitted to make use of their textbook and course notes. While writing the test, the student uses their textbook and course notes to inform their responses to test questions rather than to copy answers to test questions directly from their permitted resources. **Has an Academic Offence occurred?** (True/False)
 14. A student is writing an online test, and while the student made sure to place their phone out of reach, they forgot to turn off the sound. During the online test, the student hears their phone ping with messages numerous times. The student stays focused on the online test and does not check the messages on their phone while the online test is in progress. After the online test, the student

checks their messages and realizes that other students were sending pictures of questions and answers from the online test. The student is worried that they will be at risk of an Academic Offence because they received these messages. **Has an Academic Offence occurred?** (True/False)

15. A student is completing an auto mechanics apprenticeship and needs their supervisor to sign off on a document that confirms that the student has completed the necessary safety training. The document needs to be submitted to their Placement Coordinator at the College tomorrow, but the student forgot to bring the document to their workplace today. In order to submit the document on time, the student signs the document on behalf of their supervisor and submits the forged document to their Placement Coordinator. **Has an Academic Offence occurred?** (True/False)
 16. A student has to write an online math test, and they're worried that they won't pass. A friend of theirs recently graduated from a math program at another college, and the student knows that their friend always achieved high grades. The student asks their friend for help with the online math test, and the friend agrees. The student gives their FanshaweOnline email address and password to their friend, and their friend writes the online math test on the student's behalf. The student obtained rather than earned a high grade on the online math test. **Has an Academic Offence occurred?** (True/False)
-

Answers:

1. True
2. True
3. True
4. True
5. True
6. True
7. True
8. True
9. True
10. True
11. True
12. True
13. False
14. False
15. True
16. True

1.2.2. Artificial Intelligence

Fanshawe has a framework which outlines the application of Generative Artificial Intelligence (GenAI) in teaching and learning.



Read the [Artificial Intelligence Academic Framework \[PDF\]](#).

The use of GenAI in aiding with assignments is restricted by default unless otherwise noted by the professor. GenAI use will fall into one of the three following categories. This will be clearly indicated in your FanshaweOnline course.

Limited



Limited generative AI use

You can use AI for learning or studying, but it can't be used on any submitted assignments without consent.

Partial



Partial generative AI use

Instructor to select appropriate uses and inappropriate uses within the course.

Full



Embraces generative AI use.

Use of generative AI is encouraged in this course to support learning outcomes.

Learn more about using artificial intelligence with the [Artificial Intelligence at Fanshawe Guide](#).

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1.3 Policies

Grading

Your instructors will use a variety of evaluation types, including and not limited to: presentations, discussion posts, essays, and quizzes.

- Rubrics will be offered.
- Graded Levels 0-4.
- 60% is a pass.

Grade Scheme

Final Grade	Range	Grade Point	Final Grade	Range	Grade Point
A+	90%-100%	4.2	A	80%-89%	4.0
B+	75%-79%	3.5	B	70%-74%	3.0
C+	65%-69%	2.5	C	60%-64%	2.0
P	greater than 60%	n/a	D+	55%-59% (FAIL)	1.5
D	50%-54% (FAIL)	1.0	F	0%-49% (FAIL)	0
I	Incomplete	n/a	N	No credit achieved	n/a
W	Withdrawn	n/a	X	Audit only	n/a

Attendance

Faculty retain attendance records. If a student has to miss practice or any meetings related to practice, it is important that students let their clinical instructor know in advance (if possible). There are often no opportunities to make up missed practice; the time missed may prevent the student's achievement of specified course outcomes and may result in a student being unsuccessful. Excessive absenteeism must be discussed with the program coordinator before returning to practice.

Documentation (e.g., a note from a nurse practitioner or physician) may be required from the student to document an absence or verify that the student is able to return to practice.

Student Resources

Academic Supports	Student Supports	Campus Spaces
Academic Advisors	Student Services	Health and Wellness Supports
Accessibility & Accommodations	Counselling Services	Student Wellness Centre
Find a Peer Tutor	Indigenous Learning Centre	
Math, Writing, Research and Study Help	Sharing Shop	
Find a Mentor		

Grade Scheme Table & Attendance information from Fanshawe College Course Outlines. © All Rights Reserved.

CHAPTER 2: HISTORICAL CONTEXTS OF REPRODUCTION

Chapter Outline

[2.0 Chapter Introduction](#)

[2.1 Arrival and Orientation: Defining Reproduction](#)

[2.2 Reading the Signs: Language & Vocabulary of Reproductive Care](#)



[2.4 From Community to Institution: Colonization, Industrialization and the Medicalization of Birth](#)

[2.5 The Fork in the Trail: Reproductive Healthcare Systems & Virtual Support for Clients](#)

[2.6 Many Trails, One Map: Feminism, Reproductive Justice & Intersectionality](#)

[2.7 Under the Microscope: Abortion Care, Law & Access in Canada](#)

[2.8 Every Story Is Cultural: Diversity, Cultural Safety, and Doula Practice](#)

[2.9 Roots Beneath the Trail: Indigenous Reproductive Justice](#)

[2.10 Gaining Perspective: Assisted Reproductive Technologies and Diverse Family Building](#)

[2.11 From History to Advocacy: Black Birthing Experiences and Reproductive Justice](#)

2.0 Chapter Introduction

This course introduces students to the historical milestones that have shaped the current reproductive healthcare landscape. Drawing on anthropology, sociology, and health policy, students will explore how cultural, political, and systemic factors influence reproductive experiences and outcomes. Through a framework of reproductive justice, the course considers pathways towards more equitable care.



Underlying Assumptions

- Reproductive experiences can not be separated from the wider historical context within which they are taking place
- Patterns of reproduction reflect larger discussions/discourses/policies about who matters and who doesn't
- If we are to support reproductive choices today, we need to understand where they evolved from, who has (in)access and why

2.1 Arrival and Orientation: Defining Reproduction



Learning Outcomes

By the end of this section, you will be able to:

- Recognize reproduction as a universal human experience across time, cultures, and environments
- Situate the doula's role within the full spectrum of reproductive healthcare experiences
- Describe the three core rights of the reproductive Justice Framework

2.1.1 The Reproductive Healthcare Spectrum

Reproduction is often discussed as though it begins and ends with pregnancy and birth, but reproductive experiences extend far beyond these moments.

Reproduction includes the biological, social, emotional, cultural, political, and healthcare experiences connected to bodies, sexuality, fertility, pregnancy, parenting, and family-building across the lifespan. These experiences are shaped not only by anatomy and physiology, but also by culture, religion, healthcare systems, economics, law, geography, stigma, and power. As future doulas, understanding reproduction through a broader lens allows us to better recognize the diversity of human experiences and the systems that influence them.

Reproductive Healthcare Spectrum

One way to begin understanding this complexity is through the concept of the full spectrum of reproductive healthcare. Full-spectrum reproductive healthcare recognizes that reproductive wellbeing includes many interconnected forms of care and support, including contraception, sexual health, gynecology, abortion care, fertility assistance, gender-affirming care, HIV prevention, birth and perinatal care, and community birth practices. Although these healthcare services are often separated socially, politically, or medically, they are interconnected through the broader goal of health and wellbeing.



Figure 2.1.1 “[The CHOICES Model of Full Spectrum Reproductive Health Care](#)” by N. Grayson, N. Quinones, & T. Oseguera, [FDEd \(CAN\)](#).

The CHOICES model of care aims to reduce the fragmentation and stigmatization of reproductive health care services by offering all the following services under one roof.

However, not all reproductive healthcare experiences are viewed equally within society. Some forms of care are normalized and publicly supported, while others are stigmatized, politicized, hidden, or criminalized. Social attitudes toward abortion, HIV prevention, gender-affirming care, infertility, contraception, and home birth have shifted across time and place and continue to influence healthcare access, funding, policy, provider attitudes, and personal experiences of shame or belonging. Understanding the *spectrum of stigma* helps doulas recognize how systems of power, culture, religion, colonization, racism, sexism, homophobia, transphobia, and public policy shape reproductive experiences and outcomes.

2.1.2 Reproductive Justice

Reproductive Justice (RJ) recognizes that reproductive experiences exist across a broad and interconnected spectrum rather than a single, linear path. People may move through, revisit, skip, or experience multiple reproductive experiences simultaneously throughout their lives. This framework expands beyond pregnancy and birth to include bodily autonomy, family-building, pregnancy prevention, pregnancy outcomes, parenting, loss, and access to care.



Figure 2.1.2 CHOICES' Assessment of the Level of Stigmatization Associated with Clinic Services. The fragmentation of different reproductive health care services contributes to the stigmatization of those services that are already regarded as controversial by society. “[The CHOICES Model of Full Spectrum Reproductive Health Care](#)” by N. Grayson, N. Quinones, & T. Oseguera, [FDEd \(CAN\)](#).

The Reproductive Justice movement, founded by Black women activists in the United States in the 1990s, emphasizes three core rights:

1. the right to have children
2. the right to not have children, and
3. the right to parent children in safe and healthy environments

Video: Loretta J. Ross, Reproductive Justice and Human Rights Advocate

Video: “[Loretta J. Ross, Reproductive Justice and Human Rights Advocate](#)” by [MacArthur Foundation](#) [2:20] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

The Reproductive Spectrum

The Reproductive Spectrum (Figure 2.1.3), developed by the author of this OER, translates the Reproductive Justice framework into a visual map of the interconnected reproductive experiences individuals may encounter across their lifetimes. Unlike a linear progression from contraception through pregnancy to birth, the Spectrum illustrates that reproductive experiences are non-sequential and non-universal. A person may experience fertility challenges before or instead of pregnancy, pregnancy loss alongside or before parenting, abortion care more than once, or non-parenting as a deliberate and complete reproductive life. Experiences may be revisited, layered, or bypassed entirely. The Spectrum is designed to challenge the assumption that there is one reproductive path — and to help emerging doulas hold the full complexity of their clients’ histories without defaulting to a script.

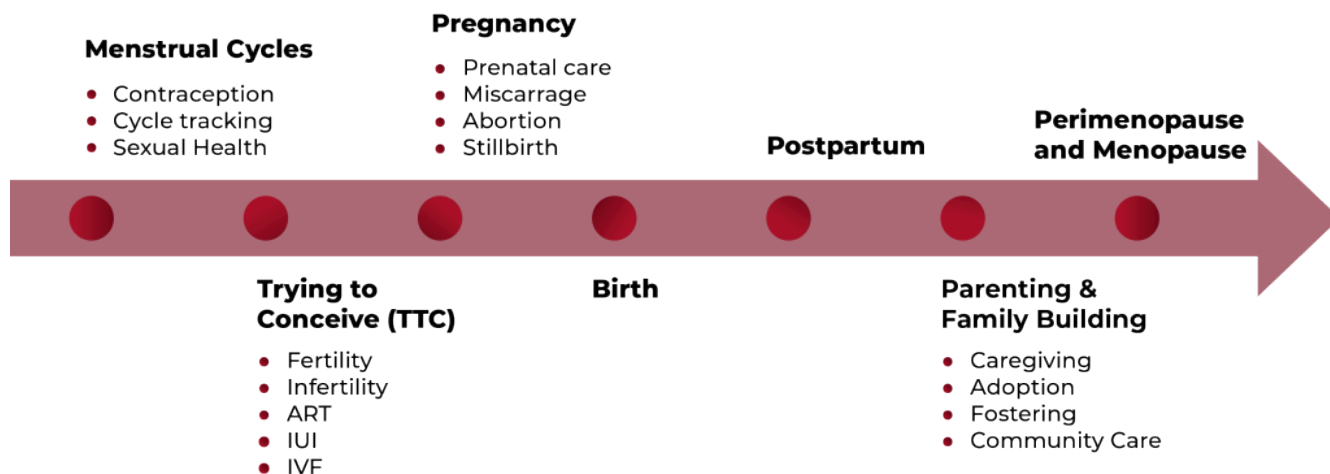


Figure 2.1.3 “The Reproductive Justice Spectrum” by Joshuelle Solomon, [CC BY-NC-SA 4.0](#). This figure, created by the author, maps the interconnected reproductive experiences individuals may encounter across their lifetimes. The Spectrum is non-linear and non-hierarchical: it does not suggest that any one reproductive experience is a more complete, more natural, or more expected path than another. Experiences shown may include but are not limited to: contraception and sexual health, fertility and conception, pregnancy (including planned and unplanned), pregnancy loss (miscarriage, stillbirth, termination), abortion care, birth and perinatal care, postpartum and lactation, parenting, non-parenting, adoption and foster care, gender-affirming reproductive care, and reproductive grief. Clients may appear at any point on the Spectrum and may be navigating more than one experience at once.

As we move through this chapter, we will explore how historical events, migration, colonization, healthcare systems, politics, economics, and social movements have shaped the current reproductive healthcare landscape. To understand the present, we must first ask a foundational question:

How did we get here?

2.2 Reading the Signs: Language & Vocabulary of Reproductive Care



Learning Outcomes

By the end of this section, you will be able to:

- Use inclusive, accurate language across the full reproductive spectrum.
- Distinguish between activism and advocacy in reproductive health contexts.
- Apply a harm reduction lens to reproductive language and care.

Three concepts will appear throughout this course more than any others: **access**, **autonomy**, and **safety**.

Access refers to the ability to obtain reproductive healthcare, including the geographic, financial, cultural, linguistic, and systemic conditions that make care reachable or place it out of reach. Access is not only about whether a service exists. It is about whether a specific person can actually get to it.

Autonomy refers to the right to make informed decisions about one's own body, reproduction, and life without coercion, manipulation, or undue influence. In reproductive health contexts, autonomy is both personal and political: it encompasses individual informed consent and the broader social conditions that make genuine choice possible.

Safety refers to the physical, emotional, cultural, and relational conditions under which people can seek and receive care. Safety is not only the absence of harm. It includes the presence of trust, dignity, and freedom from judgment, surveillance, or punishment.

Rather than definitions to memorize, these are lenses through which you can explore the course. They provide a way of asking the same question about every topic, policy, birth story, and client encounter you will face in this program:

- Who has access?
- Who can exercise genuine autonomy? and,
- who is safe in the systems meant to serve them?

This section develops the vocabulary, principles, and professional distinctions that will help you use that lens with precision.

2.2.1 The Reproductive Vocabulary

The words used in reproductive healthcare are not neutral. They encode assumptions about who is expected to seek care, what experiences are considered normal, and whose bodies are centred as the default. For students entering a doula training program, developing vocabulary literacy means not only learning correct clinical terms but also learning to notice when language excludes, stigmatizes, or renders a client invisible before care has even begun.

Pezaro et al. (2024), writing in the journal *Birth*, argue that “effective communication in relation to pregnancy and birth is crucial to quality care,” and that a growing awareness of how language marginalizes and excludes people creates an opportunity to review how reproductive health services, guidelines, and curricula address inequality. Their argument centres on what happens when reproductive healthcare language defaults to women-only framing — not because most people who give birth are not women, but because that default renders transgender, non-binary, and gender-diverse people invisible in the very systems meant to care for them.

One common attempt at inclusion is additive language: *women and people who birth*, or *women and other pregnant people*. Pezaro et al. (2024) note that this approach fails because it “reproduces women as the default” and “others the rest of people who might be pregnant into one added category.” There is, as they write, “no justice in naming women explicitly whilst not also naming other gender identities explicitly.” Centring *pregnant people* as the norm in reproductive services “does not erase cis women. It includes them within a broader category to ensure that no single gender is centred on reproduction.”

The table below, adapted from Pezaro et al. (2024, Table 2.2.1), illustrates this shift from exclusive to inclusive language in perinatal and midwifery contexts.

Table 2.2.1: A guide to gender-inclusive language in perinatal and midwifery services.

Level/Terminology	Exclusive	Inclusive
Individual	Assuming the gender of the individual receiving care and/or support person(s).	Ask the individual their name, pronouns, and words they want to use for body parts and parenting roles (e.g., dad/mum). Use this terminology. Mirror the language they use “Hello. My name is [X] and my pronouns are [Y]. What’s your name and what are your pronouns?” “How do you want to be called as a parent?” “How do you intend to feed your baby?” [mirror language used in their answer] “Who have you brought with you today?” [mirror language used in their answer]

			Ask for the name, pronouns, role, and relationship of any support person(s) present. Use this terminology. Mirror the language they use	“Who have you brought with you today?” “Hello. My name is [X] and my pronouns are [Y]. What’s your name and what are your pronouns?”
Population	People	Women/mothers/mums	Pregnant people	Pregnant people should be supported to access antenatal care
			Pregnant population	The pregnant population should be supported to access antenatal care
			Service users	Service users should be supported to access antenatal care
			Expectant parents	Expectant parents should be supported to access antenatal care

			Gestational parents	Gestational parents should be supported to access antenatal care
			Anyone who is pregnant	Anyone who is pregnant should be supported to access antenatal care
			<i>Restructure for direct address</i>	In pregnancy, you should be supported to access antenatal care
	Men/fathers/dads		Co-parents	Co-parents are welcome at antenatal classes
			Non-gestational parents	Non-gestational parents are welcome at antenatal classes
			A member of your support team	A member of your support team is welcome at antenatal classes
			<i>Restructure for direct address</i>	As a support person, you are welcome to antenatal classes
	Maternal	[adjective]	Parental [if another parent is not present]	Check parental blood pressure

			Pregnant/birthing/ postnatal [choose as appropriate]	Postnatal depression affects different people in different way	
			Gestational parents'	Gestational parents' outcomes are a priority	
		Maternal	Maternal consent	Informed consent	Informed consent given
				[Name's] consent	[X's] consent given
				Parental consent [if another parent is not present]	Parental consent given
			Maternal notes	Handheld notes/records	The telephone number is on the front of the handheld notes
				Care record	The telephone number is on the front of the care notes
				Antenatal/intrapartum / postnatal notes [choose as appropriate]	The telephone number is on the front of the antenatal/ intrapartum / postnatal notes [choose as appropriate]
		Woman-centered		Person-centered	We provide person-cente care

			Individualized	We provide individualized care
			Breast- and chestfeeding	A calm environment facilitates breast- and chestfeeding
			Breast/chestfeeding	A calm environment facilitates breast/ chestfeeding
			Body feeding	A calm environment facilitates body feeding
			Human milk feeding	A calm environment facilitates human milk feeding
			Human milk provision	A calm environment facilitates human milk provision
			Lactation	A calm environment facilitates lactation
		Breastmilk	Breast- and chest milk	Breast- and chest milk houses its own microbiome
			Breast/chest milk	Breast/ chest milk houses its own microbiome
			Human milk	Human milk houses its own microbiome

Milk from the feeding parent/co-parent [choose as appropriate]			Milk from the feeding parent/co-parent [choose as appropriate] houses its own microbiome	
System and service	Places	Maternity	Perinatal services	Perinatal services strive to provide positive experiences
			Perinatal care services	Perinatal care services strive to provide positive experiences
			Reproductive health services	Reproductive health services strive to provide positive experiences
			Gestational health services	Gestational health services strive to provide positive experiences
			Pregnancy/birth/postnatal/infant feeding services [choose as appropriate]	Infant feeding services strive to provide positive experiences
		Women's center/hospital	Perinatal care services/center/hospital	Your local perinatal care hospital is open 7 days a week
			Reproductive health services/center/hospital	Your local reproductive health services are open 7 days a week

			Gestational health services/ center/hospital	Your local gestational health services are open 7 days a week
Professional roles and titles	Matron		Executive Perinatal Lead	The Senior Perinatal Lead is in charge of the ward
	Sister		Senior Perinatal Lead	The Executive Perinatal Lead has written this policy
	Midwife		Lead perinatal practitioner	At the first appointment your lead perinatal practitioner will ask to take blood to check your blood group
	Gynecologist (Gynae translates to woman in Greek)		Reproductive Health Specialist	We can refer you to see the Reproductive Health Specialist
Parenting groups	Mum and baby classes		Antenatal/birth preparation/infant feeding classes[choose as appropriate]	You can meet other expectant parents at our birth preparation classes

			Parenting groups	You can meet other parents at our parenting group
			You and your baby class	You can meet other parents at the “You and your baby class”

The full spectrum of reproductive vocabulary you will develop across this program (from contraception to postpartum, from infertility to abortion to perimenopause) should be held within this same framework: language that is precise, responsive to the person in front of you, and free of assumptions about who is expected to be in the room.



Words You’ve Heard

Think of a word, phrase, or label connected to reproduction or healthcare that you have heard — or been given — that felt wrong. It might be a clinical term that felt cold, a common phrase that excluded someone’s experience, or a label that carried stigma. Where did you first encounter it? What was it trying to describe, and what did it miss? You do not need to share this publicly. Noticing it is the beginning of vocabulary literacy.

2.2.2 Harm Reduction as Principle

The term *harm reduction* is sometimes misunderstood, even among healthcare students. Before it becomes a principle of practice, it needs to be clearly defined — and separated from the misconceptions that surround it.

The authors of *They Will Never Forget How You Made Them Feel: Implementing Harm Reduction in the Perinatal Setting* explain that harm reduction is a paradigm that “deconstructs stigmatizing narratives” and “employs evidence-based interventions to reduce harms.” Critically, harm reduction “is not focused on whether people should or should not” engage in a particular behaviour; it “simply acknowledges that they do.” The goal is not to eliminate behaviour before offering care. The goal is to reduce harm, maintain the relationship, and keep the person connected to support.

A common misconception the authors address directly: harm reduction does not equate to condoning. It does not mean approving of every choice a client makes. It means recognizing that judgment, withdrawal of care,

and punitive responses do not reduce harm — they increase it. People who fear judgment from providers delay or avoid care entirely. Maintaining connection and trust is the intervention.

Harm reduction is also explicitly rooted in a human rights and reproductive justice framework. The same authors note that it “allows people to seek help without experiencing punitive responses” — a principle that maps directly onto the Reproductive Justice rights introduced in section 2.1. The right to parent in safe and healthy environments cannot be realized if seeking healthcare risks criminalization, surveillance, or the removal of children.

For doulas, harm reduction is not primarily about substance use, though it applies there. It is a broader orientation: non-judgmental, meeting people where they are, maintaining the relationship even when a client’s situation is complicated, or their choices differ from what you might advise. The optional reading this week from Birthing Advocacy Doula Trainings explores what this looks like in doula practice specifically.



Where is The Door?

Think about a time when you or someone you know almost didn’t seek help (medical, emotional, legal, or otherwise) because of fear of judgment, punishment, or being seen a certain way for needing it. What made the difference between going and not going? Now consider what happens if someone doesn’t go at all. Harm reduction starts with that question.

2.2.3 Activism vs. Advocacy

The words advocacy and activism are often used interchangeably, but they describe different things. Understanding the difference matters for anyone working in a field where both are present — and where confusion between the two can affect how you navigate your professional role.

Johnston and Gulliver (2022) describe advocacy as “the core activity of all social movements”: the act of persuading or arguing in support of a specific cause, policy, idea, or set of values. Advocates work through communication — presenting evidence, building coalitions, engaging decision-makers, seeking to shift opinion and policy through the channels available. Advocacy is ongoing, relational, and often slow.

Activism is a particular form that advocacy takes: “the use of direct and noticeable action to achieve a result, usually a political or social one” (Cambridge Dictionary, as cited in Johnston & Gulliver, 2022). Johnston and Gulliver describe two broad categories. Conventional activism uses legal and institutional channels — rallies, petitions, public submissions, voting, joining political parties. Radical activism operates outside those channels through blockades, occupations, or civil resistance. Both can be legitimate responses to situations where conventional channels have failed or are inaccessible, and what is considered conventional in one context may be considered radical in another.

Activism is a form of Advocacy



For a student entering a doula training program, the most useful distinction is not whether activism is appropriate but which role is called for in which context. Advocating for a specific client in a clinical setting — ensuring their preferences are heard, asking questions on their behalf, supporting informed decision-making — is a professional role that falls clearly within advocacy. Participating publicly in reproductive rights activism is a personal choice that may align with your professional values but operates in a different register. Both can coexist. Knowing which one you are doing helps you do it with intention.



Which Were You?

Think of a cause or issue you care about. Have you ever done anything about it? What form did that action take — did you show up somewhere, sign something, speak to someone in authority, post publicly, or stay quiet? Looking at what you actually did: was it closer to advocacy or activism, and was it conventional or something more direct? If you haven't done anything yet, which would feel more natural to you, and why?

Section 2.2.1 *Reproductive Vocabulary* is adapted from “[Gender-inclusive language in midwifery and perinatal services: A guide and argument for justice](#)” by Sally Pezaro, et al., is licensed under a [Creative Commons Attribution International License](#), except where otherwise noted.

Section 2.2.2 *Harm Reduction as Principle* is adapted from “[They Will Never Forget How You Made Them Feel: Implementing Harm Reduction in the Perinatal Setting](#)” by Joelle Puccio is licensed under a [Creative Commons Attribution International License](#), except where otherwise noted.

Section 2.2.3 *Activism vs. Advocacy* is partially adapted from “[7. Advocacy and activism](#)” from [Public Interest Communication](#) by Jane Johnston and Robyn Gulliver licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](#), except where otherwise noted,

2.3 Ancient Paths: Anthropology & Ancestral Ways of Being



Learning Outcomes

By the end of this section, you will be able to:

- Describe how birth and parenting practices shifted across major societal formations.
- Situate Canadian Indigenous birth traditions within a pre-colonial context.

2.3.1 Human Origins and Migration

Video: What Happened Before History? Human Origins

Video: “[What Happened Before History? Human Origins](#)” by [Kurzgesagt](#) [9:38] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

Homo Sapiens – Early Anatomically Modern Humans (AMH)

“Homo” means Same; “Sapiens” means capable of discerning.

The origin of our species is thought to have occurred in Africa sometime prior to 200 kya (kilo years ago), based on fossil and genetic evidence. The earliest Anatomically Modern Human (AMH) material is dated to 200–150 kya in East Africa (e.g. Omo Kibish and Herto in Ethiopia, Guomde in Kenya, and Ngaloba in Tanzania), 180 kya in central Africa (Katanda in the Democratic Republic of Congo), and 160 kya in South Africa (e.g. Klasies River Mouth). Later sites dated to 115 kya are found in Israel (Skhul and Jebel Qafzeh caves) and South Africa (Border Cave).

Modern humans likely began leaving Africa around 125,000 years ago during favourable climate periods, spreading through the Middle East and Asia, with some groups reaching Australia by about 50,000 years ago. Evidence suggests there may have been multiple migration waves out of Africa, and by 35,000 years ago, AMH had also spread across Western Europe, including the famous Cro-Magnon population in France.

By 15 kya, humans had spread throughout the world. They reached the New World, either by rafting along the shoreline from Asia during extremely low sea levels that characterized the last glacial maximum (~17 kya) or by

crossing the Bering Land Bridge at a later point in time. Dates in South America (~14 kya) are older than those in North America and represent the former mode of travel. Sea levels dropped by as much as 120 m during that time. Crossing Beringia involved travelling between two ice shields and was likely a difficult undertaking.

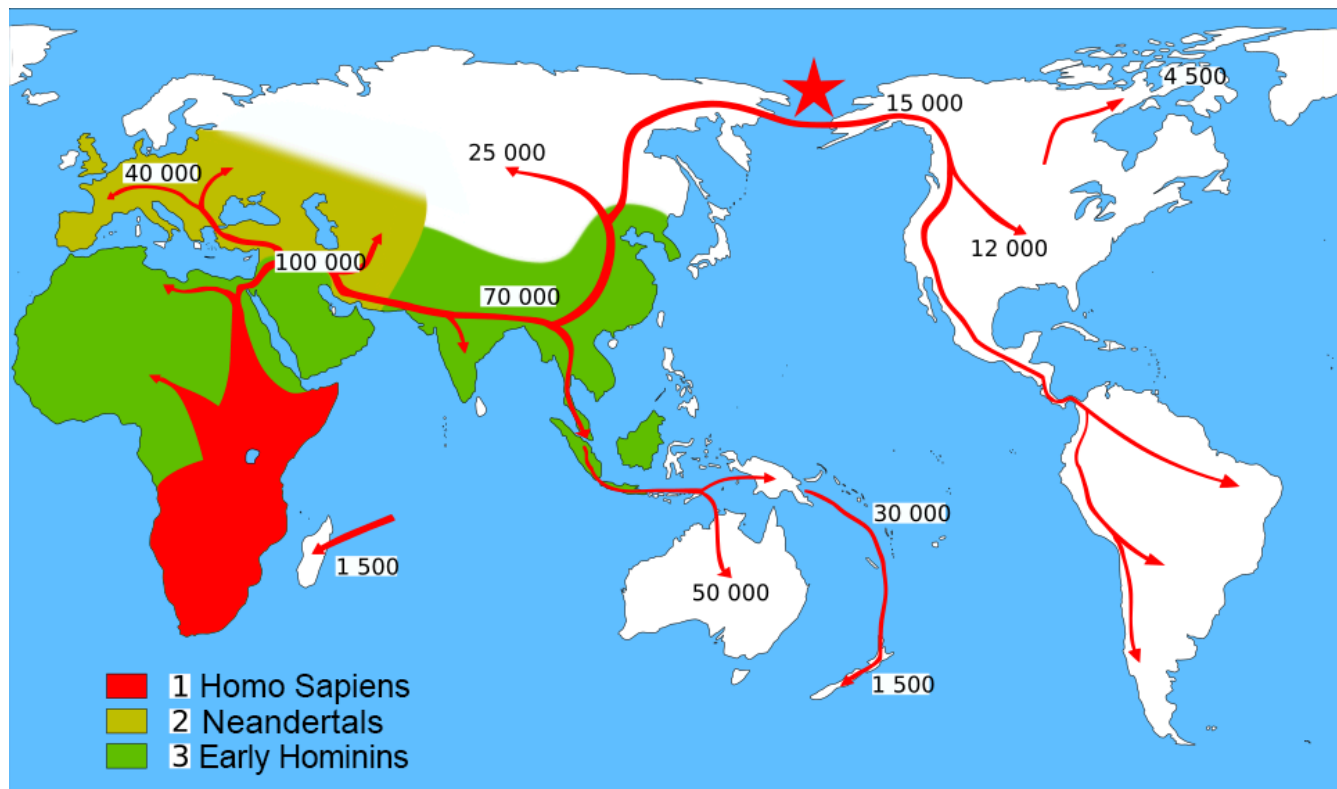


Figure 2.3.1 “[Spreading Homo-Sapiens](#)” by [Altaileopard](#), [Public Domain](#). Modifications: added labels.

AMH on Turtle Island

Following the spread of AMH across Europe, Asia, and Australia, humans also migrated into what many Indigenous peoples call Turtle Island (North America). Around 17,000 years ago, AMH crossed the Bering Land Bridge, which once connected Siberia and Alaska during the last Ice Age. Between 17,000 and 14,000 years ago (approximately 15,000 BC–12,000 BC), Paleo-Indians spread across North America and gradually moved southward through Central America.

2.3.2 The Five Societies

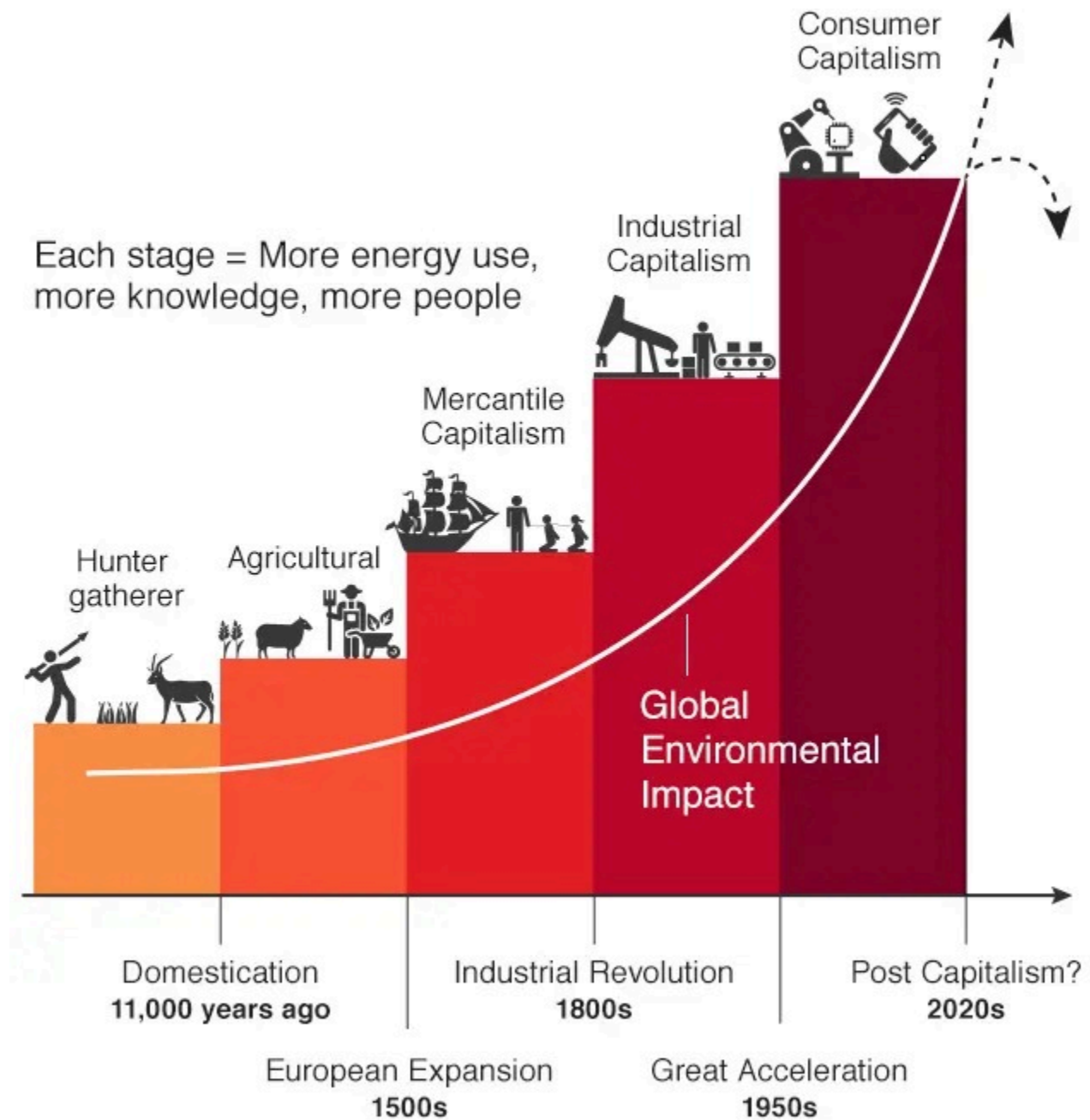
The Anthropocene

Officially, the current epoch is called the Holocene, which began 11,700 years ago after the last major ice age. However, the Anthropocene Epoch is an unofficial unit of geologic time, used to describe the most recent period in Earth’s history when human activity started to have a significant impact on the planet’s climate and ecosystems. The word Anthropocene is derived from the Greek words *anthropo*, for “man,” and *cene* for “new,” coined and made popular by biologist Eugene Storer and chemist Paul Crutzen in 2000.

The five societies that emerged and spread are: Hunter-Gatherer, Agricultural, Mercantile Capitalist, Industrial

Capitalist and Consumer Capitalist. Each of these started with a major, and usually traumatic, transition: Domestication, European Expansion and Colonization, the Industrial Revolution and the Great Acceleration that followed the end of the Second World War (1945), with each era exerting a greater influence on the natural environment.

Human societies and their increasing environmental impact



Source: Lewis & Maslin

BBC

Figure 2.3.2 Image by Lewis and Maslin, [BBC](#), [FDEd](#) ([CAN](#)).

Society: Hunter-Gatherer

Hunter-Gatherer societies existed until ~11,000 years before present (standardized to 1950). They were characterized by:

- Birth and parenting as community-centred rather than isolated experiences
- Interdependence, alloparenting, and collective caregiving
- Traditional knowledge is passed orally through generations
- Movement, squatting, and instinctive birth practices
- Connection to land, seasons, ceremony, and embodied knowledge



Canadian Context

You may hear of teachings and depictions of Inuit, Haudenosaunee, Anishinaabe, and other Indigenous peoples living in relationship with the land prior to colonization, including seasonal movement, communal caregiving, and oral knowledge-sharing traditions. We may gain further understanding through Indigenous cultural centres, land acknowledgements, or documentaries about traditional ways of living.

In the Hunter-Gatherer reproductive experience, caregiving and child-rearing were often collective responsibilities supported by extended kin and community.

Transition

Domestication refers to the process of making some species of wild animals and plants more suitable for human use. By domesticating plants and animals, some human societies began to change from hunter-gatherer groups, which relied on a changing environment for daily food, to farming, which asserted more control on the environment. This is sometimes called the Agricultural Revolution. Domestication began one of the most dramatic revolutions in how people ate, moved, and lived.

Society: Agricultural 11,000 years before present – 1500s

- Shift toward property, inheritance, patriarchy, and control over reproduction
- Gendered labour roles are becoming more rigid

- Population growth increasing expectations around fertility and motherhood
- Birth is increasingly tied to lineage, labour, and economic survival
- Early regulation of sexuality and family structure



Canadian Context

You may recall historical depictions of early settler farming communities across Ontario and the Prairies, including Mennonite or pioneer family structures where large families contributed to farm labour and household survival.

In the Agricultural reproductive experience, motherhood and fertility became strongly tied to labour, religion, inheritance, and survival.

Transition

European expansion and colonization involved European powers (like Spain, Portugal, Britain, France, the Netherlands, and Italy) exploring, occupying, and controlling lands across the Americas, Africa, Asia, and Oceania for wealth, trade, resources, and political power.

Society: Mercantile Capitalism 1500s-1800s

Mercantile capitalism emerged alongside European expansion and colonization (approximately the 15th to 18th centuries). Wealth was generated through long-distance trade, resource extraction, colonial expansion, and the labour of enslaved and exploited peoples. Governments and trading companies accumulated wealth by controlling land, resources, and trade routes. In brief:

- Colonization disrupted Indigenous birth knowledge, midwifery traditions, family structures, and systems of community care.
- The transatlantic slave trade forcibly displaced millions of Africans to the Americas, where enslaved people were treated as property and denied reproductive autonomy.
- Enslaved Black women were subjected to reproductive violence, including sexual exploitation and forced childbearing, while families were routinely separated through slavery.
- African birth knowledge, midwifery traditions, medicines, and cultural practices were disrupted, suppressed, or lost through enslavement, although many practices survived and continued to influence birth traditions across the African diaspora.
- European beliefs increasingly shaped healthcare, gender roles, and family life within colonized societies, while Indigenous and African knowledge systems were often devalued or prohibited.



Canadian Context

Although slavery in Canada was smaller in scale than in the Caribbean or the southern United States, both Indigenous and African people were enslaved in what is now Canada. Colonization disrupted Indigenous systems of pregnancy, birth, parenting, and community care through land dispossession, assimilation policies, and, later, the residential school system. The effects of these colonial systems continue to influence reproductive health inequities today.

In the Mercantile Capitalist reproductive experience, pregnancy, birth, and parenting became increasingly shaped by colonialism, slavery, racial hierarchy, and economic interests. At the same time, many Indigenous and Black communities preserved elements of their traditional birth knowledge through resilience, cultural continuity, and community care despite ongoing oppression.

Transition: The Industrial Revolution

The **Industrial Revolution** was the transition from economies based primarily on agriculture and manual labour to those driven by mechanized manufacturing, factories, and new technologies. Beginning in Britain in the late 1700s and spreading throughout Europe and North America during the 1800s, it fundamentally changed where people lived, worked, and raised families.

Industrialization led to rapid urbanization, wage labour, scientific advances, and the growth of modern institutions, including hospitals.

Society: Industrial Capitalism 1800s-1950s

Industrial capitalism is the economic system that developed during and after the Industrial Revolution. Wealth was increasingly generated through factories, mechanized production, wage labour, and technological innovation. In brief:

- Birth gradually shifted from homes into hospitals.
- Physicians increasingly replaced community midwives as birth attendants in many regions.
- Medical interventions became more common, and birth was increasingly viewed as a medical event rather than a community event.
- Families became more geographically separated from extended kin as people moved to cities for work.
- Time, productivity, and efficiency became central values that influenced work, healthcare, and

family life.



Canadian Context

Many Canadians have family histories connected to manufacturing, mining, railway construction, or factory work in growing industrial cities such as Hamilton, Windsor, or Montréal. During this period, hospitals expanded, and institutional maternity care became increasingly common.

In the Industrial Capitalist reproductive experience, birth became increasingly medicalized, healthcare became more institutional, and many families experienced reduced access to traditional community support systems.

Transition: The Great Acceleration

The **Great Acceleration** refers to the period following the end of the Second World War (around 1945), when population growth, industrial production, technology, fossil fuel consumption, globalization, and environmental change increased at an unprecedented rate. This period is closely associated with the proposed **Anthropocene**, in which human activity has become a dominant influence on Earth's ecosystems and climate.

Advances in medicine dramatically improved survival for many mothers and infants, while environmental pollution, chronic disease, climate change, and social inequalities also became increasingly important influences on health.

Society: Consumer Capitalism 1950s-present

Consumer capitalism describes the modern economic system in which economic growth depends heavily on mass production, advertising, consumer spending, and global markets. Pregnancy, birth, and parenting are increasingly commercialized, with families encouraged to purchase products, services, and experiences to optimize health and child development. In brief:

- Parenting information is widely available through the media, the internet, and social media.
- Fertility treatments and reproductive technologies continue to expand reproductive possibilities.
- Pregnancy, birth, and infancy are significant commercial markets.
- Families often experience greater social isolation despite increased digital connection.
- Awareness of informed consent, patient rights, reproductive justice, cultural safety, and trauma-

informed care continues to grow.



Canadian Context

Many families today experience pregnancy through prenatal apps, online communities, social media, baby registries, gender reveal celebrations, and a large marketplace of products and services. At the same time, Canadian maternity care increasingly emphasizes informed choice, evidence-informed practice, cultural humility, and reconciliation with Indigenous communities.

In the Consumer Capitalist reproductive experience, families have access to unprecedented medical knowledge and technology, but also navigate increasing commercialization, information overload, social comparison, and environmental challenges. Contemporary doulas play an important role in helping families critically evaluate information, advocate for informed decision-making, and rebuild connection, continuity of care, and community support within a complex healthcare system.

2.3.3 Indigenous Ways of Being

Before we begin this section, it is worth pausing to acknowledge the lands on which this OER was created and on which you are reading it. Those lands have not always been called Canada. They have been home to Indigenous peoples since time beyond memory, and the knowledge systems, birth practices, and ways of caring for families described in the following pages are not historical artifacts. They are living, continuing, and in many communities, actively being restored.

Two Eyes on the Path: Etuaptmumk and Indigenous Ways of Knowing

Before exploring what birth and family life looked like in Indigenous communities before colonization, it is essential to understand how Indigenous knowledge itself works and what it means to learn from it.

In Western educational settings, knowledge is most often treated as something that can be written down, measured, tested, and transferred from an expert to a learner. Many of us have been trained to see this as the only legitimate form of knowing. But this is one way of knowing, not the only one.

Mi'kmaw Elder Dr. Albert Marshall, from the community of Eskasoni in Unama'ki (Cape Breton, Nova Scotia), introduced the concept of Etuaptmumk (pronounced eh-DOO-apt-mum-k), or Two-Eyed Seeing. Elder Marshall describes it this way: learn to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing, and use both eyes together, for the benefit of all (Marshall, in Bartlett et al., 2012; Marshall, 2020).

For a doula working with clients from diverse backgrounds, Two-Eyed Seeing is not simply an academic concept. It is a practical orientation. It invites you to hold both a Western medical understanding of pregnancy

and birth and an Indigenous relational, land-based, and ceremonial understanding of the same experience, without collapsing one into the other or ranking one above the other (Integrative Science, Cape Breton University, n.d.).

Video: Reconciliation with the Earth

Elder Dr. Albert Marshall, Moose Clan of the Mi'kmaw Nation from Unama'ki, Cape Breton, speaks directly to the concepts of Etuaptmumk and what it means to hold multiple ways of knowing with integrity

Video: "[Albert Marshall – Reconciliation With the Earth](#)" by [Allison Bernard Memorial High School](#) [9:33] is licensed under the [Standard YouTube License](#). [Transcript](#).

Oral Tradition as Knowledge Transmission

In many Indigenous cultures, knowledge is carried not in books but in stories, songs, ceremonies, and in the relationships between people and the land. This is not an absence of literacy. It is a different and sophisticated system of knowledge transmission, one that has sustained communities, health practices, and ecological relationships for thousands of years.

For example, among the Anishinaabe, teachings about the body, pregnancy, childhood, and the seasons of life are held in the **Seven Grandfather Teachings** (nibwaakaawin, zaagi'idiwin, minaadendamowin, aakode'ewin, gwayakwaadiziwin, dabaadendiziwin, debwewin: wisdom, love, respect, bravery, honesty, humility, and truth) and are passed from Elder to learner through conversation, ceremony, and lived experience. Among the Haudenosaunee, the **Great Law of Peace** and the **Two Row Wampum** encode governance, relationships, and responsibilities in a form that has been renewed and retold for centuries.

When Inuit Elders teach about birth, nutrition, and the care of newborns, they do so through stories, through the careful demonstration of skills, and through language. Inuktitut and other Inuit languages contain specific vocabulary for stages of pregnancy, the condition of the land in different seasons, and the relational responsibilities a family takes on at the arrival of a new child. Losing language means losing that vocabulary and everything it contains.



Language and Knowing

Is there a word, phrase, or concept in your own family, cultural, or community background that does not have a direct translation into English? What gets lost when you try to explain it? How might that experience help you understand what is at stake when Indigenous languages are

threatened or erased? If this is your own community's language, what does it feel like to see it described here — and what would you add or correct?

Art, Land, and Ceremony as Ways of Understanding Life

Indigenous art is not decorative. Among the peoples of the Northwest Coast, a totem pole is a genealogical record, a legal document, a spiritual marker, and a teaching tool. Each figure carries a story about the family, the land, and the relationships between human and non-human beings. To read a totem pole correctly, you need language, lineage, and relationship. Among the Inuit, the inukshuk is a stone figure built in human form to communicate across great distances: this way, there is food here, someone was here, take care. These are not symbols. They are a literacy.

Ceremony marks the transitions of life in every Indigenous culture in Canada. Births, naming, puberty, marriage, and death: each is held by specific protocols, songs, medicines, and relationships. A baby born into a Haudenosaunee community is welcomed into a clan, a longhouse, and a set of responsibilities that will shape their entire life. A baby born in Inuit tradition may be given the name and spirit of an ancestor, carrying that person's knowledge and identity forward. These are not superstitions. They are complex relational systems for holding a new life accountable to, and protected by, a web of community, land, and living memory.



What Does Welcome Look Like?

Think of a birth or new arrival you know of, in any family or community context. What rituals, practices, or ceremonies surrounded it? What did those practices communicate about who the child was and who they belonged to? How does that compare to what you have read here?

Roots, Trunk, and Crown: Structural Determinants of Indigenous Health

To understand birth in pre-colonial Indigenous communities, it helps to understand the framework that Indigenous scholars use to describe health itself. Charlotte Loppie and Fred Wien (2022), writing for the National Collaborating Centre for Indigenous Health (NCCIH), use a **tree metaphor** to map the determinants of Indigenous peoples' health. The model has three parts.

The roots are the **distal determinants**: the deep structural conditions that create the environment in which everything else grows. For Indigenous peoples in Canada, these roots include colonization, land dispossession, racist policy, and the deliberate dismantling of governance, language, and ceremony. These are historical in origin but entirely present in their effects.

The trunk represents the **systemic determinants**: the healthcare system, the education system, child protection systems, and legal structures. These are shaped by the roots and transmit their effects into daily life.

The crown is where life is most visible: the immediate determinants that shape day-to-day experience, including income, housing, social connection, access to land and language, and the presence or absence of

community. It is also where resilience lives. The NCCIH (2013) notes that Indigenous peoples continue to strive for wellness based in Indigenous ways of knowing and being, even under extraordinary structural pressure.

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The Tree and Your Practice

Think about a client scenario where something seems like a personal choice (where to give birth, whether to ask for support, how to feed a baby) but might actually be shaped by structural conditions. How does the tree metaphor change how you would understand and support that client?

Community as the Seat of Wellness

One of the most important things the tree metaphor affirms is that community is not a backdrop to health. It is a determinant of health. Among First Nations, Inuit, and Metis peoples, the concept of wellness is relational and collective: you are well when your family is well, when your community is well, when the land is well. A new baby is not born into a nuclear family unit. A new baby is born into a web.

Understanding who is part of that web means understanding how pre-colonial Indigenous communities organized gender, relationships, and caregiving roles — which is where we turn next.

Many Nations, Many Genders: Two-Spirit People in Pre-Colonial Communities

Many Indigenous nations on Turtle Island have recognized more than two genders. People who embodied both masculine and feminine spirits, or who moved between gender roles in ways that did not fit a binary system, were not marginalized in many of these communities. They were often honoured.

The Term Two-Spirit

The term Two-Spirit is a pan-Indigenous umbrella term that was coined in 1990 at the Third Annual Intertribal Native American, First Nations, Gay and Lesbian Conference in Winnipeg, Manitoba. The concept was introduced by Elder Myra Laramee, with activist Albert McLeod helping to develop and articulate it. The English term Two-Spirit is a translation of the Anishinaabemowin (Ojibwe) phrase Niizh Manidoowag, meaning two spirits (The Canadian Encyclopedia, 2024).

Two-Spirit is not a universal or ancient term shared by all Indigenous nations. It is an umbrella concept adopted to facilitate solidarity and communication across nations, and to offer a distinctly Indigenous framework that differs from Western LGBTQ+ categories. Different nations have their own specific words,

traditions, and roles for gender-diverse people, and those are the authorities on what those identities mean within each community. Two-Spirit is not interchangeable with gay, lesbian, or transgender, though a Two-Spirit person may also identify with those terms in a Western context (Canadian Institutes of Health Research [CIHR], 2020).

Roles in Pre-Colonial Communities

In many nations where gender diversity was recognized and honoured, Two-Spirit people held specific, valued roles. According to the ABS Canada report (2019) on Two-Spirit identity and Indigenous knowledge, Two-Spirit people in pre-colonial communities often served as:

- healers and medicine persons
- name givers — a role deeply connected to birth and the arrival of new life
- spiritual gatekeepers and ceremony holders
- social mediators and counsellors
- carriers of oral traditions and songs
- caregivers for children

These roles were not marginal. They were integral to the functioning of the community, including to the practices surrounding birth, naming, and the raising of children. A Two-Spirit person might be the one who named a newborn, who carried the songs for birth ceremonies, or who held the spiritual and relational knowledge that connected a new life to its ancestors and its land.



Gender and Care

Think about the care environments you have encountered or plan to work in. What assumptions about gender are built into the intake forms, the language, the physical spaces? What would it look like to design a care environment that honoured a Two-Spirit person's full identity, including their cultural and spiritual role? If you are Two-Spirit or from a community with traditional gender diversity, what would you want a doula to understand about your experience that is not captured in Western frameworks?

Colonial Erasure

European colonization imposed a strict, Christian binary gender system on Indigenous peoples. As Elder Albert McLeod (quoted in the Canadian Museum of Human Rights) explains, colonialism was “not only claiming territory and extracting resources but also imposing strict, Christian gender roles” (Canadian Museum for Human Rights, 2024). The residential school system, the Indian Act, and missionary activity all actively suppressed Two-Spirit identities, relationships, and roles. Two-Spirit people were punished for who they were. The community roles they had held were stripped away.

This erasure was not incidental. It was structural. The same colonial forces that removed Indigenous midwives

from their communities also removed Two-Spirit knowledge keepers from theirs. The two losses are not separate stories.

Reclamation and Relevance for Doula Practice

The 1990 coining of the term Two-Spirit was itself an act of reclamation — a deliberate decision by Indigenous peoples to name their own identities in their own framework, separate from and in dialogue with, but not subsumed by, Western LGBTQ+ politics. The 35th anniversary of that term is in 2025. Across Canada, Two-Spirit organizations, artists, healers, and community leaders are actively restoring the roles, knowledge, and recognition that colonialism suppressed.

Birth as Ceremony: Pre-Colonial Birth and the Role of Indigenous Midwives

The National Centre for Indigenous Midwifery (NCIM) states plainly: “Indigenous communities across Canada have always had midwives.” Indigenous midwives were not simply birth attendants in the clinical sense. They were knowledge keepers, mentors, ceremony holders, and community leaders. They were responsible for far more than the mechanics of labour and delivery (Hayward & Bach, 2022; NCIM, 2019).

What follows draws on the NCIM's own description of Indigenous midwifery, which was written by Indigenous practitioners and advocates and is freely available at indigenousmidwifery.ca. It represents a community-held understanding, not an outside academic account.

The Midwife as Knowledge Keeper

According to the NCIM (2019), an Indigenous midwife is “a committed primary health care provider who has the skills to care for pregnant people, babies, and their families throughout pregnancy and postpartum.” But the role extends well beyond clinical care. Indigenous midwives are described as:

- knowledgeable about all aspects of sexual and reproductive health
- providers of education that helps keep family and community healthy
- promoters of breastfeeding, nutrition, and parenting skills
- keepers of ceremonies, leaders, mentors, and people who pass on important values about health to the next generation

Birth in pre-colonial Indigenous communities was understood as a profound and sacred event. The midwife held the protocols for that event: the songs to be sung, the medicines to be used, the ceremony that would welcome the child into its name and its relationships. This knowledge was transmitted through apprenticeship and oral tradition, not through a textbook. A young woman learning midwifery would learn by watching, by listening, by doing, over years, under the guidance of someone who carried that knowledge from the one who taught her.



What is a Birth keeper?

The NCIM describes the Indigenous midwife as a 'keeper of ceremonies.' What do you think that phrase means in practice? What is the difference between attending a birth and keeping a ceremony? As you learn about the doula role, where do you see overlap between those two ideas?

Birth, Language, and Land

Across Indigenous cultures in Canada, birth was embedded in language, land, and seasonal relationships. In many Inuit communities, a baby might be given an Inuit name that carried the soul and memory of an ancestor, ensuring continuity across generations. The act of naming was itself a ceremony, not a paperwork exercise at a government office. Among many First Nations peoples, the placenta was returned to the earth, not treated as medical waste. This is not a metaphor: it is a literal understanding that the child came from the land and that part of the child's connection to that land is honoured at birth by returning what the land offered.

These practices were not isolated customs. They were integrated into a complete system of understanding life: how it begins, what it needs, who is responsible for it, and how it ends. The knowledge of birth was inseparable from knowledge of plants and medicines, of the seasons, of the relationships between all living things. Midwifery was ecological knowledge.

Section 2.3.3 Indigenous Ways of Being is adapted from: "[Connection 5: A Primer on the Determinants of Indigenous Peoples' Health](#)" in *Wiidooktaadyang (We are Helping one Another)* by Cindy Peltier, licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](#), except where otherwise noted.

2.4 From Community to Institution: Colonization, Industrialization and the Medicalization of Birth



Learning Outcomes

By the end of this section, you should be able to:

- Trace the shift from community-based to hospital-based birth through the lens of colonialism and industrialization
- Explain how European expansion and industrial capitalism disrupted Indigenous, community-based, and women-centred birth practices across Turtle Island and beyond
- Describe the history and regulation of midwifery in Ontario, including the significance of the 1994 Midwifery Act
- Explain the emergence and scope of the contemporary doula role as an evidence-informed response to medicalization

2.4.1 Completing the Arc: From Agricultural Society to Consumer Capitalism

Domestication, the Agricultural Revolution, and the Gendering of Reproductive Labour

Around 11,000 years ago, the shift from foraging to farming changed not only what people ate and where they lived, but who controlled the conditions of life itself. Domestication — the selective cultivation of plants and the taming of animals for human use — produced something the Hunter-Gatherer world had not needed: surplus. Where there is surplus, there is inheritance. And where there is inheritance, there is a need to know whose children will receive it.

The classical sociological tradition has long identified this as the hinge point in the history of gender. As the SaskOER introduction to sociology text notes, drawing on Friedrich Engels, the same owner-worker relationship that structures the economy can be seen reproduced within the household: “women assum[e] the role of the proletariat” (SOC 111, n.d., Chapter 12). The agricultural family became an economic unit. Women’s reproductive capacity became tied to property: to produce children — particularly sons — who could inherit land, continue the lineage, and provide farm labour was a woman’s primary economic function. Fertility moved from a collective community responsibility, held in relationship and ceremony as described in section 2.3.3, to a private obligation enforced within the family and, increasingly, through law, religion, and custom.

The practical effects on reproductive life were immediate. Where Hunter-Gatherer mothers had spaced children roughly every four years (breastfeeding, mobility, and communal caregiving made this possible), agricultural women began giving birth every two years or less, because settled life made more frequent pregnancy sustainable and farm economies made more children useful. Birth was no longer embedded in community and ceremony. It was embedded in property, obligation, and the management of lineage (World Economic Forum, 2018).

In the Canadian context, this pattern arrived with European settlement. The farming communities of Ontario and the Prairies — including Mennonite and pioneer family structures — embodied it directly: large families, gendered divisions of domestic and field labour, and women's reproductive lives organized around household survival and inheritance (Belshaw, n.d., 2.3.2). The community-centred, Elder-supported, ceremony-held birth of the Hunter-Gatherer world did not survive the transition to the agricultural family intact. The conditions for its replacement by professional, institutional control had already been planted long before the first hospital was built.



The Body as Economic Asset

In agricultural societies, a woman's ability to bear children — especially sons — was often the measure of her value within a family and a community. Her body was productive property. Think about where echoes of this still appear: in the language used to describe fertility, in the grief that still attaches to pregnancy loss in ways it may not to other health experiences, in the pressure some families place on reproductive decisions. The agricultural era is not ancient history. Many of the assumptions it generated about whose body serves whose purposes are still circulating. Where do you notice them in the families and communities you know?

European expansion and colonization: the dismantling of Indigenous knowledge systems, and community-based birth

Colonization is the practice of domination. When European settlers arrived in what is now Canada, they did not simply claim land. They claimed culture. As Cusick (2022) states, “Not only is land stolen in the colonization process but the colonizers also steal much of the indigenous people's culture.” Canada, as we know it today, exists because of colonization.

This theft of culture was not incidental. It was systematic and legislative. The **Indian Act**, which became law in 1876, was designed, in the words of Canada's first Prime Minister, to “do away with the tribal system and assimilate the Indian people in all respects with the other inhabitants of the Dominion as speedily as they are fit to change” (John A. Macdonald, 1887, as cited in Cusick, 2022). The Act made practicing Indigenous culture illegal. Under its provisions:

- **Indigenous children were placed in residential schools**, which removed them from their families, communities, and Elders, severing the relationships through which knowledge is transmitted across generations
- **Indigenous people were renamed with European names**, severing their connection to family lineage and

ancestral identity

- **Speaking Indigenous languages was forbidden**, erasing the vocabulary through which ecological, ceremonial, and relational knowledge is held and passed on
- **Practicing Indigenous spirituality was outlawed**, including the use of traditional medicines and healing practices
- **Wearing traditional regalia was forbidden**
- **Potlatches and other cultural ceremonies were declared illegal**, a ban not lifted until 1951

The residential school system in particular attacked what could not be eliminated through a single law: the relationship between teacher and learner, Elder and child, ceremony and community. As the UBC Indigenous Foundations resource notes (quoted in Cusick, 2022), residential schools “systematically undermined Indigenous, First Nations, Métis and Inuit cultures across Canada and disrupted families for generations, severing the ties through which Indigenous culture is taught and sustained.” For the knowledge systems described in earlier sections of this chapter — the oral traditions, the medicines, the seasonal understandings of pregnancy and new life, the ceremonial roles connected to birth and the arrival of a new person into the community — these were precisely the ties that had held them.

What Colonization Did to Birth

The knowledge that was severed through these policies included the specific, practical, and ceremonial knowledge of how to bring life into the world. Indigenous midwives had carried that knowledge for generations. What happened to them followed the same colonial logic, applied now to the body.

Murdock and Durant (2024), writing in the open-access journal *Birth*, trace this history directly. European settlers did not simply ignore Indigenous birth knowledge. They actively discredited it. Settlers framed Indigenous peoples as uncivilized and their birthing practices as substandard in order to justify erasure, while omitting the history of Indigenous midwifery from the public and professional record altogether. Having delegitimized Indigenous birth knowledge, settler midwives then replaced traditional Indigenous birth attendants. This was not a neutral improvement in care. It was the establishment of a colonial healthcare system built on the removal of Indigenous authority over reproduction.

Across Canada in the late 19th and into the 20th century, Indigenous midwifery was criminalized. Indigenous midwives and women’s healing work were relegated to the domestic sphere through what Murdock and Durant (2024) describe as “legislated hierarchical medicalization, and assimilation attempts.” The legislation, the schools, the renaming, the prohibition of ceremony and language, and the criminalization of Indigenous birth knowledge were not separate events. They were parts of the same project, applied to different entry points into the same community life.

When midwifery was eventually regulated in Ontario in 1994, the framework required all midwives to train at formal post-secondary institutions. Murdock and Durant (2024) observe that these institutions “sustain colonial logics, systems, and practices,” prioritizing Western biomedical approaches while maintaining barriers to the growth of Indigenous midwifery. The system that replaced community-based birth did not simply arrive. It was installed, through law and policy, over the bodies of the midwives and families it displaced.

The births that had taken place in community, with knowledge passed through apprenticeship and oral tradition over generations and held in relationship with land, ceremony, and kin networks, became, over the course of little more than a century, the births that took place in hospitals. Attended by strangers. Managed by a profession whose licensing requirements specifically excluded the knowledge systems that had guided birth

on Turtle Island for thousands of years. In the next section, we look at exactly how that transition happened and who built it.

Industrial Capitalism: urbanization, the rise of the medical profession, and the hospital as the new institution of birth

In Canada, industrialization accelerated rapidly after Confederation. As the eCampusOntario open textbook *Canadian History: Post-Confederation* describes, large factories replaced smaller shops in towns and cities, and the opportunity to earn cash wages pulled young people off the land and into urban centres. By 1871, more than 80 percent of Hamilton, Ontario's workers laboured in workshops of ten or more employees — a transformation that had taken less than two decades. Two major cities, Montreal and Toronto, grew into industrial centres, while company towns appeared across the country from Britannia Beach, British Columbia, to the mining communities of Northern Ontario. Overcrowding was widespread. Health conditions were often poor (Belshaw, n.d.).

This movement off the land changed not only where people worked, but how they lived. Families who had grown up in rural communities surrounded by extended kin, seasonal rhythms, and local knowledge networks now rented rooms in dense urban tenements, far from those they had grown up with. The neighbours who had attended births, the Elders who had held knowledge of plants and medicines, the women who had supported labouring mothers through the night — these relationships did not make the move to the city. The wages that replaced them were barely sufficient: in Quebec's working-class districts, women were routinely paid half a man's wage for the same work, and maternity leave did not exist (Alloprof, n.d.). To give birth was to lose income. In that environment, pregnancy was not only a physical event. It was an economic crisis.

The hospital, which had previously been a place associated with poverty and contagion — a last resort for those with no home and no one to care for them — began to be reframed as the safe, modern, scientific alternative to birth at home. Working-class women in cities were among the first to give birth in hospitals, often in charity wards that served simultaneously as training grounds for medical students and obstetricians. The presence of physicians at birth was not initially driven by evidence that hospital birth was safer. It was driven by urbanization, by the dissolution of community support networks, and by the professionalization of medicine at precisely the moment when women in cities had no one else to call.



Then and Now

Think about the last time you or someone you know navigated a health system while also managing work, housing, or financial pressure. Now consider a pregnant person in Toronto in 1890, living in a rented room in a tenement, without family nearby, without maternity leave, and with no midwife in their building or on their street. What would they have needed? Who would have been there? This is the structural gap the hospital was built to fill — not because it offered better care, but because the industrial city had already taken away everything else.

Consumer Capitalism: Birth in the Marketplace

The end of the Second World War set off what historians call the Great Acceleration — a concentrated, deliberate expansion of Western capitalist economies unlike anything that had come before. Western Allied governments had met at Bretton Woods in New Hampshire in 1944 to plan the rebuilding of the liberal democratic and capitalist order. A central piece of that plan was the creation of a working class with disposable income. Economists had observed the benefits of mass consumption in the 1920s and, conversely, what the collapse of spending power had meant during the Depression. The engine that would drive Canada's post-war economy, as the *Canadian History: Post-Confederation* textbook describes, included house construction, suburban development, the sale of automobiles, and the furnishing of every home with appliances and televisions — goods that families could not afford in the 1930s and could not purchase in the 1940s due to wartime restrictions (Belshaw, n.d., Section 8.11).

The vehicle for all of this was the **baby boom**. Between 1946 and 1961, approximately 6.7 million children were born in Canada, which is about one-third of the population. Canada briefly held the highest birth rate in the industrialized world, peaking in 1959. The baby boom, as the textbook notes, provided a market for “family-oriented products like suburban homes and washing machines, bicycles, and station wagon cars” (Belshaw, n.d., Section 8.18 Summary). The baby boomers themselves became what the textbook calls “the first generation raised on television and nurtured by consumerism, a generation for which car-ownership and home-ownership was a given, if not a right” (Belshaw, n.d., Section 9.13). By the 1970s, more of Canada's housing stock had been built since 1945 than before, and the vast majority of that construction was suburban.

In this era, **healthcare became a consumer category**. The hospital had already claimed birth. Consumer capitalism transformed it: the managed, medicalized hospital birth was now the modern, safe, scientific experience that a responsible mother chose. The products surrounding pregnancy — prenatal care packages, formula, cribs, baby monitors, pediatricians — became part of the same consumer economy that sold washing machines and station wagons. Birth became a market as opposed to just a clinical event. This is the era in which our society operates now.



Pregnancy as a Consumer Experience

Walk through a pharmacy or open a parenting app. Count the number of products, services, tests, subscriptions, and upgrades you are invited to purchase before a baby is born: prenatal vitamins, genetic testing packages, 3D ultrasounds, birth photography, hospital room upgrades, doula services, Lamaze classes, lactation consultants, and baby registries. Now ask: which of these are available to everyone? Which require money, internet access, English fluency, and a permanent address? Consumer capitalism made birth into a marketplace. But not everyone shops with the same budget or gets the same service when they arrive.

2.4.2 The Rise of Medical Authority: Germ Theory, the Hospital, and the Managed Birth

The shift of birth from home to hospital did not happen overnight, and it was not driven by a single discovery.

It unfolded over roughly a century, built on genuine scientific breakthroughs that were then extended, distorted, and marketed well beyond what the evidence justified. Understanding that arc — what was real, what was amplified, and who bore the costs — is essential for any doula working in a contemporary healthcare system.

Germ Theory and Antiseptic Practice: The Discovery That Changed Everything

In the 1840s, a Hungarian physician named **Ignaz Semmelweis** was working at the Vienna General Hospital's First Obstetrical Clinic when he noticed something troubling. The mortality rate from **puerperal fever** (childbed fever) in the clinic staffed by physicians and medical students was dramatically higher than in the adjacent clinic staffed by midwives. The difference, he eventually realized, was that physicians were moving directly from performing autopsies to attending labouring women without washing their hands. When he introduced mandatory hand-washing in chlorinated lime solution, mortality in the physicians' ward fell from roughly ten per cent to below one per cent (Canadian Museum of Health Care, n.d.).

The medical establishment rejected him. His results were published, his data was sound, and he was still dismissed, eventually committed to an asylum. He died in 1865, at 47, of the same septicemia he had spent his career trying to prevent. As the Canadian Museum of Health Care (n.d.) notes, his theories became more widely accepted only in the 1860s when Louis Pasteur confirmed germ theory through laboratory experiments, and Joseph Lister demonstrated antiseptic technique in surgery. The irony that the midwives' ward had the better outcomes all along was not lost on everyone at the time. It simply was not enough to stop what was coming.

Germ theory was a genuine scientific revolution, and antiseptic and later aseptic practices did save lives in birth, particularly in preventing the infections that had killed women in hospital at catastrophic rates. This is not contested. What matters for this chapter is what came next: having claimed the language of science and safety, the medical profession used that authority to argue that all birth should be brought under medical supervision, in hospital, whether the evidence supported it or not.

The Shift from Home to Hospital: The Safety Argument and Its Uneven Distribution

The campaign to move birth into hospitals was not simply a story of scientific progress. It was a campaign, deliberately conducted. As the PMC open access essay "A Reclamation of Childbirth" describes through three generations of one American family's birth experiences, obstetricians in the late 19th and early 20th centuries "waged a highly successful, ideological campaign to eliminate midwifery, appropriate women's control of childbirth, and convince the public that childbirth was pathological and dangerous" (Behrmann, 2006). In an era when scientific and technological progress was understood as unambiguously good, this argument found a ready audience. The hospital was modern. Home birth was backwards.

But the safety argument was not evenly distributed. In North America, the first women to give birth in hospitals were predominantly poor, racialized, and immigrant women who had no alternative; **charity hospitals** served as training grounds for medical students precisely because these patients had no power to refuse. As the Introduction to Sociology (1st Canadian Edition) notes, medicalization refers to "the process by which previously normal aspects of life are redefined as deviant and needing medical attention to remedy," and the medicalization of birth had as much to do with professional authority and access to bodies for training as it did with outcomes (Steckley & Letts, n.d.). Middle-class and wealthy women continued to give birth at

home, attended by private physicians, well into the 1930s and 40s. By 1938, only about half of all births in North America had moved to hospital.

The Medicalization of Labour: Twilight Sleep, Forceps, Episiotomy, and Electronic Fetal Monitoring

Once birth was in the hospital, it became subject to a succession of interventions — some developed to address genuine problems, many introduced routinely before evidence existed to support them.

Twilight sleep arrived in North American hospitals around 1914, popularized first in Germany and then, as the PBS Call the Midwife blog (2022) describes, brought to the United States by women's magazines eager to offer their readers a pain-free birth. It was a combination of morphine and scopolamine, an amnesiac — women gave birth without any memory of the experience. The intervention required physician supervision, required hospital admission, and, because it left women unable to push, it also required **forceps** deliveries. As the PBS blog notes, Semmelweis had already demonstrated that doctors' hands spread infection; now those same hands were reaching into labouring women routinely, instrumentally, in a medically managed setting presented as the height of progress.

Episiotomy, a surgical incision to widen the vaginal opening, became routine in American and Canadian hospitals from the 1920s onward, advocated by influential obstetricians as preventative of tearing, despite no evidence supporting routine use. It would take until the 1990s and 2000s for clinical guidelines to formally recommend against it except in specific circumstances.

Electronic fetal monitoring (EFM), introduced commercially in the early 1970s, became standard practice in virtually every North American hospital within a decade, transforming how labour was assessed. EFM shifted authority from the labouring person's own reports of bodily sensation to objective data on a screen — and was later recommended only for high-risk pregnancies by the same professional bodies that had made it universal.

Each of these interventions followed the same pattern: introduced with enthusiasm, adopted universally, and not evaluated against evidence for decades. The hospital made this possible. Once birth was in a managed, institutional setting, it became a site of routine clinical procedure rather than a supported physiological process.

The Criminalization of “Untrained” Birth Attendants: How Midwifery Became Illegal Before It Became Regulated

The hospital's rise was not only a story of institutions growing, it was also a story of knowledge systems being deliberately suppressed. In England, the **Midwives Act of 1902** created the Central Midwives Board, which introduced licensing for midwives but also made it a penal offence for unlicensed women to practise midwifery habitually for gain. The regulatory framework presented as protecting women also served to eliminate the community-based, apprenticeship-trained birth attendants who had served working-class and rural families for generations. In the United States, there was no equivalent federal regulation — instead, individual states introduced laws that progressively restricted who could legally attend a birth, using the

language of public safety to displace the Granny Midwives and immigrant midwives who attended the majority of births in many communities.

The Smithsonian's National Museum of African American History and Culture describes how early African American midwives were central community figures even during enslavement. After Emancipation, **Granny Midwives** continued to serve Black and white women in the rural South, attending up to 75 percent of births in some communities through the 1940s. From the 1920s onward, state laws — framed around sanitation, training, and safety — systematically pushed them out. As the Black Midwifery Collective's history documents (n.d.), the language used to discredit them was the language of germ theory: they were unclean, untrained, and dangerous. The irony is complete: the same scientific framework that Semmelweis had used to demonstrate that physicians' unwashed hands were killing women was now deployed to remove the community birth attendants who had consistently had better outcomes.



The Evidence and the Authority

Think about a time you were given medical advice and simply followed it – not because you had read the evidence, but because someone with a title and a white coat told you this was the right thing to do. Now consider: Twilight sleep was standard practice for thirty years. Routine episiotomy was standard practice for over fifty years. Electronic fetal monitoring became universal within a decade of its introduction, with no randomized trials supporting that use. In each case, professional authority ran ahead of evidence, and the people on the receiving end of the intervention had limited power to question it.

As a doula, you will sit with clients navigating exactly this dynamic. Your role is not to dismiss medical expertise — germ theory is real, antisepsis saves lives, and some interventions are genuinely necessary. Your role is to support clients in asking the questions that the history of this section makes clear they have every right to ask: What is the evidence for this? Who decided this was routine? And who were the people it was first practiced on?

If you are someone whose community was on the receiving end of that history — whose grandmothers and great-grandmothers were the ones practiced on, or the ones pushed out — that question is not abstract. It is personal. And it is part of what you bring to this profession.

2.4.3 From Suppression to Regulation: The History of Midwifery

Sections 2.4.1 and 2.4.2 described how community-based birth knowledge was suppressed: through colonization, through the professionalization of medicine, and through laws that made unlicensed birth attendance a criminal act. But suppression is not the same as elimination. In two very different contexts — the rural American South and the United Kingdom — midwifery survived. And in Canada, a grassroots movement eventually forced the question of survival into law. This section traces that arc.

Long before hospitals existed in North America, birth was attended by women who carried knowledge passed from generation to generation. For Black communities in the United States, this tradition extended through the era of enslavement, when African midwifery practices were carried across the Middle Passage and maintained in enslaved communities. As the Smithsonian's National Museum of African American History and Culture (NMAAHC) describes, early African American midwives were important community figures even during enslavement — some were allowed to travel distances that other enslaved people were not, and some received payment for their work. After Emancipation, African American midwives, known as **Granny Midwives**, continued to serve Black and white women in the rural South, often as the only viable option where hospitals were inaccessible and few physicians were willing to attend births for the two or three dollars a midwife would accept (NMAAHC, n.d.). The documentary *All My Babies: A Midwife's Own Story* (1952), produced for the Georgia Department of Public Health and freely available on the Internet Archive, follows Mary Frances Hill Coley, a Black Granny Midwife in Albany, Georgia, who delivered more than 3,000 babies over a thirty-year career. The film was originally intended to train granny midwives in modern sanitation practices, and its central irony is visible in every frame: here is a woman of profound skill, experience, and community trust, being supervised by public health nurses who have far less experience catching babies than she does. *All My Babies* was selected for the United States National Film Registry in 2002 as a work of cultural, historical, and artistic significance. It runs 19 minutes and is essential viewing for this section.

Video: All My Babies

Video: "[All My Babies](#)" by [George C. Stoney](#), [Public Domain](#). [19:16]. [Transcript](#).

By the mid-20th century, Granny Midwives attended up to 75 percent of births in some Southern communities. From the 1920s onward, state laws framed around sanitation, training, and public safety systematically eliminated them. The same language of scientific hygiene that Semmelweis had used to implicate physician hand-washing was now turned against women whose birth outcomes were, in many cases, better than those of the hospitals they were being displaced by (NMAAHC, n.d.).

The Canadian parallel is direct. The colonial and racial forces that suppressed Black community midwifery in the American South are the same forces described in section 2.4.1 in relation to Indigenous midwifery in Canada: the Indian Act, residential schools, the imposition of settler medical authority, and the deliberate discrediting of community-held knowledge. In both contexts, the people who bore the costs of medicalization most acutely — the poor, the racialized, the rural — were precisely the people whose birth workers were most systematically removed. The through-line from Granny Midwives in Georgia to Indigenous midwifery evacuations in Northern Ontario is not a metaphor. It is the same project applied across different geographies.

While Black and Indigenous midwifery was being suppressed in North America, a different story was unfolding in England. Instead of eliminating community midwifery, the United Kingdom formalized it. The **Midwives Act of 1902** created the Central Midwives Board and made the title of “midwife” legally protected in England. As the PBS *Call the Midwife* companion blog describes, the Act required midwives to undergo supervised training and registration. Crucially, it professionalized midwifery, and midwives who could demonstrate competence were permitted to continue practicing. A licensed midwife attending an uncomplicated home birth was not a criminal. She was a regulated health professional.

The second pivotal moment came in 1948, with the establishment of the **National Health Service (NHS)**. Post-war public health reform brought midwives into the funded healthcare system as district practitioners, working in communities, attending home births, and providing continuity of care through pregnancy and the postpartum period. The period between 1948 and 1974 has been described as a “golden era” for the social model of midwifery care in the UK: the district midwife was a known figure in her community, not an anonymous hospital employee. It is this era that the BBC television series *Call the Midwife* depicts — community midwives in the East End of London in the late 1950s and 1960s, navigating poverty, overcrowding, and institutional medicine while holding the knowledge and relationships that hospital birth could not replace.

The UK story is not without its shadows. The 1902 Act enshrined midwives’ formal subordination to physicians — they could not use instruments, they were required to summon a doctor for a range of complications, and their scope was defined by exclusion. The route to professional survival was acceptance of a secondary status within the medical hierarchy. That trade-off shaped British midwifery for the rest of the century. But midwifery survived. Today, UK midwives attend the majority of births in the country, working as autonomous practitioners in hospitals, birth centres, and homes. The contrast with North America, where midwifery was either eliminated or driven underground, is stark.

The Ontario Midwifery Act (1994): What the Advocacy Required, What Regulation Achieved, and Who It Initially Left Out

In 1994, Canada held a distinction that no other developed nation shared: it had no system of regulated midwifery whatsoever. Midwifery had not been formalized, as in the UK. It had simply been absent from the regulated healthcare system — or rather, it had been present, practiced by unlicensed women who worked outside the law, serving clients who chose home birth and community-based care in the face of a system that offered no alternative model.

What changed this was advocacy. The movement to regulate midwifery in Ontario grew out of the natural birth and consumer health movements of the 1970s, feminist organizing around reproductive autonomy, and the direct experience of women who had given birth with midwives and wanted that option to exist legally. In 1986, the Ontario government announced it would establish midwifery as a regulated health profession. A 1987 task force was convened to plan implementation. The process took seven years. In January 1994, Ontario became the first province in Canada to implement a Midwifery Act.

Karen Kaufman, a registered Ontario midwife and McMaster University professor who lobbied the government

in the 1980s and was admitted to the first regulated midwifery class at McMaster in 1993, writes directly about what the profession looked like at the moment of regulation: midwives attending home births, providing **continuity of care**, on-call 24 hours a day, seven days a week, working under principles of **informed choice** and **choice of birthplace**. The 1994 Act codified those principles as the foundation of Ontario midwifery care. It made midwifery publicly funded. It established the College of Midwives of Ontario as the self-regulatory body. It created a university-based baccalaureate program. The number of practising midwives in Canada grew from 60 in 1994 to approximately 1,700 by 2019 (Roome, 2019).

But the 1994 Act also had structured limitations. The university-based degree requirement meant that Indigenous community midwifery — practiced through apprenticeship, oral tradition, and community knowledge, not institutional credentials — did not fit the new regulatory framework. The Act included an exemption allowing Aboriginal midwives to practice in Aboriginal communities without registration, but it provided no funding pathway, no recognized training route, and no institutional support for those practices. As Murdock and Durant (2024) document, the regulation that legalized settler midwifery simultaneously maintained the marginalization of Indigenous midwifery by requiring training from institutions that “sustain colonial logics, systems, and practices.”

Internationally trained midwives faced a parallel exclusion: credential recognition pathways were unclear or inaccessible, and the profession remained predominantly white. Rural and remote communities lacked access to midwifery services entirely. The regulation that marked an enormous advance for reproductive autonomy in Ontario also encoded whose birth knowledge would be valued, funded, and recognized — and whose would not.

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Who Holds the Knowledge?

Granny Midwives in the American South attended births for generations before they were declared untrained and unlicensed and removed. Indigenous midwives in Canada held birth knowledge for thousands of years before colonial law made their practice illegal. Ontario midwives practiced outside the healthcare system for decades before advocacy forced regulation.

In each case, the knowledge existed before the institution recognized it. In each case, someone decided whose knowledge counted.

Think about your own family or community. Who attended births? What happened to those people? If there was a break in that knowledge — if hospital birth replaced something else — what was lost, and is anyone in your community working to restore it? If you come from a community that maintained birth traditions outside the formal system, what did it cost to hold onto that knowledge?

As a doula, you are entering a profession that was itself unlicensed and marginalized until very recently, and that in many Canadian provinces and territories is still not regulated. Your scope of practice is defined by what you do not do clinically. But you hold something the regulated system has repeatedly failed to protect: continuous, relational, community-centred presence at birth. The history in this section is not only about the past. It is about the profession you are entering, and why it exists.

2.4.4 The Emergence of the Doula: Community Support Reinvented

The Word, the Role, and Its Limits

The word doula is borrowed from the Greek δούλα (doúla, “servant-woman”), itself from the Ancient Greek δούλη (doúlē, “female slave”)(National Health Law Program, 2024). It entered the contemporary birth world through the work of American medical anthropologist and breastfeeding advocate **Dana Louise Raphael** (1926–2016), who used it in her dissertation and gave it wider currency in her 1973 book *The Tender Gift: Breastfeeding* to identify a woman who served as a supportive companion to a pregnant person during childbirth. The term was subsequently adopted by Klaus and Kennell to describe the continuous labour support person in their clinical research, covered in the next section. Although the word is ancient, the professional role it names is not. The contemporary doula is a modern invention, not a recovered tradition.

As Montejo et al. (2021) define it plainly: a doula is “a trained companion who is not a healthcare professional, does not perform clinical tasks or give any medical advice, and supports another individual through her significant health-related experience.” The doula’s goal is to help the client feel safe and comfortable, complementing — not replacing — the role of the healthcare professionals who provide medical care. Although the word *doula* is historically gendered, the role today is practiced by people of any gender.

That boundary, ‘*what a doula does not do*’, is not a limitation on the role. It is its architecture. By remaining outside clinical scope, the doula can be present across every birth setting, alongside every care provider, in every model of care, without conflict of authority or overlap of responsibility. The reading for this week, Rebecca Dekker’s *Evidence on: Doulas* (Evidence Based Birth), explores what that presence produces in practice.



The One Who Stays

Think about a significant health experience — yours or someone you know. Who was the most helpful person in the room? In many cases, it was not the most qualified person. It was the person who stayed. Who kept asking how you were doing. Who translated what the doctor said into something that made sense. Who held the space when things got uncertain? That person was doing something close to doula work but likely without the title, training, or recognition. The doula role takes that function seriously enough to define it, train for it, and show up for it on purpose. What does it mean to make presence a profession?

The Guatemala Research and the Birth of a Profession

The discovery that changed how the world thinks about labour support was accidental. In 1973, Marshall Klaus and John Kennell were conducting a maternal-infant bonding study in Guatemala City, where hospital protocol required labouring women to wait together in a room before being moved individually into a single-occupancy birth room attended by medical staff. One of Klaus's female students, unintentionally violating that protocol, stayed in the waiting room with ten labouring women. While she was there, three women quickly gave birth before they could be moved to the labour rooms and without complication. Klaus and Kennell noticed. They began to ask why.

What followed was seven years of structured research into what that presence had done. The findings were published in the *New England Journal of Medicine* in 1980 by Sosa, Kennell, Klaus, Robertson, and Urrutia: women who had the continuous support of a companion during labour had significantly shorter labours, fewer perinatal complications, and better early mother-infant interaction than those who laboured without support. The difference was not technology nor clinical skill, but a present support person.

Klaus and Kennell named that person a doula. The role they were describing — a trained, non-clinical companion whose sole purpose was continuous presence and support during labour — was, formally, new. No professional training existed for it. No organization certified it. No hospital had a budget line for it. DONA International, the first organization to train and certify birth doulas, was not founded until 1992, nearly two decades after that waiting room in Guatemala (DONA International, n.d.).

DONA International's founding in 1992 marks the formalization of doula work as a profession, not its invention. Continuous, trusted presence at birth, by a known woman from the community, is documented across every culture and every period of history this chapter covers. The hospital created the conditions that made a profession of it necessary.

The section *Domestication, the Agricultural Revolution, and the Gendering of Reproductive Labour* is adapted from "[Introduction to Gender Sex and Sexuality](#)" in *Foundations in Sociology II* by Susan Robertson is licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

The section *European expansion and colonization: the dismantling of Indigenous knowledge systems, and community-based birth* is adapted from "[Impact of Colonization on Indigenous Peoples' Culture](#)" in *Post-Secondary Peer Support Training Curriculum* by Jenn Cusick, licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

The Section *Industrial Capitalism: urbanization, the rise of the medical profession, and the hospital as the new institution of birth* is adapted from “[3.5 Urbanization and Industry](#)”, and the section *Consumer Capitalism: Birth in the Marketplace* from “[8.11 Fashioning a Post-War Economy](#)” in *Canadian History: Post-Confederation* by John Douglas Belshaw, licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

The section *The Shift from Home to Hospital: The Safety Argument and Its Uneven Distribution* is partially adapted from “[Chapter 19. Health and Medicine](#)” in *Introduction to Sociology – 1st Canadian Edition* by William Little and Ron McGivern is licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

The section *The Ontario Midwifery Act (1994): What the Advocacy Required, What Regulation Achieved, and Who It Initially Left Out* is partially adapted from “[The Professional Framework for Midwifery Practice in Canada](#)” from *The Professional Framework for Midwifery Practice in Canada* by Kris Robinson, RM, BScN & MSc is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](#), except where otherwise noted.

2.5 The Fork in the Trail: Reproductive Healthcare Systems & Virtual Support for Clients



Learning Outcomes

By the end of this section, you should be able to:

- Compare publicly funded reproductive healthcare options across Ontario.
- Apply evidence-informed thinking to a doula's referral and support practices.
- Analyze how digital and virtual tools are reshaping access to reproductive care (CLO 7).

2.5.1 Ontario's Reproductive Healthcare System

Ontario's publicly funded reproductive healthcare system involves four categories of regulated providers, each with a distinct scope of practice, training background, and model of care. For doulas — who work alongside rather than within the clinical system — knowing who does what, and what that means for a specific client's autonomy, safety, and access, is the foundation of effective referral and support.

Midwifery

In Ontario, registered midwives are autonomous, regulated primary care providers for people with low-risk pregnancies. Midwifery care is publicly funded through OHIP and is built on three guiding principles: informed choice, continuity of care, and choice of birthplace. A client may give birth at home, in a hospital, or in a birth centre. The same midwife or small team follows that client through pregnancy, labour, birth, and the postpartum period, typically to six weeks after delivery (Association of Ontario Midwives, n.d.).

The midwifery model centres client autonomy: informed choice means the client makes decisions about their own care with evidence-based information from the midwife, not in response to a directive. Safety is understood relationally — continuity with a known provider means changes in clinical status are identified earlier, and transfer of care to an obstetrician when indicated is a built-in part of the model, not a failure of it. Access remains uneven across the province. Midwifery services are concentrated in urban areas, demand outpaces available providers in many regions, and wait lists in some communities are long.

Indigenous Midwifery

Indigenous midwifery in Ontario operates under a distinct legal and cultural framework. The Ontario Midwifery Act (1994) includes an exemption clause permitting Indigenous midwives to practice in Indigenous communities without holding registration from the College of Midwives of Ontario. In 2015, the Association of Ontario Midwives negotiated dedicated funding through the Ontario Ministry of Health for eight community-based Indigenous Midwifery Programs, creating funded pathways for care in First Nations, Métis, and Inuit communities across Ontario. As of 2025, over 70 Indigenous midwives are practicing in the province, either as registered midwives or under the exemption clause (Association of Ontario Midwives [AOM], 2019/20).

The Indigenous midwifery model is explicitly grounded in community, sovereignty, and cultural continuity. Autonomy in this context encompasses not only the individual client's right to informed choice but the community's right to reclaim birth on its own land, in its own language, and with its own ceremonies and protocols. Safety includes freedom from birth evacuation — the policy that has historically required Indigenous pregnant people to travel hundreds of kilometres from their communities and families to give birth in urban hospitals. The AOM notes that decades of evacuation have been “costly and devastating for families and communities” (AOM, 2019/20). Access remains constrained by geography, the pace of program development, and the ongoing shortage of Indigenous midwives in many communities.

Obstetrics

Obstetricians and gynecologists (OB/GYNs) are physicians who specialize in reproductive health, high-risk pregnancy, and surgical birth. In Ontario, OB/GYN care is funded through OHIP and is hospital-based. Obstetricians are the appropriate primary provider for pregnancies involving significant medical complexity like hypertension, diabetes, fetal anomalies, multiple gestation, placenta previa, and other conditions requiring specialist management and access to surgical and diagnostic resources. They may also co-manage care with midwives or family physicians for lower-risk clients.

Within the medical model, autonomy operates through informed consent: clients are told about recommended interventions and asked to agree. Safety in obstetric care is primarily understood as clinical risk management and complication prevention, which is appropriate for high-risk contexts, and not always suited to the physiological needs of low-risk birth. Section 2.4.2 examined the history of interventions introduced routinely into low-risk births before evidence existed to support their use. Access is concentrated in urban centres. In rural Ontario, obstetric coverage is limited, and family physicians frequently fill this gap.

Family Physicians

Family physicians (FPs) are primary care providers who, depending on their training and the community they serve, may provide the full range of prenatal, intrapartum, and postpartum care. A 2025 study of Ontario billing data found that rural FPs provide a significantly broader range of services than urban colleagues (including maternity and intrapartum care) because specialist density in rural and northern communities is lower and community health needs require generalist breadth (Savage et al., 2025). In many rural and northern Ontario communities, the family physician is the only local provider of maternity care.

For clients in these communities, the FP relationship may be the most consistent source of reproductive healthcare across a lifetime: contraception counselling, prenatal care, delivery, postpartum follow-up, and perimenopause, with the same provider. This continuity can support genuine autonomy and trust. Safety depends on the individual FP's training and experience with maternity care, which varies considerably across providers and settings. Access through FPs is highest in underserved areas — not because rural Ontarians have more options, but because the family physician is sometimes the only option available.

Comparing Models of Care in Ontario

The table below maps key qualities across the five provider types discussed in this section and in section 2.4.4. Use it as a reference when thinking through referral decisions and scope questions with clients.

Table 2.5.1: Provider Type Qualities

Scope / Quality	Registered Midwife	Indigenous Midwife	Obstetrician (OB/ GYN)	Family Physician	Doula
Publicly funded in Ontario	yes	yes	yes	yes	no
Attends home birth	yes	yes	no	context-dependent	yes
Attends hospital birth	yes	yes	yes	yes	yes
Attends birth centre birth	yes	yes	no	no	yes
Prescribes medication	yes	yes	yes	yes	no
Orders diagnostic tests	yes	yes	yes	yes	no
Continuity of care: pregnancy through portpartum	yes	yes	context-dependent	context-dependent	yes
Primary care provider during pregnancy	yes	yes	yes	yes	no
Practices autonomously	yes	yes	yes	yes	yes (non-clinical scope only)
Community-based or cultural care model	context-dependent	yes	no	context-dependent	context-dependent
Rural accessibility	context-dependent	context-dependent	no	yes	context-dependent

2.5.2 Virtual and Digital Support for Clients

Telehealth

COVID-19 accelerated the adoption of virtual care across Ontario and Canada at a pace health systems would not have achieved independently. As Health Canada’s (2021) report on equitable access to virtual care describes, telehealth expanded rapidly during the pandemic. In many cases, practitioners continued delivering care virtually after in-person care became safe to resume — raising concerns about whether virtual care had become a default rather than a tool chosen on the basis of the patient’s needs.

The report identifies the Ontario Telemedicine Network as a significant provincial resource, having expanded public access sites to virtual care equipment over more than a decade and collaborating with Indigenous healthcare networks to support fly-in communities with equipment and trained coordinators. At the federal level, significant broadband investment was announced to improve high-speed internet access for all Canadians by 2030 — an acknowledgment that without connectivity, virtual care is inaccessible regardless of the quality of the platform.

The **digital divide** is the central equity concern in virtual reproductive care. Telehealth requires a device, an internet connection, digital literacy, and sufficient privacy to speak openly about sensitive health matters. Clients who lack any one of these — whether due to income, age, language, disability, or geography — may find that virtual care designed to improve access in fact narrows it. The report’s guiding principle is direct: the

patient's specific context and needs must determine the modality of care delivery. Virtual care should be an option. It should not be the only option.



Additional Reading

For more information on Telehealth in Canada, read the article [Telehealth as a Means of Enabling Health Equity](#) in the Yearbook of Medical Informatics.

Online Birth Communities

Before the COVID-19 pandemic, La Leche League International (LLL) maintained a robust network of in-person community meetings facilitated by trained volunteer Leaders. They held gatherings held in homes, libraries, and community centres where parents could share breastfeeding experiences, ask questions, and receive support in a continuous, relational context over months or years. The pandemic ended those meetings. Many groups never restarted (La Leche League International, n.d.).

LLL now maintains a public Facebook group, “The LLLI Breastfeeding Support group”, as a primary community resource. When a parent posts a question, an LLLI Leader may respond, and the broader community may comment as well. The group’s stated purpose, access, and limitations are described directly in its own About section:

“

Welcome to La Leche League International's Breastfeeding Support group. The purpose of this group is to provide support to individual parents in breastfeeding their own babies. No information provided in this group is a substitute for medical advice. If you are worried about the health or care of your children or you, please contact your medical provider. For urgent or time-sensitive questions, please contact an LLL Leader in your area. We can't guarantee an immediate response in the group.

— La Leche League International, n.d.



From the Living Room to the Feed

Before the pandemic, a parent with a breastfeeding question might have driven to a La Leche League meeting on a Tuesday evening and sat in someone's living room with a Leader and a small group of other parents — people they might see again next month, and the month after that. That model is largely gone. The Facebook group has hundreds of thousands of members and is available at 3 a.m.

Consider:

- Who benefits most from the shift to a virtual group? Think about geography, time of day, and mobility.
- Who might find the group harder to use, or less useful than an in-person meeting would have been?
- A post about nipple pain or low supply may receive twelve responses in different directions. What would a sleep-deprived parent do with that at 3 a.m.? What would you do with it?
- LLLI states directly: “We can’t guarantee an immediate response in the group.” What does that mean for how you would reference this resource to a client with an urgent concern?
- The in-person Leader knew a family over time and across children, complications, and returning challenges. What does continuity of relationship provide that a comment thread cannot?
- As a doula, would you recommend this group to a client? Under what circumstances, and with what caveats?

These questions do not have single right answers. They are the questions that come up every time you refer a client to a digital resource, which will be often.

For doulas supporting breastfeeding clients, the LLLI Facebook group is a resource with genuine value and genuine limits. Knowing both is part of the referral conversation. LLLI’s own recommendation is to use the group for community connection and general information, and to contact a local Leader directly for anything time-sensitive or clinical.

2.5.3 Accessibility Criteria

Assessing whether a reproductive healthcare service is genuinely accessible to a specific client requires more than confirming that the service exists. The WHO’s AAAQ Framework — developed for international health systems and widely applied in Canadian health policy — provides a structured lens for this kind of assessment. The framework identifies four dimensions of access:

Availability. Are sufficient services, facilities, and providers present in the area to meet demand? In Ontario, availability varies significantly between urban and rural settings, between publicly funded and out-of-pocket services, and between mainstream and Indigenous-specific programs.

Accessibility. Can the client reach the service physically and economically? This includes geographic distance and transportation, cost and OHIP coverage, physical access to facilities for clients with disabilities, and information accessibility — whether a person can find out what is available and navigate to it.

Acceptability. Is the service culturally, linguistically, and ethically appropriate for this client? A service that is available and reachable but experienced as dismissive, discriminatory, or culturally unsafe is not genuinely accessible. Acceptability encompasses language of service delivery, the cultural competencies of providers, and freedom from judgment.

Quality. Is the service evidence-based and clinically appropriate? Access to poor-quality care is not the same as access to care (Physio-pedia, n.d.).

Much of the applied work with this framework — including the Landscape Scan evaluation and broader accessibility analysis — will be developed further in HLTH 3080. The in-class activity for this section uses the DREDF checklist as the practical tool for applying the AAAQ dimensions to a real or hypothetical reproductive healthcare setting.



DREDF Checklist: Providing Accessible Sexual and Reproductive Healthcare

A practical [checklist for evaluating the accessibility of sexual and reproductive health practices](#) across dimensions, including physical access, communication access, language, hours, equipment, and accommodation. Use as the scaffold for the in-class accessibility assessment activity.

2.6 Many Trails, One Map: Feminism, Reproductive Justice & Intersectionality



Learning Outcomes

By the end of this section, you should be able to:

- Trace the three waves of feminism and their relationship to reproductive rights
- Apply the Reproductive Justice framework to current and historical scenarios
- Introduce intersectionality and social determinants of health as analytical tools.

2.6.1 Three Waves of Feminism

Scholars think of the feminist movement in three historical “waves,” each expanding available knowledge when people previously excluded as knowledge producers demanded full inclusion. The first wave, in the late 19th and early 20th centuries, was marked by movement activism to end slavery and secure voting rights for women. The second wave, in the mid-20th century, was also tied to the struggle for Black Freedom, and as in the first wave, it was sometimes derailed by false choices between the liberation of women and civil rights for all people. The third wave, from the 1990s to the present day, takes issue with exclusionary feminisms and builds a more intersectional body of theory and more coalitional activism that centers the standpoints of people who are disabled, people who identify as LGBTQIA+, and People of the Global Majority.

First Wave Feminism

The “first wave” of the feminist movement began in the mid-19th century and lasted until the passage of the 19th Amendment in 1920, which gave women the right to vote (figure 2.6.1). White middle-class feminists like Elizabeth Cady Stanton and Susan B. Anthony primarily focused on women’s suffrage (the right to vote), striking down coverture laws (that give a husband ownership of his wife’s property), and gaining access to education and employment. These goals are famously enshrined in the Seneca Falls Declaration of Sentiments from the first women’s rights convention in the United States in 1848.



Figure 2.6.1. "Votes for Women Sellers 1908" by [LSE Library](#), [Public Domain](#). The "first wave" of the feminist movement began in the mid-19th century and lasted until the passage of the 19th Amendment in 1920, which gave women the right to vote. How would conflict theorists describe the conditions that inspired this social movement?

White middle-class abolitionists often made analogies between slavery and marriage. As abolitionist Antoinette Brown wrote in 1853, "The wife owes service and labor to her husband as much and as absolutely as the slave does to his master" (Brown, cited in Cott, 2000, p. 64). This analogy between marriage and slavery confused the unique experience of the racialized oppression of slavery that Black women faced with a very different type of oppression faced by white women who were legally considered to be subject to their husbands' authority. While white women abolitionists and feminists of the time made important contributions to anti-slavery campaigns, they often failed to understand the uniqueness and severity of slave women's lives and the complex system of chattel slavery (Davis, 1983).



Figure 2.6.2. “[Ida B Wells](#)” by Mary Garrity, restoration by [Adam Cuerden](#), [Public Domain](#). Ida B. Wells-Barnett. Wells was a journalist and researcher who meticulously documented the violent oppression experienced by Black people. How might her standpoint as a Black woman have helped her understand and communicate those experiences differently than a white man?

Despite their marginalization, Black women were passionate and powerful leaders. Ida B. Wells (figure 2.6.2) (she/her) (1683–1931), who participated in the movement for women’s suffrage, was a founding member of the National Association of the Advancement of Colored People (NAACP). She was also a journalist and the author of numerous pamphlets and articles exposing the violent lynching of thousands of African Americans. Wells argued that lynching was a systematic attempt to maintain racial inequality (Wells 1979). Additionally, thousands of Black women were members of the National Association of Colored Women’s Clubs, which was pro-suffrage, but did not receive recognition from the predominantly middle-class, white National American Woman Suffrage Association (NAWSA).

Second-Wave Feminism

The emergence of feminist sociology can be traced to this period, and like the larger second-wave feminist movement, was influenced and facilitated by the activist tools provided by the civil rights movement. The actions described in the opening of this chapter are an example of this influence. When the women of the American Sociological Society held a separate caucus, they produced a statement with demands for equality and presented it to the next business meeting, where they applied lessons learned from the movement for civil rights. Feminist sociologists then turned their attention to researching, documenting, and theorizing about the specific lived experiences of women and girls in all the social settings where they were ignored by masculine-dominated social science.

Social movements change according to movement gains or losses, depending on their political and social contexts. Following women’s suffrage in 1920, feminist activists channelled their energy into institutionalized legal and political channels to effect changes in labour laws and to attack discrimination against women in the workplace.

Despite the conservative political climate of the 1940s and 1950s, civil rights organizers began to challenge both the de jure segregation of Jim Crow laws and the de facto segregation experienced by African Americans on a daily basis. The landmark *Brown v. Board of Education* ruling of 1954, which made “separate but equal” educational facilities illegal, provided an essential legal basis for activism against the institutionalized racism of Jim Crow laws.

The Black Freedom Movement, of which the Civil Rights Movement was a part, fundamentally changed U.S. society and inspired the second-wave feminist movement and the radical political movements of the New Left (e.g., gay



Figure 2.6.3. “[Ella Baker](#)” by George Ballis, [Smithsonian Terms of Use](#). Civil rights leader Ella Baker believed in the power of young people to make a more just society.

liberationism, black nationalism, socialist and anarchist activism, the environmentalist movement) in the late 1960s. The Student Non-Violent Coordinating Committee (SNCC), initiated by Ella Baker (Figure 2.6.3), was an important catalyst.

Not only did many women involved in the civil rights movement become activists in the second-wave feminist movement, but they also used tactics from the civil rights movement, including marches, caucusing, and non-violent direct action. Feminists in the civil rights movement challenged gender norms that excluded women from politics and restricted them to the domestic sphere (Du Bois & Dumenil, 2005).

Video: Students in the Civil Rights Movement

To learn more about the work of student organizers in the civil rights era, watch this video.

Video: "[Student Civil Rights Activism: Crash Course Black American History #37](#)" by [CrashCourse](#) [13:26] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

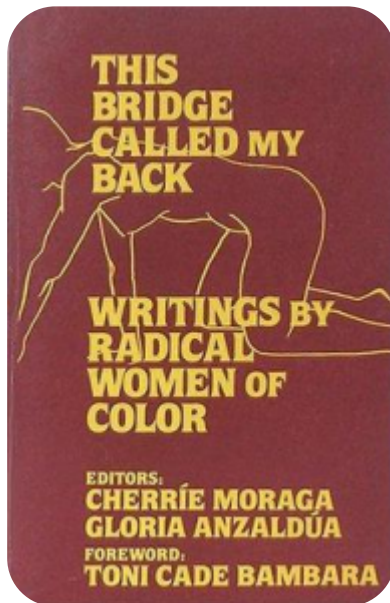


Figure 2.6.4. "[This Bridge Called My Back: Writings by Radical Women of Color](#)" cover design Maria von Brincken, [FDEd \(CAN\)](#). Why is it important to pay attention to the perspectives of people marginalized by systems of power?

Although the second-wave feminist movement challenged gendered inequalities and brought women's issues to the forefront of national politics in the late 1960s and 1970s, the movement also reproduced race and sex inequalities. Becky Thompson argues that by the mid and late 1960s, Latina women, African American women, and Asian American women were developing multiracial feminist organizations. These racially specific groups would become important and challenge racism and homophobia within feminist movements (Thompson 2002).

In the late 20th century, radical women of the global majority, including some who also identified as LGBTQIA+, wrote powerfully about "*the complex confluence of identities-race, class, gender, and sexuality-systemic to women of color oppression and liberation*" (Moraga et al., 1981). These scholars, poets, and activists had a profound impact on gender theories. Their work, *including This Bridge Called My Back: Writings by Radical Women of Color* (figure 2.6.4), drew from personal experiences of oppression and marginalization in feminist spaces, where they were marginalized as women of colour, and in masculine-dominated racial justice spaces, where they were marginalized as women. Those who also identified as LGBTQIA+ and experienced oppression in both feminist and racial justice spaces asserted that their specific knowledge and experience as women of the global majority were critical to the struggle against oppression.

In Black Feminist Thought, Patricia Hill Collins describes the specific impacts of racism and sexism on black women. She describes her struggle "to replace the external definitions of my life forwarded by

dominant groups with my own self-defined viewpoint” (Hill Collins, 2022). Hill Collins argued that liberatory theory must be centred on the lived experience of those who are marginalized by dominant systems of power. In other words, the necessary knowledge to dismantle systems of power sits with those who are marginalized by those systems.

Third Wave Feminism

Freedom Inc. is an example of coalitional politics.

Video: Our Story: Building Black & Hmoob Movement

Video: “[Our Story: Building Black & Hmoob Movement](#)” by [Freedom, Inc.](#) [4:26] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

Can you think of other coalitions that organize across differences to address shared experiences of oppression?

Third-wave feminism is influenced by earlier waves but has expanded to include a multitude of standpoint-specific feminisms developed by Black women, transnational women, women of the Global South, disabled women, and people who are LGBTQIA+. A defining characteristic of the third wave is coalitional politics. Coalitional politics refers to political association with those who have differing identities around shared experiences of oppression (Taylor 2017). This is in contrast to identity politics, which refers to organizing politically around the experiences and needs of people who share a particular identity. Identity politics is a coin termed in the 1980s and was commonly derided as “the oppression Olympics.” Coalitional politics avoids this by addressing shared interest from identity-specific perspectives. To see coalitional politics in action, watch the video about Freedom Inc. in Madison, Wisconsin, which describes itself as “a Black and Southeast Asian non-profit organization that works with low- to no-income communities of color” (Freedom Inc. 2017).

Consider how, during the early HIV/AIDS Crisis, another example of coalitional politics emerged in solidarity with gay men, who were the first group to be disproportionately impacted by the deadly virus. This movement inspired a significant social shift in social norms about sex and gender.

However, since this movement did not specifically address racial discrimination or the economic conditions of poor people, this social progress unevenly benefited middle-class white people at the expense and continued marginalization of people of the global majority, disabled, trans, single or non-monogamous, or low-income. In response, more radical subsets of activists began to explicitly reclaim the derogatory term “queer” to describe their activism and set themselves apart from more mainstream organizing.

People outside the U.S. have also broadened the feminist frameworks for analysis and action. In a world

characterized by global capitalism, transnational immigration, and a history of settler-colonialism that still has effects today, transnational feminism is a body of theory and activism that highlights the connections between sexism, racism, classism, and imperialism.

Transnational feminist theorist Chandra Talpade Mohanty (she/her) (Figure 2.6.5) critiques feminist activism and theory that prioritizes a white, North American standpoint and ignores the needs and political situations of women in the Global South (Mohanty et. al. 1991). Transnational feminists argue that Western feminist projects to “save” women in another region do not liberate these women, since this approach constructs the women as passive victims devoid of agency to save themselves. These “saving” projects are especially problematic when they are accompanied by Western military intervention.



Figure 2.6.5. “[Dr. Chandra Talpade Mohanty](#)” [Public Domain](#). Chandra Talpade Mohanty argues that U.S. feminism can harm women in the rest of the world if the standpoint of transnational women is excluded.

Third-wave feminism is a vibrant mix of differing activist and theoretical traditions that grapples with multiple points of view and refuses to be pinned down as representing just one group of people or one perspective. Similar to the way queer activists and theorists have insisted that “queer” is and should be open-ended and never set to mean one thing, third-wave feminism’s complexity, nuance, and adaptability become assets in a world marked by rapidly shifting political situations. The third wave’s insistence on coalitional politics as an alternative to identity-based politics is a crucial project in a world that is marked by multiple overlapping inequalities. Now that you’ve surveyed feminist movements and

feminist theory from the first wave to the third wave (Figure 2.6.6), let's take a deeper dive into some contemporary gender theories.

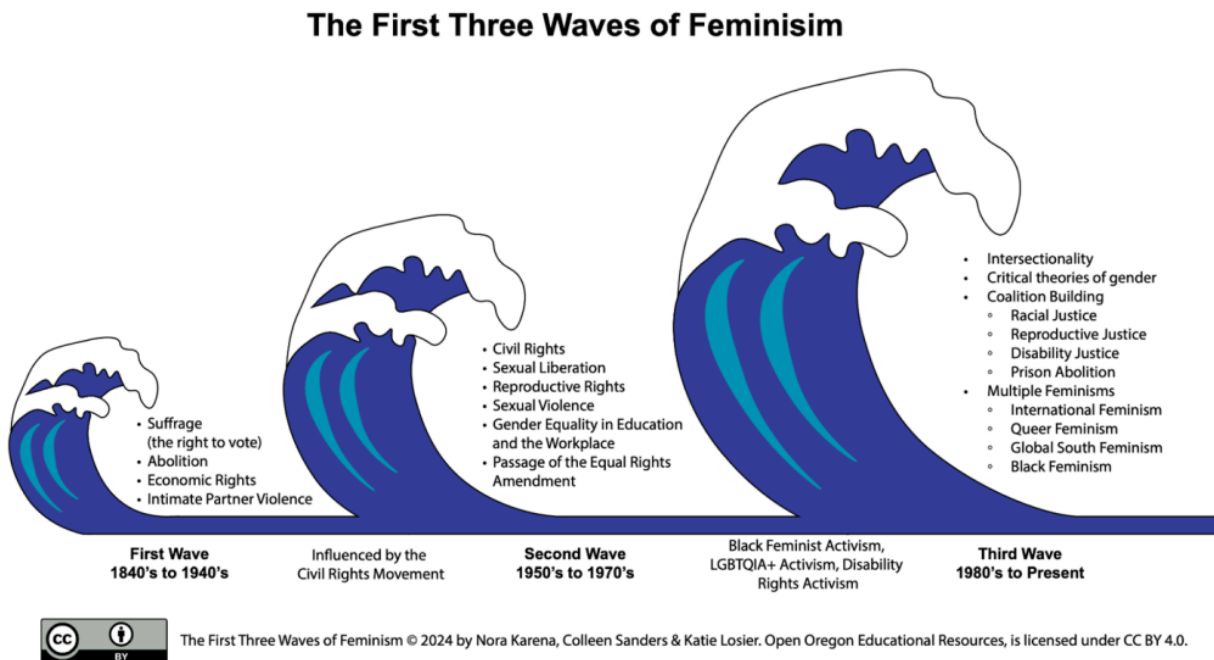


Figure 2.6.6. "Three Waves of Feminism" by [Nora Karena, Heidi Esbensen, & Dana Pertermann](#), CC BY 4.0. This image summarizes the major themes of the three waves of feminism. Notice that feminism grows more dynamic and inclusive as it expands to accommodate multiple standpoints. Image description available. Image description.

Image Description

Infographic titled "The First Three Waves of Feminism," using three increasingly large waves arranged from left to right along a timeline.

The first wave, dated from the 1840s to the 1940s, focused on suffrage, abolition, economic rights, and intimate partner violence. The second wave, dated from the 1950s to the 1970s and influenced by the Civil Rights Movement, addressed civil rights, sexual liberation, reproductive rights, sexual violence, gender equality in education and the workplace, and passage of the Equal Rights Amendment.

The third wave, dated from the 1980s to the present, was influenced by Black feminist activism, LGBTQIA+ activism, and disability-rights activism. Its themes include intersectionality, critical theories of gender, and coalition-building around racial justice, reproductive justice, disability justice, and prison abolition. It also encompasses multiple feminisms, including international, queer, Global South, and Black feminism.

Video: Harriet Martineau & Gender Conflict Theory

Video: "[Harriet Martineau & Gender Conflict Theory: Crash Course Sociology #8](#)" by [CrashCourse](#) [9:01] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

2.6.2 Reproductive Justice Revisited

Reproductive Justice: The Three Rights in Depth

You were introduced to the Reproductive Justice framework and its founding in section 2.1.2. What follows is a deeper examination of each of the three rights — not only as legal claims but as analytical tools for understanding what reproductive freedom actually requires in practice. As SisterSong (n.d.) defines it: Reproductive Justice is “the human right to maintain personal bodily autonomy, have children, not have children, and parent the children we have in safe and sustainable communities.”

The right to have children. This right is violated when people are coerced, deceived, or forced into preventing or terminating pregnancies. The history of forced sterilization of Indigenous, Black, immigrant, disabled, and incarcerated women in North America is extensive and documented: in Canada, coerced sterilizations of Indigenous women have been reported as recently as 2019. This right also requires the material conditions that make pregnancy and parenting possible — access to prenatal care, economic stability, and freedom from incarceration, deportation, and child removal.

The right to not have children. This right is most commonly associated with abortion access, and abortion access is critical. But as SisterSong (n.d.) states directly: “Even when abortion is legal, many women of color cannot afford it, or cannot travel hundreds of miles to the nearest clinic. There is no choice where there is no access.” The right to not have children also encompasses contraception, comprehensive sex education, and STI prevention — and freedom from the stigma that makes any of these harder to seek.

The right to parent in safety. This is the right that most clearly extends reproductive justice beyond birth. SisterSong identifies the conditions this right requires: domestic violence assistance, adequate wages to support families, safe homes, access to healthcare, and so much more. For doulas, this right is particularly significant: it reframes the postpartum period as reproductive territory. A client’s safety as a parent — from child welfare surveillance, economic precarity, housing instability, and intimate partner violence — is a reproductive justice issue. It is also a doula’s concern, even when clinical care has ended.



After the Birth

Think about what a new parent needs in the weeks and months after a baby is born. Not clinically — not episiotomies and latch assessment — but structurally. What does a family need to parent safely?

Consider: stable housing that they will not be evicted from. Income that does not require returning to work at six weeks. A neighbourhood that is not toxic, overcrowded, or policed in ways that make it unsafe. Community and family nearby who can help. Freedom from the fear that a welfare check by a child services worker could become a removal. Freedom from the fear that someone in the family could be deported. Access to food that is affordable and culturally appropriate. A healthcare system they trust and that treats them with dignity.

Now ask: which families in your community have most of these? Which families have few or none? What does that mean for what reproductive care actually requires — and for what a doula's support can and cannot address?

The third right extends reproductive justice into the postpartum period and beyond, encompassing the structural conditions that determine whether parenting is sustainable, safe, and supported. For doulas, this extension of scope is both an ethical orientation and a practical one.

2.6.3 Intersectionality and the Social Determinants of Health

The Concept

The term **intersectionality** was coined by legal scholar and critical race theorist **Kimberlé Crenshaw** in her 1989 article “Demarginalizing the Intersection of Race and Sex.” Crenshaw showed that when legal systems and social movements treated race and gender as separate and mutually exclusive categories, the experiences of Black women – who faced discrimination on both axes simultaneously – were effectively made invisible. A framework that only addressed racism spoke to Black men. A framework that only addressed sexism spoke to white women. Black women fell through the gap between both.

Video: Kimberle Crenshaw on Intersectionality | The Big Idea

Video: “[Kimberle Crenshaw on Intersectionality | The Big Idea](#)” by [The Institute of Art and Ideas](#) [5:14] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

Intersectionality holds that social identities — race, class, gender, sexuality, ability, age, immigration status, language, religion, and others — operate relationally rather than independently. At the points where these

identities intersect, they produce experiences of privilege and oppression that are qualitatively distinct from what any single axis of identity would predict. Crenshaw's framework is distinguished from additive models of discrimination precisely by this emphasis on qualitative difference: addressing racism and sexism as separate problems leaves intact the specific forms of harm produced at their intersection.

As Audre Lorde wrote, and SisterSong has since made a cornerstone of the Reproductive Justice framework: "There is no such thing as a single-issue struggle because we do not live single-issue lives."



The Wheel of Power / Privilege

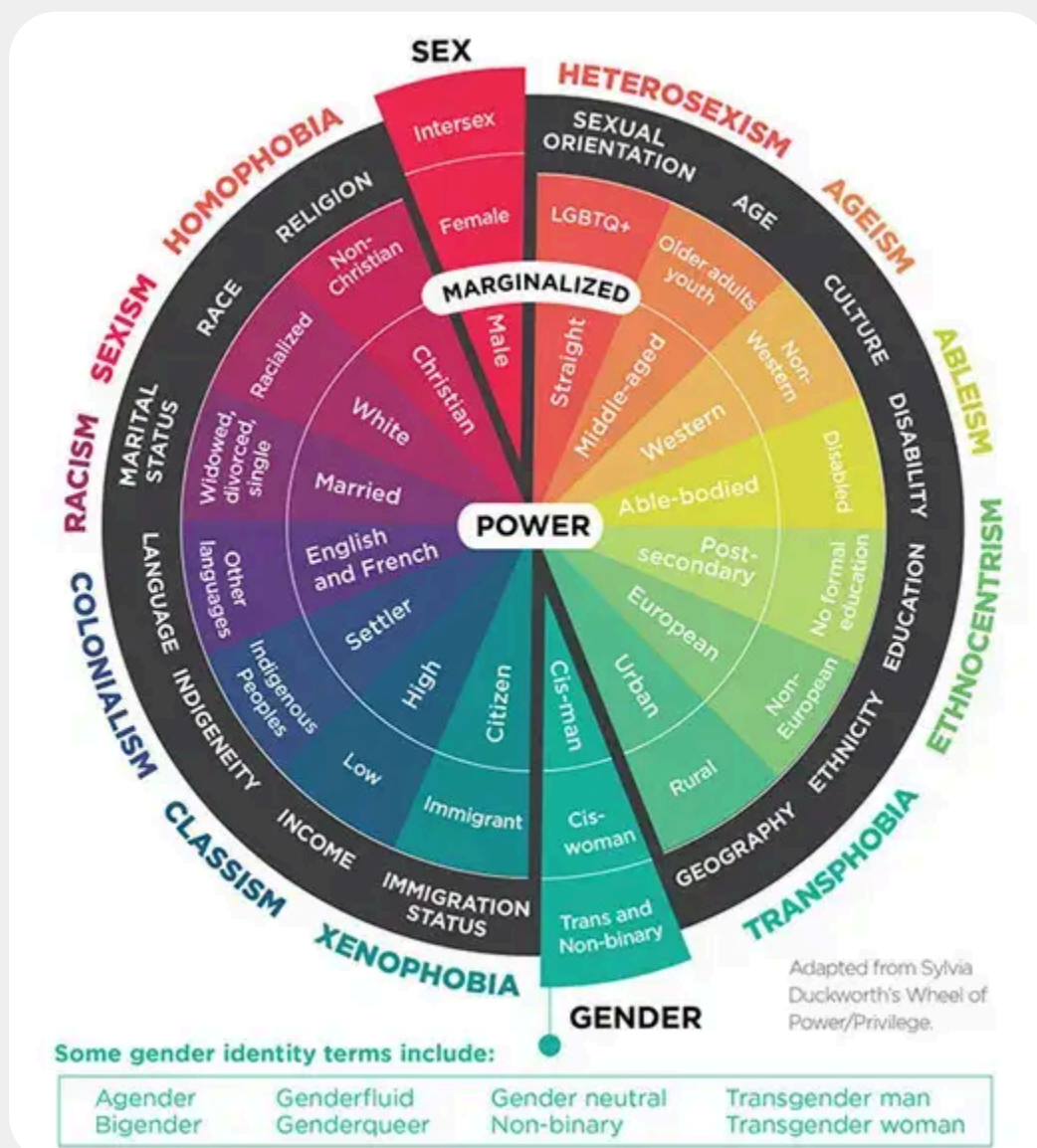


Figure 2.6.7. "The Wheel of Power / Privilege" used under the [Crown Copyright – NonCommercial Reproduction Licence \(Canada\)](#). The Government of Canada is not affiliated with nor endorses the reproduction of its official documents here.

Image Description

Circular "Wheel of Power and Privilege" diagram showing how social identities may be positioned closer to power or marginalization. Identity categories form wedges around a center labelled "Power." Within each wedge, identities associated with greater social power are closest to the center, while

marginalized identities appear progressively farther outward.

The categories include sex, sexual orientation, age, culture, disability, education, ethnicity, geography, gender, immigration status, income, Indigeneity, language, marital status, race, and religion. Examples near the center include male, straight, middle-aged, Western, able-bodied, highly educated, European, urban, cisgender, citizen, high income, settler, English- or French-speaking, married, White, and Christian. Examples farther from the center include intersex, LGBTQ+, older adults and youth, non-Western, disabled, no formal education, non-European, rural, transgender and non-binary, immigrant, low income, Indigenous peoples, speakers of other languages, widowed, divorced or single people, racialized people, and non-Christian people.

The outer edge names related systems of oppression, including sexism, heterosexism, ageism, ableism, ethnocentrism, transphobia, xenophobia, classism, colonialism, racism, and homophobia. Additional gender-identity terms listed below the wheel include agender, bigender, genderfluid, genderqueer, gender-neutral, non-binary, transgender man, and transgender woman.

This diagram from [CRIA W](#) (2009) is a visual tool used by researchers and activists to visualize the various axes along which oppression may occur.

The innermost circle represents a person's unique circumstances, including the specific combination of experiences, opportunities, and histories that shape who they are and what they have had access to.

The second ring (in black) represents aspects of identity: race, gender, class, age, ability, sexual orientation, language, religion, immigration status, and others.

The third ring (in white) represents the social institutions and systems of discrimination that shape those identities: racism, sexism, ableism, heterosexism, classism, and colonialism — as embedded in healthcare, legal, educational, economic, and media systems.

Some models include a fourth ring that represents the larger global forces that structure all of the above: capitalism, colonialism, globalization, and migration patterns.

This model is particularly useful in reproductive health education because it provides a framework for understanding how structural forces shape the clinical encounter. A client seeking prenatal care arrives with their individual circumstances, their identities, the institutions through which those identities have been filtered, and the global forces that shaped their housing, income, and community safety.

Reproductive health equity research demonstrates that outcomes are consistently related to these structural conditions, which the CRIA W/ICREF model makes visible as a set of analytically distinct but interconnected layers.

Social Determinants of Health

The Social Determinants of Health (SDOH) are the conditions in which people are born, grow up, live, work, and age. The following twelve determinants, drawn from the Government of Canada's health framework and adapted by Cusick (2022), describe the upstream conditions that shape health outcomes at both the individual and population level. As the wheel above illustrates, these conditions are distributed unequally across society, shaped by the intersecting systems of privilege and oppression discussed in this section.

1. **Income and Social Status.** Income is among the most significant social determinants of health. Level of income shapes overall living conditions, affects psychological functioning, and influences the quality of diet, physical activity, and access to housing and other prerequisites of health (Mikkonen and Raphael, 2010, as cited in Cusick, 2022).

2. **Employment and Working Conditions.** Employment provides income, a sense of identity, and daily structure. Unemployment and underemployment are associated with material deprivation, psychological stress, and increased rates of depression, anxiety, and social isolation.
3. **Education and Literacy.** Higher levels of education are associated with better employment prospects, higher income, greater health literacy, and an improved ability to navigate healthcare systems. Lower educational attainment is linked to reduced life expectancy and higher rates of preventable illness.
4. **Childhood Experiences.** Early development shapes health across the lifespan. Research on Adverse Childhood Experiences (ACEs) demonstrates that exposure to harm, instability, and stress in childhood is associated with significantly increased risk of physical and mental health problems in adulthood. The experience of intergenerational trauma and discrimination functions as a social determinant of health in its own right.
5. **Physical Environments.** Housing quality, access to clean water, air and soil safety, transportation, and neighbourhood conditions all directly affect health. Poor housing conditions, including mould, overcrowding, and lack of affordability, are associated with respiratory disease, chronic illness, and poor mental health outcomes.
6. **Social Supports and Coping Skills.** Strong family, friend, and community networks are consistently associated with better health outcomes. Community belonging, stability, and cohesion enhance health. Cusick (2022) notes that personal coping choices are heavily shaped by the socioeconomic environment, and not everyone has equal access to health-supporting options.
7. **Healthy Behaviours.** Health behaviours, including diet, physical activity, substance use, sleep, and healthcare-seeking, are shaped by the resources and environments available to a person. Access to health-supporting options is distributed unequally across income levels, geographic regions, and social positions.
8. **Access to Health Services.** Despite Canada's universal healthcare system, significant gaps exist in coverage. Eye care, dental care, many pharmaceuticals, and mental health services are not publicly funded. These gaps produce health inequities that fall disproportionately on lower-income and marginalized populations.
9. **Biology and Genetic Endowment.** Genetic predispositions interact with all other social determinants to shape individual health trajectories. The expression of genetic predispositions is mediated by the environments in which people live.
10. **Gender.** Gender norms, stereotypes, and biases embedded in healthcare systems produce different health experiences and outcomes across genders. People who are Two-Spirit, transgender, or non-binary face additional discrimination and systemic barriers in healthcare settings that function as determinants of health.
11. **Culture.** People from non-dominant cultures in Canada frequently face stigmatization, culturally inappropriate services, and systemic racism that constitutes a determinant of health in its own right. These effects are especially pronounced for racialized and Indigenous peoples, and for those at the lower end of the social gradient (Canadian Public Health Association, 2018, as cited in Cusick, 2022).
12. **Social Environments.** The norms, values, and social cohesion of communities shape the conditions in which people make decisions about health. Environments characterized by inequality, discrimination, and social exclusion produce worse health outcomes at the population level.

A notable limitation of the Government of Canada framework adapted here is that **race and racism are not named as standalone social determinants of health**, despite extensive evidence that experiences of racism — including interpersonal discrimination, systemic exclusion, and the chronic stress of racialization — function as direct determinants of health outcomes. Racism is embedded across several of the categories above, most visibly in Culture (#11) and Social Environments (#12), but its effects are not reducible to those categories alone. The CRIAW/ICREF wheel above makes racism explicitly visible as a system of discrimination in its third ring. Scholars, including the National Collaborating Centre for Determinants of Health, have called for race and

racism to be named explicitly within Canadian health frameworks. Doula's working with clients from racialized communities should understand that what appears in health data as a “cultural” or “social environment” difference often reflects the measurable health consequences of racism.

The twelve determinants above are directly relevant to reproductive care at every stage. Who can access prenatal services, whether a person can afford a doula, the safety of the environment in which a family raises a child, and the conditions that determine whether parenting is sustainable and supported are all shaped by income, employment, education, housing, culture, gender, and the other determinants listed here. The AAAQ Framework introduced in section 2.5.3 provides a practical tool for assessing these conditions in specific healthcare settings. Section 2.3.3 addresses the social determinants of health in an Indigenous context, using Loppie and Wien's (2022) tree model of distal, systemic, and proximate determinants.

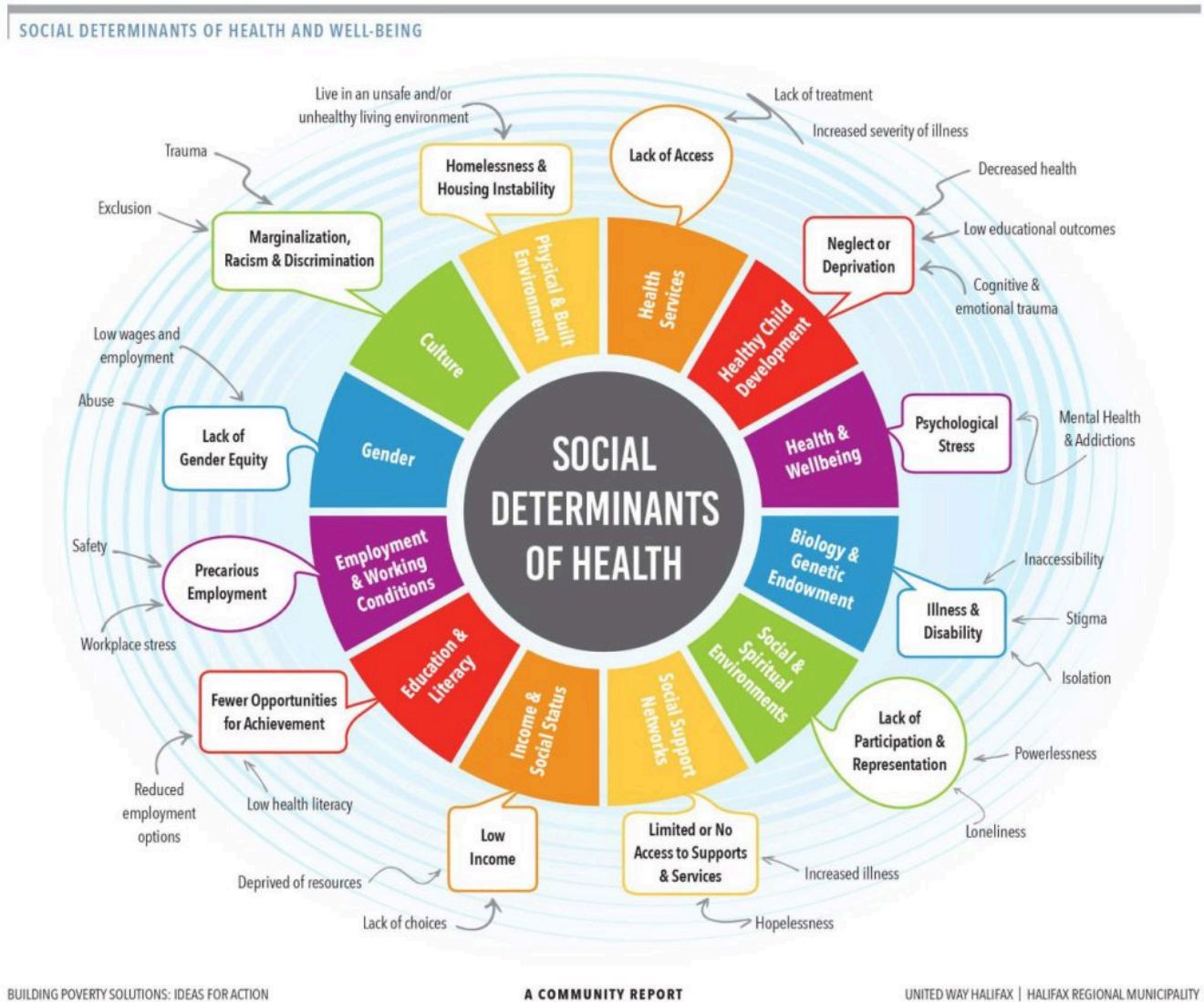


Figure 2.6.8. “[The Social Determinants of Health and Well-being](#)” by [United Way Halifax, FDEd \(CAN\)](#).

2.6.4 Population Policy: A Brief Introduction

Canada's demographic profile shapes the policy context in which reproductive decisions are made.

Understanding how a population grows, ages, and sustains itself through birth rates, death rates, and immigration provides a framework for recognizing why reproductive choices are never entirely private matters. Population-level pressures, whether explicit or implicit, shape the political environment in which people exercise the three rights of the Reproductive Justice framework.

Reading a Population Pyramid

A population pyramid is a graphic representation of a population by age group and sex, with males conventionally shown on the left and females on the right. Age groups are displayed horizontally in bars, with younger cohorts at the base and older cohorts at the top. The shape of the pyramid reveals a great deal about a population's growth trajectory, fertility history, and future demographic pressures (BCCampus, 2021).

Population pyramids fall into three general categories:

Expansive pyramids have a wide base and narrow apex, indicating a large proportion of young people relative to older cohorts. This pattern is typical of rapidly growing populations where fertility rates are high and death rates are declining. Expansive pyramids are associated with countries in early stages of demographic transition.

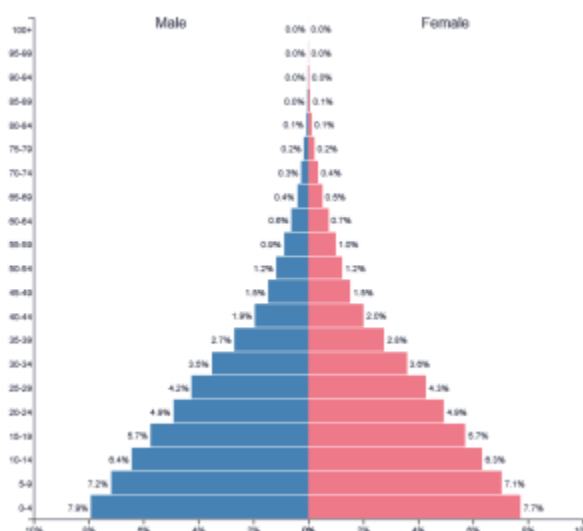


Figure 2.6.9. "Population pyramid of Uganda" by PopulationPyramid.net, CC BY 3.0 IGO

Stationary pyramids have a base close in size to the cohorts above it, indicating a population that is either slowly growing or maintaining a stable size. These populations have moved through demographic transition: birth rates and death rates have both declined to comparably low levels.

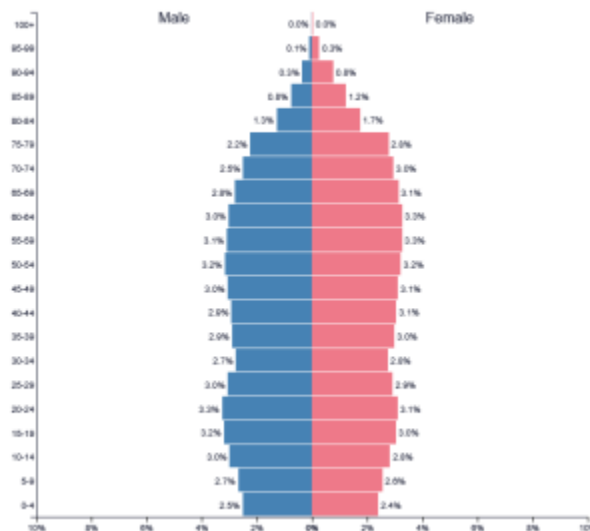


Figure 2.6.10. "Population pyramid of France" by [PopulationPyramid.net](https://populationpyramid.net/). CC BY 3.0 IGO

Constrictive pyramids have a narrower base than the cohorts above them, indicating more older people than younger people in the population. These populations are ageing and, without immigration to compensate, will decline in total size. As the BCcampus Introduction to Sociology describes, when fertility rates fall below replacement, the pyramid "begins to take the form of a kite or oval, because there is a proportional decrease in younger age groups compared to older age groups." Canada currently has a constrictive pyramid shape.

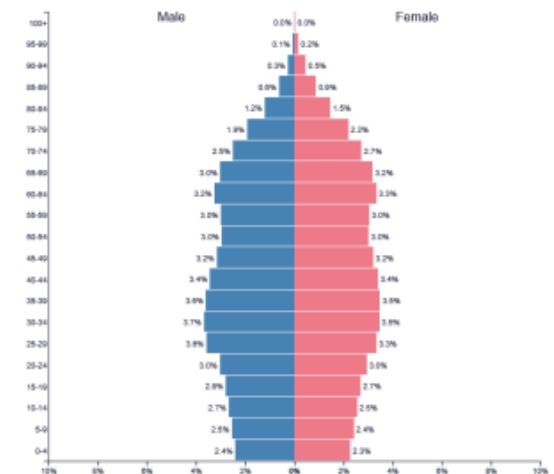


Figure 2.6.11. "Population pyramid of Canada" images by [PopulationPyramid.net](https://populationpyramid.net/). CC BY 3.0 IGO.

Image Descriptions

Three population pyramids compare the projected 2026 age and sex distributions of Uganda, France, and Canada. Each chart places males on the left and females on the right, with the youngest age group at the bottom and the oldest at the top.

Uganda, population 52,761,469, has a broad base that narrows steadily with age. Children ages 0–4 form the largest group, at 7.9% of males and 7.7% of females, indicating a very young and rapidly growing population.

France, population 66,746,400, has a more column-shaped distribution. Most age groups represent roughly

2.5%–3.3% of each sex, with middle-aged and older adults making up substantial shares. Women increasingly outnumber men at older ages.

Canada, population 40,467,727, has a narrower base and wider middle. The largest groups are adults, approximately 25–44 years old, while children make up smaller proportions. As in France, females increasingly outnumber males among the oldest age groups.

How Populations Grow

Canada's total fertility rate reached a record low of 1.25 children per woman in 2024, well below the replacement level of 2.1 at which a population replaces itself through births alone. In 2022, Canada recorded its lowest absolute number of births in 17 years, and from 2021 to 2022, the total fertility rate dropped by 7.4 percent, the largest single-year decline in 50 years. The average age of mothers at first birth was 31.3 years in 2020, one of the highest in the world (Statistics Canada, 2026).

Demographic Policy and Reproductive Justice

These demographic realities do not exist in a neutral policy space. When a country's birth rate falls below replacement level, reproductive decisions become subjects of public and political interest. Canada has not adopted explicitly pronatalist policies that incentivize higher birth rates, but demographic context shapes which reproductive choices are framed as socially beneficial, whose fertility receives structural support, and whose is surveilled or constrained.

The three rights of the Reproductive Justice framework must be understood against this backdrop. The right to have children requires not only freedom from coercion but also access to the social and economic conditions that make having children viable: stable housing, adequate income, parental leave, childcare, and community support. In Canada, these conditions are unevenly distributed, and the people most likely to face structural barriers to exercising the right to have children are also those whose communities' immigration policy relies on most heavily to sustain demographic growth. The right to not have children must be understood in a social context where below-replacement fertility generates implicit pressure toward parenthood. And the right to parent in safety applies across a population that is increasingly diverse, older at the time of first birth, and navigating reproductive decisions in a high-cost economic environment.

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parenthood. And the right to parent in safety applies across a population that is increasingly diverse, older at the time of first birth, and navigating reproductive decisions in a high-cost economic environment.

These trends are reflected in Canada's age structure. In 2025, 19.5 percent of Canadians were aged 65 and over, a proportion that Statistics Canada projects will increase to between 22.6 and 32.5 percent by 2075, depending on future immigration levels. All baby boomers, the large cohort born between 1946 and 1964, will have reached age 65 by 2030, placing sustained pressure on pension systems, healthcare infrastructure, and the working-age population that supports both.

Canada's response to below-replacement fertility has been immigration-led population growth. Statistics Canada (2026) notes that migratory increase has been the main driver of population growth at the national level since the early 1990s. In all projection scenarios to 2075, immigration remains the primary mechanism sustaining Canada's population size. Canada has one of the highest per-capita immigration rates in the world, a deliberate policy choice that reflects this demographic reality.



The Cost of Having Children

Canada's record-low fertility rate and rising average age of first-time parents are not simply the product of personal preference. They reflect, in significant part, the economic conditions in which people are making reproductive decisions: housing costs that place ownership out of reach for many young families, childcare fees that can exceed rent, parental leave policies that leave significant income gaps, and employment precarity that makes the financial commitment of parenthood feel impossible to time well.

Consider the clients doulas are most likely to support in Canada over the next decade. Many will be having their first child in their mid-thirties, navigating pregnancy while managing a mortgage, student debt, or a dual income that cannot easily absorb a full parental leave. Some will be doing this far from family, in cities where they immigrated within the last decade, without the community infrastructure that earlier generations relied on. The demographic pressures described in this section are not abstract policy questions. They are the social context in which your clients are making reproductive decisions.

Now consider the third right: the right to parent in safety. What does safety mean for a family making that decision in Canada in 2025, and what part of that does a doula's support address?

The *Reading a Population Pyramid* section is partially adapted from "[20.1 Demography and Population](#)" in [Introduction to Sociology – 3rd Canadian Edition](#) by William Little, licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

Section 2.6.1 Three Waves of Feminism is adapted from "[4.3 Feminist Activism and Theory](#)" in [Sociology of Gender: An Equity Lens](#) by Nora Karena, Heidi Esbensen, and Dana Pertermann, licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

The *Social Determinants of Health* section is partially adapted from “[Overview of all 12 Social Determinants of Health \(SDOH\)](#)” in [Post-Secondary Peer Support Training Curriculum](#) by Jenn Cusick, licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

2.7 Under the Microscope: Abortion Care, Law & Access in Canada



Learning Outcomes

By the end of this section, you should be able to:

- Explain the legal history of abortion access in Canada
- Compare abortion access histories between Canada and the United States
- Analyze barriers to abortion access for marginalized populations

2.7.1 History of Abortion Care in Canada

Abortion in Canada has never been simply a medical question. It has been a site where criminal law, reproductive autonomy, public health, and the politics of whose body the state can control have all converged. The legal history that follows traces the major milestones from criminalization through decriminalization and the expansion of medication abortion, drawn from the CBC News timeline “Abortion rights: significant moments in Canadian history.”

The Criminal Code Era: 1892

In 1892, Canada’s first Criminal Code prohibited abortion as well as the sale and distribution of contraceptives. Despite this prohibition, abortion continued to be performed by physicians and non-physicians alike. Access to relatively safe care depended on a patient’s ability to pay and the willingness of some physicians to provide the service outside the law. For many women, self-induced abortion and unsafe procedures were the only available alternatives (CBC News, 2017).

The Therapeutic Abortion Committee Regime: 1969

In 1969, Prime Minister Pierre Trudeau’s Liberal government amended the Criminal Code to allow abortion under specific circumstances: it could be performed in a hospital if a **Therapeutic Abortion Committee** of at least three physicians determined that continuing the pregnancy would endanger the mother’s life or health. Access under this regime varied dramatically across the country, with some hospitals creating committees and others refusing to. In the same year the amendment passed, Dr.

Henry Morgentaler defied the law and opened an abortion clinic in Montreal, beginning twenty years of legal battles that would eventually reach the Supreme Court of Canada.

Video: Democracy on Trial: The Morgentaler Affair

Video: "[Democracy on Trial: The Morgentaler Affair](#)" by NFB [58:48] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

R. v. Morgentaler (1988): Decriminalization

On January 28, 1988, the Supreme Court of Canada struck down Section 251 of the Criminal Code in a 5–2 decision. The law was found to violate Section 7 of the Charter of Rights and Freedoms because the procedural requirements of the Therapeutic Abortion Committee regime were so burdensome and inconsistently applied that they violated a woman's right to security of the person. Chief Justice Brian Dickson wrote: "Forcing a woman, by threat of criminal sanction, to carry a fetus to term unless she meets certain criteria unrelated to her own priorities and aspirations, is a profound interference with a woman's body and thus a violation of her security of the person." Since this ruling, Canada has had no federal criminal law governing abortion. The procedure is treated as a medical service, regulated by provincial and territorial healthcare policies.

In 1989, the Supreme Court also ruled that a man has no legal right to veto a woman's abortion decision, following the case of Chantal Daigle, whose partner had obtained a court injunction preventing her from obtaining an abortion. Daigle had already accessed abortion in the United States by the time the case was decided.

Decriminalization and Its Limits

Decriminalization was a significant advance, but it did not produce uniform access. In 1990, the federal government introduced Bill C-43, which would have reinstated criminal penalties for physicians providing abortions where a woman's health was not at risk. The bill passed the House of Commons and was defeated in the Senate by a single tied vote. Decriminalization survived by one vote.

Provincial variation continued after 1988. New Brunswick and Nova Scotia initially restricted access to hospitals. Prince Edward Island provided no abortion services at all until 2016. Coverage of clinic abortions by provincial health plans has varied and remains uneven. Violence against providers continued throughout the 1990s: Morgentaler's Toronto clinic was firebombed in 1992, and in 1994, Dr. Garson Romalis became the first Canadian doctor shot for performing abortions. Similar attacks followed in 1995 and 1997. The legal access secured in 1988 came with a personal cost borne by the providers who chose to offer it.

Medication Abortion: Mifegymiso

In 2015, Health Canada approved mifepristone (brand name **Mifegymiso** — mifepristone combined with misoprostol) for use in Canada (Health Canada, 2016). The drug stops a pregnancy from continuing; misoprostol causes uterine contractions to expel tissue. In 2017, regulations were amended to allow community pharmacists to dispense mifepristone directly, without requiring special authorization, and to permit prescription by primary care physicians and nurse practitioners. Mifegymiso is approved for use up to nine weeks of pregnancy and is covered under provincial health insurance plans in most provinces. Its introduction substantially changed the landscape of abortion access in Canada, as examined in section 2.7.3.

Surgical Abortion

Surgical abortion is a clinical procedure performed by a physician in a clinic or hospital setting. The most common method, **vacuum aspiration**, is available up to approximately 14 to 16 weeks of pregnancy. It uses gentle suction to empty the uterus and typically takes 5 to 10 minutes. Local anesthesia or sedation is used depending on the clinical setting and patient preference (Costescu & Guilbert, 2018).

For pregnancies further along, **dilation and evacuation (D&E)** is the standard of care: the cervix is gradually dilated over one or more days, and the pregnancy is removed using surgical instruments and suction, under sedation or general anesthesia. **Dilation and curettage (D&C)** is now used more commonly for management of early pregnancy loss than for induced abortion, though it may be encountered in both contexts (Costescu & Guilbert, 2018).

Surgical abortion is covered under provincial health insurance in Canada. Availability concentrates in urban centres, and gestational age limits vary by provider and region, making early access important for people who choose or require a procedural approach.

Both medication and surgical abortion are standard medical care. In Canada, abortion is treated as any other regulated healthcare service: provided by trained professionals, covered under provincial insurance, subject to informed consent requirements, and governed by clinical guidelines rather than criminal law. Stigma that persists in some settings is a social and institutional condition, not a reflection of the clinical or legal status of the procedure.

2.7.2 Roe v. Wade and the Canadian Context

Canada and the United States are frequently compared on abortion access, and that comparison became more urgent after the United States Supreme Court overturned *Roe v. Wade* in *Dobbs v. Jackson Women's Health Organization* in June 2022, returning the regulation of abortion to individual states. In the months after *Dobbs*, several states implemented near-total bans. The comparison prompts an important question about Canada's own legal framework — and the answer is more complicated than it first appears.

In the United States, *Roe v. Wade* (1973) established a constitutional right to abortion under the 14th Amendment's due process protections. *Dobbs* (2022) overturned this, holding that the Constitution confers no right to abortion and returning regulation entirely to the states.

Canada's *R. v. Morgentaler* (1988) is often described as Canada's equivalent of *Roe*, but the comparison is imprecise in ways that matter. As CBC News reported in 2022, the 1988 decision did not establish abortion as a constitutionally guaranteed right. The five-judge majority struck down the specific procedural requirements of the Therapeutic Abortion Committee regime as unconstitutionally unfair, violating Section 7 (security of the

person), but no majority affirmed that abortion is a right protected by the Charter. Justice Bertha Wilson's concurring opinion came closest to this position, finding that Section 7, along with other Charter provisions, did affirm a woman's right to choose. Her opinion has remained a minority view. No Supreme Court of Canada majority has since ruled on the question directly.

This leaves Canada in an unusual position: abortion has no criminal restrictions, and public opinion polls consistently show strong Canadian support for access, but the right itself rests on the absence of law and on political will rather than on an explicit constitutional guarantee. As University of Ottawa law professor Daphne Gilbert observed after *Dobbs*, if a Canadian government ever attempted to legislate restrictions, the constitutional landscape is less settled than many assume — though the political barriers to such an attempt are significant.



A Right on Paper?

Abortion access in Canada rests primarily on the absence of criminal law and on provincial healthcare policy, not on a constitutionally enshrined right. The *Dobbs* decision in the United States in 2022 prompted significant advocacy in Canada from those who noted that this distinction is not merely academic.

Consider: if a future federal or provincial government moved to restrict abortion access in Canada, what legal and structural protections would be available? What would your role be, as a doula, if access became more restricted in your province? And what does it mean that the right to not have children, as articulated in the Reproductive Justice framework, is currently secured in Canada by political consensus rather than constitutional guarantee?

2.7.3 Current Access and Barriers

Abortion is publicly funded in Canada with few exceptions, and self-referral is available in all provinces and territories. However, as Martha Paynter, a nurse-researcher and reproductive justice scholar based in Nova Scotia, and colleagues document in their 2025 national qualitative study of abortion doulas in Canada — the first published study in the country to examine this practice — decriminalization and public funding have not produced equitable access. Barriers persist, and they are not evenly distributed.

Medication Abortion

Abortion is medical care. As with any medical care, the goal is effective, timely, equitable access — and the measure of a system is whether that access is available to everyone, not only those with means, proximity to services, and uncomplicated social circumstances. The expansion of medication abortion through mifepristone has been the most significant development in Canadian abortion access in decades.

The availability of mifepristone since 2017 has substantially expanded access. Before that change, abortion was performed as a procedure in fewer than 100 hospitals and clinics, most in urban centres. A 2025 study in the *Canadian Medical Association Journal* (Schummers et al., 2025) found that by 2022, 82 percent of regions in

Ontario had access to a pharmacy dispensing mifepristone, up from 19 percent in 2017. Medication abortion represented 56 percent of all abortions in Ontario by 2022. The shift is significant: a person can now be prescribed mifepristone by a family physician or nurse practitioner and take it at home, without travelling to a clinic or hospital.



Resource: Abortion Access Tracker

An [interactive map of abortion service availability](#) across Canada by province and territory, updated regularly. Produced by Action Canada for Sexual Health and Rights and research partners.

Barriers to Care

Improvements to medication abortion access have not eliminated all barriers. Paynter et al. (2025) identify the following as persistent, particularly for people in underserved groups.

Geographic and logistical barriers. Procedural abortion remains concentrated in urban centres. Those in rural and remote areas who require procedural care or who need care after the first trimester may face significant travel. Doulas in the study consistently described transportation as a central element of their work.

The lack of access to the services is an issue, but also the lack of financial resources for the people who do have to travel, have to take time off work, have to pay for gas, or have childcare — all of those things are an issue specific to any area outside of the city.

— Participant 9, cited in Paynter et al. (2025)

Financial barriers. Although abortion is publicly insured under Medicare, private costs accumulate: travel, accommodation, childcare, and missed wages. People without Medicare cards — undocumented

individuals, temporary foreign workers, and international students — may be required to pay out of pocket or seek assistance from community organizations.

Right now, we're paying [taxes] for a healthcare system, and then we're paying to send people to healthcare.

— Participant 12, cited in Paynter et al. (2025)

Stigma. Paynter et al. (2025) identify abortion stigma as a systemic barrier that shapes both clinic-level policies and individual decisions to seek care. Some clinics conduct all communication by phone, creating barriers for patients without cell phones. Clinic requirements that patients arrange a chaperone for the drive home after a procedural abortion can be serious barriers for people with few social supports. Stigma also prevents some people from disclosing the abortion to family or friends, isolating them at a particularly vulnerable moment.

Population-specific barriers. Youth may be uncertain about their rights to seek care without parental involvement. Medication abortion taken at home is not appropriate for patients without a safe home environment. Indigenous people in Canada have disproportionately experienced coerced sterilization and the removal of newborns through the “birth alert” practice, creating specific healthcare trauma that affects abortion access. 2SLGBTQIA+ patients encounter heteronormativity in reproductive care approaches and language. People with disabilities may face physical accessibility barriers at clinic sites (Paynter et al., 2025).

Video: Barriers have Canadian women turning to ‘abortion doulas’ for help

Video: “[Barriers have Canadian Women Turning to ‘Abortion Doulas’ for Help](#)” by [CBC News: The National](#) [2:08] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

The Doula’s Role in Abortion Care

Abortion doulas, working in a non-clinical and unregulated supportive role, may facilitate access to care in ways the formal healthcare system does not provide. Paynter et al. (2025) identified six key themes in Canadian abortion doula practice: inter- and intra-systems navigation; after-care; gaps in training; the challenge of

sustainable remuneration; the importance of peer support; and advocacy beyond the individual client relationship.

Abortion doulas provide logistical support — sourcing transportation, securing accommodation, meeting clients at airports, purchasing supplies — alongside emotional support before, during, and after the procedure. They act as navigators: connecting clients who are uncertain about “where to start” with providers, answering clinical questions clients would not otherwise know how to ask, and helping them understand their options. Paynter et al. (2025) found that abortion doula clients are frequently those facing intersecting structural barriers: people in rural areas, youth, people experiencing poverty or housing insecurity, Indigenous people, newcomers, and those requiring care later in pregnancy when options are most limited.

Not all doulas provide abortion support, and training programs vary significantly in whether and how they address it. Paynter et al. (2025) found that doulas who felt most confident had completed comprehensive, stand-alone abortion doula training — and emphasized the importance of that training being regionally specific, since knowledge of local providers, gestational duration limits, and available services varies considerably across Canada.



If a Client Called You

A client reaches out to you at 9 p.m. She is eight weeks pregnant. She lives in a small town three hours from the nearest city. She cannot drive. She has a two-year-old at home and no family nearby. She does not want to continue the pregnancy. She has never heard of Mifegymiso. She doesn't know if she qualifies for it. She is scared.

What do you know right now that could help her? What do you not know? Where would you start? What does your non-clinical scope mean in this moment, and what does it allow you to do?

This is the scenario Paynter et al. describe their research participants encountering regularly. The question is not whether it will come up in your practice. It is whether you will be prepared for it.

2.8 Every Story Is Cultural: Diversity, Cultural Safety, and Doula Practice



Learning Outcomes

By the end of this section, you will be able to:

- Define culture and its role in shaping reproductive experiences and decisions
- Compare individualist and collectivist frameworks in the context of birth and parenting
- Apply cultural safety principles to doula practice

2.8.1 What is Culture?

Section 2.6.4 described who lives in Canada through the lens of population data: age distribution, fertility rates, and immigration patterns. This section asks the next question: how do those people understand and organize their lives? Culture is the set of shared meanings, practices, and values through which people make sense of the world and of each other (Little, 2023). It shapes what birth looks like, who is in the room, what is eaten in the days after delivery, what prayers or ceremonies mark a new arrival, how long a postpartum person is expected to rest, and how grief is held when a pregnancy is lost. For doulas supporting clients across Canada's diverse population, understanding culture is not supplementary knowledge. It is foundational.

Material and Nonmaterial Culture

Sociologists distinguish between two dimensions of culture. Material culture includes the physical objects people create, use, and imbue with meaning: food prepared for a new family, ritual objects brought to a birth, clothing that marks a religious community, the herbs of a traditional postpartum practice, the room itself. Nonmaterial culture includes the beliefs, values, norms, and language through which people give meaning to those objects and events. The two are linked: a dish of food is material, but whether it signals love, obligation, healing, or celebration depends on nonmaterial culture — on what it means in context (Gougherty, 2024).

Language, Values, and Norms

Language is probably the most significant component of culture because it allows communication across generations and shapes how people experience their world (Gougherty, 2024). The Sapir-Whorf hypothesis holds that language does not simply name experience — it structures it. A culture with specific, nuanced vocabulary for different stages of postpartum recovery communicates something different than one that treats the postpartum period as a brief medical event. Over 200 languages are spoken in Canadian homes

(Statistics Canada, 2022), and each carries its own cultural toolkit for understanding reproduction, family, and health.

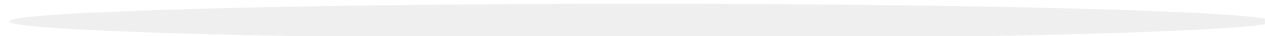
Values are a culture's standards for discerning what is good and just. They operate at an abstract level, shaping priorities without always naming them explicitly (Gougherty, 2024). **Norms** are the more specific expectations that follow from values — the social rules, written and unwritten, that govern how people are expected to behave in particular situations. Norms include *folkways* (everyday conventions like who speaks first or how close to stand), *mores* (norms with strong moral weight), and *taboos* (norms whose violation provokes a strong social response). In reproductive healthcare, understanding the norms of a client's cultural community can be as clinically important as understanding their medical history.

A Wheel of Culture

The six elements below are present in every culture, though they take different forms across communities, generations, and individuals. The figure that follows maps them as a wheel to emphasize that they are not separate categories but interconnected dimensions of a single cultural reality. Understanding any one element in isolation — knowing a client's food practices, for example, without understanding the religious meaning of those practices — produces only a partial picture.

Wheel of Culture

Six connected aspects of culture arranged as equal segments of a wheel.



Wheel of Culture

Six connected aspects of culture arranged as equal segments of a wheel.

Language

The words, idioms, and silences through which birth and parenting are named, described, and understood. Including what can and cannot be said.

Food

What is prepared for a labouring person, a new parent, or a grieving family reflects cultural meaning as much as nutrition.

Ceremony & Celebration

The rituals that mark birth, naming, puberty, marriage, death, and loss. Who officiates, who is invited, and what is done.

Values

The deeper standards that determine what is considered good, right, or worthy: individual autonomy, family honour, community interdependence, humility, self-reliance.

Norms

The unwritten rules about what is expected in specific situations: who speaks for the family, how long postpartum rest lasts, who touches the newborn first.

Religion & Spirituality

Beliefs about life, death, suffering, healing, the body, and what happens before and after birth.

Individualist and Collectivist Orientations

One of the most practically useful frameworks for understanding cross-cultural differences in reproductive care is the distinction between **individualist** and **collectivist** cultural orientations. As Hofstede (1984, as cited in Little, 2023) described, in individualist cultures, “the ties between individuals are loose: everyone is expected to look after themselves and their immediate family.” In collectivist cultures, “people are integrated from birth into strong, cohesive ingroups, which throughout their lifetime continue to protect them in exchange for loyalty.”

These are orientations, not fixed categories. Most people hold both individualist and collectivist tendencies, and these can vary by domain of life, by generation, by the degree of acculturation within an immigrant family, and by the specific situation. The goal is not to categorize a client but to hold a wider range of possibilities about what birth, postpartum, and family life might look like — and to avoid assuming that the individualist model, which is dominant in mainstream Canadian healthcare settings, is the default or the norm.

Table 2.8.1: Comparison of Collectivist and Individualist Orientations

Domain	Individualist Orientation	Collectivist Orientation
Who makes the birth plan?	The pregnant person and their partner; individual preferences are primary	The pregnant person in consultation with family, elders, or community; group consensus may matter
Who attends labour and birth?	Partner and/or individually selected support persons	Extended family or community members may expect to attend or be near; presence signals care
Postpartum care	Nuclear family unit; professional supports (doula, lactation consultant, public health nurse)	Extended family and community members share postpartum responsibilities; specific roles may be assigned to specific relatives
Infant feeding	Personal choice informed by evidence and preference	May be shaped by family tradition, elder guidance, or cultural and religious norms; choice may not feel entirely individual
Rest after Birth	Return to activity is often framed as resilience; expectations vary by class and employment	Extended postpartum rest (30 to 40+ days) may be expected; specific foods, practices, and prohibitions may apply
Grief and Pregnancy Loss	Often experienced as private; individual therapy or private mourning supported	May involve community ritual, collective mourning, or ceremony; grief may be more public and communally held
Communication with providers	Direct; individual questions and preferences expressed to the provider	May communicate through a family spokesperson; direct questioning of authority may be culturally uncomfortable
The doula's role	Hired professional providing evidence-based continuous support	May overlap with family or community role; clear discussion of scope and purpose is important at intake

Canada's Cultural Landscape: Who You Will Serve

Canada's 2021 Census offers a clearer picture of the country's cultural diversity than any previous data collection. Three dimensions are particularly relevant for doulas: ethnocultural background, religious affiliation, and sexual orientation and gender identity.

Ethnocultural diversity

In 2021, 26.5 percent of Canadians — approximately 9.4 million people — belonged to a visible minority group, the term defined by the Employment Equity Act as “persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour.” Statistics Canada itself notes that in the 2021 Census communications, it replaced “visible minority” with “racialized population” or “racialized groups” to reflect evolving public usage. In many advocacy and community settings, the term BIPGM (Black, Indigenous, and People of the Global Majority) is preferred, as it names specific communities and acknowledges that these populations represent the majority of the world's people, not a minority of it. This OER uses the terms interchangeably where context requires, noting the distinction. Indigenous peoples are counted separately under the Employment Equity Act and comprised 5 percent of the total Canadian population, or approximately 1.8 million people. Statistics Canada projects that by 2041, between 31 and 38 percent of Canada's population could be visible minority — a shift driven largely by immigration-led population growth as described in section 2.6.4 (Statistics Canada, 2022a).

Table 2.8.2: Canadian Population Breakdown by Ethnicity(Statistics Canada, 2022a)

Population Group	% of Total Canadian Population (as of 2021)
South Asian	7.1%
Chinese	4.7%
Black	4.3%
Filipino	2.6%
Arab	1.9%
Latin American	1.6%
Southeast Asian	1.1%
West Asian	1.0%
Korean	0.6%
Multiple visible minority	0.7%
Visible minority, not included elsewhere	0.5%
Japanese	0.3%
Total: visible Minority groups	26.5%
Indigenous peoples (First Nations, Métis, Inuit)	5.0%
Not a visible minority, not indigenous	68.5%
Total	100.0%
Percentages are approximate due to rounding. Visible minority groups are as defined by the Employment Equity Act.	



Your own Cultural Background

Think about the communities you come from or are close to. What do you know about how birth, postpartum recovery, and parenting are understood in those communities? What practices might be unfamiliar to a mainstream Canadian healthcare setting? What practices might conflict with clinical recommendations? What would it mean for a doula to support a client navigating between the expectations of their family and the protocols of a hospital ward?

Religious Landscape

In 2021, for the first time in Canadian Census history, “no religious affiliation” was the single largest category, at 34.6 percent. This represents a dramatic shift from 2011, when Christians comprised 67.3 percent of the population; in 2021, that figure had fallen to 53.3 percent. This shift does not mean that religion is less relevant to reproductive care. It means that the relationship between Canadians and religion is more diverse than it has ever been. A client whose faith shapes decisions about contraception, pain management in labour, the presence of a male provider, dietary restrictions after birth, or the naming and celebration of a new child is not an edge case — they are part of a large and growing portion of the population you will serve (Statistics Canada, 2022b).

Table 2.8.3: Canadian Population Breakdown by Religion (Statistics Canada, 2022b)

Religious Affiliation	% of Total Canadian Population (as of 2021)
Christian	53.3%
No religious affiliation	34.6%
Muslim	4.9%
Hindu	2.3%
Sikh	2.1%
Buddhist	1.0%
Jewish	0.9%
Other Religions	0.9%
Total	100.0%
Christian includes Catholic, Protestant, Eastern Orthodox, and other Christian denominations.	



Faith, Practice, and the Doula's Role

Think about your own relationship to religion or spirituality — whether that relationship is active, absent, complicated, or in transition. How might your own lens affect how you support a client whose faith shapes their reproductive choices in a way that differs from your own values? What does it mean to hold space for a practice or belief you do not share? What would it mean to impose your own values, even unintentionally?

Sexual Orientation and Gender Identity

The 2021 Census was the first time Statistics Canada collected data on sexual orientation at the population level. Overall, approximately 4 percent of Canadians aged 20 and over identified as LGBTQ+. Among Canadians aged 20 to 24, that proportion was approximately 8.7 percent. Approximately 0.6 percent of Canadians aged 15 and over identified as non-binary. These figures likely underestimate the true proportion, given privacy considerations affecting Census self-reporting. They signal that 2SLGBTQIA+ clients are a significant and growing presence in every healthcare context, including reproductive and perinatal care (Statistics Canada, 2023).

Table 2.8.4: Canadian Population Breakdown by Sexuality (Statistics Canada, 2023)

Sexual Orientation	% of Total Canadian Population (as of 2021)
Heterosexual	53.3%
Bisexual	34.6%
Gay or Lesbian	4.9%
Another sexual orientation (pansexual, queer, asexual, etc.)	2.3%
Prefer not to answer	2.1%
Total	1.0%

2021 was the first Canadian Census in which sexual orientation data was collected. Note: 0.6% of Canadians ages 15+ also identified as non-binary in a separate gender identity question.



Preparing the Space

Think about the birth spaces you are familiar with — hospitals, clinics, birth centres, or homes. What assumptions about gender, sexuality, and family structure are built into the intake forms, the language of the staff, and the physical environment? What would it mean for a transgender man who is pregnant, a non-binary person giving birth, or a same-sex couple to walk into each of these spaces? What part of making that space safer falls to the doula?

2.8.2 Cultural Safety vs Cultural Competency

Cultural safety is not the same as cultural competency, and the distinction matters. As Curtis et al. (2019) argue in *Why Cultural Safety Rather than Cultural Competency Is Required to Achieve Health Equity*, approaches centred on “cultural awareness,” “sensitivity,” or “competency” share a common limitation: they locate the work in the provider. They focus on building the provider’s knowledge of other cultures, developing checklists of cultural practices, and acquiring a set of transferable skills. This approach risks stereotyping, reduces complex human beings to cultural profiles, and leaves intact the power dynamics of the clinical encounter — including the assumption that the provider is the competent expert and the culturally different patient is the problem to be managed.

Cultural safety, a concept first developed by Māori nurses in Aotearoa New Zealand in the 1990s, shifts the frame. Curtis et al. (2019) define culturally safe care as care “determined by the recipient of care, not the provider.” It is not a set of skills the doula acquires once. It is an ongoing, reflexive practice: examining your own assumptions, acknowledging the power you hold in the care relationship, and creating a space where the client’s identity, knowledge, and experience are affirmed rather than managed. A culturally safe encounter is one in which the client reports feeling safe — and that judgement belongs to them, not to you.

The Continuum

Cultural safety exists within a continuum of related concepts that are sometimes used interchangeably but represent meaningfully different positions:



Figure 2.8.1. “The cultural safety continuum” by Joshuelle Solomon, [CC BY-NC-SA 4.0](#).

Cultural awareness recognizes that differences exist between people and communities.

Cultural sensitivity acknowledges that these differences are significant and may affect care.

Cultural competency equips providers with knowledge and skills to work effectively across cultural differences — but locates that effectiveness in the provider’s expertise.

Cultural humility moves beyond competency: it is a lifelong commitment to self-reflection, learning, and the recognition that one’s own cultural lens shapes what one can see and offer.

Cultural safety is determined by the client. It is reached when the recipient of care — not the provider — reports that the care environment affirmed their identity and did not diminish them.

The continuum is useful because it shows that good intentions and cultural knowledge are not sufficient. A provider who has completed cultural competency training but has not examined their own assumptions may deliver technically competent care that the client nonetheless experiences as unsafe. Cultural safety requires the ongoing, uncomfortable work of reflexivity.



Deepen Your Understanding: CASN Cultural Humility and Cultural Safety Standards for Nursing Education (2024)

This freely downloadable [Canadian standard document](#) provides detailed learning outcomes, competencies, and a framework for moving through the full continuum from cultural awareness to cultural safety in health professions education. While written for nursing, it is directly applicable to doula training and any reproductive health profession.

Section 2.8.1 is adapted from “[3.1. What is Culture?](#)” in *Introduction to Sociology – 3rd Canadian Edition* by William Little, licensed under a [Creative Commons Attribution 4.0 International License](#), and “[6.3 Elements of Culture](#)” in *Sociology in Everyday Life* by Matthew Gougherty and Jennifer Puentes, licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

2.9 Roots Beneath the Trail: Indigenous Reproductive Justice



Learning Outcomes

By the end of this section, you will be able to:

- Explain how colonization shaped and continues to shape reproductive experiences for Indigenous peoples in Canada
- Identify how the right to have children and the right to parent in safety apply to Indigenous reproductive health contexts
- Apply the five TVIC principles to reproductive and perinatal care contexts (CLO 6)
- Describe non-carceral alternatives to surveillance-based child protection

2.9.1 The Right to Have Children: Reproductive Equity and Reclamation

The first right of the Reproductive Justice framework — the right to have children — is not equally at stake for everyone. As Martha Paynter writes in *Abortion to Abolition*: “Protecting the right to have children is disproportionately a Black and Indigenous struggle” (Paynter, 2022, p. 78). This section examines why.

Protecting the right to have children is disproportionately a Black and Indigenous struggle.

“

— Paynter, M. (2022). *Abortion to Abolition: Reproductive Health and Justice in Canada*. Fernwood Publishing, p. 78.

Reprocede: A Framework for Understanding What Happened

Paynter (2022) introduces the term reprocede to describe the deliberate restraint of reproduction among a particular group. Reprocede is not always violent or sudden. It can operate through law, through policy, through professional discretion, and through the everyday practices of healthcare systems that treat some

bodies as appropriate for reproduction and others as needing management. Understanding what happened to Indigenous peoples in Canada requires holding this framework: it was not incidental, it was not accidental, and it was not finished.

Eugenics, Legislation, and Forced Sterilization

The theory of **eugenics**, the belief that human populations could be improved through selective breeding and the elimination of “undesirable” traits, was taught in Canadian universities as legitimate science in the early 20th century. In Canada, eugenics was institutionalized in legislation. The **Sexual Sterilization Act of Alberta** (1928–1972) established a eugenics board with the power to authorize the sterilization of any individual deemed unfit for reproduction. Between 1928 and 1972, 4,725 individuals were proposed for sterilization, and 2,822 were sterilized. The racial dimension of the program was explicit: while First Nations and Métis peoples made up approximately 2.5 percent of Alberta’s population, they accounted for 25 percent of those sterilized. The **Sterilization Act of British Columbia** operated from 1933 to 1973. Sterilizations also occurred outside these formal legislative regimes, in federally operated Indian hospitals across Canada, where consent was either coerced or bypassed entirely (The Canadian Encyclopedia, 2019).

Abortion, Contraception, and Sterilization in Canada

1. **1892**

The Criminal Code criminalizes abortion and contraception.

2. **1928**

Alberta passes the Sexual Sterilization Act.

3. **1933**

British Columbia passes its Sterilization Act.

4. **1972**

Alberta repeals the Sexual Sterilization Act.

5. **1996**

Leilani Muir wins her lawsuit against the Alberta government.

6. **2017**

A class-action lawsuit is filed in Saskatchewan.

7. **2022**

The Senate releases its report.

8. 2023

The Survivors Circle is registered.

The most widely known individual case is that of **Leilani Muir**, who was institutionalized as a child and sterilized without her knowledge under the Alberta Act. As an adult, she took an IQ test that demonstrated she was of normal intelligence. In 1996, she won a lawsuit against the Government of Alberta for wrongful sterilization, receiving compensation and contributing to a formal apology to hundreds of others similarly violated. Her case made visible what the Alberta government had called “scientific” practice (The Canadian Encyclopedia, 2019).

This history did not end with the repeal of the legislation. Approximately 100 Indigenous women have come forward alleging that they were pressured into sterilization between the 1970s and 2018, often while in labour or recovering from childbirth. A class action lawsuit filed in Saskatchewan in 2017 grew to include women from multiple provinces. Survivors described being coerced through confinement, manipulation, or threats. Some were as young as 14. Some were not consulted at all. The most recently documented case occurred in 2023 (The Canadian Encyclopedia, 2019; Standing Senate Committee on Human Rights, 2022).

Video: Allegations from Indigenous Women of Forced Sterilizations

Video: “[W5: Allegations from Indigenous women of forced sterilizations](#)” by [Official W5](#) [21:35] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

The Senate Responds: The Scars That We Carry (2022)

In 2022, the Standing Senate Committee on Human Rights released [The Scars That We Carry: Forced and Coerced Sterilization of Persons in Canada — Part II](#), the product of years of testimony from survivors, experts, and advocates. The Committee confirmed that forced and coerced sterilization continues to occur in Canada and disproportionately affects Indigenous, Black, and racialized women, people with disabilities, intersex children, and institutionalized persons. Its 13 recommendations include the following, which are directly relevant to doulas and other reproductive health practitioners:

- **Criminalize forced and coerced sterilization** as a specific offence in the Criminal Code, punishable by up to 14 years in prison (Recommendation 1)
- **Issue a formal federal apology and establish a survivor-led compensation framework** for all people subjected to forced or coerced sterilization (Recommendations 2 and 4)
- **Require all medical and nursing school students to study Indigenous health issues** and provide cultural competency training for all practising healthcare professionals (Recommendation 9)
- **Increase investments in community-based midwifery in northern and remote communities** as a direct response to the loss of community birth practices (Recommendation 11)



Holding This Information

You may have just learned some or all of this for the first time. That is normal. Forced sterilization of Indigenous women is not taught widely in Canadian schools, and its continuation into the 2020s is not widely known outside of survivor communities and advocacy circles.

Take a moment with that. What does it mean to enter a healthcare profession carrying this history? Not as guilt, but as knowledge: as an understanding of why trust between Indigenous clients and healthcare providers is not automatic, and why it has to be earned differently than it does in other contexts.

Which of the four Senate recommendations above feels most directly connected to your role as a doula? What would it mean to act on it?

Pregnancy Evacuation: A Policy Still in Practice

Forced sterilization is not the only colonial policy that has restricted the reproductive lives of Indigenous peoples. The **Out-for-Confinement (OFC) policy**, commonly called pregnancy evacuation, requires pregnant people in remote and rural First Nations communities to leave their communities weeks before their due dates to give birth in urban hospitals, often hundreds of kilometres away. This policy has operated across Canada for decades and continues today.

Viens (2018), writing in McMaster University's open-access Health Reform Observer, argues that the OFC policy is not a neutral health measure but a continuation of the colonial logic of removing Indigenous people from their communities for state-managed events. The title of her analysis, "Separating Birth from Community," names what the policy does: it severs the social, cultural, and ceremonial context of birth from the moment of birth itself. Elders cannot attend. Families cannot gather. Traditional medicines and practices are absent. The knowledge that should be present is not there.

A population-based study of First Nations communities in Manitoba (2005–2015) found that compared to women who gave birth in or near their communities, those evacuated under the OFC policy had significantly higher rates of inadequate prenatal care, lower rates of breastfeeding initiation, and increased rates of small-for-gestational-age births. The policy causes measurable harm. It is also not over: evacuation remains standard policy in many northern communities in Ontario and across Canada. Sections 2.3.3 and 2.5.1 of this OER describe what community-based Indigenous midwifery looks like when it is not suppressed, and what is being done to restore it.



If the Hospital is in a Different City

Imagine your client is due in six weeks. She lives in a First Nations community in northern Ontario.

Her mother and grandmother have both given birth on the land. Her Elders have knowledge about her pregnancy that the nurses in Thunder Bay do not. But she has been told she must travel to the city alone, stay in a stranger's home through an organization she has never met, and wait. Her family cannot afford to come. No one from her community will be in the room.

What might a doula offer in this situation? What falls within your scope, and what falls outside it? What would you need to know, and who would you need to know, to show up usefully in that room?

2.9.2 Trauma- and Violence-Informed Care (TVIC): Five Principles in Practice

Trauma- and Violence-Informed Care (TVIC) is a practice framework developed to respond to exactly the histories described in section 2.9.1. As the Government of Canada's public health guidance explains, TVIC requires "fundamental changes in how systems are designed, organizations function and practitioners engage with people" based on an understanding that trauma and violence are not only individual experiences but are produced by structural and systemic conditions, including colonialism (Government of Canada, 2022).

The Five Principles

The five principles below draw on the TVIC frameworks developed by the Public Health Agency of Canada, EQUIP Health Care, and the BC Provincial Mental Health and Substance Use Planning Council. Different organizations organize and name the principles slightly differently; the five presented here reflect the specific application to reproductive and perinatal care with Indigenous clients. Section 2.9.3 puts them to work.

Table 2.9.1: The Five Principles of TVIC

Principle	What it Means	In Indigenous Reproductive Care Contexts
Safety	Physical, emotional, and cultural safety for everyone in the care relationship, including the client, the doula, and the provider team.	For Indigenous clients, cultural safety is inseparable from physical and emotional safety. The healthcare environment itself has historically been a site of harm. Creating safety requires acknowledging that history explicitly and adjusting the environment accordingly.
Trustworthiness	Transparency, honesty, and follow-through. Doing what you say you will do. Being clear about your scope and limitations.	For clients whose communities have experienced coercion and deception in healthcare settings, trustworthiness must be actively demonstrated over time. It cannot be assumed.
Choice	Offering meaningful options. Ensuring the client understands their options and is genuinely free from pressure in making decisions.	Informed consent is not a form. It is an ongoing process. For Indigenous clients, the history of coerced consent requires that genuine choice be made explicit, not assumed. The doula's role includes helping clients understand that they have choices.
Collaboration	Working with the client, not for them. Understanding their life history, cultural background, and preferences, and involving them in decisions about their own care.	Collaboration includes working with Indigenous providers, Elders, and community members when the client wishes. It means resisting the impulse to provide and instead supporting the client's own knowledge and agency.
Cultural Responsiveness	Actively recognizing the historical and contemporary impacts of colonial relations on Indigenous peoples. Altering the therapeutic environment to be informed by Indigenous knowledge and healing practices.	Cultural responsiveness in this context means more than acknowledging diversity. It means understanding that colonialism is a determinant of health, that its effects are present in every healthcare encounter, and that adapting care to Indigenous ways of knowing is not optional.

Note: The SAMHSA trauma-informed care framework and the full TVIC model are explored in greater depth in HLTH-3080: Inclusion, Belonging, and Justice in Reproductive Healthcare. What follows here is the introductory application, specifically for Indigenous reproductive and perinatal care contexts.

The Doula's Role: From Principles to Practice

Applying TVIC in doula practice means bringing these five principles into every interaction: not only during labour and birth, but in intake conversations, in how you introduce yourself, in how you describe your scope, and in how you follow up. Some specific applications for doulas supporting Indigenous clients include the following.

Informed consent as an ongoing process. Ensuring clients fully understand their options during labour and birth is essential. In a context where consent has historically been ignored, obtained through coercion, or used as a mechanism of harm, making consent explicit, transparent, and genuinely voluntary is an act of practice, not just of paperwork.

Advocacy within care systems. Doulas can act as advocates for clients in medical settings, helping to bridge gaps between Western medical protocols and traditional Indigenous practices. This may include

advocating for the presence of Elders or family members, supporting the use of traditional medicines where clinically possible, and raising concerns about care practices that violate TVIC principles.

Community building. Building networks with Indigenous and racialized providers, organizations, and support services means you arrive with resources, not just intentions. A doula who knows which Indigenous midwifery organizations operate in their region, which community health centres serve First Nations families, and which postpartum support programs are culturally grounded is better positioned to offer genuine support.



Which Principle Feels Hardest?

Read through the five TVIC principles again. Which one would be hardest for you to consistently practice, and why? Not in theory. In a real room, with a real client, under time pressure, when you are tired or uncertain.

There is no correct answer. TVIC is not a checklist. It is a practice that requires ongoing self-reflection, and part of that reflection is knowing where your edge is. What would you need to get better at the principle you identified?

2.9.3 The Right to Parent in Safety: Toward Non-Carceral Futures

The third right of the Reproductive Justice framework — the right to parent in safe and sustainable communities — extends reproductive justice well beyond the moments of conception and birth. As SisterSong notes, this right involves multiple layers of protection: social, political, economic, and environmental. Without those protections, “individual Black, Indigenous, low-income, queer, and disabled parents experience punishment and child removal” (Paynter, 2022, p. 97). For Indigenous families in Canada, the child welfare system has functioned as one of the most powerful instruments of that punishment.

Birth Alerts and the Continuity of Colonial Removal

A **birth alert** is a hospital notification system through which child welfare societies are informed when a person with an existing CAS file gives birth, often without the parent’s knowledge or consent. The practical effect is that child welfare workers can be present at the birth, or arrive immediately after, to assess the family and potentially apprehend the newborn. Indigenous mothers have been disproportionately subjected to birth alerts. In 2019, the National Inquiry into Missing and Murdered Indigenous Women and Girls (MMIWG) called upon all provincial and territorial governments to immediately end the practice, which the Inquiry determined was racist and discriminatory.

In Ontario, *Ministry Policy Directive CW 005-20* (2020) mandated that Children’s Aid Societies cease the practice of birth alerts by October 15, 2020. The directive acknowledged the MMIWG finding and required societies to notify local hospitals, prenatal services, and midwifery practices of the change. Ontario was one of the last provinces to formally end the practice

The Numbers Behind the System

The child welfare system in Canada produces outcomes that are inseparable from the history in sections 2.9.1 and 2.9.2. According to 2021 Census data compiled by Indigenous Services Canada, Indigenous children account for 7.7 percent of Canada’s child population but represent 53.8 percent of all children in foster care. Indigenous children are 12.4 times more likely to be taken into formal care than non-Indigenous children. These numbers are not the product of parenting failure. They are the product of **systemic racism** embedded in a system that has historically treated Indigenous families as sites of risk rather than as communities deserving of support (Indigenous Services Canada, 2025).

Many social workers and child welfare employees are well-intentioned. The problem is not always the person in the room. It is the system within which that person operates: the policies, the risk thresholds, the mandatory reporting requirements, the absence of culturally grounded alternatives, and the structural underfunding of preventive support. Well-intentioned individuals working within a system shaped by racism will produce racially unequal outcomes unless the system itself changes. That is what systemic racism means.

Table 2.9.2: Comparisons of Child Welfare Models

Surveillance-Based Model	Community Support Model
Birth alerts, CAS apprehension, Investigation-first	Kinship care, Community wellness, Preventive funding, Indigenous-led services

Dr. Dorothy Roberts, a US legal scholar and author, coined the term **family policing system** to describe what is commonly called the child welfare system, naming it by what it actually does: surveils, investigates, and removes. Roberts argues that the system provides more violence and control than care or protection. While her analysis focuses on the US context, scholars and advocates in Canada have applied the same framing to the Canadian child welfare system and its colonial continuities (Roberts, 2022).

Toward Non-Carceral Alternatives

Reproductive justice demands that the state not only refrain from interfering with reproductive decisions but actively create the conditions for **self-determination**: the right of individuals and communities to govern their own lives, families, and futures. For Indigenous communities in Canada, self-determination in child and family services means Indigenous nations designing, implementing, and evaluating care that is grounded in their own knowledge systems, values, and laws, rather than in provincial systems built on colonial frameworks of risk and removal.

Non-carceral alternatives do not begin by asking who should be taken from a family. They begin by asking what a family needs to stay together safely. This reframing reflects the social determinants of health framework from section 2.6.2: inadequate housing, income insecurity, absence of culturally safe care, geographic isolation, and intergenerational trauma are not signs of parental unfitness. They are structural conditions that require structural responses. Supporting **bodily autonomy** and **equity** in parenting means investing in those conditions before apprehension becomes the only tool available.

Bill C-92, An Act respecting First Nations, Inuit and Métis children, youth and families, received Royal Assent on June 21, 2019 (SC 2019, c 24). It is the first federal legislation to affirm the inherent right of Indigenous peoples to exercise jurisdiction over child and family services affecting their communities. For the first time in Canadian law, Indigenous nations can design and operate their own child welfare systems, rooted in their own laws, protocols, and values. Implementation has been uneven, and resources remain inadequate, but the Act

establishes a legal foundation for Indigenous-led, non-carceral care that centres access, cultural safety, and community connection over surveillance.

The Senate report from section 2.9.1 reinforces this direction. Recommendation 11 calls specifically for increased investment in community-based midwifery in northern and remote communities, recognizing that reproductive **access** and parenting safety are not separate issues. Systems that support Indigenous birth on the land, with Elders present, with cultural continuity intact, produce healthier starts for children who are far less likely to enter the child welfare system. The right to have children and the right to parent in safety are inseparable. Addressing one without the other is not reproductive justice.

The Doula's Position

Doulas are not child welfare workers. That boundary is part of the scope of practice introduced in section 2.4.4, and it matters here particularly. But doulas who work with Indigenous clients may encounter families who are afraid: afraid of the hospital, afraid of mandatory reporting, afraid of losing their child. That fear reflects a rational assessment of real risk, grounded in the statistics in this section and the histories in section 2.9.1. It is not irrational. It is intersectional: shaped by race, geography, socioeconomic status, and intergenerational experience with systems that have historically treated Indigenous families as problems to be managed.

Applying the five TVIC principles from section 2.9.2 in this context means understanding that a client's hesitation to seek care, reluctance to disclose, or distrust of providers is not obstruction. It is a rational response to a rational threat. Supporting that client's **bodily autonomy** and **self-determination** means creating safety, demonstrating trustworthiness, ensuring genuine choice, collaborating rather than directing, and actively centring the cultural context and community connections of the client. Reproductive justice, as this OER has argued from the beginning, is not only about the right to not have children or the right to have them. It is about the conditions, across a lifetime, in which all three rights can actually be exercised.



An Indigenous Client in Your Care

You are supporting an Indigenous client through their pregnancy and birth. During your discussions, they share concerns about cultural safety, the absence of traditional birthing practices, and the fact that the nearest Indigenous midwifery program is two hours away. They mention that their sister's baby was apprehended at birth three years ago and that they are afraid.

Consider: What barriers to access, autonomy, and safety does this client face? How do the social determinants of health from section 2.6.2 show up in their situation? Which of the five TVIC principles would you draw on most immediately, and what would that look like in practice? What Indigenous-led reproductive health resources exist in your region that you could connect them with?

For the last question, this is not hypothetical. Find three actual organizations or programs before you finish this section.

This section has traced a path from the history of reproductive oppression in section 2.9.1, through the practice framework of TVIC in section 2.9.2, to the contemporary landscape of parenting, surveillance, and emerging self-determination in section 2.9.3. The goal is not to leave you overwhelmed, though some of what is here is overwhelming. The goal is for you to enter a care relationship with an Indigenous client, knowing that the room holds more history than you can see, that equity requires more than good intentions, and that your practice is one small but real part of a much larger project of restoring what colonialism took.

2.10 Gaining Perspective: Assisted Reproductive Technologies and Diverse Family Building



Learning Outcomes

By the end of this section, you will be able to:

- Briefly describe the history and regulation of ART in Canada
- Analyze access barriers for 2SLGBTQIA+ and non-traditional families
- Apply cultural humility to diverse family-building contexts in doula practice

2.10.1 History and Types of ART

Assisted Reproductive Technologies (ART) are a group of medical procedures and techniques designed to help individuals or couples achieve pregnancy when other methods have not been successful (Bastawros, 2023). Clinically, the term ART is applied specifically to procedures that involve the handling of eggs or embryos outside the body. Several related fertility treatments, including intrauterine insemination (IUI), technically fall outside this definition because they handle only sperm. However, IUI is commonly grouped with ART in healthcare, policy, and patient-facing contexts, and it is included here on that basis.

In Vitro Fertilization (IVF). The most widely used ART procedure. Eggs are extracted from the ovaries, fertilized with sperm in a laboratory, and the resulting embryos are transferred into the uterus. IVF can address blocked fallopian tubes, male factor infertility, or unexplained infertility. It is also used outside infertility contexts, including by same-sex couples, single parents, and trans individuals who require donor gametes.

Intrauterine Insemination (IUI). Washed and concentrated sperm are placed directly into the uterus, bypassing the cervix. IUI is less invasive and less costly than IVF, and is commonly the first step for same-sex female couples or single people using donor sperm.

Donor Gametes. Donor sperm or eggs are used when a person is unable to provide viable gametes, or when the family structure requires gametes from outside the partnership. Donors are screened for medical and genetic conditions. Legal and ethical questions around donor anonymity and parental rights vary by jurisdiction; in Canada, disclosure practices are evolving as donor-conceived people increasingly seek genetic information.

Surrogacy. In gestational surrogacy, a surrogate carries a pregnancy conceived using the intended parents' embryo or donor gametes. The surrogate has no genetic connection to the child. In traditional surrogacy, the surrogate provides the egg and carries the pregnancy, creating a genetic connection. Gestational surrogacy is far more common in contemporary practice.

Embryo Cryopreservation. Embryos or gametes can be frozen for future use, allowing multiple attempts at pregnancy without repeating ovarian stimulation and egg retrieval. Cryopreservation is also used to preserve fertility before cancer treatment or gender-affirming care.

Preimplantation Genetic Testing (PGT). Embryos are tested for genetic abnormalities before transfer, reducing the risk of passing on certain conditions. PGT is used both for medical reasons and, in some contexts, to select embryo characteristics, raising ongoing ethical debate

Regulation in Canada: The Assisted Human Reproduction Act (2004)

The *Assisted Human Reproduction Act* (AHRA, 2004) established Canada's federal regulatory framework for ART. The Act is grounded in the principle that reproductive technologies can benefit individuals and society, but their use must be governed by respect for human dignity, protection of vulnerable persons, and the welfare of children born through these technologies (Health Canada, 2024). Key provisions include:

- Altruistic surrogacy is permitted. Surrogates may be reimbursed for reasonable pregnancy-related expenses, but cannot receive payment or compensation beyond that. Commercial surrogacy is prohibited.
- Gametes and embryos cannot be bought or sold. Sperm and egg donation is permitted on an unpaid basis. Donors may receive reimbursement for related costs. Donor anonymity has historically been the norm in Canada, limiting the information available to donor-conceived people and to families choosing a donor. As a result, many Canadians purchase gametes from sperm and egg banks in the USA, where open-identity donors are more common, and profiles routinely include physical characteristics, education, family medical history, childhood photographs, and audio recordings. The ability to learn more about a donor's identity is a significant driver of this cross-border practice.
- The AHRA does not distinguish between heterosexual and same-sex intended parents. The Act applies equally across family structures.

In 2015, Ontario launched the **Ontario Fertility Program**, extending public funding for one IVF cycle per patient to eligible Ontarians under age 43. Approximately 20,000 ART cycles are performed annually across Canada's roughly 35 fertility clinics. A 2020 study of Ontario's publicly funded IVF program found that while funding improved access for some, significant barriers remained: geographic concentration of clinics in urban centres, age limits, long wait times, and a program design that did not fully account for the needs of 2SLGBTQIA+ patients, single parents, or people who did not meet the medical infertility definition (Winsor et al., 2020).

2.10.2 2SLGBTQIA+ and Non-Traditional Families

The design of ART policy and practice has historically centred on the heterosexual couple experiencing medical infertility. As Tam (2021) argues in a reproductive justice analysis of ART access in Canada, this design creates systemic barriers for 2SLGBTQIA+ people, BIPOC individuals, and those with intersecting marginalized

identities, not because they are infertile in a clinical sense, but because the healthcare system was not built with their reproductive needs in mind.

Social Infertility

Tam (2021) applies the concept of **social infertility** to describe the reproductive barriers faced by same-sex couples, single people by choice, and trans and non-binary individuals who require ART not because of a medical diagnosis but because of the biological circumstances of their relationships or gender identity. Unlike heterosexual couples, whose ART need is typically framed as a medical problem warranting clinical support, 2SLGBTQIA+ people encounter a system that often treats their family-building needs as elective rather than medically necessary. This framing affects insurance coverage decisions, clinic intake practices, and how care is delivered.

Tam (2021) frames access through the three rights of the Reproductive Justice framework introduced in section 2.1.2: the right to have children, the right to not have children, and the right to parent in safety. For 2SLGBTQIA+ people, all three rights require structural support that existing ART systems do not fully provide.

Access Barriers

Financial barriers. A single IVF cycle costs between \$10,000 and \$15,000 before medications. Ontario's publicly funded IVF program ties eligibility to a medical infertility diagnosis, which 2SLGBTQIA+ people who do not have a clinical infertility diagnosis may not meet. Those who do not qualify for public funding face the full cost out of pocket. As Tam (2021) notes, the cost of ART is not distributed equally across race, class, and sexuality.

Geographic concentration. Fertility clinics are concentrated in major urban centres. Rural and remote populations, including many Indigenous communities, face the same access gap documented in sections 2.5.1 and 2.9.1 in the context of pregnancy care.

Heteronormative clinical design. Intake forms, clinical language, and care assumptions are often built around opposite-sex couples. 2SLGBTQIA+ patients report navigating heterosexist assumptions throughout the ART process, from initial consultations through to postpartum care. This is a cultural safety issue in the terms established in section 2.8.2.

Legal Recognition in Ontario

Ontario's *All Families Are Equal Act* (2016) updated the Children's Law Reform Act to formally recognize diverse family structures. Key changes include: same-sex couples no longer need to legally adopt their own children when the child was conceived through donor conception with proper consent agreements; up to four parents can be named on a birth certificate; and pre-birth parentage orders are available, establishing legal parentage before birth. The Act reflects a significant step toward reproductive equity in Ontario law, though legal practitioners note that provincial parentage processes still vary and legal advice remains important for families navigating surrogacy and donor conception (Government of Ontario, 2016).



Advocacy in Practice: Affirmations and Responsibilities

Advocacy for 2SLGBTQ+ clients in reproductive care is two-sided. One side belongs to the client: affirmations of what they are owed. The other belongs to the provider: responsibilities they must fulfil. Neither side is optional.

On the side of affirmations: 2SLGBTQ+ folks have the right to safe, equitable, and comfortable care. They deserve to have options when it comes to providers. Their needs are specific to their identities; queer folks are not a monolith. For each of these three affirmations, name one concrete, specific example of what it looks like in a doula context.

On the side of responsibilities: It is the responsibility of healthcare providers to learn how to best support 2SLGBTQ+ clients. Providers have the responsibility to unlearn the hidden micro and macro aggressions that persist in care settings. Providers need to commit to actively engaging in queer solidarity work. For each of these three responsibilities, name one concrete action you could take this month, not eventually.

Together, both sides describe what inclusive care actually requires. The affirmations articulate what 2SLGBTQ+ clients are owed. The responsibilities describe what providers must do to deliver it.

2.10.3 Cultural Humility in Doula Practice

Section 2.8.2 established that cultural safety is determined by the recipient of care, not the provider, and that cultural humility requires ongoing self-reflection rather than a one-time training (Curtis et al., 2019). Both principles apply directly in the context of ART and diverse family building. A doula supporting a 2SLGBTQIA+ client, a single parent by choice, or a polyamorous family through conception, pregnancy, or birth is navigating a care environment that was not built for that client.

Affirming language and inclusive intake practices are not peripheral to this work. Assuming the gender of a pregnant person, defaulting to “mom and dad” when describing family roles, or using intake forms that have no space for non-binary gender identity or multiple parents, are not neutral oversights. They communicate to the client whether this is a space where they are expected. Section 2.2.1 introduced the principles of gender-inclusive language in reproductive care. Those principles apply here with particular weight, because the ART process and the pregnancy that follows often involve clinical encounters across multiple providers over months or years.

Note: Diverse family formations, including ART, LGBTQ+ parenting, adoption, and foster care, are explored in depth in HLTH-3080 Inclusion, Belonging, & Justice in Reproductive Healthcare. This section provides foundational context for doula students entering reproductive care settings.

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2.11 From History to Advocacy: Black Birthing Experiences and Reproductive Justice



Learning Outcomes

By the end of this section, you should be able to:

- Trace the history of systemic racism in medicine as it relates to reproductive healthcare
- Analyze how anti-Black racism, poverty, substance use, and criminalization shape reproductive experiences, using the Social Determinants of Health framework
- Describe community-based, non-carceral pathways toward reproductive justice
- Identify the contributions of Black-led reproductive health movements to the broader field of reproductive justice in Canada and internationally

2.11.1 A History of Black Birth in Five Phases

This section begins where Chapter 2 began: in the knowledge that existed before colonial disruption. Just as section 2.3.3 established the richness of Indigenous ceremonial birth practices before tracing their suppression, this section opens with the African birthing traditions that arrived in North America through the transatlantic slave trade and survived, in forms altered by violence, through every era that followed. The history is a record of harm, yes, but it is also a record of resistance, persistence, and reclamation.

Phase 1: African Customs (Pre-15th Century)

Before the transatlantic slave trade disrupted the lives of millions of people across the African continent, birth was held within a rich framework of community, ceremony, and specialized knowledge. Midwives served as community healers, plant medicine practitioners, knowledge keepers, and storytellers. Their role extended well beyond the clinical: they carried oral traditions about birth across generations and held the social fabric of communities together through the moments of arrival that shape families. Births were surrounded by ceremony: cleansing rituals before labour, naming ceremonies after arrival, massage, prayer, and practices designed to invoke ancestral protection for both the birthing person and the child. Specific herbs, foods, and dietary practices marked the postpartum period as a time of restoration and community investment.

With enslavement, these traditions were suppressed, transformed, driven underground, and carried forward in altered forms by the same people who were denied the right to practise them openly. Understanding what was present before what was taken is the foundation of understanding the history that follows.

Phase 2: Enslavement (Late 15th Century to 1865)

Enslavement fundamentally restructured the reproductive lives of Black women. The children of enslaved people were born into slavery and became the property of enslavers, making Black reproduction an economic resource to be extracted rather than a human experience to be supported. Enslaved women were used as forced reproducers of labour. The bodies of Black women were not understood, within the dominant framework of the time, as bodies deserving of autonomy, consent, or protection.

This period is also the origin point of J. Marion Sims, known in medical history as the ‘Father of Modern Gynecology’ and credited with inventing the speculum. Sims developed his surgical techniques for repairing vesicovaginal fistulas by performing repeated experimental surgeries on enslaved women, including Anarcha, Lucy, and Betsy, without anesthesia. His justification relied on the racist doctrine that Black people did not feel pain in the same way as white people — a belief that, as section 2.11.2 will show, persists in modified form among medical trainees today. Anarcha alone underwent at least 30 surgeries without consent. The practice of naming these women is an act of recognition of the medical institutions that honoured Sims failed to make for generations (Holland, 2017).

Enslaved women resisted. They maintained cultural birthing practices where possible, supported each other through labour and birth, and preserved knowledge across a system designed to erase it. That resistance, communal, relational, and grounded in Phase 1, is the foundation of every Black-led birth movement that followed.

Phase 3: Post-Emancipation and Segregation (1865 to 1950s)

After emancipation, Black communities in the United States and Canada continued to face segregated healthcare. Black patients were excluded from white hospitals or confined to inferior facilities. Continued reliance on Black midwives, the Granny Midwives introduced in section 2.4.3, was both a community necessity and an act of cultural continuity, maintaining the traditions of Phase 1 in a system that was actively dismantling them through licensing laws and professionalization.

The Tuskegee Syphilis Study (1932–1972), conducted by the US Public Health Service in Alabama, is the canonical case of research ethics violation in the context of Black healthcare. 399 Black men with syphilis were enrolled in a study of the natural progression of the disease without being told their diagnosis or offered treatment, even after penicillin became the standard of care (Centers for Disease

Control and Prevention, n.d.). Although the study began during segregation, it continued through the Civil Rights Movement and was not publicly exposed until 1972.

Video: The Tuskegee Study

Video: "[The Tuskegee Study](#)" by [Black History in Two Minutes or so](#) [3:01] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

Phase 4: The Civil Rights Era (1950s to 1970s)

The civil rights era brought renewed federal attention to reproductive rights and renewed reproductive coercion. Federal funding for the birth control pill in the United States coincided with policies aimed at managing welfare reliance, specifically targeting poor women and women of colour. Forced and coerced sterilizations, colloquially known as 'Mississippi appendectomies', were performed on Black, Indigenous, and low-income women without their knowledge or consent in US hospitals and clinics. The public outrage that followed the Tuskegee Syphilis Study led directly to the National Research Act (1974), which for the first time required that all federally funded human subjects research be approved by an Institutional Review Board. The Belmont Report (1979) followed, establishing the principles of respect for persons, beneficence, and justice that now govern research ethics across Canada and the United States (National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research, 1979).

It was also in this era that Black feminist organizing for reproductive justice took root. The grassroots activism of this period, led by Black women who recognized that mainstream reproductive rights movements were not speaking to their full experiences, produced the political and intellectual foundations for the Reproductive Justice framework.

Phase 5: Contemporary Context (1980s to Present)

As section 2.6.1 established, the term Reproductive Justice was coined in 1994 by twelve Black women, including Loretta Ross. The five-phase history of Black birthing experiences is the reason the Reproductive Justice movement exists. Reproductive Justice did not arise in response to a single event, but to centuries of reproductive oppression, medical racism, and community resistance.

The contemporary period has produced new evidence for what Black communities have known for generations: that anti-Black racism operates at every level of the healthcare system. In Canada, research

on Black health has expanded but remains limited compared to the United States. Olanlesi-Aliu, Alaaazi, and Salami (2023), in a scoping review protocol of Black health in Canada published in JMIR Research Protocols, document the relative scarcity of Canadian data disaggregated by race and the need for research frameworks that centre the lived experiences of Black Canadians. Black people in Canada face systemic barriers to quality care in racialized communities, experience racial disparities in diagnosis and treatment, and carry the legacy of medical mistrust established in Phases 2 and 3 into every clinical encounter. Black women experiencing pregnancy and birth in Canada face these dynamics at an intersection of race, gender, and the healthcare system's historical failures. The persistence of implicit bias in clinical settings is not a theoretical concern: section 2.11.2 documents its specific mechanism.

Summary of Events

1. Before the 15th century – African traditions
2. Late 15th century–1865Enslavement
3. 1865–1960s – Segregation and the Tuskegee syphilis study
4. 1950s–1970s – The Civil Rights Movement and forced sterilizations
5. 1980s–present – Implicit bias, health disparities, and resistance



Entering the Room

You have just read a five-phase history spanning pre-colonial Africa to contemporary Canada. Phase 1 established what was present. Phases 2 through 5 documented what was taken, suppressed, violated, and distorted. Phase 5 shows that this is not finished.

Consider: how does knowing this history change how you would enter a room with a Black client? Not as guilt or over-compensation, but as context. What does it mean that a client's hesitation to trust a clinical provider is historically grounded and statistically warranted? What does it mean that the traditions of Phase 1 — community, ceremony, plant medicine, relational knowledge — are actively being reclaimed?

Cross-reference: Apply the five TVIC principles from section 2.9.2 to what you now know. Which principle feels most urgent in this context, and why?

2.11.2 Anti-Black Racism as a Social Determinant

Section 2.6.2 established that the social determinants of health are not equally distributed, and that intersecting systems of privilege and oppression shape who has access to the upstream conditions that support health. Anti-Black racism is not incidental to those systems: it is itself a social determinant. It operates through every level of the Social-Ecological Model (Dumbaugh et al., 2021) — individual, interpersonal, institutional, community, and public policy — producing health disparities that accumulate across a lifetime and across generations.

The Pain Myth in Clinical Practice

The false belief that Black people feel less pain than white people traces directly to the pseudoscientific justifications used during Phase 2 of this chapter's history. Hoffman, Trawalter, Axt, and Oliver (2016), in a landmark study published in *Proceedings of the National Academy of Sciences*, found that approximately half of white medical students and residents endorsed at least one false belief about biological differences between Black and white patients, including claims that Black people have thicker skin, less sensitive nerve endings, or blood that coagulates more quickly. None of these beliefs has any scientific basis. Participants who endorsed more false beliefs rated Black patients' pain as lower than white patients' pain in identical clinical scenarios and made less accurate treatment recommendations. Participants who endorsed zero false beliefs showed no racial bias.

These trainees are now in practice. The implication for Black patients seeking pain management, labour support, or postpartum care is direct and measurable: they are more likely to be undertreated for pain, more likely to have their concerns dismissed, and more likely to experience a clinical encounter that does not meet the standard of care they are owed. This is what section 2.8.2 names as cultural unsafety: a care experience determined by the provider's assumptions rather than the patient's reality.

Five Levels, Five Sites of Intervention

Dumbaugh et al. (2021)'s Social-Ecological Model identifies five levels at which health behaviours are shaped: Individual, Interpersonal, Institutional, Community, and Public Policy. These same five levels are also five sites for intervention and resistance. Anti-Black racism operates at all five simultaneously; meaningful change requires action at all five simultaneously.

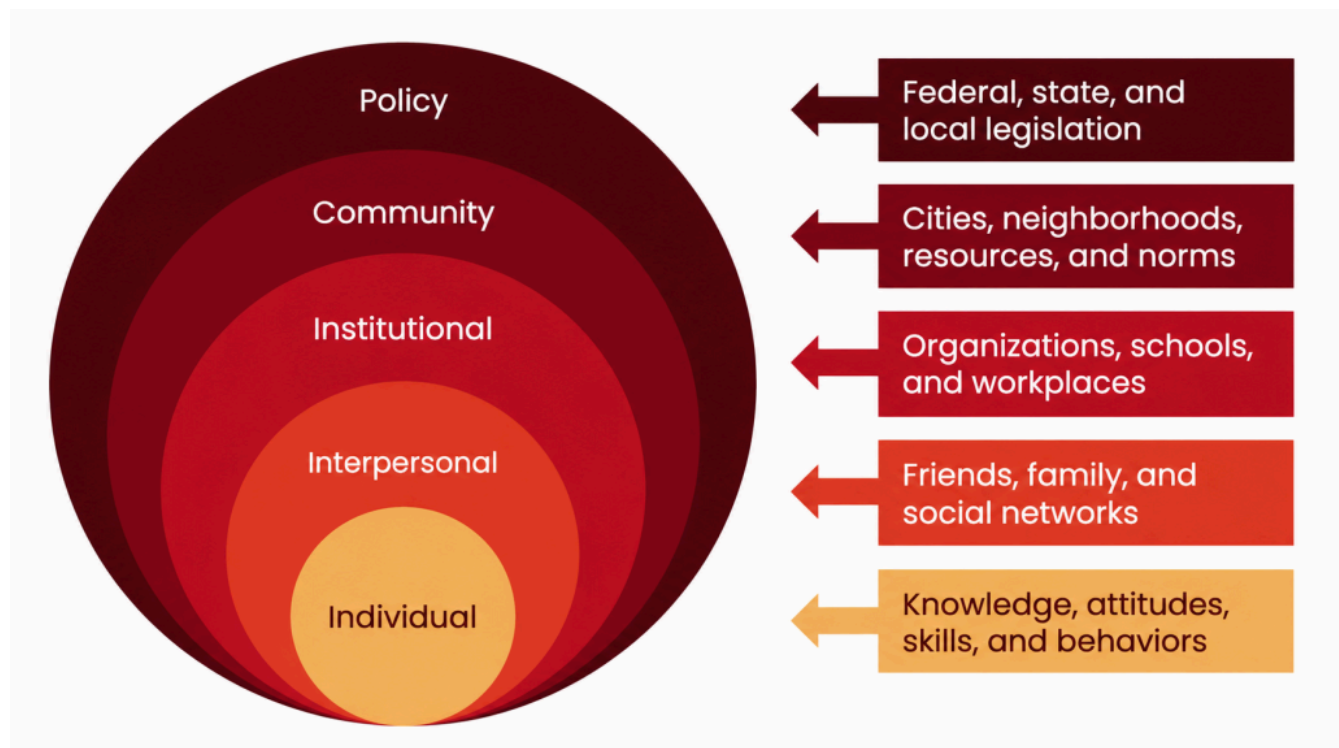


Figure 2.11.1 "The Social-Ecological Model" by PUBH 110: Public Health and Global Societies, CC BY-NC-SA 4.0. Modifications: Reworded, recoloured.

At the individual level: Black clients carry the cumulative burden of Phases 2 through 5 into every clinical encounter. Hesitation to seek care, reluctance to disclose, or distrust of providers is not obstruction: it is a rational response to a rational history.

At the interpersonal level: The pain myth, implicit bias, and microaggressions operate in individual provider-client interactions. Cultural humility, as section 2.8.2 established, is determined by the client, not the provider.

At the institutional level: Hospitals, clinics, and healthcare organizations shape whose pain is taken seriously, whose cultural practices are accommodated, and whose family formations are recognized. Institutions can also create change through policy, training, and accountability structures.

At the community level: Community-based organizations, birth collectives, and culturally aligned care networks provide reproductive support that institutions have consistently failed to offer. Section 2.11.3 examines these in depth.

At the public policy level: Maternal mortality data disaggregated by race, funding for community midwifery, ending birth alerts (section 2.9.3), and legislative frameworks that centre equity are all policy interventions with direct reproductive consequences.

Poverty, Substance Use, and Criminalization: A Brief Note

The social determinants of health described in section 2.6.2 are unequally distributed along racial lines in Canada. Anti-Black racism shapes access to income, housing quality, neighbourhood safety, and educational opportunity in ways that compound across generations (Public Health Agency of Canada, n.d.). These are structural outcomes, not individual failures. Substance use and involvement with child protection systems affect Black families at disproportionate rates, shaped by intersecting systems of poverty, racism, and criminalization. Birth alerts, described in section 2.9.3 as disproportionately affecting Indigenous mothers, have similarly been documented as disproportionately affecting Black mothers in urban Ontario. For incarcerated pregnant people specifically, Sapkota et al. (2022) document that reproductive health needs are routinely deprioritized within correctional systems and that mothers feel disempowered to enact their parenting role while imprisoned. These realities are named here as context for section 2.11.3.



The Social-Ecological Model in Your Practice

Dumbaugh et al. (2021) identified five levels of the Social-Ecological Model: Individual, Interpersonal, Institutional, Community, and Public Policy. At each level, there is both a mechanism of harm and a site of intervention.

Think about a Black client you might support through a pregnancy and birth in Canada today. At each of the five levels, name one specific harm they might encounter and one specific intervention that is possible. Not theoretically possible: actually possible, in your community, with the tools available to a doula.

At which level can you have the most direct impact? At which level are you dependent on others

to act? What does advocacy beyond the individual client relationship look like at the levels where your influence is indirect?

2.11.3 Reclaiming Reproductive Sovereignty: Black-Led Pathways

The organizing question of this section is the same question that produced the Reproductive Justice framework in 1994: not what is being done to Black communities, but what Black communities are doing for themselves. The three rights of the Reproductive Justice framework are all actively being claimed and defended through Black-led movements and organizations in Canada and internationally. This section maps three of them, one for each right.

The Right to Have Children: Black Maternal Health Week

Black women in Canada and the United States experience maternal death at approximately 2 to 3 times the rate of white women (Hunte et al., 2025). This disparity is not primarily explained by differences in underlying health conditions. It is explained by differences in how care is delivered and by whom, and by the structural conditions documented in section 2.11.2 that shape Black women's access to quality care, safety in clinical encounters, and ability to exercise bodily autonomy throughout pregnancy and birth.

Black Maternal Health Week (April 11–17), led by the **Black Mamas Matter Alliance (BMMA)**, is an annual campaign to raise awareness about Black maternal health disparities, advocate for policies that reduce mortality and improve care, celebrate community-led initiatives, and amplify the voices and experiences of Black birthing individuals. BMMA's advocacy framework centres self-determination: the claim that Black birthing people have the right to define what safe, equitable care looks like for them, and that healthcare systems are accountable to that definition. The right to have children requires not only freedom from coercion but access to the conditions in which pregnancy and birth are not life-threatening (Black Mamas Matter Alliance, n.d.).

The Right to Parent in Safety: Black Breastfeeding Week

The third right of the Reproductive Justice framework extends well beyond birth. It encompasses the conditions in which families raise children, including the cultural, relational, and embodied practices of early parenthood. Breastfeeding is one such practice, and its history in Black communities is inseparable from the history in section 2.11.1.

During enslavement, Black women were forced to wet-nurse the children of enslavers, often at the expense of their own infants' access to breastfeeding. This severing of the breastfeeding relationship produced intergenerational disruptions in breastfeeding culture, knowledge, and confidence that persist today. Black infants in North America are breastfed at lower rates than white infants, a disparity shaped by this history, by 'lactation deserts' where resources are limited, by economic conditions that make breastfeeding harder to sustain, and by a healthcare system that does not consistently provide culturally responsive lactation care.

Black Breastfeeding Week (August 25–31), co-founded by Kimberly Seals Allers, Kiddada Green, and Anayah Sangodele-Ayoka, was created to address these disparities: to challenge the stigma and historical traumas around breastfeeding in Black communities, to promote culturally relevant lactation support, to address lactation deserts, and to reclaim breastfeeding as a key strategy for improving maternal and infant health

outcomes. It is the right to parent in safety expressed as a community-led health movement (Black Breastfeeding Week, n.d.).

Video: Understanding Racial Disparities in Breastfeeding

Video: "[Understanding Racial Disparities in Breastfeeding: Guidance for Healthcare Professionals](#)," by [The Children's Hospital of Philadelphia](#) [8:21] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

The Black Birth Project: A Canadian Initiative

The [Black Birth Project](#) is a Canadian initiative founded by Cheyenne Scarlett, Kamika Sylvester, and Kaminda Musumbulwa to address disparities in maternal and infant health for Black Canadians. Its work is grounded in storytelling, advocacy, and the amplification of Black birthing experiences as a tool for systemic change. The organization collects and shares personal stories of Black birthing people to make visible the challenges and successes that aggregate data cannot capture. It provides educational resources, builds community networks to support Black parents and families, and engages in policy advocacy to improve health outcomes and promote equity in reproductive healthcare (Black Birth Project, 2024).

The Black Birth Project matters for this OER because it operates specifically within Canada: within the same healthcare system doula students are training to work in, addressing the same inequities documented in this section. Its work is an example of the Social-Ecological Model operating at the community and public policy levels simultaneously, and a direct expression of the self-determination and equity principles this chapter has articulated across eleven sections.

Collaborative Anti-Racist Perinatal Care: A Model in Practice

Hunte et al. (2025) document a case study of the partnership between Healthy Birth Initiatives (HBI), a community-based organization and Black-led public health nurse home visiting program, and the maternal health division of Providence Health System in Portland, Oregon. The study examined how this partnership formed, why it mattered, and what it produced, drawing on qualitative interviews with staff and leadership from both organizations.

The partnership illustrates what anti-racist perinatal care looks like in practice: a Black-led community organization bringing culturally specific knowledge and relational trust into partnership with a healthcare institution, expanding what either could provide alone. The study's finding that cultural responsiveness was central to the partnership's success connects directly to the TVIC principles of section 2.9.2. The institutional willingness to be held accountable by a community organization is itself a form of cultural safety in practice.

Applying This to Doula Practice

Awareness and advocacy. Understanding the historical context in section 2.11.1 is the foundation of

understanding why trust between Black clients and healthcare providers is not automatic, and why a doula's relational role carries particular weight in this context. Reflection on personal biases, including the implicit biases documented by Hoffman et al. (2016), is an ongoing practice. Advocacy means ensuring clients' voices are heard, standing up against discrimination when encountered, and advocating for transparency and accountability within care settings.

Personalized care strategies. Care plans for Black clients should take into account their unique medical, cultural, and social context, not a generalized assumption about what Black clients need. Acknowledging healthcare mistrust and taking extra steps to build trust is not accommodation: it is evidence-based care, supported by everything in this section. Connecting clients with culturally aligned care providers, lactation consultants with experience in Black communities, and organizations like the Black Birth Project is not a supplementary service. It is the work.



What You Carry Out of Chapter 2

This is the final section of Chapter 2. You have moved from the earliest human societies through colonization, medicalization, the professionalization of birth, the development of the doula role, feminist waves, Reproductive Justice, intersectionality, social determinants of health, abortion law, cultural safety, assisted reproduction, Indigenous reproductive justice, and now Black birthing experiences. These topics form one argument made across eleven sections.

The argument is this: whose body is centred in reproductive care, whose knowledge is valued, whose autonomy is protected, and whose safety is prioritized are political and historical questions, not medical ones. The clinical encounter reflects these politics. The doula's role is shaped by them. Changing outcomes requires understanding what produced them.

What is one thing you know now that you did not know before this chapter that will change how you show up in a room? Name it specifically and then name what you will do with it.

Note: Anti-oppressive frameworks for systemic racism, trauma-informed approaches for families affected by incarceration, and stigma-reduction strategies are explored in depth in HLTH-3080 Inclusion, Belonging & Justice in Reproductive Healthcare.

CHAPTER 3 ANATOMY AND PHYSIOLOGY

This course introduces the biology of reproduction. Students will explore biochemistry, basic medical terminology, and the anatomy and physiology of the human body's eleven systems. Additional topics include physiological adaptations to pregnancy, embryology, lactation, and labour.

Chapter Outline

[3.0 Orienting: Uniting the Pack](#)

[3.1 Building Block of Life: Basic Biochemistry, Cells and Reproduction, Tissues](#)

[3.2 Rivers and Currents: Cardiovascular System](#)

[3.3 Communication: Nervous System](#)

[3.4 Nourishment: The Digestive System](#)

[3.5 The Power of Breath: The Respiratory System](#)

[3.6 Filtration & Balance: The Urinary System](#)

[3.7 The Body's Invisible Orchestra: The Endocrine System](#)

[3.8 Reproductive Systems](#)

[3.9 The Body's Defence: The Immune System](#)

[3.10 The Tree of Life: The Placenta](#)

[3.11 The Passageway: The Pelvis](#)

[3.12 The First Food: Lactation and the Mammary Glands](#)

[3.13 Sitting With it: Physiological Adaptations to Pregnancy](#)

[3.14 Development and Inheritance: Genetics, Embryology, and Diversity](#)

[3.15 Physiology of Labour](#)



3.0 Orienting: Uniting the Pack

Human anatomy and physiology have remained largely unchanged for approximately 300,000 years. What has evolved is our understanding, language, and the ways we interpret and talk about bodily functions, including reproduction, hormones, and lactation.

As you move through this chapter, you are invited to explore anatomy and physiology through a doula lens. This means engaging not only with the biological systems but also with a sense of respect and reverence for the human body. The body is both intricate and expansive, capable of countless micro- and macroscopic processes that support life, adaptation, and transformation.

For simplicity, we will at times refer to “male” and “female” reproductive systems. At the same time, it is important to recognize that sex characteristics exist along a continuum, and not all bodies fit neatly into binary categories. As we introduce foundational concepts, including intersex variations, this material does not represent an exhaustive account of all anatomical possibilities.

This chapter is designed to be interactive. Learning deepens when we connect new information to what we already know, to lived experience, and to the real-world contexts in which we will apply this knowledge as doulas. You are encouraged to reflect, question, and make meaning as you go.



Learning Outcomes

In this chapter, you will:

- Explore levels of structural organization.
- Identify the organ systems.
- Describe the functions of the human body that contribute to maintaining life.
- Describe orientation, directional, and regional terms of anatomy, i.e. “the language of anatomy”.
- Provide examples of Homeostasis, Positive and Negative Feedback.

3.0.1 Medical Language Within the Context of Anatomy and Physiology



Learning Outcomes

By the end of this section, you will be able to:

- Connect medical language learning to the context of anatomy and physiology.
- Introduce the basic architecture and levels of organization of the human body.
- Evaluate the anatomical position, regional terms, directional terms, body planes, and body quadrants for anatomical positioning.
- Describe body cavities and the functions of associated membranes.
- Discuss the role of homeostasis in healthy functioning.
- Recognize negative and positive feedback, and physiologic examples of each mechanism

As you memorize the language components of medical terminology, it is important to support that learning within the context of anatomy and physiology. Proceeding through the body system chapters, you will learn word parts, whole medical terms, and common abbreviations. It is important to put into context where in the body the medical term is referencing, and then consider how it works within the body.

Anatomy focuses on structure, and **physiology** focuses on function. Much of the study of physiology centres on the body's tendency toward homeostasis (Marieb, 2015).



Gross Anatomy

Large structures, easily observable (e.g. the stomach).



Microscopic Anatomy

Structures can be viewed only with a microscope (e.g. epithelial cells). Complementarity of Structure and Function: Structure determines what functions can occur; if structure changes, the function must also change

3.0.2 Structural Organization of the Human Body

All matter in the universe is composed of one or more unique pure substances called **elements**. familiar examples are hydrogen, oxygen, carbon, nitrogen, calcium, and iron.

- The smallest unit of any of these pure substances (elements) is an **atom**.
 - Atoms are made up of subatomic particles such as the proton, electron, and neutron.
- Two or more atoms combine to form a **molecule**, such as the water molecules, proteins, and sugars found in living things.
 - **Molecules** are the chemical building blocks of all body structures.
- A **cell** is the smallest independently functioning unit of a living organism
 - Even bacteria, which are extremely small, independently living organisms, have a cellular structure. Each bacterium is a single cell. All living structures of human anatomy contain cells, and almost all functions of human physiology are performed in cells or are initiated by cells.
 - A human cell typically consists of flexible membranes that enclose cytoplasm, a water-based cellular fluid, together with a variety of tiny functioning units called **organelles**. In humans, as in all organisms, cells perform all functions of life.
- A **tissue** is a group of many similar cells (though sometimes composed of a few related types) that work together to perform a specific function.
- An **organ** is an anatomically distinct structure of the body composed of two or more tissue types. Each organ performs one or more specific physiological functions.

An **organ system** is a group of organs that work together to perform major functions or meet the physiological needs of the body. There are 11 organ systems:

1. Cardiovascular System
2. Digestive System
3. Endocrine System
4. Integumentary System
5. Lymphatic System

6. Muscular System

7. Nervous System

8. Reproductive System

9. Respiratory System

10. Skeletal System

11. Urinary System

The **organism** level is the highest level of organization. An organism is a living being that has a cellular structure and that can independently perform all physiologic functions necessary for life. In multicellular organisms, including humans, all cells, tissues, organs, and organ systems of the body work together to maintain the life and health of the organism (National Geographic, 2017).

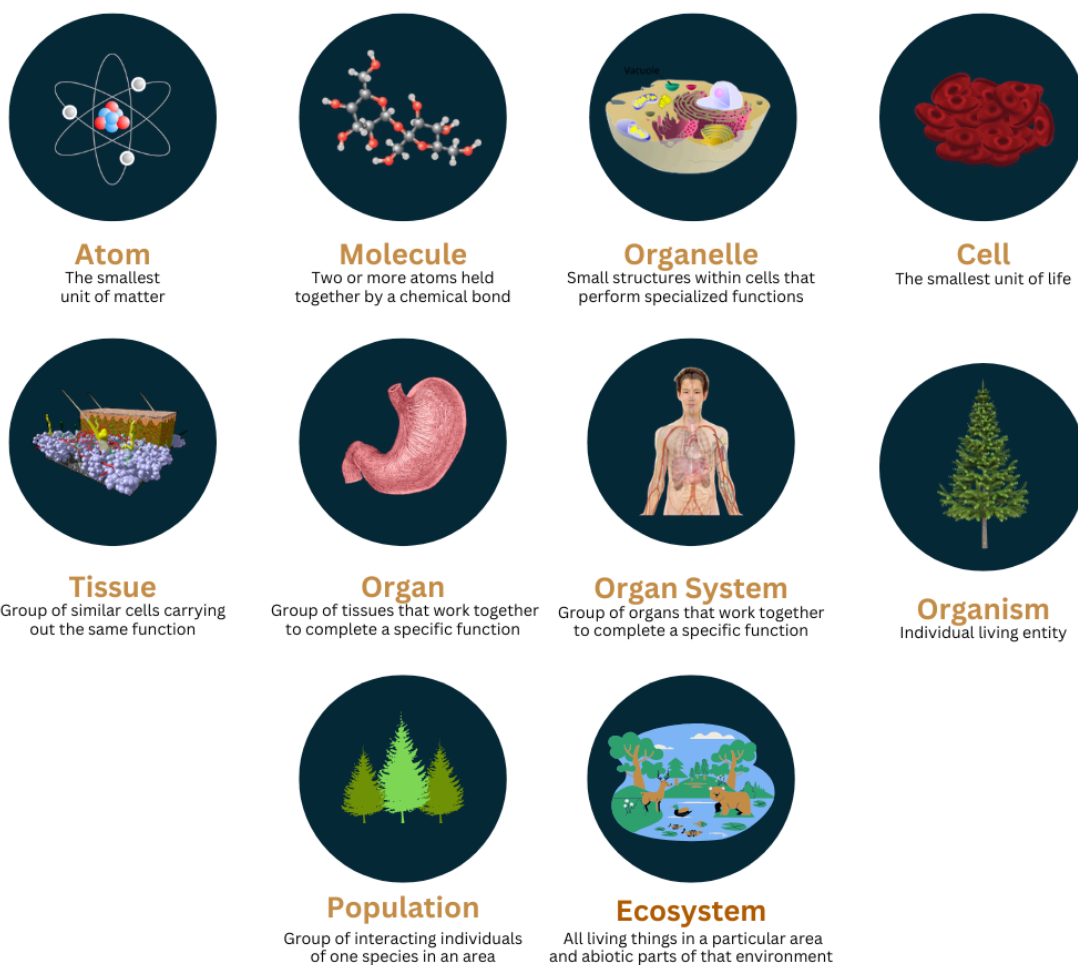


Figure 3.0.1 “12 Levels of Life” by OER Design Studio, [CC BY-CA-SA 4.0](#). Mods: recoloured, removed biosphere & community.

Image Description

The image is an infographic showing levels of biological organization from smallest to largest. It uses a white background with dark navy circular image panels arranged in three rows. Each circle contains an illustration representing a biological level: an atom, molecule, organelle, cell, tissue, organ, organ system, organism, population, and ecosystem. Beneath each circle is a gold heading with a short black definition. The sequence progresses from basic chemical structures to larger living systems and environments.

Full image text:

- **Atom:** The smallest unit of matter
- **Molecule:** Two or more atoms held together by a chemical bond
- **Organelle:** Small structures within cells that perform specialized functions
- **Cell:** The smallest unit of life
- **Tissue:** Group of similar cells carrying out the same function
- **Organ:** Group of tissues that work together to complete a specific function
- **Organ System:** Group of organs that work together to complete a specific function
- **Organism:** Individual living entity
- **Population:** Group of interacting individuals of one species in an area
- **Ecosystem:** All living things in a particular area and abiotic parts of that environment

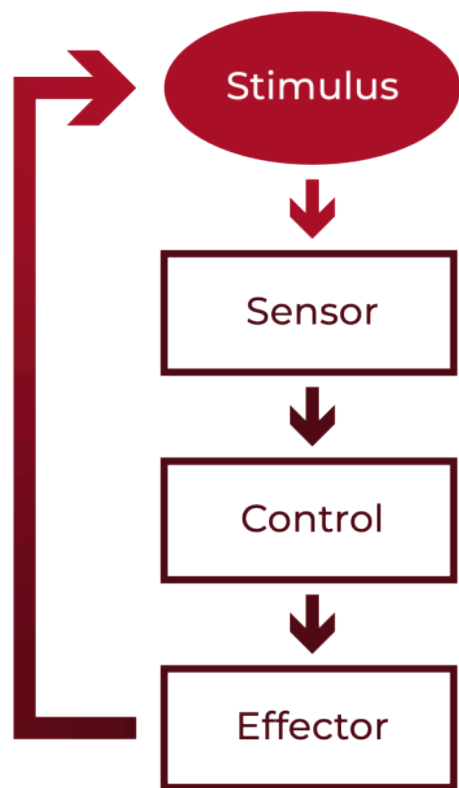
3.0.3 Homeostasis

Homeostasis is the state of steady internal conditions maintained by living things. Maintaining homeostasis requires that the body continuously monitor its internal conditions. From body temperature to blood pressure to levels of certain nutrients, each physiological condition has a particular set point. A **set point** is the physiological value around which the normal range fluctuates. A **normal range** is the restricted set of values that is optimally healthful and stable. For example, the set point for normal human body temperature is approximately 37°C (98.6°F). Physiological parameters, such as body temperature and blood pressure, tend to fluctuate within a normal range, a few degrees above and below that point. Control centres in the brain and other parts of the body monitor and react to deviations from homeostasis using negative feedback. **Negative feedback** is a mechanism that reverses a deviation from the set point. Therefore, negative feedback maintains body parameters within their normal range. The maintenance of homeostasis by negative feedback goes on throughout the body, at all times, and an understanding of negative feedback is thus fundamental to an understanding of human physiology.

Negative Feedback

A negative feedback system has three basic components (Figure 3.0.2). A **sensor**, also referred to as a receptor, is a component of a feedback system that monitors a physiological value. This value is reported to the control centre. The **control centre** is the component in a feedback system that compares the value to the normal range. If the value deviates too much from the set point, then the control centre activates an effector. An **effector** is the component in a feedback system that causes a change to reverse the situation and return the value to the normal range.

(A) Negative Feedback Loop



(B) Positive Feedback Loop

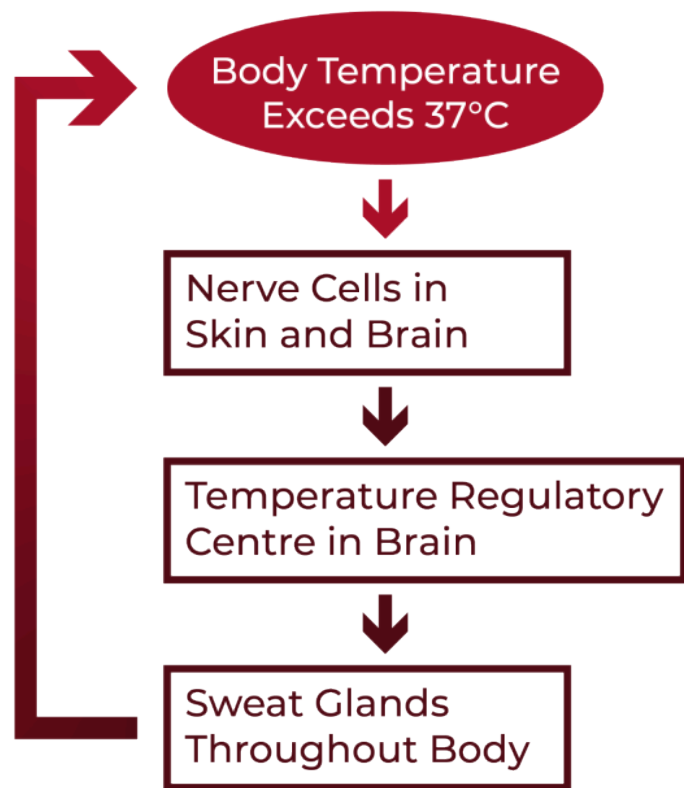


Figure 3.0.2 “Feedback Loops” by OpenStax, CC BY 4.0. Mods: Recoloured.

Image Description

The image is a two-part flow diagram explaining a negative feedback loop and using body temperature regulation as an example. Both diagrams use arrows to show the direction of the feedback process. Each diagram flows from an initial condition at the top, down through detection and response stages, and then loops back upward to show that the response helps regulate or reduce the original stimulus. The left diagram presents the general structure of a negative feedback loop, while the right diagram applies the process to the example of body temperature rising above 37°C.

Full text in the image:

Left diagram:

- Stimulus
- Sensor
- Control
- Effector

Label: Negative feedback loop

Right diagram:

- Body temperature exceeds 37°C
- Nerve cells in skin and brain
- Temperature regulatory centre in brain
- Sweat glands throughout body

Label: Body temperature regulation

In order to set the system in motion, a stimulus must drive a physiological parameter beyond its normal range (that is, beyond homeostasis). This stimulus is “heard” by a specific sensor. For example, in the control of blood glucose, specific endocrine cells in the pancreas detect excess glucose (the stimulus) in the bloodstream. These pancreatic beta cells respond to the increased level of blood glucose by increased secretion of the hormone insulin into the bloodstream (i.e., more than the normal basal secretion). The insulin signals skeletal muscle fibres, fat cells (adipocytes), and liver cells to take up the excess glucose, removing it from the bloodstream. As glucose concentration in the bloodstream drops, the decrease in concentration—the actual negative feedback—is detected by pancreatic alpha cells, and insulin release stops. This prevents blood glucose levels from continuing to drop below the normal range.

Humans have a similar temperature regulation feedback system that works by promoting either heat loss or heat gain (Figure 3.0.2). When the brain’s temperature regulation centre receives data from the sensors indicating that the body’s temperature exceeds its normal range, it stimulates a cluster of brain cells referred to as the “heat-loss centre.” This stimulation has three major effects:

1. Blood vessels in the skin begin to dilate, allowing more blood from the body core to flow to the surface of the skin, allowing the heat to radiate into the environment.
2. As blood flow to the skin increases, sweat glands are activated to increase their output. As the sweat evaporates from the skin surface into the surrounding air, it takes heat with it.
3. The depth of respiration increases, and a person may breathe through an open mouth instead of through the nasal passageways. This further increases heat loss from the lungs.

In contrast, activation of the brain’s heat-gain centre by exposure to cold reduces blood flow to the skin, and blood returning from the limbs is diverted into a network of deep veins. This arrangement traps heat closer to the body’s core and restricts heat loss. If heat loss is severe, the brain triggers an increase in random signals to skeletal muscles, causing them to contract and produce shivering. The muscle contractions of shivering release heat while using up ATP. The brain triggers the thyroid gland in the endocrine system to release thyroid hormone, which increases metabolic activity and heat production in cells throughout the body. The brain also signals the adrenal glands to release adrenaline (US: epinephrine), a hormone that causes the breakdown of glycogen into glucose, which can be used as an energy source. The breakdown of glycogen into glucose also results in increased metabolism and heat production.

Positive Feedback

Positive feedback intensifies a change in the body’s physiological condition rather than reversing it. A deviation from the normal range results in more change, and the system moves farther away from the normal range. Positive feedback in the body is normal only when there is a definite endpoint. Childbirth and the body’s response to blood loss are two examples of positive feedback loops that are normal but are activated only when needed.

Childbirth at full term is an example of a situation in which the maintenance of the existing body state is not desired. Enormous changes in the mother’s body are required to expel the baby at the end of pregnancy, and

the events of childbirth, once begun, must progress rapidly to a conclusion, or the life of the mother and the baby are at risk. The extreme muscular work of labour and delivery is the result of a positive feedback system (Figure 3.0.3).

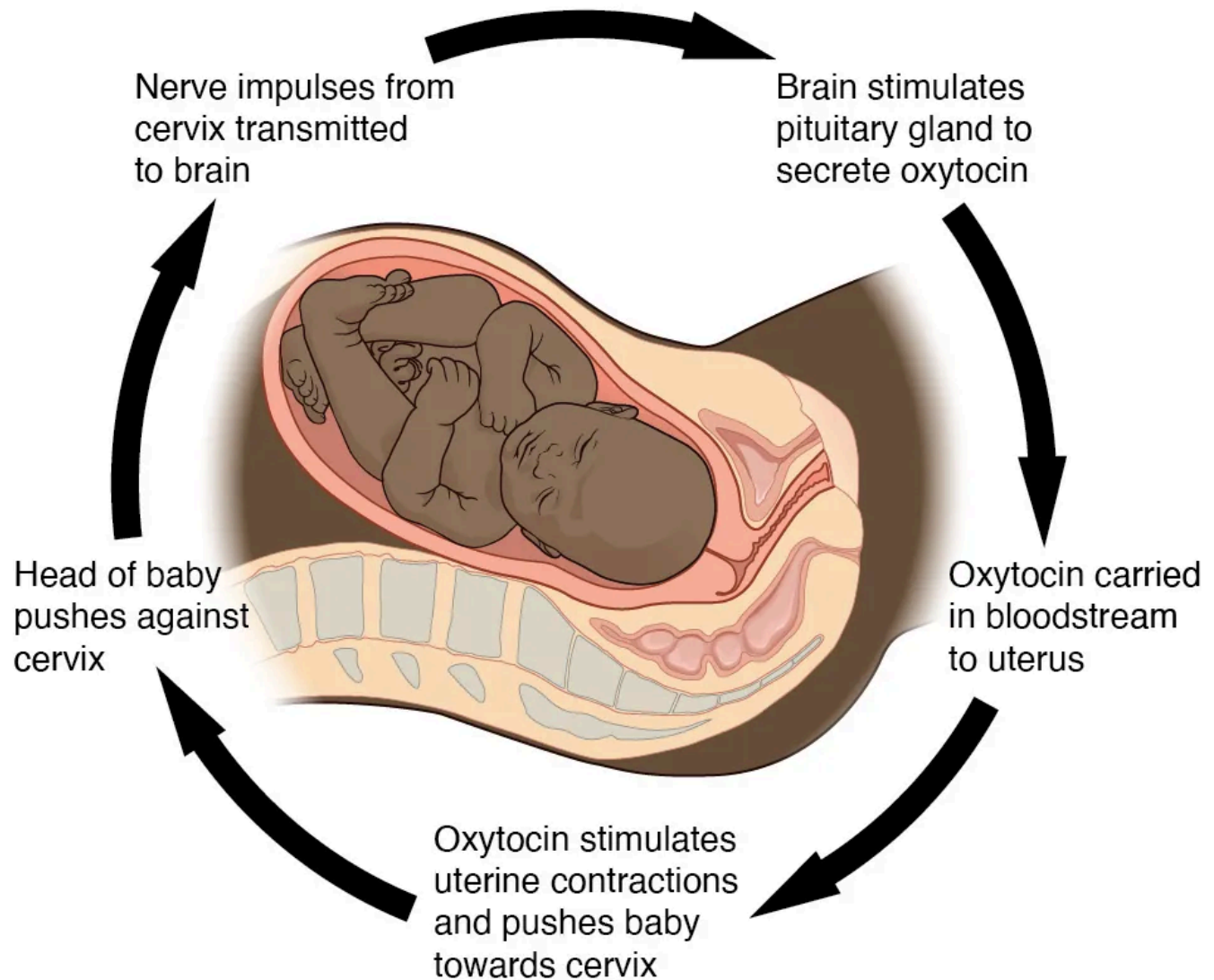


Figure 3.0.3 “[Positive Feedback Loop](#)” by [OpenStax](#), [CC BY 4.0](#).

Image Description

The image is a medical-style diagram showing the positive feedback loop involved in childbirth/labour. In the centre, there is a side-view illustration of a fetus positioned inside the uterus, with the baby’s head pressing against the cervix. Thick black curved arrows form a circular loop around the illustration, showing how

pressure on the cervix sends nerve impulses to the brain, which stimulates oxytocin release. Oxytocin then travels to the uterus, causes contractions, and pushes the baby further toward the cervix, continuing the cycle.

Full text in the image:

- Nerve impulses from the cervix are transmitted to the brain.
- The brain stimulates the pituitary gland to secrete oxytocin.
- Oxytocin is carried in the bloodstream to the uterus.
- Oxytocin stimulates uterine contractions and pushes the baby towards the cervix.
- The head of the baby pushes against the cervix.

Normal childbirth is driven by a positive feedback loop. A positive feedback loop results in a change in the body's status, rather than a return to homeostasis.

The first contractions of labour (the stimulus) push the baby toward the cervix (the lowest part of the uterus). The cervix contains stretch-sensitive nerve cells that monitor the degree of stretching (the sensors). These nerve cells send messages to the brain, which in turn causes the pituitary gland at the base of the brain to release the hormone oxytocin into the bloodstream. Oxytocin causes stronger contractions of the smooth muscles of the uterus (the effectors), pushing the baby further down the birth canal. This causes even greater stretching of the cervix. The cycle of stretching, oxytocin release, and increasingly more forceful contractions stops only when the baby is born. At this point, the stretching of the cervix halts, stopping the release of oxytocin (Kabi, 2012).

A second example of positive feedback centres on reversing extreme damage to the body. Following a penetrating wound, the most immediate threat is excessive blood loss. Less blood circulating means reduced blood pressure and reduced perfusion (penetration of blood) to the brain and other vital organs. If perfusion is severely reduced, vital organs will shut down, and the person will die. The body responds to this potential catastrophe by releasing substances in the injured blood vessel wall that begin the process of blood clotting. As each step of clotting occurs, it stimulates the release of more clotting substances. This accelerates the processes of clotting and sealing off the damaged area. Clotting is contained in a local area based on the tightly controlled availability of clotting proteins. This is an adaptive, life-saving cascade of events.

Thermoregulation

Animals, such as humans, that maintain a constant body temperature in the face of differing environmental temperatures, are called **endotherms** or more commonly called "warm-blooded". We are able to maintain this temperature by generating internal heat (a waste product of the cellular chemical reactions of metabolism) that keeps the cellular processes operating optimally even when the environment is cold.

Endotherms use their circulatory systems to help maintain body temperature. Vasodilation, the opening up of arteries to the skin by relaxation of their smooth muscles, brings more blood and heat to the body surface, facilitating radiation and evaporative heat loss, cooling the body. Vasoconstriction, the narrowing of blood vessels to the skin by contraction of their smooth muscles, reduces blood flow in peripheral blood vessels, forcing blood toward the core and vital organs, conserving heat.

Thermoregulation is coordinated by the nervous system. The processes of temperature control are centred in a region of the brain called the hypothalamus. The hypothalamus maintains the set point for body temperature through reflexes that cause vasodilation or vasoconstriction and shivering or sweating. The hypothalamus directs the responses that affect the changes in temperature loss or gain that return the body to the set point. The set point may be adjusted in some instances. During an infection, compounds called pyrogens are

produced and circulate to the hypothalamus, resetting the thermostat to a higher value. This allows the body's temperature to increase to a new homeostatic equilibrium point in what is commonly called a fever. The increase in body heat makes the body less optimal for bacterial growth and increases the activities of cells so they are better able to fight the infection.

Section Review

Homeostasis is the activity of cells throughout the body to maintain the physiological state within a narrow range that is compatible with life. Homeostasis is regulated by negative feedback loops and, much less frequently, by positive feedback loops. Both have the same components of a stimulus, sensor, control centre, and effector; however, negative feedback loops work to prevent an excessive response to the stimulus, whereas positive feedback loops intensify the response until an endpoint is reached.



Review Questions

Activity Description

1. After you eat lunch, nerve cells in your stomach respond to the distension (the stimulus) resulting from the food. They relay this information to?
 - a. sensors
 - b. effectors
 - c. a set point
 - d. a control centre
2. Stimulation of the heat-loss centre causes?
 - a. breathing to become slow and shallow
 - b. sweat glands to increase their output
 - c. blood vessels in the skin to constrict
 - d. All of the above
3. Which of the following is an example of a normal physiologic process that uses a positive feedback loop?
 - a. temperature regulation
 - b. blood pressure regulation
 - c. childbirth

Answers:

1. a control centre
2. sweat glands to increase their output
3. childbirth

Activity Description

Identify the four components of a negative feedback loop and explain what would happen if secretion of a body chemical controlled by a negative feedback system became too great.

Sample Answer:

The four components of a negative feedback loop are: stimulus, sensor, control centre, and effector. If too great a quantity of the chemical was excreted, sensors would activate a control centre, which would in turn activate an effector. In this case, the effector (the secreting cells) would be adjusted downward.

Activity Description

What regulatory processes would your body use if you were trapped by a blizzard in an unheated, uninsulated cabin in the woods?

Sample Answer:

Any prolonged exposure to extreme cold would activate the brain's heat-gain centre. This would reduce blood flow to your skin and shunt blood returning from your limbs away from the digits and into a network of deep veins. Your brain's heat-gain centre would also increase your muscle contraction, causing you to shiver. This increases the energy consumption of skeletal muscle and generates more heat. Your body would also produce thyroid hormone and adrenaline, chemicals that promote increased metabolism and heat production.

3.0.4 Anatomical Terminology

Anatomical Position

Anatomists and health care providers use terminology for the purpose of precision and to reduce medical errors. For example, is a scar “above the wrist” located on the forearm, two or three inches away from the hand? Or is it at the base of the hand? Is it on the palm-side or back-side? By using precise anatomical terminology, we eliminate ambiguity. Anatomical terms derive from ancient Greek and Latin words.

To further increase precision, anatomists standardize the way in which they view the body. Just as maps are normally oriented with north at the top, the standard body “map,” or anatomical position, is that of the body standing upright, with the feet at shoulder width and parallel, toes forward. The upper limbs are held out to each side, and the palms of the hands face forward as illustrated.

Using this standard position reduces confusion. It does not matter how the body being described is oriented; the terms are used as if it is in anatomical position. For example, a scar in the “anterior (front) carpal (wrist) region” would be present on the palm side of the wrist. The term “anterior” would be used even if the hand were palm down on a table.

Regional Terms

The human body's numerous regions have specific terms to help increase precision. Some of the most common terms a doula may hear include:

- Abdominal – Abdomen
- Brachial – Arm
- Buccal – Cheek area

- Carpal – Wrist
- Cephalic – Head
- Cervical – Neck Area
- Coxal – Hip
- Deltoid – Curve of shoulder
- Digital – Fingers/toes
- Femoral – Thigh
- Gluteal – Buttock
- Inguinal – Groin
- Lumbar – Area of back between hips and ribs

- Nasal – Nose area
- Occipital – Base of Skull
- Oral – Mouth
- Pelvic – Overlaying the pelvis
- Plantar – Sole of the foot
- Pubic – Genital region
- Sacral – Area between hips
- Scapular – Shoulder blade area
- Sternal – Breastbone area
- Thoracic – Chest
- Umbilical – Navel
- Vertebral – Area of spinal column

Directional Terms

Directional terms are essential for describing the relative locations of different body structures. For instance, an anatomist might describe one band of tissue as “inferior to” another, or a physician might describe a tumour as “superficial to” a deeper body structure. Commit these terms to memory to avoid confusion when you are studying or describing the locations of particular body parts (Corporis, 2018).

- **Anterior** (or **ventral**) describes the front or direction toward the front of the body. The toes are anterior to the foot.
- **Posterior** (or **dorsal**) describes the back or direction toward the back of the body. The shoulder blade is posterior to the chest.
- **Superior** (or **cranial**) describes a position above or higher than another part of the body. The head is superior to the feet.
- **Inferior** (or **caudal**) describes a position below or lower than another part of the body. The pelvis is inferior to the abdomen.
- **Lateral** describes the side or direction toward the side of the body. The thumb (pollex) is lateral to the digits.
- **Medial** describes the middle or direction toward the middle of the body. The hallux is the medial toe.

- **Proximal** describes a position in a limb that is nearer to the point of attachment or the trunk of the body. The brachium is proximal to the antebrachium.
- **Distal** describes a position in a limb that is farther from the point of attachment or the trunk of the body. The crus is distal to the femur.
- **Superficial** describes a position closer to the surface of the body. The skin is superficial to the bones.
- **Deep** describes a position farther from the surface of the body. The brain is deep to the skull.

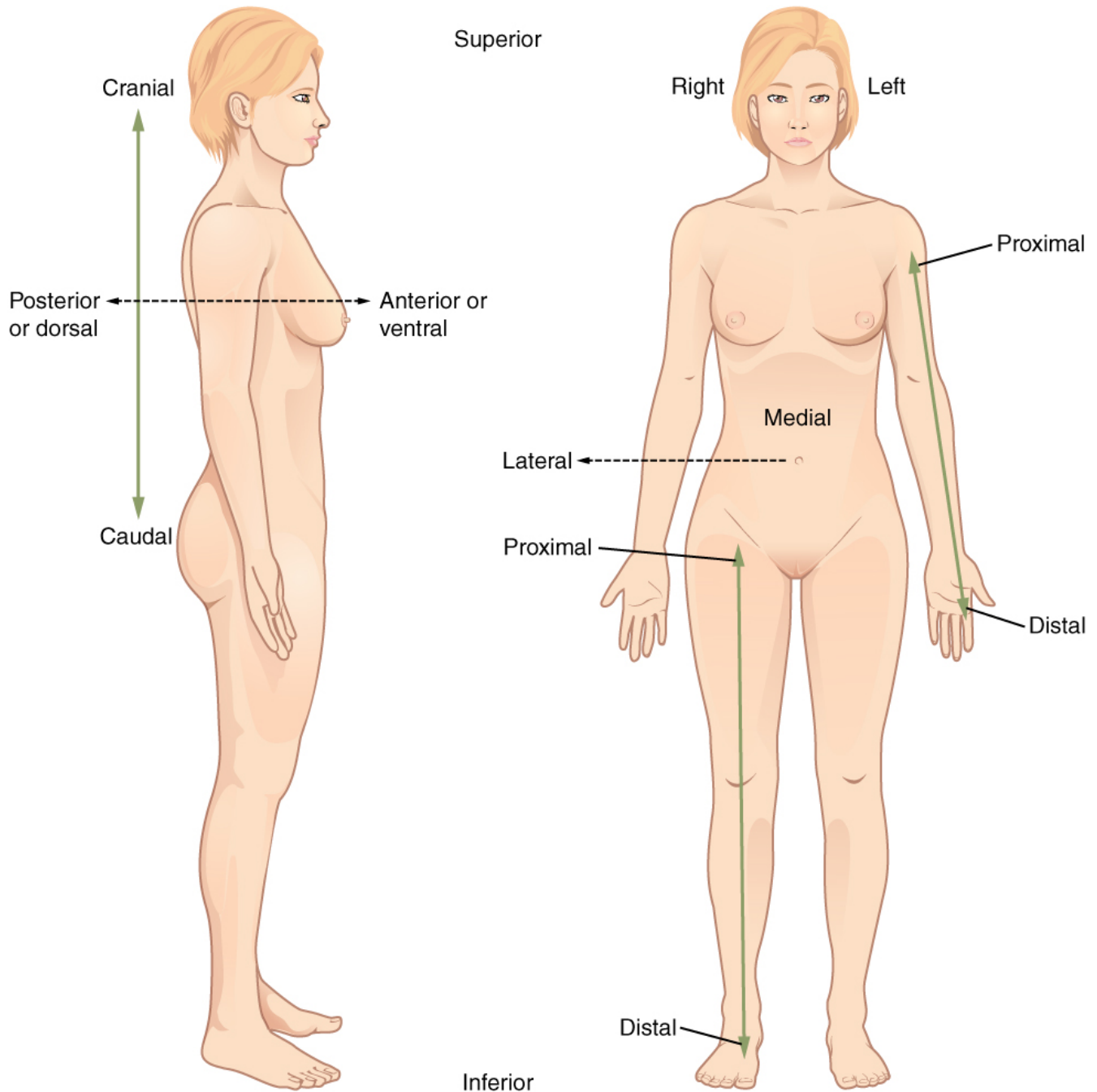


Figure 3.0.4 “[Directional Terms](#)” by [OpenStax](#), [CC BY 3.0](#).



Exercise

Practice these directional terms.

Activity Description

The activity is a flash card set with 10 terms matched to their definitions. The terms and definitions are:

1. Anterior (or Ventral): Describes the front or direction toward the front of the body.
2. Posterior (or Dorsal): Describes the back or direction toward the back of the body.
3. Superior (or Cranial): Describes a position above or higher than another part of the body proper.
4. Inferior (or Caudal): Describes a position below or lower than another part of the body proper; near or toward the tail
5. Lateral: Describes the side or direction toward the side of the body.
6. Medial: Describes the middle or direction toward the middle of the body.
7. Proximal: Describes a position in a limb that is nearer to the point of attachment or the trunk of the body.
8. Distal: Describes a position in a limb that is farther from the point of attachment or the trunk of the body.
9. Superficial: Describes a position closer to the surface of the body.
10. Deep: Describes a position farther from the surface of the body.

Body Planes

A section is a two-dimensional surface of a three-dimensional structure that has been cut. Modern medical imaging devices enable clinicians to obtain “virtual sections” of living bodies. We call these scans. Body sections and scans can be correctly interpreted, however, only if the viewer understands the plane along which the section was made. A plane is an imaginary two-dimensional surface that passes through the body. There are three planes commonly referred to in anatomy and medicine:

- The **sagittal plane** is the plane that divides the body or an organ vertically into right and left sides. If this vertical plane runs directly down the middle of the body, it is called the midsagittal or median plane. If it divides the body into unequal right and left sides, it is called a parasagittal plane or, less commonly, a longitudinal section.
- The **frontal plane** is the plane that divides the body or an organ into an anterior (front) portion and a posterior (rear) portion. The frontal plane is often referred to as a coronal plane (“Corona” is Latin for “crown.”).
- The **transverse plane** is the plane that divides the body or organ horizontally into upper and lower portions. Transverse planes produce images referred to as cross sections.



Exercise

Drag and drop the labels to the correct spots on the diagram.

Activity Description

The diagram is of a human body bisected lengthwise, width-wise, and height-wise. Each of these bisections contains a label to be filled in. The possible answers are:

- Sagittal Plane
- Frontal (coronal) plane
- Transverse plane

Answers:

The correct label for the plane bisecting the body into left and right halves is: "Sagittal plane".

The correct label for the plane bisecting the body into front and back halves is: "Frontal (coronal) plane".

The correct label for the plane bisecting the body into top and bottom halves is: "Transverse plane".

Body Cavities

The body maintains its internal organization by means of membranes, sheaths, and other structures that separate compartments.

The **dorsal** (posterior) cavity is subdivided into the spinal and cranial cavities. The spinal cavity (or vertebral cavity) encloses the spinal cord. Just as the brain and spinal cord make up a continuous, uninterrupted structure, the cranial and spinal cavities that house them are also continuous.

The **ventral (anterior) cavity** allows for significant changes in the size and shape of the organs as they perform their functions. Within the ventral cavity, the diaphragm marks the division between the thoracic and abdominopelvic cavities. The **thoracic cavity** houses the heart, lungs, and other organs. The abdominopelvic cavity can be further divided based on the pelvic inlet. Superior to the pelvis, the **abdominal cavity** contains the stomach, liver, and other organs and is protected by trunk muscles. The **pelvic cavity** contains the reproductive organs, bladder, and rectum. They are somewhat protected by the bony pelvis.



Exercise

Drag and drop the labels to reconstruct the hierarchy of directional terms.

Activity Description

The activity is a diagram labelling exercise that asks you to reconstruct a hierarchy of the body cavity in positional terms. There are two hierarchies; each top level has two connections, and one child of one hierarchy has two connections of its own. The potential labels are:

- Pelvic
- Dorsal (Posterior)
- Spinal
- Thoracic
- Cranial
- Ventral (Anterior)
- Abdominopelvic
- Abdominal

Answer: The first hierarchy has the label “Ventral (Anterior)” at the top level. Below it are the labels “Thoracic” with no further connections, and “Abdominopelvic” with two additional connections. Below the “Abdominopelvic” label are the labels “Abdominal” and “Pelvic”.

The second hierarchy had the label “Dorsal (Posterior)” at the top level. Below it are the labels “Spinal” and “Cranial”.

3.1.3 Homeostasis: “[1.3 Homeostasis](#)” from [Fundamentals of Anatomy and Physiology](#) by Anna Chruścik, Kate Kauter, Louisa Windus & Eliza Whiteside is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#), except where otherwise noted.

3.1.1 Medical Language Within the Context of Anatomy and Physiology & 3.1.2 Structural Organization of the Human Body: “[Medical Language Within the Context of Anatomy and Physiology](#)” from [Building a Medical Terminology Foundation](#) by Kimberlee Carter & Marie Rutherford is licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted. Modifications: Added Gross/Microscopic examples; Removed & replaced images; Removed video; Added list of regional terms; Removed sections Abdominal Regions and Quadrants, Tissue Membranes; Rewritten; Added activity.

3.1 Building Block of Life: Basic Biochemistry, Cells and Reproduction, Tissues



Learning Outcomes

By the end of this section, you will be able to:

- Identify the characteristics of organic compounds
- Identify components of a cell and their functions
- Identify types of tissues and their functions

3.1.1 Macromolecules (Organic and Inorganic)

Recall the levels of structural organization

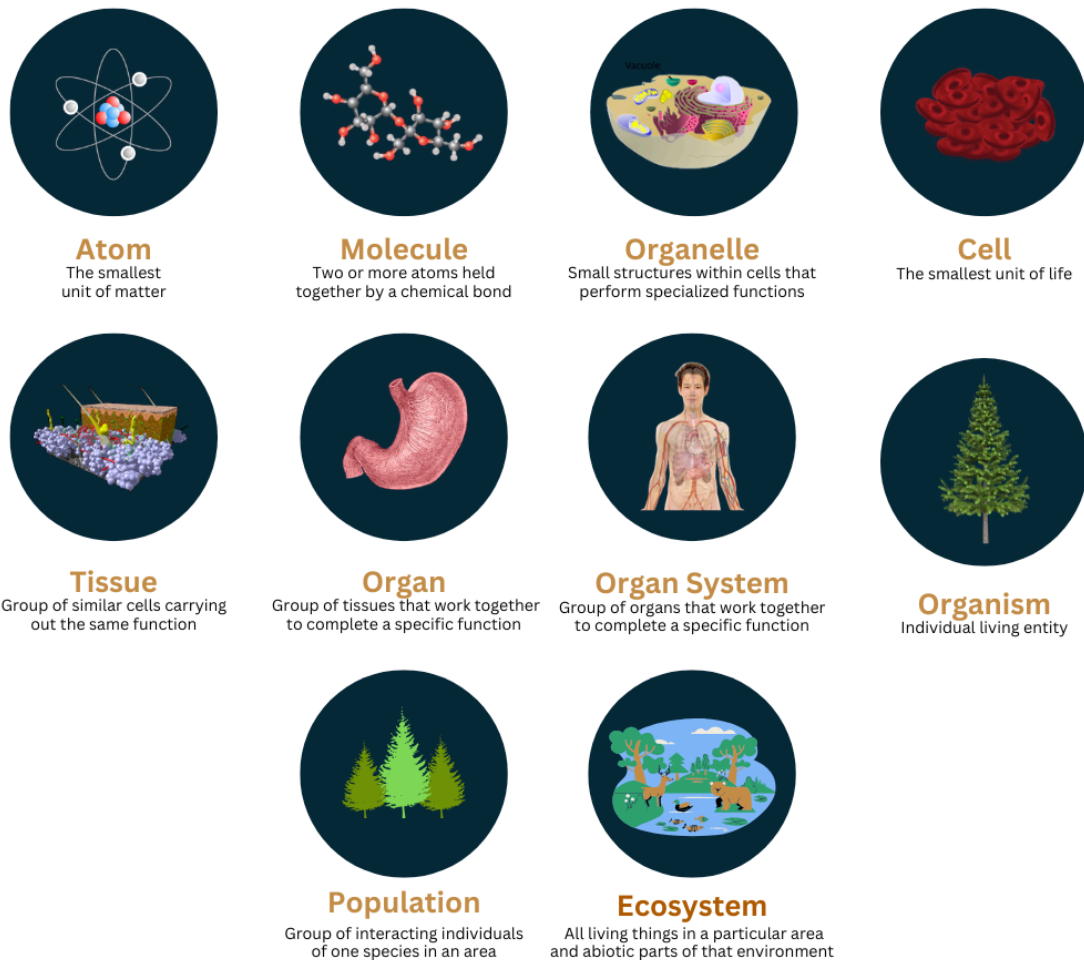


Figure 3.1.1 “12 Levels of Life” by OER Design Studio, [CC BY-CA-SA 4.0](#). Mods: recoloured, removed biosphere & community.

Image Description

The image is an infographic showing levels of biological organization from smallest to largest. It uses a white background with dark navy circular image panels arranged in three rows. Each circle contains an illustration representing a biological level: an atom, molecule, organelle, cell, tissue, organ, organ system, organism, population, and ecosystem. Beneath each circle is a gold heading with a short black definition. The sequence progresses from basic chemical structures to larger living systems and environments.

Full image text:

- **Atom:** The smallest unit of matter
- **Molecule:** Two or more atoms held together by a chemical bond
- **Organelle:** Small structures within cells that perform specialized functions
- **Cell:** The smallest unit of life
- **Tissue:** Group of similar cells carrying out the same function
- **Organ:** Group of tissues that work together to complete a specific function
- **Organ System:** Group of organs that work together to complete a specific function
- **Organism:** Individual living entity

- **Population:** Group of interacting individuals of one species in an area
- **Ecosystem:** All living things in a particular area and abiotic parts of that environment

Atoms are elements – indivisible. 96% of the body is made of four elements:

- Oxygen (65%)
- Carbon (18.5%)
- Hydrogen (9.5%)
- Nitrogen (3.5%)

Matter occupies space and has mass (weight). There are three forms: Solid (e.g. ice), liquid (e.g. water), and gas (e.g. water vapour).

Molecules or Compounds are two or more bonded atoms (like carbon dioxide).

Inorganic Compounds typically lack carbon-hydrogen bonds. Examples include:

- Water (H_2O). The human body is 60% water. Water provides a cushion (e.g. amniotic fluid).
- Salts (e.g. electrolytes, NaCl). vital for body functions (e.g., nerve impulse, muscle contraction).
- Acids (e.g. hydrochloric acid (HCl) produced by the stomach, which digests food).
- Bases (e.g. bicarbonate (HCO_3), which regulates blood pH).

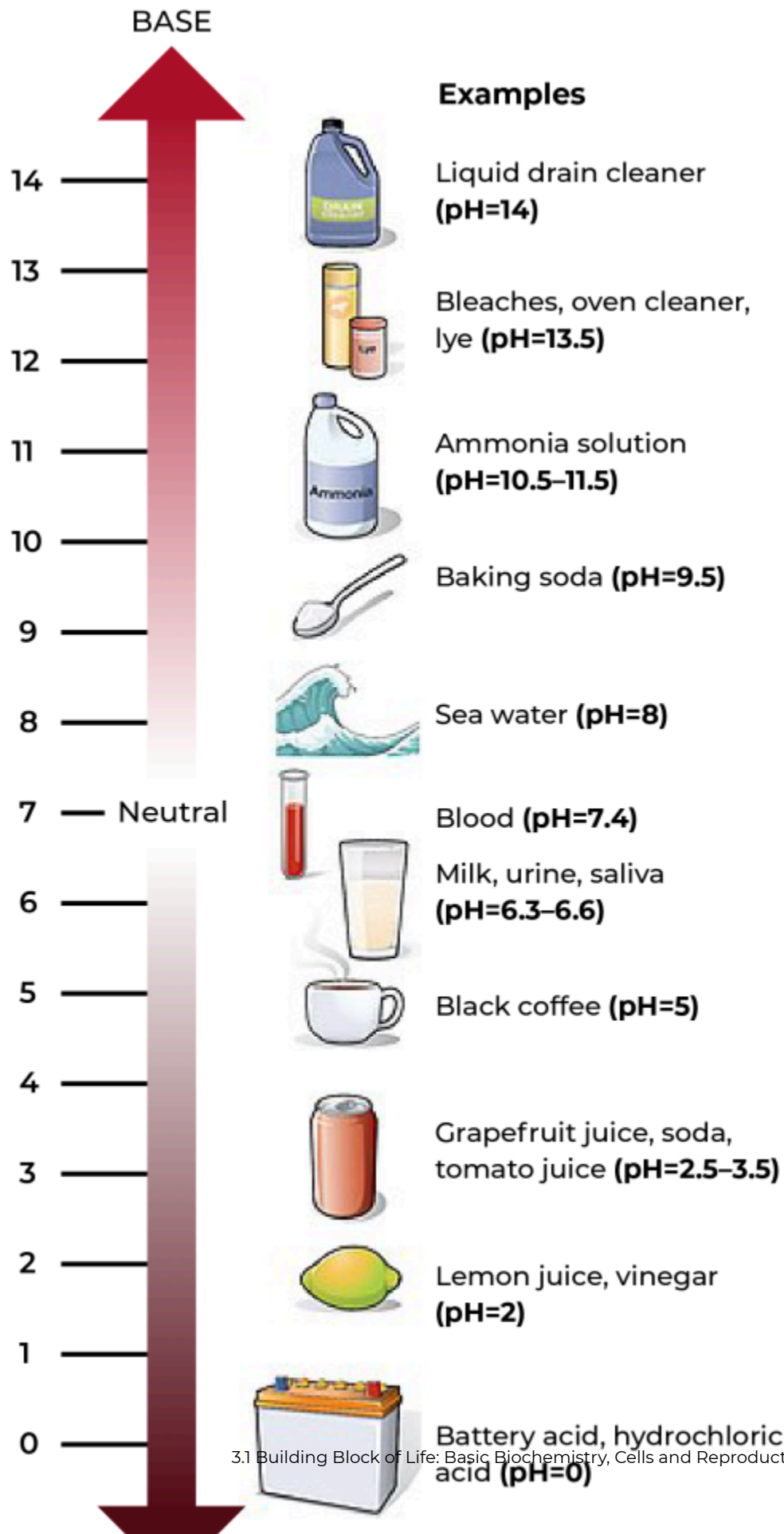


Image Description

The image is an educational pH scale diagram ranging from 0 to 14. The middle of the scale is labelled Neutral at pH 7. On the right side, illustrated examples are shown beside their approximate pH values, moving from strong bases at the top to strong acids at the bottom.

Full image text:

Liquid drain cleaner
(pH=14)

Bleaches, oven cleaner, lye
(pH=13.5)

Ammonia solution
(pH=10.5–11.5)

Baking soda
(pH=9.5)

Sea water
(pH=8)

Blood
(pH=7.4)

Milk, urine, saliva
(pH=6.3–6.6)

Black coffee
(pH=5)

Grapefruit juice, soda, tomato juice
(pH=2.5–3.5)

Lemon juice, vinegar
(pH=2)

Battery acid, hydrochloric acid
(pH=0)

A note about Acids, Bases, and the pH Scale

- pH = 7, neutral
- pH < 7, acidic
- pH > 7, basic



Life Connection

The pH of blood is about 7.4. The regulation of blood's pH is a critical function of homeostasis. This is accomplished through:

- Buffers, compounds like bicarbonate.
- Acid-base exchange in the kidneys (renal system) and lungs (respiratory system).

Organic Compounds

Organic Compounds are typically composed of carbon atoms bonded to other atoms – usually nitrogen, oxygen, and hydrogen. They often form rings or chains. Important organic compounds include:

- **Carbohydrates:** Sugars and starches.
- **Lipids:** Fats/triglycerides, phospholipids, estrogen, progesterone, etc. Insoluble in water.
- **Nucleic Acids:** make up genetic material (DNA and RNA).
- **Proteins:** Built from combinations of 20 amino acids. These can be structural (fibrous) and functional (globular).
 - **Fibrous proteins:** Appear in body structures, bind structures together (e.g. collagen and keratin).
 - **Functional proteins:** Interact chemically with other molecules via 'active sites' and act as enzymes, hormones, and antibodies.



Exercise

Drag and drop the labels to reconstruct the hierarchy of molecules and compounds.

Activity Description

The activity is a diagram labelling exercise that asks you to reconstruct a hierarchy of the levels of structural organization. There are two hierarchies; each top level has two connections, and one child of one hierarchy has two connections of its own. The potential labels are:

- Organix
- Proteins
- Molecules/Compounds
- Lipids (fats)
- Structural
- Nucleic Acids
- Acids
- Bases
- Carbohydrates
- Globular
- Inorganic

Answer: The hierarchy has the label “Molecules/Compounds” at the top. Below it are the labels “organic” and “inorganic”. Below the label “inorganic” are the labels “acids” and “bases”. below the label “organic” are the labels “carbohydrates”, “lipids (fats)”, “nucleic acids”, and “proteins”. Below the label “proteins” are the labels “structural” and “globular”

3.1.2 The Cell, Organelles, and Cell Growth

Video: [Overview of Cell Structure](#)

Video: “Overview of Cell Structure” by [Nucleus Biology](#) [7:28] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

What Do Doulas Need to Know About Cells?

The cell is the functional unit of life. Cells are alive. They consume oxygen and sugar for energy and produce carbon dioxide as waste. Human cells are eukaryotic, meaning they have:

1. A true, membrane-bound **nucleus**,

2. A **cell membrane** and,
3. Cytoplasm (cytosol and **organelles**). (Marieb, 2015).

The **nucleus** contains genetic material (DNA), which is the instructions for cell function and structure.

The **cell membrane** is embedded with receptors and channels that selectively interact with important substances. Substances like sugars, electrolytes, and gases can move across the membrane in both directions, from the interstitial (extracellular) fluid to the intracellular fluid (cytosol).

An **organelle** ("little organ") is one of several different types of membrane-enclosed bodies in the cell, each performing a unique function. Organelles include:

- Nucleus – Headquarters or control centre of a cell – contains DNA (genetic material).
- Mitochondrion – powerhouse of the cell – The site of aerobic respiration (burning of glucose for energy).
- Endoplasmic Reticulum – Site of protein synthesis (DNA to RNA to proteins).
- Ribosomes – The sites of protein synthesis.
- Vacuole – membrane-bound organelle. May contain waste or fat.
- Golgi Apparatus – The "traffic director" that modifies, packages and ships proteins out.

Cellular Appendages

Cilia are found on many cells of the body, including the epithelial cells that line the airways of the respiratory system. Cilia move rhythmically; they beat constantly, moving waste materials such as dust, mucus, and bacteria upward through the airways, away from the lungs and toward the mouth. Beating cilia on cells in the female fallopian tubes move egg cells from the ovary towards the uterus.

A **flagellum** (plural = flagella) is an appendage larger than a cilium and specialized for cell locomotion. The only flagellated cell in humans is the sperm cell that must propel itself towards the female egg cells.

Cell Diversity

The human body houses over 200 different cell types that vary in size, shape, and function. The sperm cell is 1/12,000 of an inch and a motor neuron can exceed 3 feet (1 meter). The ovum is the largest cell by volume and diameter and can be seen with the human eye.

Examples include:

- Fibroblasts – They connect body parts.
- Epithelial Cells – They cover and line organs.
- Muscles – They move organs and parts of the body
- Fat Cells – They store nutrients.
- Macrophages/White Blood Cells – They fight disease.
- Neurons – They control body function and receive/send messages.
- Sperm & Egg – They reproduce!

3.1.3 Tissue

Types of Tissues

Although there are many types of cells in the human body, they are organized into four broad categories of tissues: epithelial, connective, muscle, and nervous. Each of these categories is characterized by specific functions that contribute to the overall health and maintenance of the body. A disruption of the structure is a sign of injury or disease. Such changes can be detected through **histology**, the microscopic study of tissue appearance, organization, and function (Corporis, 2020).

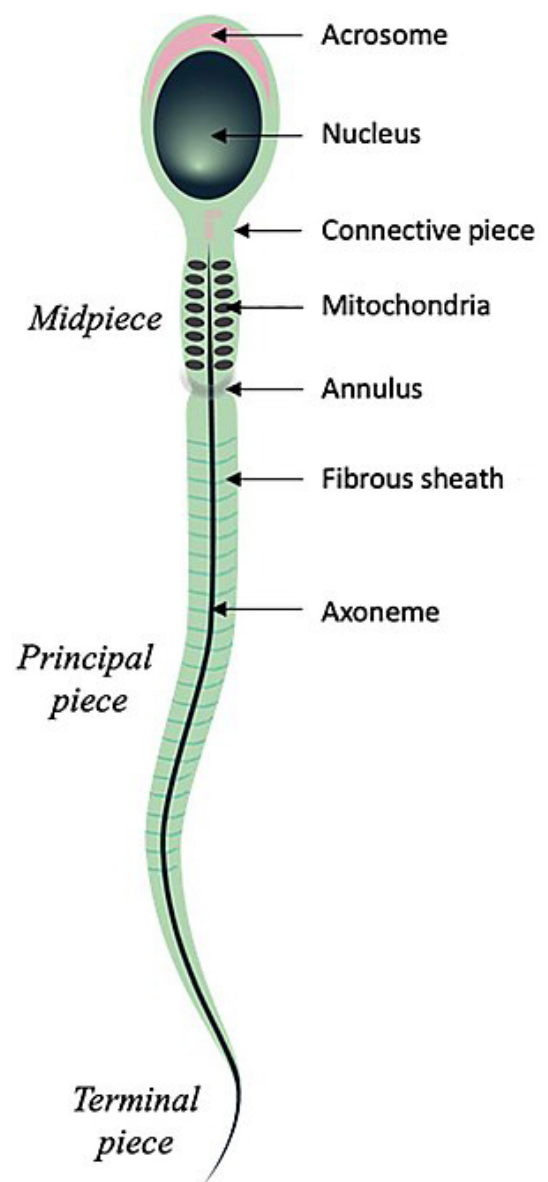


Figure 3.1.3 "[Schematic Representation of Mammalian Spermatozoa and Flagellum Structure](#)" by Aminata Touré, [CC BY 4.0](#). Mods: cropped.

Video: Intro to Histology

Video: “[Intro to Histology: The Four Tissue Types | Corporis](#)” by [Corporis](#) [9:23] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

Epithelial Tissue

Most epithelial tissues are essentially large sheets of cells covering all the surfaces of the body exposed to the outside world and lining the outside of organs. Epithelium also forms much of the glandular tissue of the body. Skin is not the only area of the body exposed to the outside. Other areas include the airways, the digestive tract, as well as the urinary and reproductive systems, all of which are lined by an epithelium. Hollow organs and body cavities that do not connect to the exterior of the body, which include blood vessels and serous membranes, are lined by endothelium (plural = endothelia), which is a type of epithelium.

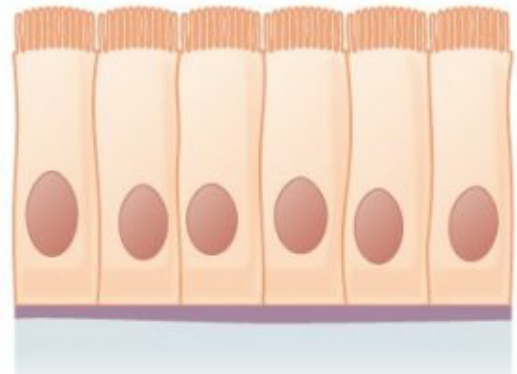


Figure 3.1.4. “[Simple Columnar Epithelium](#)” by [OpenStax College](#), [CC BY 3.0](#). Mods: cropped.



Tissue Type: Epithelial

Location

- Body coverings (e.g. skin)
- Body linings (e.g. esophagus)
- Glandular tissue (e.g. ovaries)

Functions

- Protection
- Absorption
- Filtration
- Secretion

Characteristics

- Cells fit closely together and often form sheets
- The top layer is the free surface of the tissue – exposed to the exterior of the body or inside of a cavity
- The lower layers of the epithelium rest on a basement (basal) membrane
- Avascular (no blood supply) – depends on diffusion from the capillaries underneath it
- Regenerates easily if well nourished

Connective Tissue

Connective tissues perform many functions in the body, but most importantly, they support and connect other tissues; from the connective tissue sheath that surrounds muscle cells, to the tendons that attach muscles to bones, and to the skeleton that supports the positions of the body. Protection is another major function of connective tissue, in the form of fibrous capsules and bones that protect delicate organs and, of course, the skeletal system. Specialized cells in connective tissue defend the body from microorganisms that enter the body. Transport of fluid, nutrients, waste, and chemical messengers is ensured by specialized fluid connective tissues, such as blood and lymph. Adipose cells store surplus energy in the form of fat and contribute to the thermal insulation of the body.



Tissue Type: Connective

Location

- Everywhere
- Connects the organs, tissues, and other parts of the body

Functions

- Provides protection
- Binds the body tissues together
- Supports the body

Types of Connective Tissue

From most rigid to most fluid:

- Bone
- Cartilage
- Dense connective tissue (e.g. tendons and ligaments)
- Loose connective tissue (e.g. adipose/fat tissue)
- Blood

Muscle Tissue

Muscle tissue is characterized by properties that allow movement. Muscle cells are excitable; they respond to a stimulus. They are contractile, meaning they can shorten and generate a pulling force. When attached between two movable objects, in other words, bones, contractions of the muscles cause the bones to move. Some muscle movement is voluntary, which means it is under conscious control. For example, a person decides to open a book and read a chapter on anatomy. Other movements are involuntary, meaning they are not under conscious control, such as the contraction of your pupil in bright light. Muscle tissue is classified into three types according to structure and function: skeletal, cardiac, and smooth (Coad & Dunstall, 2011).



Tissue Type: Muscle

Location

- Along the skeleton
- The walls of organs (e.g. stomach, uterus)
- The heart
- Everywhere else except the fingers and the brain

Functions

- Contract or shorten
- Produce movement

Types of Muscle Tissue

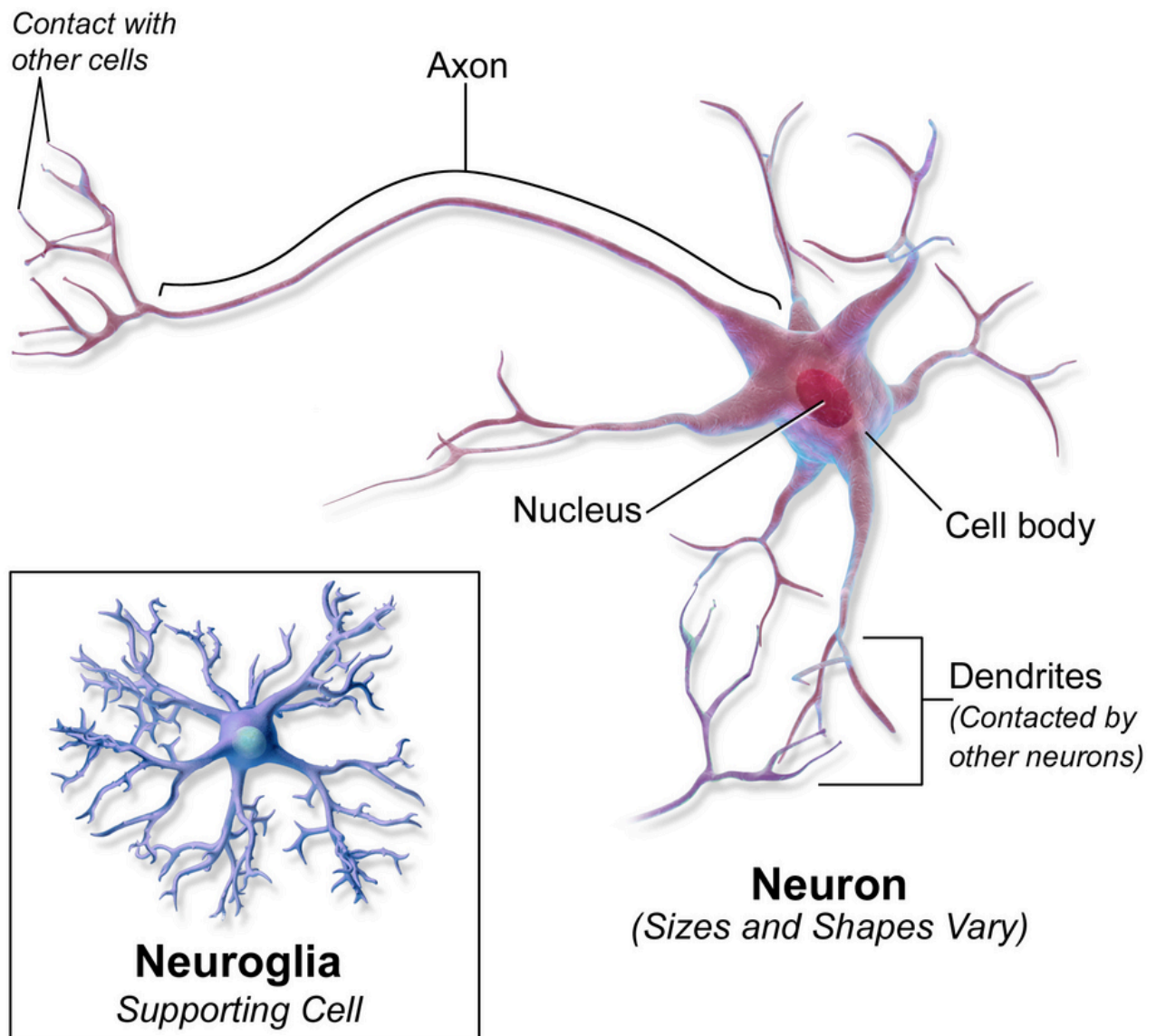
- Skeletal muscle
- Cardiac muscle
- Smooth muscle – found in the walls of hollow organs such as the stomach, uterus, and blood vessels. Involuntary movement, moves food, involuntary control of respiration, moves secretions, and regulates the flow of blood in arteries by contraction

A tissue is a group of many similar cells (though sometimes composed of a few related types) that work together to perform a specific function.

Nervous Tissue

Nervous tissue is characterized as being excitable and capable of sending and receiving electrochemical signals, which provide the body with information. Two main classes of cells make up nervous tissue: the **neuron** and **neuroglia**. Neurons propagate information via electrochemical impulses, called action potentials, which are biochemically linked to the release of chemical signals. Neuroglia play an essential role in supporting neurons and modulating their information propagation.





Neural Tissue

Figure 3.1.5. "Neural Tissue" by [BruceBlaus](#), [CC BY 3.0](#).

Image Description

The image is an anatomical diagram titled "Neural Tissue." It shows a large neuron with a cell body at its centre, branching dendrites extending from the cell body towards other neurons, and a long axon extending towards other cells. The nucleus is shown as a circular area inside the cell body. There is also an inset image of a blue, highly branched neuroglia cell, identified as a supporting cell.



Tissue Type: Nervous

Location

- Throughout the body
- Brain, spinal cord, nerves

Functions

- To receive and conduct electrochemical impulses to and from body parts
- To protect and support neurons

Summary – Putting it Together

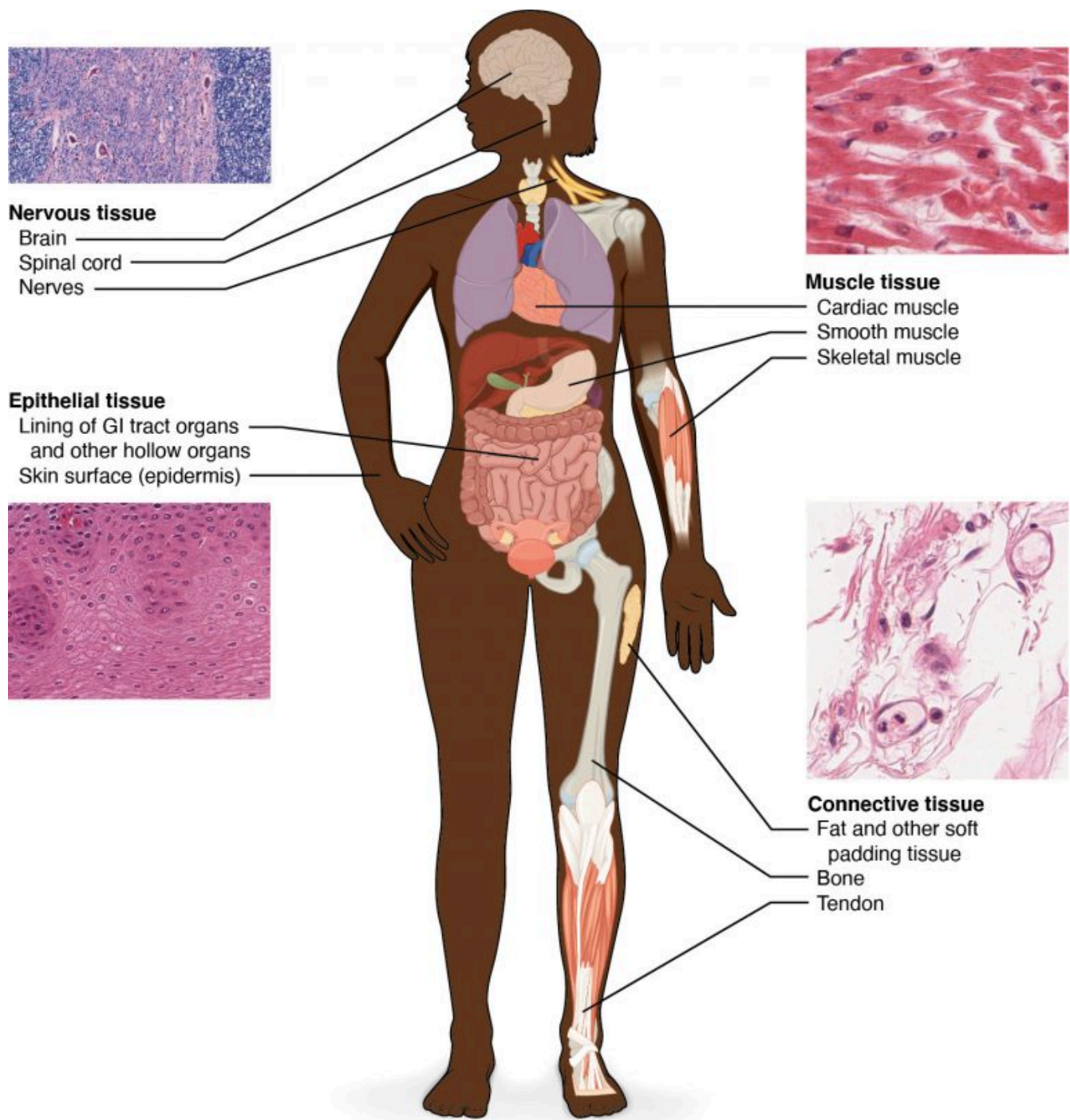


Figure 3.1.6. “[Four Types of Tissue: Body](#)” from [Medical Terminology: An Interactive Approach](#), CC BY 4.0.

Image Description

This image is a labelled educational diagram showing the four primary tissue types in the human body. In the centre, there is a front-facing human figure with selected internal organs, muscles, nerves, and bones visible.

Lines connect different parts of the body to four labelled tissue categories around the image. Each tissue category is paired with a microscope-style image showing what that tissue looks like at the cellular level. The four categories shown are nervous tissue, epithelial tissue, muscle tissue, and connective tissue.

Full image text:

Nervous tissue

- Brain
- Spinal cord
- Nerves

Epithelial tissue

- Lining of GI tract organs
- and other hollow organs
- Skin surface (epidermis)

Muscle tissue

- Cardiac muscle
- Smooth muscle
- Skeletal muscle

Connective tissue

- Fat and other soft
- padding tissue
- Bone
- Tendon

Tissue Damage and Repair

Inflammation is the body's natural response to injury, stress, and strain. In the context of pregnancy, birth, and postpartum recovery, it's part of how the body protects tissues, adapts to change, and begins to heal.

The body increases blood flow to the area to initiate repair and regeneration of damaged tissue. This can show up as warmth, swelling, tenderness, or sensitivity.

The suffix “-itis” denotes inflammation of a specific organ or type. For example, mastitis indicates inflammation of the mammary glandular tissue.

Clotting (coagulation) reduces blood loss from damaged blood vessels and forms a network of fibrin proteins that trap blood cells and bind the edges of the wound together. This function is especially important during the third stage of labour when the placenta detaches from the wall of the uterus, and the wound inside must clot to restrict blood loss.

In **regeneration**, destroyed cells are replaced by the same kinds of cells. Examples include epithelial tissue (skin and mucous membranes) and bone (dense connective tissue).

In contrast to regeneration is **fibrosis**, a process where damaged tissue is repaired by dense, fibrous

connective tissue (scar tissue). Tissue examples include cardiac muscle tissue and nervous tissue within the brain and spinal cord

Tissue Growth

Hyperplasia is the increase in size of a tissue or organ. This may occur when tissue is strongly stimulated or irritated (e.g. breast/chest in pregnancy).

Atrophy is the decrease in size of a tissue or organ that occurs when the organ is no longer stimulated normally (e.g. muscles in people on bedrest)

“[Levels of Organization and Tissue Types](#)” from [Medical Terminology: An Interactive Approach](#) by Kendra Anspaugh, Sarah Goncalves, Emily Jackson-Osagie & Sandra Q. Smith is licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

“[4.2 Epithelial Tissue](#)” from [Anatomy and Physiology](#) by J. Gordon Betts, Kelly A. Young, James A. Wise, Eddie Johnson, Brandon Poe, Dean H. Kruse, Oksana Korol, Jody E. Johnson, Mark Womble, Peter DeSaix for OpenStax is licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

3.2 Rivers and Currents: Cardiovascular System



Learning Outcomes

By the end of this section, you will be able to:

- Relate the structure of the heart to its function as a pump
- Compare systemic circulation to pulmonary circulation
- Differentiate the types of Blood vessels
- Break down the parts that compose blood
- Learn the Vitals/Measures of the heart

Introduction



Organs of the Cardiovascular System

- The Heart
- Blood Vessels
- Blood (Connective Tissue)



Functions of the Cardiovascular System

- The heart pumps blood, which is transported through vessels
- Blood carries nutrients, oxygen, hormones and other substances to the body's cells so they can function
- The cardiovascular system increases blood flow to meet increased energy demands as needed
- Has clotting capability to stop bleeding and promote healing
- Blood removes waste products from cells
- Blood/blood vessels help regulate temperature through mechanisms such as sweating
- The cardiovascular system helps to defend the body by carrying and producing white blood cells and antibodies (the immune system)

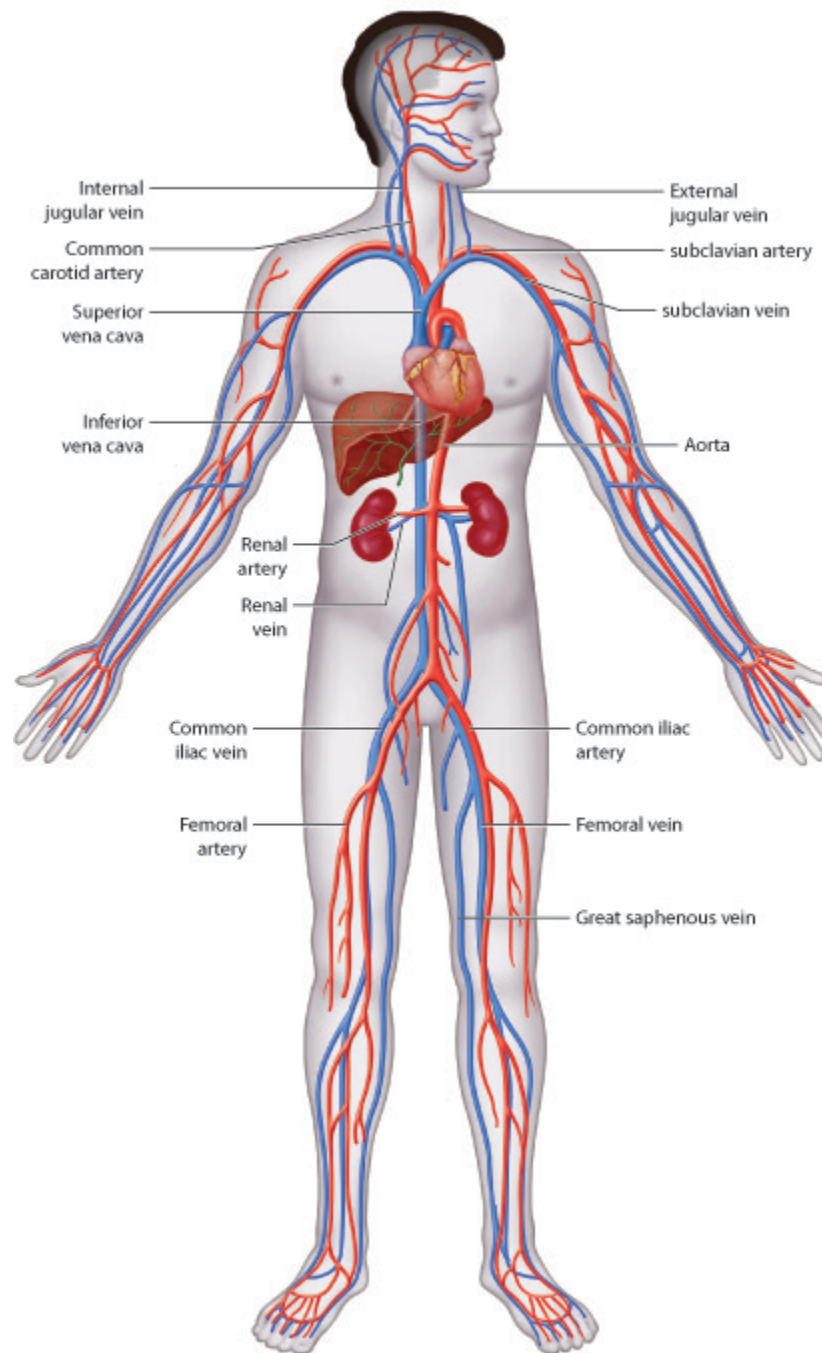


Figure 3.2.1. “[Major veins and arteries](#)” from [Anatomy and Physiology](#), CC BY-NC-SA 4.0.

Image Description

The image is an anatomical diagram of the human circulatory system. It shows a front-facing human body with the major blood vessels labelled. The heart, liver, kidneys, and parts of the head and limbs are visible to help show where the major vessels travel through the body.

Full image text:

Left side labels:

- Internal jugular vein
- Common carotid artery
- Superior vena cava
- Inferior vena cava
- Renal artery
- Renal vein
- Common iliac vein
- Femoral artery

Right side labels:

- External jugular vein
- Subclavian artery
- Subclavian vein
- Aorta
- Common iliac artery
- Femoral vein
- Great saphenous vein

3.2.1 The Heart

The vital importance of the heart is obvious. It is responsible for circulating blood (and important substances like energy and waste) throughout the body. The human heart is located within the thoracic cavity, medially between the lungs in the space known as the mediastinum. A typical heart is approximately the size of your fist.

Video: The Heart and Circulatory System

Video: “[The Heart and Circulatory System – How They Work](#)” by [Mayo Clinic](#) [3:00] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

Video: The Cardiovascular System in Under 10 Minutes

Video: “[Cardiovascular System in Under 10 Minutes](#)” by [CTESkills.com](#) [9:24] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

Chambers and Circulation

The human heart consists of four chambers.

The human heart is divided into left and right sides by a septum. Each side of the heart has one **atrium** and one **ventricle**. Each of the upper chambers, the right atrium (plural = atria) and the left atrium, acts as a receiving chamber and contracts to push blood into the lower chambers, the right ventricle and the left ventricle. The ventricles serve as the primary pumping chambers of the heart, propelling blood to the lungs or to the rest of the body.

There are two distinct but linked circuits in the human circulation called the pulmonary and systemic circuits. Although both circuits transport blood and everything it carries, we can initially view the circuits from the point of view of gases. The **pulmonary circuit** transports blood to and from the lungs, where it picks up oxygen and delivers carbon dioxide for exhalation. The **systemic circuit** transports oxygenated blood to virtually all the tissues of the body and returns relatively deoxygenated blood and carbon dioxide to the heart to be sent back to the pulmonary circulation.

The right ventricle pumps deoxygenated blood into the **pulmonary trunk**, which leads toward the lungs and bifurcates into the left and right **pulmonary arteries**. These vessels, in turn, branch many times before reaching the **pulmonary capillaries**, where gas exchange occurs: Carbon dioxide exits the blood and oxygen enters. The pulmonary trunk arteries and their branches are the only arteries in the post-natal body that carry relatively deoxygenated blood. Highly oxygenated blood returning from the pulmonary capillaries in the lungs passes through a series of vessels that join to form the **pulmonary veins**—the only post-natal veins in the body that carry highly oxygenated blood. The pulmonary veins conduct blood into the left atrium, which pumps the blood into the left ventricle, which in turn pumps oxygenated blood into the aorta and on to the many branches of the systemic circuit. Eventually, these vessels will lead to the systemic capillaries, where exchange with the tissue fluid and cells of the body occurs. In this case, oxygen and nutrients exit the systemic capillaries to be used by the cells in their metabolic processes, and carbon dioxide and waste products will enter the blood.

The blood exiting the systemic capillaries is lower in oxygen concentration than when it entered. The capillaries will ultimately unite to form venules, joining to form ever-larger veins, eventually flowing into the two major systemic veins, the **superior vena cava** and the **inferior vena cava**, which return blood to the right atrium. The blood in the superior and inferior venae cavae flows into the right atrium, which pumps blood into the right ventricle. This process of blood circulation continues as long as the individual remains alive. Understanding the flow of blood through the pulmonary and systemic circuits is critical to all health professions (Figure 3.2.3).

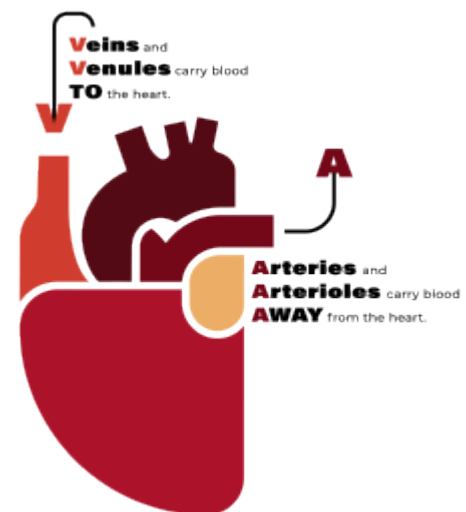


Figure 3.2.2 “Heart Mnemonic” by Koen Liddard, [CC BY-NC-SA 4.0](#).

3.3.2 Blood Vessels

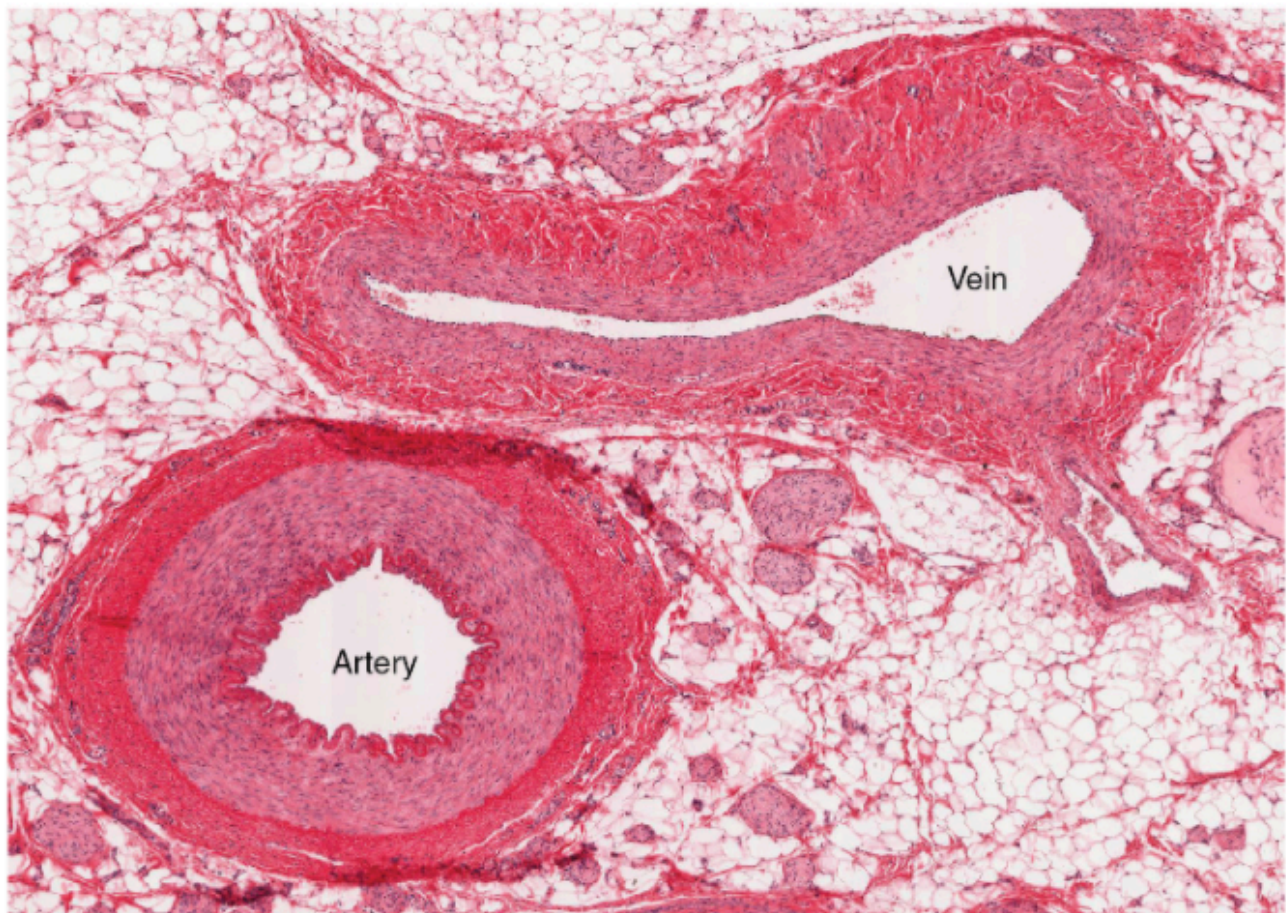
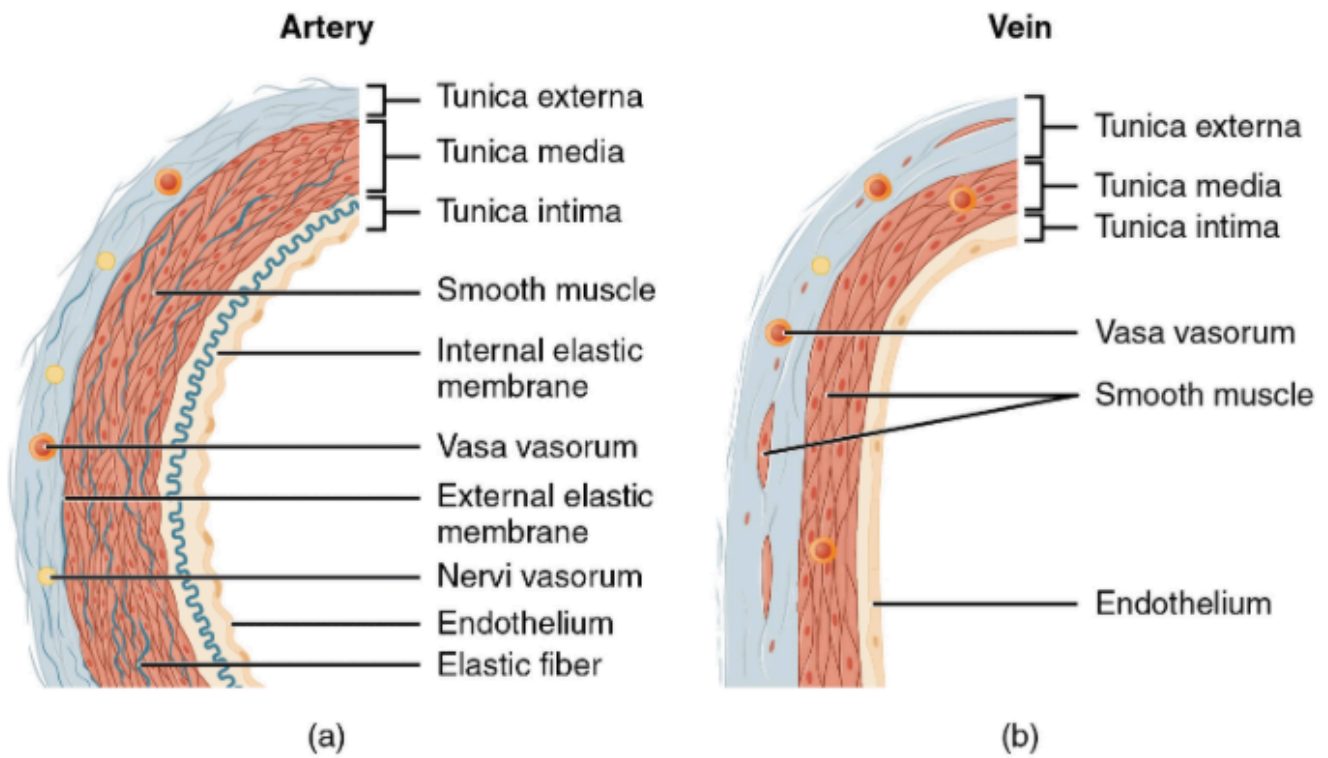
Introduction

Blood vessels are the rivers and tributaries of the body. They deliver blood (e.g. nutrients, oxygen, sugars) to cells and tissues, and carry wastes (e.g. carbon dioxide) away.

Vessel types include: arteries, arterioles, capillaries, veins and venules.

Arteries and Arterioles carry blood AWAY from the heart. Arterioles connect with capillaries, which are tiny, thin-walled vessels. It is through the capillaries that nutrients and oxygen pass into the cells. Venules drain the

blood and its wastes from capillaries and help to bring back the deoxygenated blood to the veins. **Veins** and venules carry blood TO the heart.



(c)

Image Description

The image compares the structure of an artery and a vein. The top half contains two labelled cross-section illustrations: one of an artery and one of a vein. The artery has a thicker muscular wall and a more distinct elastic membrane, while the vein has a thinner wall and a wider inner opening. The bottom half shows a microscope image of an artery and a vein in tissue, with each vessel labelled.

Full image text:

Artery:

- Tunica externa
- Tunica media
- Tunica intima
- Smooth muscle
- Internal elastic membrane
- Vasa vasorum
- External elastic membrane
- Nervi vasorum
- Endothelium
- Elastic fiber

Vein

- Tunica externa
- Tunica media
- Tunica intima
- Vasa vasorum
- Smooth muscle
- Endothelium

Shared Structures

Different types of blood vessels vary slightly in their structures, but they share the same general features. Arteries and arterioles have thicker walls than veins and venules because they are closer to the heart and receive blood that is surging at a far greater pressure (Figure 3.2.4). Each type of vessel has a **lumen**—a hollow passageway through which blood flows. Arteries have smaller lumens than veins, a characteristic that helps to maintain the pressure of blood moving through the system. Together, their thicker walls and smaller diameters give arterial lumens a more rounded appearance in cross-section than the lumens of veins.

Vein walls are considerably thinner, and their lumens are correspondingly larger in diameter, allowing more blood to flow with less vessel resistance. In addition, many veins of the body, particularly those of the limbs, contain **valves** that assist the unidirectional flow of blood toward the heart. This is critical because blood flow becomes sluggish in the extremities as a result of the lower pressure and the effects of gravity.

Both arteries and veins have the same three distinct tissue layers, called tunics (from the Latin term tunica), for

the garments first worn by ancient Romans; the term tunic is also used for some modern garments. From the most interior layer to the outer, these tunics are the **tunica intima**, the **tunica media**, and the tunica externa (see Figure 3.2.4).

The **tunica media** is the substantial middle layer of the vessel wall (see Figure 3.2.4). It is generally the thickest layer in arteries, and it is much thicker in arteries than it is in veins. The tunica media consists of layers of smooth muscle supported by connective tissue that is primarily made up of elastic fibres, most of which are arranged in circular sheets. Toward the outer portion of the tunic, there are also layers of longitudinal muscle. Contraction and relaxation of the circular muscles decrease and increase the diameter of the vessel lumen, respectively. Specifically, in arteries, **vasoconstriction** decreases blood flow as the smooth muscle in the walls of the tunica media contracts, making the lumen narrower and increasing blood pressure. Similarly, **vasodilation** increases blood flow as the smooth muscle relaxes, allowing the lumen to widen and blood pressure to drop.

A **capillary** is a microscopic channel that supplies blood to the tissues themselves, a process called **perfusion**. Exchange of gases and other substances occurs in the capillaries between the blood and the surrounding cells and their tissue fluid (interstitial fluid). The diameter of a capillary lumen ranges from 5–10 micrometres; the smallest are just barely wide enough for an erythrocyte to squeeze through.



Varicose Veins

Varicose veins are enlarged, visible veins that most commonly appear in the legs and vulva during pregnancy. They develop when blood pools in the veins instead of efficiently returning to the heart. In pregnancy, several factors contribute:

- **Hormonal Influence (especially estrogen and progesterone):** These hormones relax the smooth muscle in the tunica media, making the vein walls less firm and more prone to stretching. This also affects the valves within veins, making them less effective at preventing backflow.
- **Increased Blood Volume:** More circulating blood places additional pressure on the venous system.
- **Growing Uterus:** The weight of the uterus can compress major veins in the pelvis, slowing blood return from the lower body.

Together, these changes can lead to vein distension, valve inefficiency, and visible caricosities. For doulas, supportive measures can include encouraging rest with legs elevated, gentle movement, position changes, and avoiding long periods of standing or sitting.

3.2.3 Blood

The specific functions of blood also include defence, distribution of heat, and maintenance of homeostasis.

Transportation

Nutrients from the foods we eat are absorbed in the digestive tract. Most of these travel in the bloodstream directly to the liver, where they are processed and released back into the bloodstream for delivery to body cells. Oxygen from the air we breathe diffuses into the blood, which moves from the lungs to the heart, which then pumps it out to the rest of the body. Moreover, endocrine glands scattered throughout the body release their products, called hormones, into the bloodstream, which carries them to distant target cells. Blood also picks up cellular wastes and by-products and transports them to various organs for removal. For instance, blood moves carbon dioxide to the lungs for exhalation from the body, and various other waste products are transported to the kidneys and liver for excretion from the body in the form of urine or bile.

Defence

Many types of WBCs protect the body from external threats, such as disease-causing bacteria that have entered the tissues. Other WBCs seek out and destroy internal threats, such as cells with mutated DNA that could multiply to become cancerous, or body cells infected with viruses.

When damage to the blood vessels results in bleeding, blood platelets and certain proteins dissolved in the plasma, the fluid portion of the blood, interact to patch the ruptured areas of the blood vessels involved. This helps to protect the body from further blood loss and initiates the healing process.

Maintenance of Homeostasis

Recall that body temperature is regulated via a classic negative-feedback loop. If you were exercising on a warm day, your rising core body temperature would trigger several homeostatic mechanisms, including increased transport of blood from your core to your body periphery, which is typically cooler. As blood passes through the vessels of the skin, heat would be dissipated to the environment, and the blood returning to your body's core would be cooler. In contrast, on a cold day, blood is diverted away from the skin to maintain a warmer body core. In extreme cases, this may result in frostbite.

Blood also helps to maintain the chemical balance of the body. For example, proteins and other compounds in blood act as pH buffers, which thereby help to regulate the pH of body fluids and cells. Blood also helps to regulate the water content of body cells and tissues.

Composition and Characteristics of Blood

- Diverse blood cells + plasma = blood.
- Normal blood is about 45% erythrocytes or red blood cells (RBC), 55% plasma (90% water, protein, nutrients, hormones) and <1% buffy coat (white blood cells, platelets).
- RBCs give blood its red colour because they contain a protein called hemoglobin.
- The pH of blood averages about 7.4; However, it can range from 7.35 to 7.45 in a healthy person. Blood is therefore somewhat more basic (alkaline) on a chemical scale than pure water, which has a pH of 7.0. Blood contains numerous buffers, including bicarbonate, hemoglobin and proteins, that help to regulate pH.

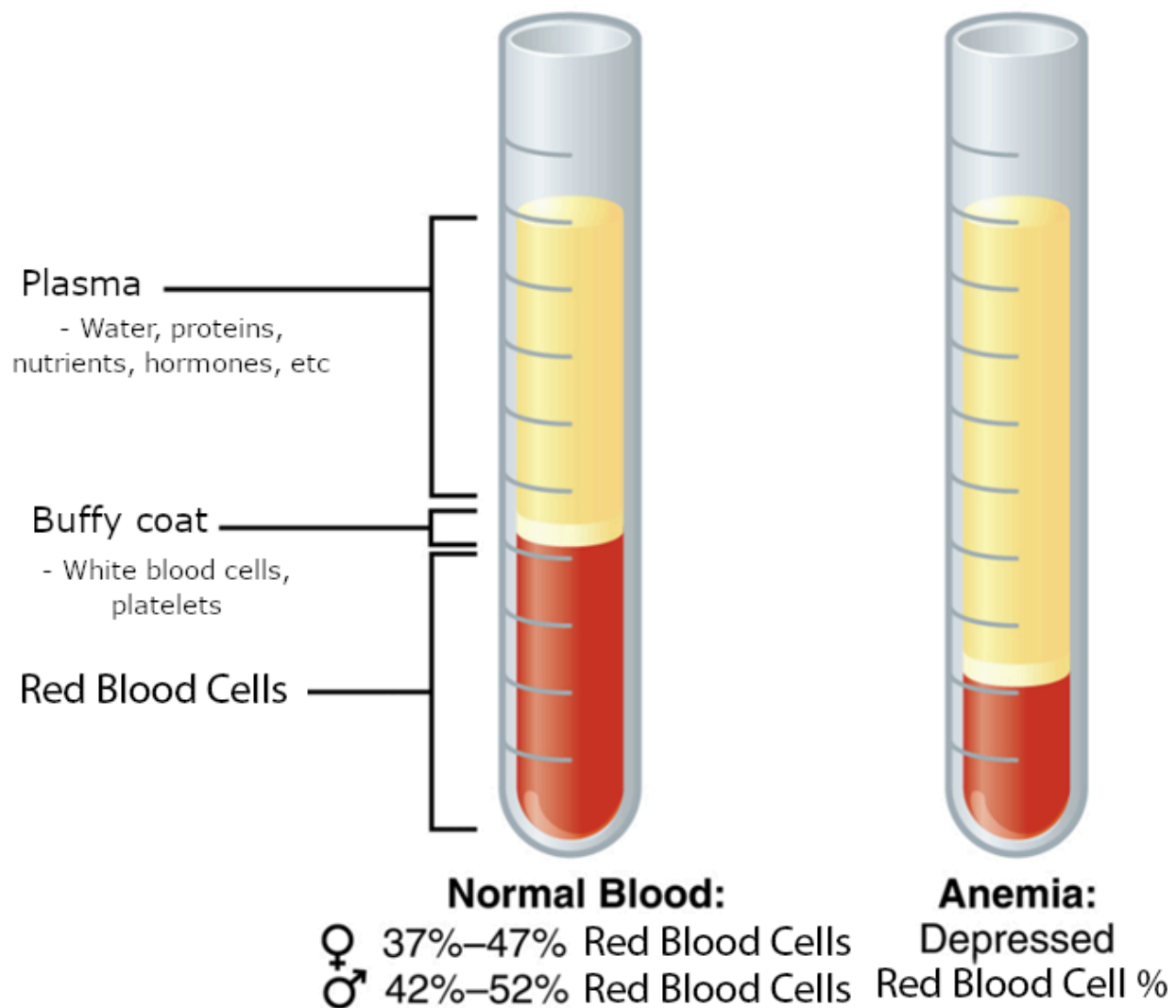


Figure 3.2.4 “[Composition of Blood](#)” from [Fundamentals of Anatomy and Physiology](#), CC BY-SA 4.0. Modifications: Cropped additional examples, reworded.

Image Description

The image shows two test tubes comparing normal blood and anemia. The first test tube shows normal blood separated into three layers: plasma at the top, the buffy coat in the middle, and red blood cells at the bottom. The right test tube shows anemia, where the red blood cell portion is visibly smaller, indicating a depressed red blood cell percentage.

Full image text:

Plasma

- water, proteins, nutrients, hormones, etc

Buffy coat

- White blood cells, platelets

Red Blood Cells

- Normal Blood:
In women – 37%–47% Red Blood Cells
In men – 42%–52% Red Blood Cells

Anemia:

- Depressed Red Blood Cell %

Red Blood cells

- RBCs circulate through the body and deliver oxygen to tissues through the use of a protein called hemoglobin.
- 25 trillion RBCs in the body.
- RBCs are made in bone marrow with the support of folate and vitamin B12.
- Immature RBCs have a nucleus; Mature RBCs have no nucleus.

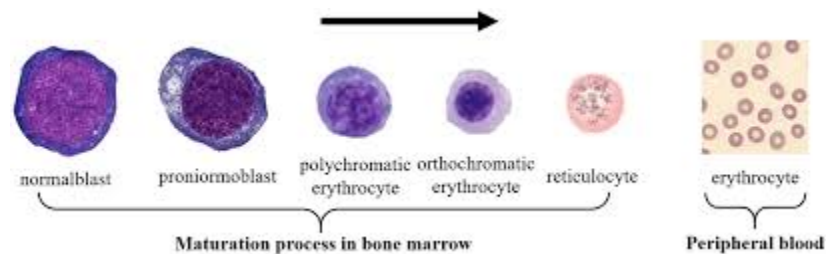


Figure 3.2.5 “[Red Blood Cell Maturation Process](#)” by Song Weiqing et al., [CC BY 4.0](#).

Image Description

The image shows the stages of red blood cell development, moving from left to right. It begins with larger immature cells and progresses through smaller developing cells, then to a reticulocyte, and finally to mature erythrocytes. Brackets below the cells show that the early developmental stages occur during the maturation process in the bone marrow, while the mature erythrocytes are found in peripheral blood. Once the cell has matured into a reticulocyte, the nucleus has disappeared.

Anemia

The size, shape, and number of RBCs, and the number of hemoglobin molecules, can have a major impact on a person's health. When the number of RBCs or the amount of hemoglobin is deficient, the general condition is called anemia.

Anemias caused by faulty or decreased RBC production include sickle cell anemia, iron deficiency, vitamin deficiency anemia and diseases of the bone marrow and stem cells.

Iron deficiency anemia is the most common type of anemia and results when the amount of available iron is insufficient to allow the production of sufficient hemoglobin. This condition can occur in individuals with a deficiency of iron in the diet and is especially common in teens and children, as well as in vegans and vegetarians. Additionally, iron deficiency anemia may be caused by either an inability to absorb and transport iron or through heavy menstruation.

Vitamin-deficient anemias generally involve insufficient vitamin B12 and folate.

Pregnancies, some medications, excessive alcohol consumption, and some diseases, such as coeliac disease, are also associated with vitamin deficiencies. It is essential to provide sufficient folic acid during the early stages of pregnancy to reduce the risk of neurological defects, including spina bifida, a failure of the neural tube to close.



Life Connection

You may have had blood drawn from a superficial vein in your arm, which was then sent to a lab for analysis. Some of the most common blood tests—for instance, those measuring lipid or glucose levels in plasma—determine which substances are present within blood and in what concentrations. Other blood tests check for the composition of the blood itself, including the quantities and types of cellular components. This testing is essential for folks accessing reproductive healthcare, as the composition of their blood may indicate risk factors like high glucose (a sign of gestational diabetes), low platelet levels (a sign of poor clotting ability and risk of hemorrhage), or anemia.

3.3.4 Measures of the Heart

Pulse, Heart Rate, and Heartbeat

Pulse indicates heart rate. It is measured clinically to provide clues to a patient's state of health. It is recorded as beats per minute. Both the rate and the strength of the pulse are important clinically. A high or irregular pulse rate can be caused by physical activity or other temporary factors, but it may also indicate a heart condition.

Pulse can be palpated manually by placing the tips of the fingers across an artery that runs close to the body surface and pressing lightly. A variety of commercial electronic devices are also available to measure pulse. In reproductive care settings, a finger cuff is often used to measure pulse.



Life Connection

The monitoring of a baby's heart rate (HR) throughout labour can be a vital measurement. Compared to the contraction pattern, it gives insight as to how well the baby is tolerating labour.

Blood Pressure

The intermittent flow of blood from the heart into the arteries causes the blood pressure to rise and fall during each beat. Two pressures are measured: systolic pressure when the ventricles are contracted, and diastolic pressure when the ventricles are relaxing.

Blood pressure is measured in mmHg, with the higher systolic pressure written first. (e.g. 120/80 is systolic pressure of 120mm Hg and diastolic pressure of 80 mm Hg.)



Life Connection

Heart rate and blood pressure are standardized objective measures of vital bodily functions. Four core “vitals” include heart rate, blood pressure, body temperature, and oxygen saturation.



Review Questions

1. Which is the largest and main artery of the circulatory system?
2. What separates the left and right sides of the heart?
3. Name the blood vessels that carry blood to and from the lungs.
4. What are the four chambers of the heart?
5. What keeps blood from flowing back into a chamber of the heart? Why is this important?
6. What is the ‘job’ of the circulatory system?
7. What is blood?
8. What are the 3 main substances found in blood?
9. What are capillaries?

Chambers and Circulation & Blood adapted from “[6.7 Blood Flow, Blood Pressure and Resistance](#)” from [Fundamentals of Anatomy and Physiology](#) by Anna Chruścik, Kate Kauter, Louisa Windus & Eliza Whiteside is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#), except where otherwise noted.

Blood Vessels adapted from “[6.8 Capillary Exchange](#)” from [Fundamentals of Anatomy and Physiology](#) by Anna Chruścik, Kate Kauter, Louisa Windus & Eliza Whiteside is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#), except where otherwise noted.

Life Connection: OpenAI. (2026). [ChatGPT](#) [Large Language Model].

Prompt

After the section about the circulatory systems blood vessels, and the tunica media of the veins, I'd like to add a “LIFE CONNECTION” for the doulas. a short but efficient explanation of varicose veins and pregnancy and the effects of estrogen.

3.3 Communication: Nervous System



Learning Outcomes

By the end of this section, you will be able to:

- Identify the anatomical and functional divisions of the nervous system.
- List the basic functions of the nervous system.
- Differentiate between sympathetic and parasympathetic responses and their impact on labour.
- Explore key concepts like nerve impulses, afferent vs. efferent nerves, cerebrospinal fluid, and the blood-brain barrier.
- Connect theory to practice through topics such as the autonomic nervous system's role in labour and the effects of epidural anesthesia.



The nervous system at a glance

- Fact-acting control system
- Consists of brain, spinal cord, nerves, and sensory receptors
- responds to internal and external change
- Sends messages via nerve impulses to central nervous system
- Central nervous system activates effectors (muscles and glands).

Video: The Nervous System in 9 Minutes

Video: "[The Nervous System in 9 Minutes](#)" by [CTE Skills.com](#) [9:22] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

3.4.1 Anatomy of Nervous Tissues and Cells

The nervous system can be divided into two major regions: the central and peripheral nervous systems (Marieb & Keller, 2022). The **central nervous system** (CNS) is the brain and spinal cord, and the **peripheral nervous system** (PNS) is many pairs of peripheral nerves that branch off of the spinal cord (Figure 3.3.1).

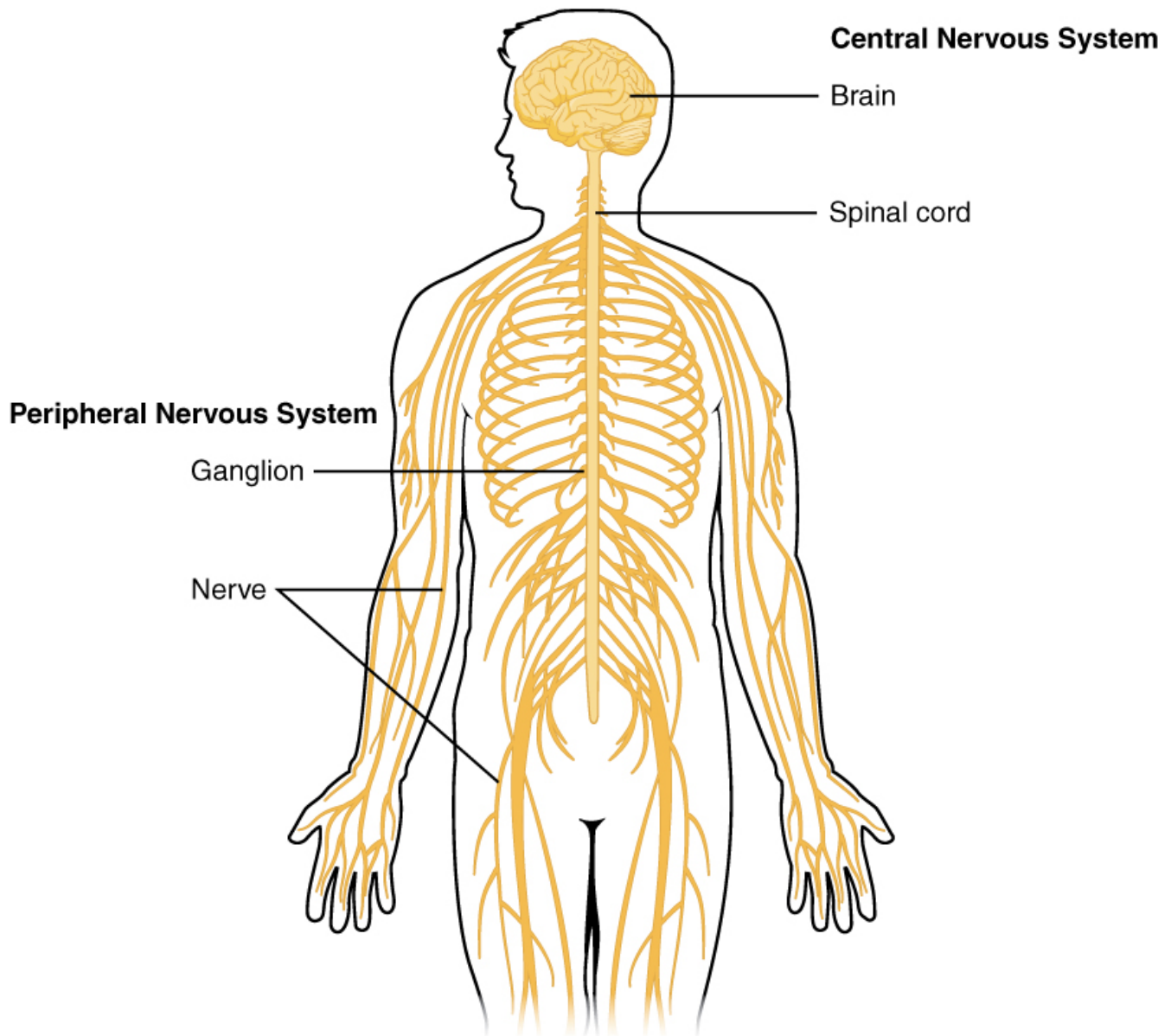


Figure 3.3.1 “[The Central and Peripheral Nervous System](#)” by [Medical Terminology: An Interactive Approach](#). CC BY 4.0.

Image Description

The image is a labelled diagram showing an overview of the human nervous system. A front-facing outline of the upper human body is shown with the nervous system highlighted. The brain and spinal cord are labelled as part of the Central Nervous System. Branching nerves extending from the spinal cord throughout the torso,

arms, and hands are shown as part of the Peripheral Nervous System. Labels also identify a ganglion and a nerve.

Complete text in the image:

Central Nervous System

- Brain
- Spinal cord

Peripheral Nervous System

- Ganglion
- Nerve

Nervous Tissues and Cells

Nervous tissue contains two basic types of cells: **glial cells** and **neurons**.

Glial cells nourish, protect, and insulate neurons. An abundant type of glial cell is the astrocyte, which helps to form the **blood-brain barrier** (a barrier which prevents toxic substances in the blood from getting into the nervous tissue).

Neurons are specialized cells that transmit information throughout the nervous system in the form of electrical nerve impulses. Like other cells, neurons contain a **cell body**, but they also have extensions called processes.

Every neuron has a single **axon**, a long fibre that carries electrical impulses away from the cell body toward a target cell. Some axons can reach up to one metre in length. Neurons also have branching processes called **dendrites**, which receive incoming signals from other neurons.

When a neuron is activated, it generates an electrical signal called an action potential. Communication between neurons occurs through both electrical and chemical processes. At the end of the axon are axon terminals, which release chemical messengers called neurotransmitters. These neurotransmitters cross a small gap between neurons called the synapse, or synaptic cleft, and bind to receptors on the dendrites of the next neuron, allowing the nerve impulse to continue.

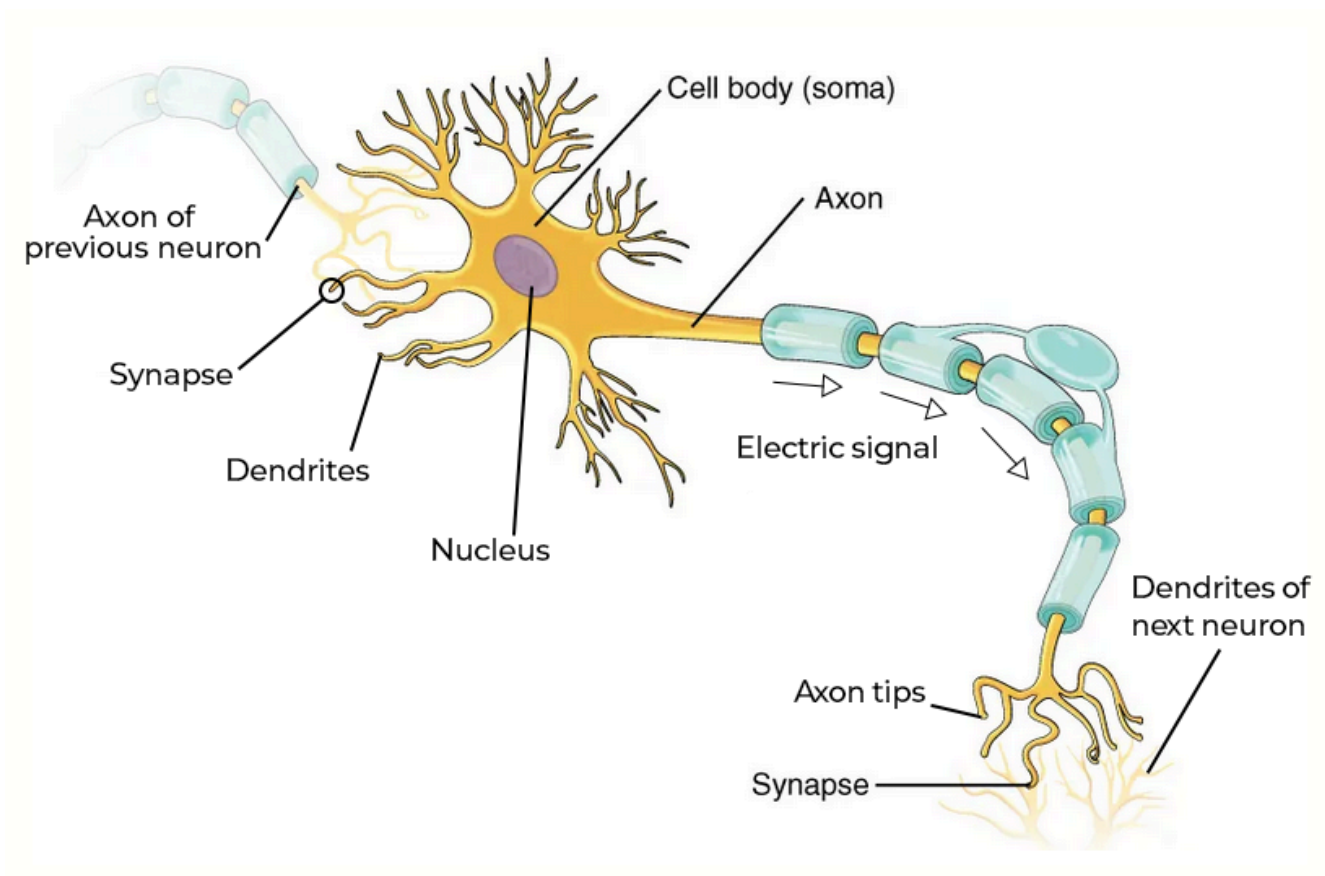


Figure 3.3.2 “[Structure of a Neuron](#)” by [OpenStax Anatomy and Physiology](#), CC BY 4.0. Mods: adjusted labels to show different elements.

Image Description

The image is a labelled diagram showing how an electrical signal travels from one neuron to another. On one side, the axon of a previous neuron connects to a neuron’s cell body at a connection point labelled as a synapse. The signal then travels through the neuron’s own axon toward the other side, where the axon tips connect across another synapse to the next neuron. The neuron cell bodies contain a nucleus and other branching components labelled as dendrites.

3.3.2 Physiology of the Nervous System

The nervous system is involved in receiving information about the environment around us (sensation) and generating responses to that information (motor responses). The nervous system can be divided into regions that are responsible for sensation (sensory functions) and for the response (motor functions). But there is a third function that needs to be included. Sensory input needs to be integrated with other sensations, as well as with memories, emotional state, or learning (cognition). Some regions of the nervous system are termed integration or association areas. The process of integration combines sensory perceptions and higher cognitive functions such as memories, learning, and emotion to produce a response.

Sensation. The first major function of the nervous system is sensation—receiving information about the

environment to gain input about what is happening outside the body (or, sometimes, within the body). The sensory functions of the nervous system register the presence of a change from homeostasis or a particular event in the environment, known as a stimulus. The senses we think of most are the “big five”: taste, smell, touch, sight, and hearing. The stimuli for taste and smell are both chemical substances (molecules, compounds, ions, etc.), touch is a physical or mechanical stimuli that interact with the skin, sight is light stimuli, and hearing is the perception of sound, which is a physical stimulus similar to some aspects of touch. There are more senses than just those, but that list represents the major senses. Those five are all senses that receive stimuli from the outside world, and of which there is conscious perception. Additional sensory stimuli might be from the internal environment (inside the body), such as the stretch of an organ wall or the concentration of certain ions in the blood.

Response. The nervous system produces a response on the basis of the stimuli perceived by sensory structures. An obvious response would be the movement of muscles, such as withdrawing a hand from a hot stove, but there are broader uses of the term. The nervous system can cause the contraction of all three types of muscle tissue. For example, skeletal muscle contracts to move the skeleton, cardiac muscle is influenced as heart rate increases during exercise, and smooth muscle contracts as the digestive system moves food along the digestive tract. Responses also include the neural control of glands in the body as well, such as the production and secretion of sweat by the eccrine and merocrine sweat glands found in the skin to lower body temperature.

Responses can be divided into those that are voluntary or conscious (contraction of skeletal muscle) and those that are involuntary (contraction of smooth muscles, regulation of cardiac muscle, activation of glands). Voluntary responses are governed by the somatic nervous system, and involuntary responses are governed by the autonomic nervous system, which are discussed in the next section.

Integration. Stimuli that are received by sensory structures are communicated to the nervous system, where that information is processed. This is called integration. Stimuli are compared with, or integrated with, other stimuli, memories of previous stimuli, or the state of a person at a particular time. This leads to the specific response that will be generated. Seeing a baseball pitched to a batter will not automatically cause the batter to swing. The trajectory of the ball and its speed will need to be considered. Maybe the count is three balls and one strike, and the batter wants to let this pitch go by in the hope of getting a walk to first base. Or maybe the batter’s team is so far ahead, it would be fun to just swing away.



Summary of Basic Functions

1. Sensory Function

- Sensory nerves gather information from inside the body as well as the environment.
- The nerves carry this info to the CNS.

2. Integrative Function

- Sensory info brought to the brain is interpreted.
- The brain puts together what it knows and then makes a plan.

3. Response/Motor Function

- Motor nerves carry info from the NCS to the muscles and glands of the body.
- Motor nerves carry out the plans made by the CNS.

3.4.3 The Central Nervous System

The Central Nervous System consists of the brain and the spinal cord. The brain is contained within the cranial cavity of the skull, and the spinal cord is contained within the vertebral cavity of the vertebral column.

Recall:

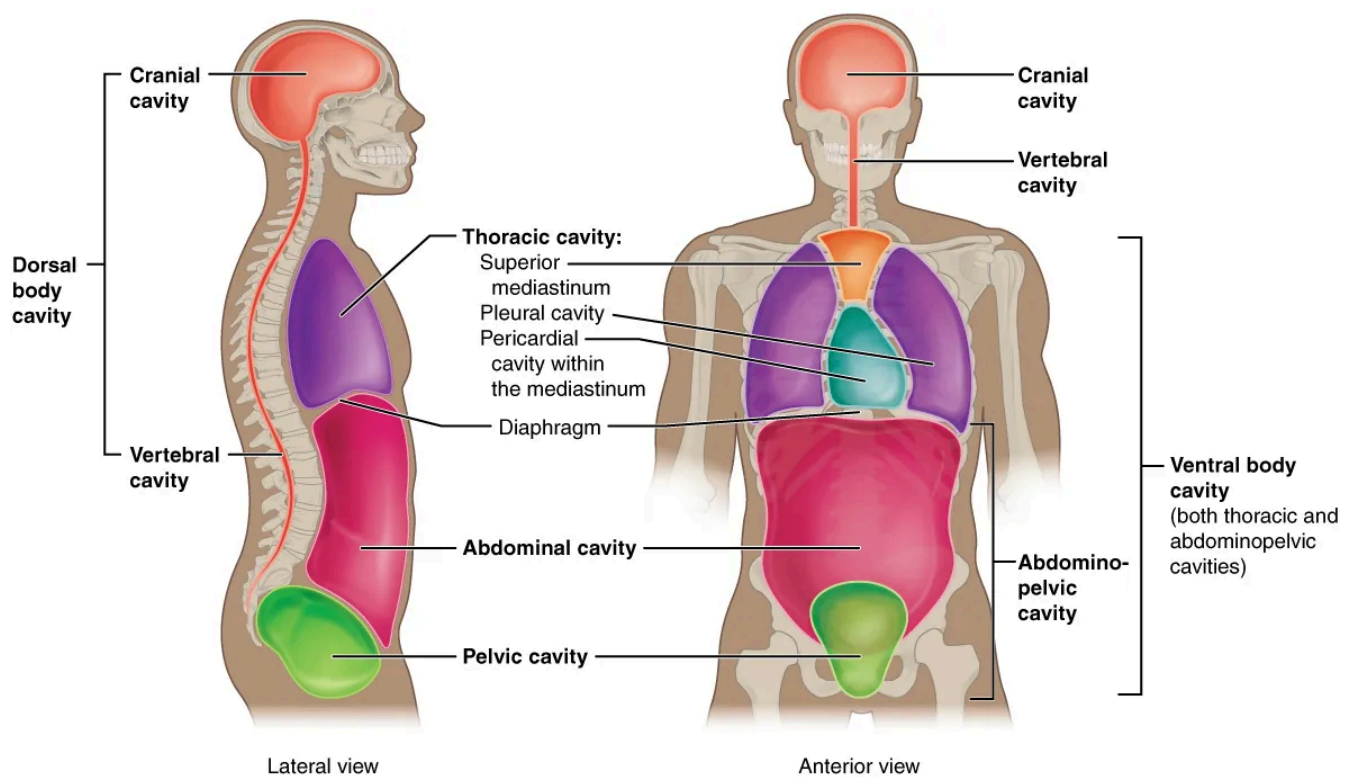


Figure 3.3.3 "The Cavities of the Body" from [Anatomical Terminology, CC BY 4.0](#).

Image Description

The image is a labelled anatomical diagram showing the major human body cavities from two perspectives: a lateral view on the left and an anterior view on the right. Labelled regions identify the dorsal and ventral body cavities. The dorsal body cavity includes the cranial cavity and vertebral cavity. The ventral body cavity includes the thoracic cavity, abdominal cavity, pelvic cavity, and abdominopelvic cavity. Within the thoracic cavity, the diagram also labels the superior mediastinum, pleural cavity, pericardial cavity within the mediastinum, and diaphragm.

Text shown in the image:

Lateral view

- Dorsal body cavity
 - Cranial cavity
 - Vertebral cavity
- Thoracic cavity:
 - Superior mediastinum
 - Pleural cavity
 - Pericardial cavity within the mediastinum
 - Diaphragm
- Abdominal cavity
- Pelvic cavity

Anterior view

- Cranial cavity
- Vertebral cavity
- Ventral body cavity (both thoracic and abdominopelvic cavities)
- Abdominopelvic cavity

The Brain

The brain is a soft organ with a pinkish-gray colour and a bumpy surface, weighing about 3 pounds. The brain relies primarily on glucose for energy (as opposed to proteins or fats).

There are four main parts, including the cerebrum, cerebellum, brain stem, and diencephalon.



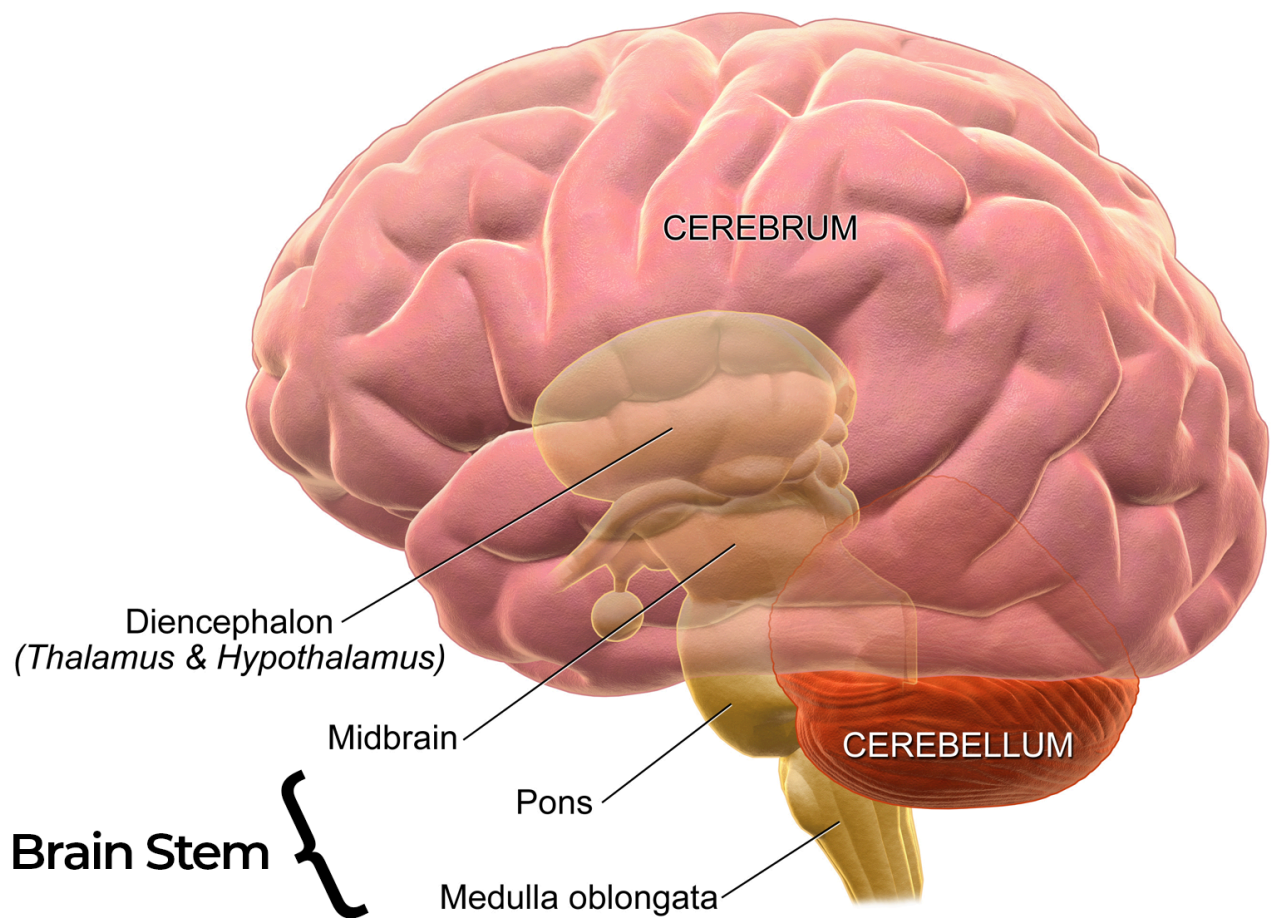


Figure 3.3.4 [Brain Structures](#) by BruceBlaus, [CC BY 3.0](#). Modifications: relabeled.

The **cerebrum** is the largest part of the brain and the centre of thought and intelligence. It is divided into hemispheres (the left hemisphere controls the right side, and the right hemisphere controls the left side). Each hemisphere has four lobes: frontal, parietal, temporal and occipital.

The **cerebellum** regulates and controls body movements, balance, and muscle tone.

The **brain stem** connects the cerebrum to the spinal cord. It contains the midbrain, pons, and medulla oblongata. The midbrain and pons relay messages. Medulla controls heart rate, breathing, blood flow, blood pressure, as well as primitive reflexes like swallowing, sneezing, coughing and vomiting.

The **diencephalon** includes the thalamus and the hypothalamus. The thalamus sorts out sensory information. The hypothalamus regulates body temp, water balance and metabolism, and is especially important for reproductive healthcare as it regulates endocrine (hormone) function.

The Spinal Cord

The spinal cord is within the vertebral cavity of the body. It contains pathways that conduct messages to and from the brain and spinal nerves. It also acts as a major reflex centre. From the spinal cord branches 31 pairs of nerves.

Cerebrospinal fluid (CSF) provides a layer of protection. CSF is formed from the blood within the brain (is clear in appearance and circulates around the brain and spinal cord).



Epidural Anaesthesia

“Epidurals” are a common form of pain management for childbirth. An epidural catheter is placed in the lumbar region of the spine, between the spinal cord and the ‘dura’ (connective tissue). Pain medication is sent from a bag, through a pump, and into the epidural space to effectively block the nerves responsible for pain in the lower abdomen, pelvis, and perineum.

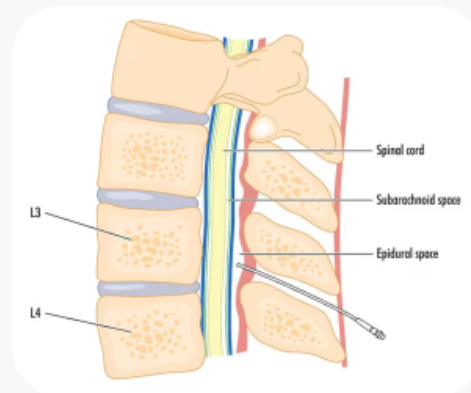


Figure 3.3.5 “[Application of Epidural Anesthesia](#)” by [MedCentral](#), [FDEd \(CAN\)](#).

Video: Epidural Anesthesia

Video: “[Epidural Anaesthesia](#)” by [LHSCCanada](#) [3:43] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

3.4.4 The Peripheral Nervous System



Exercise

Drag and drop the labels to reconstruct the hierarchy of the nervous system's anatomy.

Activity Description

The activity is a drag-and-drop activity that asks you to construct a hierarchy of the components of the nervous system. The parts are:

- Nervous System
- Central Nervous System
- Peripheral Nervous System
- Sensory (afferent)
- Motor (efferent)
- Automatic (Involuntary)
- Somatic (voluntary)
- Parasympathetic (rest and digest)
- Sympathetic (fight or flight)

Answer:

The proper construction of the hierarchy puts the nervous system at the top. Below it are the central nervous system and the peripheral nervous system. Below the peripheral nervous system are the sensory and motor components. Below the motor component are the automatic and somatic components.

Below the automatic component are the sympathetic and parasympathetic components.

The peripheral nervous system (PNS) includes 12 pairs of cranial nerves and 31 pairs of spinal nerves. **Cranial nerves** conduct impulses between the brain and head, neck, chest, and abdomen, while **spinal nerves** conduct impulses from skin, extremities, and internal body structures not supplied by cranial nerves.

The PNS has both sensory and motor functions. The sensory nerves carry impulses towards the CNS, and motor nerves carry impulses away from the CNS (Sorrentino et al., 2018). The motor functions can be divided into voluntary and involuntary movement, or the somatic and autonomic nervous systems, respectively.

The **Somatic Nervous System** (SNS) is responsible for voluntary motor responses. Voluntary motor response includes the contraction of skeletal muscle, including reflexes, which often happen without a conscious decision to perform them.



Life Connection

Somatic/Voluntary Motor Response Example: During labour, a person may intentionally change positions, lean over a birth ball, or use their hands to squeeze a comb for comfort. These actions involve conscious control of skeletal muscles through the somatic nervous system.

The **Autonomic Nervous System** (ANS) is responsible for involuntary control of the body. The motor output extends to smooth muscle (e.g. vessels, stomach, intestines, and bladder), cardiac muscle, as well as glandular tissue (e.g. adrenal glands). The role of the autonomic system is to regulate the organ systems of the body, usually for the sake of homeostasis (regulation of the internal environment).



Life Connection

During labour, a birthing person may sweat because their body is working hard to regulate temperature and maintain homeostasis during intense physical exertion. The activation of sweat glands is involuntary.

The ANS is further divided into the sympathetic and parasympathetic nervous systems and is of particular interest to doulas!

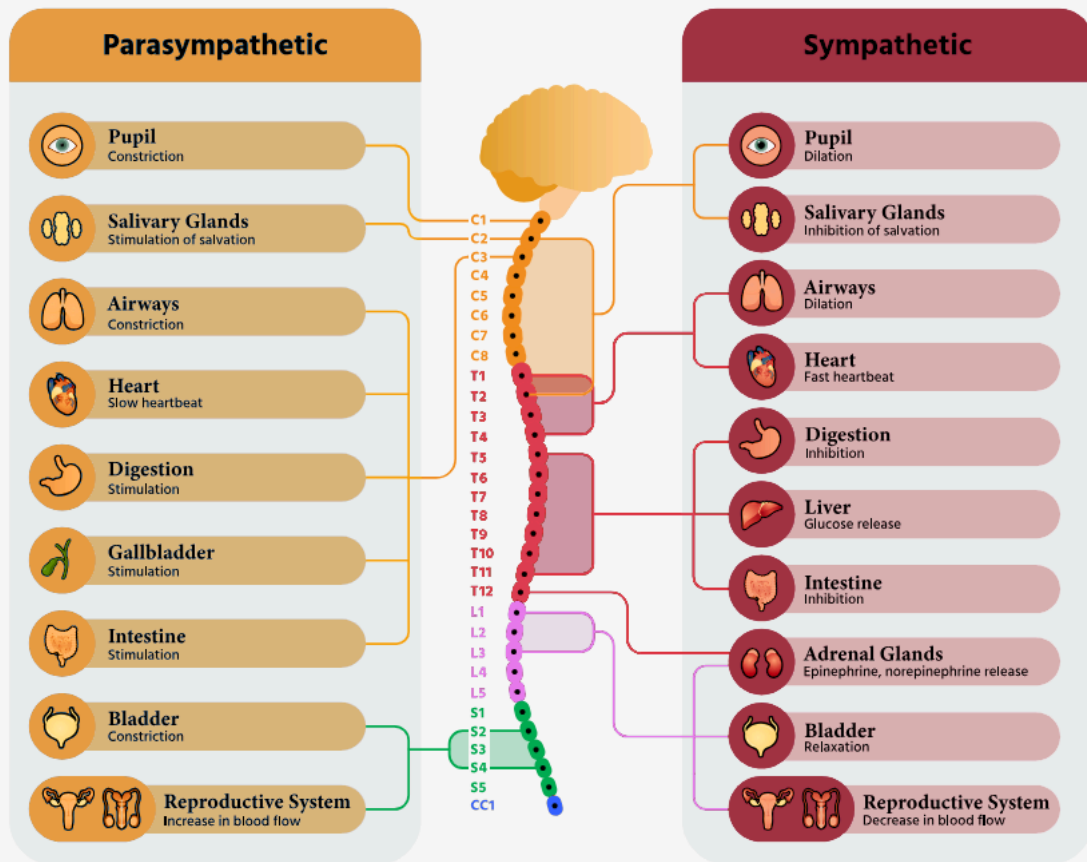


Figure 3.3.6. “Autonomic Nervous System” by Jacqueline Flores, [CC BY-NC-SA 4.0](#). Modifications: cropped; recoloured.

Sympathetic Nervous System

The Sympathetic Nervous System (SNS) is associated with the body’s “fight or flight” response. When a person experiences stress, frustration, worry and fear, sensory input signals the body to release stress hormones like adrenaline. This response causes changes, including dilated pupils, increased heartbeat, and reduced digestion. Blood flow is redirected to towards the muscles of the arms and legs (away from the abdomen) to prepare the body for action.

In labour, heightened fear or stress can contribute to the Fear-Tension-Pain cycle. Fear may increase muscular tension, and increased tension can intensify the perception of pain. This can make it more difficult for a labouring person to relax, rest, and cope with contractions effectively.

Extended activation of the sympathetic nervous system may interfere with labour progress for some people, particularly in early labour when feelings of safety and relaxation support oxytocin release. However, adrenaline can also serve an important purpose during birth. Near the pushing phase, a natural increase in adrenaline may provide a labouring person with renewed alertness and energy after a physically demanding experience. Adrenaline also crosses the placenta and may support the baby’s transition at birth.



Life Connection

Sweating can occur not only to cool the body, but also in response to fear, stress, pain, or anxiety through activation of the sympathetic nervous system. In this case, sweating reflects an emotional or stress response rather than temperature regulation.



Expand Your Knowledge

More recent understandings of stress and trauma responses expand beyond “fight or flight” to also include responses such as freeze and fawn. During a freeze response, a person may experience helplessness, difficulty responding, shame, and disassociation. During a fawn response, a person may prioritize pleasing others, avoiding conflict, or complying with perceived authority figures in order to maintain safety or reduce the risk of harm. Trauma-informed care recognizes that these responses are protective nervous system adaptations rather than conscious choices.

Parasympathetic Nervous System

The Parasympathetic Nervous System is associated with the body’s “rest and digest” response. It is activated by feelings of calmness, relaxation, and safety. The parasympathetic response slows the heartbeat, stimulates digestion, and promotes blood flow to the reproductive system.

This state is generally more compatible with labour progression due to improved circulation, oxygen delivery, and oxytocin activity within the uterus, which is a large smooth muscle. Many comfort measures used in labour aim to encourage PNS activity through rest, reassurance, privacy, emotional safety, and breathwork.

Slow intentional breathing helps to activate the vagus nerve – one of the major nerves in the PNS. Deep inhales and longer exhales can decrease heart rate and blood pressure, and reduce muscle tension.

“[12.1 Basic Structure and Function of the Nervous System](#)” in [Anatomy and Physiology](#) by J. Gordon Betts, Kelly A. Young, James A. Wise, Eddie Johnson, Brandon Poe, Dean H. Kruse, Oksana Korol, Jody E. Johnson, Mark Womble, Peter DeSaix is licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise indicated.

Life Connection: OpenAI. (2026). ChatGPT [Large Language Model].

Prompt

The textbook offered, "Sweat glands, for example, are controlled by the autonomic system. When you are hot, sweating helps cool your body down. That is a homeostatic mechanism. But when you are nervous, you might start sweating also. That is not homeostatic, it is the physiological response to an emotional state" replace with a labour example

3.4 Nourishment: The Digestive System



Learning Objectives

By the end of this section, you will be able to:

- Outline the sequential process of digestion, absorption, and elimination.
- Identify the major digestive organs, accessory structures, and their functions.
- Examine physiological phenomena like heartburn and nutrient absorption.
- Discuss implications of digestive health for pregnancy and postpartum recovery.



The Digestive System at a Glance

The digestive system is also known as the gastrointestinal system (GI). It:

- Includes the oral cavity, esophagus, stomach, small and large intestines, and accessory organs,
- Breaks down food,
- Allows for nutrient absorption into blood,
- Eliminates indigestible material as feces,
- Reclaims water.

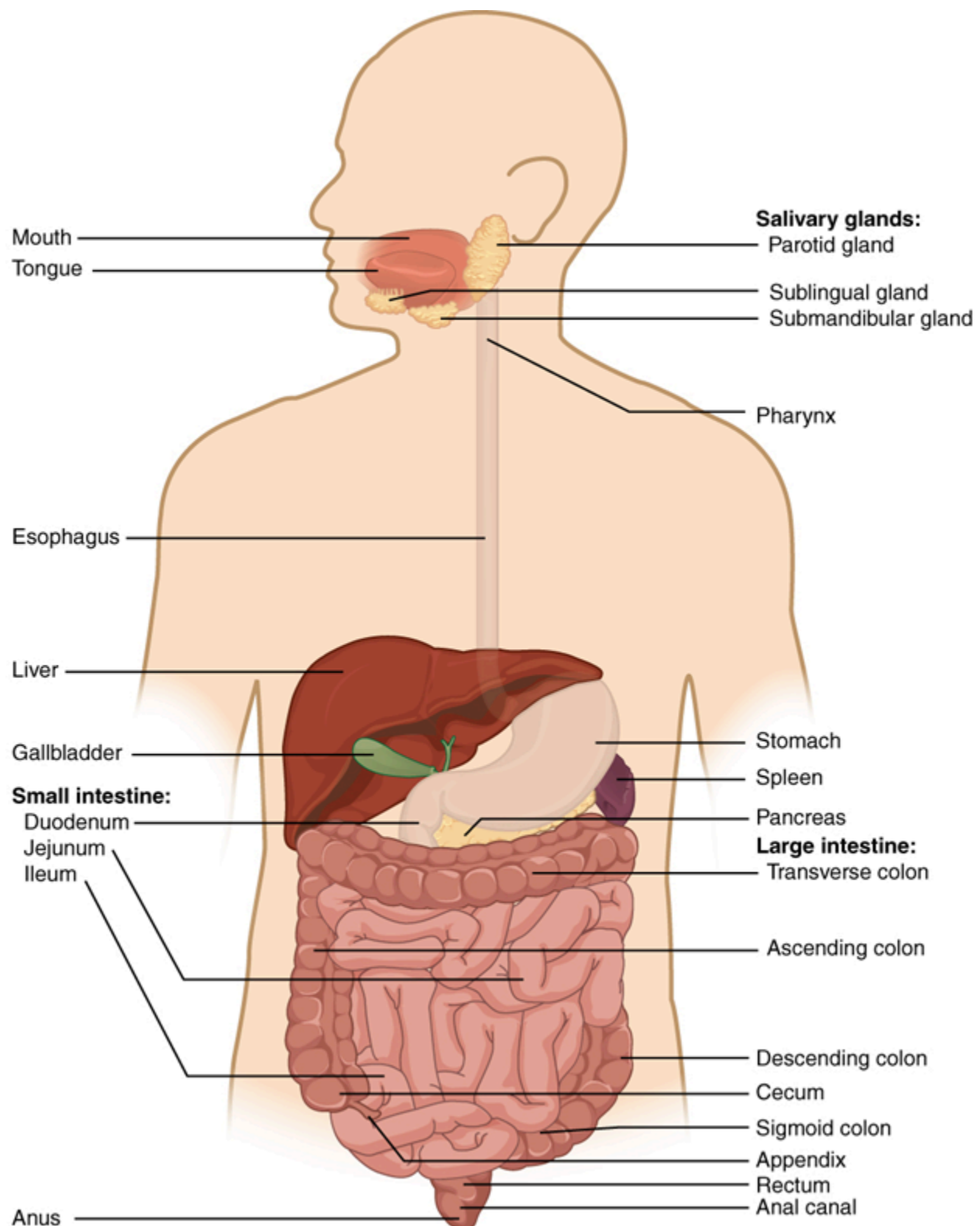


Figure 3.4.1 “Components of the digestive system” by *Fundamentals of Anatomy and Physiology*, CC BY-SA 4.0.

Image Description

The image is a labelled anatomical diagram of the human digestive system. It shows a side profile of the head and upper body, with the mouth, tongue, salivary glands, pharynx, and esophagus labelled. The digestive organs are shown in the torso, including the liver, gallbladder, stomach, spleen, pancreas, small intestine, large intestine, rectum, anal canal, and anus. The small intestine and large intestine are further labelled by section.

Image labels:

- Mouth
- Tongue
- Salivary glands:
 - Parotid gland
 - Sublingual gland
 - Submandibular gland
- Pharynx
- Esophagus
- Liver
- Gallbladder
- Small intestine
 - Duodenum
 - Jejunum
 - Ileum
 - Stomach
 - Spleen
 - Pancreas
- Large intestine
 - Transverse colon
 - Ascending colon
 - Descending colon
 - Cecum
 - Sigmoid colon
 - Appendix
 - Rectum
 - Anal canal
- Anus

Video: How the Digestive System Works

Video: “[How Your Digestive System Works – Emma Bryce](#)” by [TED-Ed](#) [4:56] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

3.4.1 Physiology of the Digestive System

The digestive system uses the process of digestion to break down food into nutrients the body can use and eliminates the waste. Large molecules are broken into smaller molecules that are more readily transported through the circulatory system (Marieb & Keller, 2022).

The processes of digestion include six activities: **ingestion**, propulsion, mechanical or physical digestion, **chemical digestion**, **absorption** and **defaecation**.

The first of these processes, ingestion, refers to the entry of food into the gastrointestinal tract through the mouth. There, the food is chewed and mixed with saliva, which contains enzymes that begin breaking down the carbohydrates in the food, plus some lipid digestion via lingual lipase. Chewing increases the surface area of the food and allows an appropriately sized bolus to be produced.

Food leaves the mouth when the tongue and pharyngeal muscles propel it into the esophagus. This act of swallowing, the last voluntary act until defaecation, is an example of **propulsion**, which refers to the movement of food through the digestive tract. It includes both the voluntary process of swallowing and the involuntary process of peristalsis. **Peristalsis** consists of sequential, alternating waves of contraction and relaxation of the alimentary wall smooth muscles, which act to propel food along (Figure 3.4.1). These waves also play a role in mixing food with digestive secretions. Peristalsis is so powerful that foods and liquids you swallow enter your stomach even if you are standing on your head.

Digestion includes both mechanical and chemical processes. **Mechanical digestion** is a purely physical process that does not change the chemical nature of the food. Instead, it makes the food smaller to increase both surface area and mobility. It includes **mastication**, or chewing, as well as tongue movements that help break food into smaller bits and mix food with saliva. Although there may be a tendency to think that mechanical digestion is limited to the first steps of the digestive process, it occurs after the food leaves the mouth, as well. The mechanical churning of food in the stomach serves to further break it apart and expose more of its surface area to digestive secretions, creating an acidic “soup” called **chyme**. **Segmentation**, which occurs mainly in the small intestine, consists of localized contractions of the circular muscle of the muscularis layer of the gastrointestinal tract. These contractions isolate small sections of the intestine, moving their contents back and forth while continuously subdividing, breaking up, and mixing the contents. By moving food back and forth in the intestinal lumen, segmentation mixes food with digestive secretions and facilitates absorption.

In chemical digestion, starting in the mouth, digestive secretions break down complex food molecules into their chemical building blocks (for example, proteins into separate amino acids). These secretions vary in composition, but typically contain water, various enzymes, acids, and salts. The process is completed in the small intestine.

Food that has been broken down is of no value to the body unless it enters the bloodstream and its nutrients are put to work. This occurs through the process of absorption, which takes place primarily within the small intestine. There, most nutrients are absorbed from the lumen of the gastrointestinal tract into the bloodstream through the epithelial cells that make up the mucosa. Lipids are absorbed into lacteals and are transported via the lymphatic vessels to the bloodstream (the subclavian veins near the heart). The details of these processes will be discussed later.

In defaecation, the final step in digestion, undigested materials are removed from the body as feces.

3.4.2 Anatomy of the Digestive System

Digestive System Organs = GI tract + Accessory Organs

GI tract

The Gastrointestinal (GI) tract, AKA the alimentary canal, includes the mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum and anus.

Table 3.4.1: Gastrointestinal Tract Organs and Their Functions

Organ	Major Functions
Mouth	• Ingests, chews, and mixes food • Begins chemical breakdown of carbohydrates • Moistens and dissolves food
Pharynx	The Throat – Propels food from the oral cavity to the esophagus
Esophagus	Long tube that uses peristalsis to propel food to the stomach
Lower esophageal sphincter or “Cardiac sphincter”	A ringlike muscle that prevents food and gastric juices from rising through the esophagus and into the mouth
Stomach	• Mixes and churns food with gastric juices to form chyme • begins chemical breakdown of proteins • Releases food into the duodenum as chyme • Absorbs some fat-soluble substances (e.g. alcohol, aspirin) • Possesses antimicrobial functions
Pyloric Sphincter	A ringlike muscle that controls the flow of food or “ chyme ” from the stomach into the small intestine
Small Intestine	• Mixes chyme with digestive juices • Propels food at a rate slow enough for digestion <i>and</i> absorption • Villi absorb the broken-down products of carbohydrates, proteins, lipids, and nucleic acids, along with vitamins, minerals, and water • Performs physical digestion via segmentation • Is 6 meters long • Subsections include the duodenum, jejunum, and ileum
Large Intestine	• Further breaks down food residues • Reabsorbs most residual water, electrolytes, and vitamins produced by enteric bacteria • Propels feces towards rectum • Eliminates feces • 1.5 metres long; Consists of cecum, colon, rectum, and anal canal

Accessory Structures

Accessory Structures include the teeth, tongue, salivary glands, liver, gall bladder and pancreas. Within the mouth, the teeth and tongue begin mechanical digestion, whereas the salivary glands begin chemical digestion. Once food products enter the small intestine, the gallbladder, liver, and pancreas release

secretions—such as bile and enzymes—essential for digestion to continue. Together, these are called accessory organs because they sprout from the lining cells of the developing gut (mucosa) and augment its function; indeed, you could not live without their vital contributions, and many significant diseases result from their malfunction. Even after development is complete, they maintain a connection to the gut by way of ducts.

Table 3.4.2 Accessory Structures of the GI Tract and Their Functions

Organ	Major Functions
Salivary Glands	These minor exocrine glands constantly secrete saliva, either directly into the oral cavity or indirectly through ducts. An average of 1 to 1.5 litres of saliva is secreted each day. Usually, just enough saliva is present to moisten the mouth and teeth.
Tongue	Facilitates ingestion, digestion, sensation, swallowing and vocalization
Liver	Bile salts, which emulsify lipids, aiding their digestion and absorption
Gall Bladder	Stores, concentrates and releases bile
Pancreas	Produces digestive enzymes and bicarbonate



Tongue Ties

A fold of mucous membrane on the underside of the tongue, the lingual frenulum, tethers the tongue to the floor of the mouth. People with the congenital anomaly ankyloglossia, also known by the non-medical term “tongue tie,” have a lingual frenulum that is too short or otherwise malformed. In infants it can impede latch quality and affect milk transfer and gas intake. Severe ankyloglossia can impair speech and must be corrected with surgery.

Tissues of the Digestive System

The alimentary tract is composed of the same four tissue layers. From the lumen moving outwards, these layers are the mucosa, submucosa, muscularis, and serosa, which is continuous with the connective tissues that suspend all organs.

Table 3.4.3 Tissues of the Digestive System and Their Functions

Layer	Function
Lumen	Open space within GI tract where food, fluids, enzymes and waste move
Mucosa	Inner lining of epithelial cells that secrete mucus, digestive substances, and absorbs nutrients
Submucosa	Support layer containing blood vessels, lymphatic vessels, glands, and nerves
Muscle Layer	Smooth muscle that mixes and propels food through the GI tract using peristalsis and segmentation
Serosa	Outer protective covering; Connective tissue that holds organs in place

Image Description

The image is a labelled diagram of an intestinal villus. The villus is shown as a finger-like projection lined with epithelial cells. Inside the villus are blood vessels, including capillaries connected to an arteriole and venule, as well as a central lymphatic vessel called a lacteal. The diagram highlights how the villus contains both blood and lymphatic vessels for nutrient absorption.

Image labels:

- Epithelial Cell
- Capillary
- Lacteal
- Venule
- Lymphatic Vessel
- Arteriole

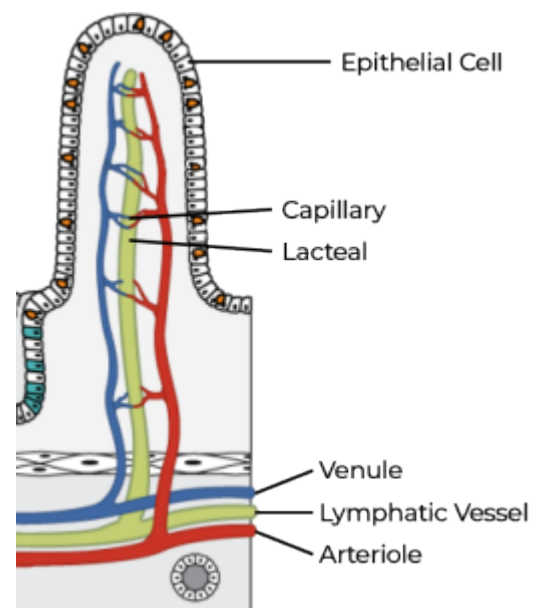


Figure 3.4.2 “Anatomy of Villi” by OpenStax, CC BY 4.0. Modifications: cropped and relabeled

The wall of the small intestine is composed of the same four layers typically present in the gastrointestinal system. However, the mucosa and submucosa have features including circular folds, villi, and microvilli, which increase the absorptive surface area of the small intestine more than 600-fold. These adaptations are most abundant in the proximal two-thirds of the small intestine, where most of the absorption occurs.

3.5.4 The Digestive System and Reproductive Health

Pregnancy and postpartum recovery can significantly influence the digestive system and nutritional needs of the body. Hormonal changes, physical pressure from the growing uterus, shifts in metabolism, and changes in nutrient demands can all affect digestion, absorption, appetite, and blood glucose regulation. Some digestive experiences are common and temporary, while others may require medical monitoring or intervention. Understanding these conditions helps doulas appreciate the interconnectedness of body systems and the ways physiological changes can influence comfort, nourishment, energy, and overall well-being.

Heartburn in Pregnancy

Heartburn is a common digestive complaint in pregnancy characterized by a burning sensation in the chest or throat. Despite the name, it does not involve the heart.

Normally, the lower esophageal sphincter (LES) helps prevent acidic stomach contents from moving upward into the esophagus. During pregnancy, hormones such as progesterone relax smooth muscle tissue throughout the body, including the LES. As the uterus enlarges, increased pressure within the abdominal cavity can also push stomach contents upward.

When gastric acid refluxes into the esophagus, the esophageal mucosa can become irritated because it is not designed to withstand the stomach's acidic environment. Symptoms may worsen after eating large meals, lying down, or during the third trimester.

Hyperemesis Gravidarum

Hyperemesis Gravidarum (HG) is a severe form of nausea and vomiting in pregnancy that extends beyond typical morning sickness. Persistent vomiting can interfere with the ingestion, digestion, and absorption of nutrients and fluids.

People experiencing HG may develop dehydration, electrolyte imbalances, weight loss, fatigue, and nutritional deficiencies. In severe cases, hospitalization and intravenous fluids may be required. HG can also significantly affect emotional well-being, daily functioning, and mental health.

Gestational Diabetes

Gestational Diabetes (GD) is primarily an endocrine disorder involving changes in insulin sensitivity during pregnancy. However, digestion and nutrition still play an important role in management.

Food is broken down during digestion into nutrients, including glucose, which enters the bloodstream through absorption in the small intestine. In GD, the body has difficulty regulating blood glucose levels effectively. Nutritional strategies such as balancing carbohydrates with protein and fibre, eating regular meals, and monitoring blood glucose can help support regulation.

Slowed Digestion

Digestive processes often slow during the third trimester of pregnancy, labour, and the early postpartum period. Hormonal changes, nervous system responses, physical pressure from the uterus, and changes in activity levels can all contribute to altered GI function.

During late pregnancy, elevated progesterone relaxes smooth muscle tissue throughout the gastrointestinal tract. Because peristalsis depends on coordinated smooth muscle contractions, digestion and intestinal transit may become slower. This can contribute to bloating, constipation, fullness, and increased reflux or heartburn. The enlarging uterus can also physically compress digestive organs and intestines, further affecting movement through the GI tract.

During labour, digestion naturally slows as blood flow and energy are redirected toward the uterus and skeletal muscles involved in labour. Activation of the sympathetic nervous system during stress, pain, or intense exertion can further inhibit digestive activity. Nausea, vomiting, reduced appetite, and delayed stomach emptying are common physiological responses during labour.

In the postpartum period, recovery from birth, dehydration, pain medications, abdominal surgery, pelvic floor soreness, and reduced mobility can temporarily slow bowel function. Some people may feel anxious about their first bowel movement after birth due to swelling, stitches, hemorrhoids, or discomfort. Hydration, nourishment, mobility, fibre intake, and rest can all support gastrointestinal recovery.



Putting it Together

Nutrition, Digestion, and Red Blood Cell Synthesis

The digestive system does more than break down food. It also allows nutrients to be absorbed into the bloodstream, where they can support cellular function, tissue repair, hormone production, and red blood cell synthesis.

Red blood cell production depends on adequate intake and absorption of nutrients, including iron, folate, and vitamin B12. Vitamin B12 is absorbed in the small intestine after binding with intrinsic factor produced by the stomach. Without sufficient digestion and absorption, the body may not have access to the nutrients needed to produce healthy red blood cells.

When nutrient deficiencies occur, anemia can develop. In vitamin B12 or folate deficiency anemia, red blood cells may become abnormally large and less effective at transporting oxygen. Symptoms can include fatigue, weakness, dizziness, pallor, and shortness of breath.

For doulas, this highlights the interconnectedness of body systems. Nourishment, digestion, absorption, circulation, oxygen transport, and energy levels are all closely linked, particularly during pregnancy, postpartum recovery, lactation, and healing.

“12.1 Overview of the Digestive System” in [Fundamentals of Anatomy and Physiology](#) by Anna Chruścik, Kate Kauter, Louisa Windus, and Eliza Whiteside is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#), except where otherwise indicated.

Putting it Together: OpenAI. (2026). [ChatGPT](#) [Large Language Model].

Prompt

Combine essential A&P RBC synthesis and nutrition with reproductive health considerations.

3.5 The Power of Breath: The Respiratory System

Breathing marks both the beginning and end of human life. At birth, the respiratory system undergoes a profound physiological transition as fluid-filled fetal lungs expand with air for the first time. The diaphragm contracts, the lungs inflate, and oxygen exchange begins independently.

At the end of life, breathing patterns may again change significantly. As body systems slow, respirations can become irregular, shallow, or punctuated by pauses such as Cheyne–Stokes breathing. These changes reflect shifts in neurological, muscular, and circulatory function.

For many cultures and traditions, breath carries symbolic meaning beyond physiology. Breath is often associated with presence, spirit, transition, and connection to life itself. Doulas working across the reproductive spectrum may witness breath as both a biological process and a deeply human experience



Learning Objectives

By the end of this chapter, you will be able to:

- Identify and describe the structures and functions of the respiratory system.
- Describe how the respiratory system processes oxygen and CO₂.



The Respiratory System at a Glance

- Includes the nasal passages, pharynx, larynx, trachea, bronchi, and lungs.
- Facilitates gas exchange by oxygenating blood and removing carbon dioxide
- Respiration is regulated by the pons and medulla of the brainstem

Video: Respiratory System

Video: “[STD 07 Science Respiratory System](#)” by [Dr. Rafiul Islam](#) [5:58] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

3.5.1 Anatomy of the Respiratory System

The major organs of the respiratory system function primarily to provide oxygen to body tissues for cellular respiration, remove the waste product carbon dioxide, and help to maintain acid-base balance. Portions of the respiratory system are also used for non-vital functions, such as sensing odours, speech production, and for straining, such as during childbirth or coughing (Figure 3.5.1) (Marieb & Keller, 2022).

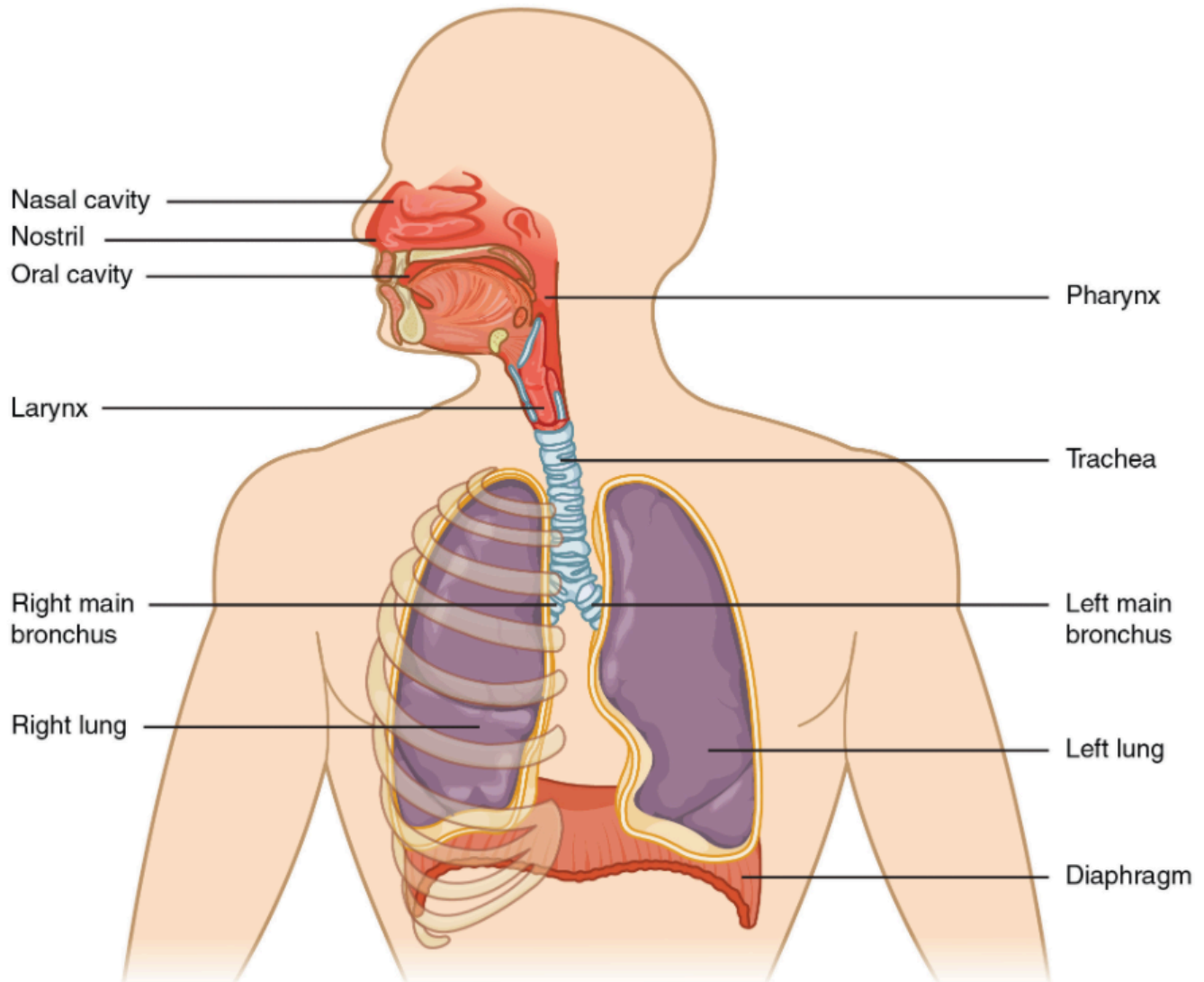


Figure 3.5.1 “[Major Respiratory Structures](#)” *Fundamentals of Anatomy and Physiology*, CC BY-SA 4.0.

Image Description

The image is a labelled anatomical diagram of the major structures of the respiratory system. It shows a side view of the head and neck connected to a front view of the chest. The nasal cavity, nostril, oral cavity, pharynx, larynx, trachea, main bronchi, lungs, and diaphragm are identified.

Image labels:

- Nasal cavity
- Nostril
- Oral cavity
- Pharynx
- Larynx
- Trachea
- Right main bronchus
- Left main bronchus
- Right lung
- Left lung
- Diaphragm

Table 3.5.1 Organs of the Upper Respiratory Tract and Their Functions

Organ	Function
Nasal Cavity	Contains features that disrupt the flow of air as it enters the nose. Upon inhalation, it causes air to bounce along the epithelium, where it is cleaned and warmed. Upon exhalation, the features trap water and prevent dehydration of the nasal epithelium.
Pharynx	The pharynx is a tube formed by skeletal muscle and lined by mucous membrane that is continuous with that of the nasal cavities. It is a passageway for food and air.
Epiglottis	A very flexible piece of elastic cartilage that covers the opening of the trachea during swallowing.
Larynx	Regulates the volume of air that enters and leaves the lungs. Holds the vocal cords.

Table 3.5.2 Organs of the Lower Respiratory Tract and Their Functions

Organ	Function
Trachea (windpipe)	• Extends from the larynx toward the lungs • Composed of cartilage or dense connective tissue
Bronchi (Primary and Secondary) and Bronchioles	Branches off of the trachea.
Alveolar sac or Alveolus	A cluster of individual alveoli that are responsible for gas exchange. An alveolus is approximately 200 µm in diameter with elastic walls that allow the alveolus to stretch during air intake, which greatly increases the surface area available for gas exchange.
Pulmonary Capillaries	The site of gas exchange between the cardiovascular system and respiratory system.

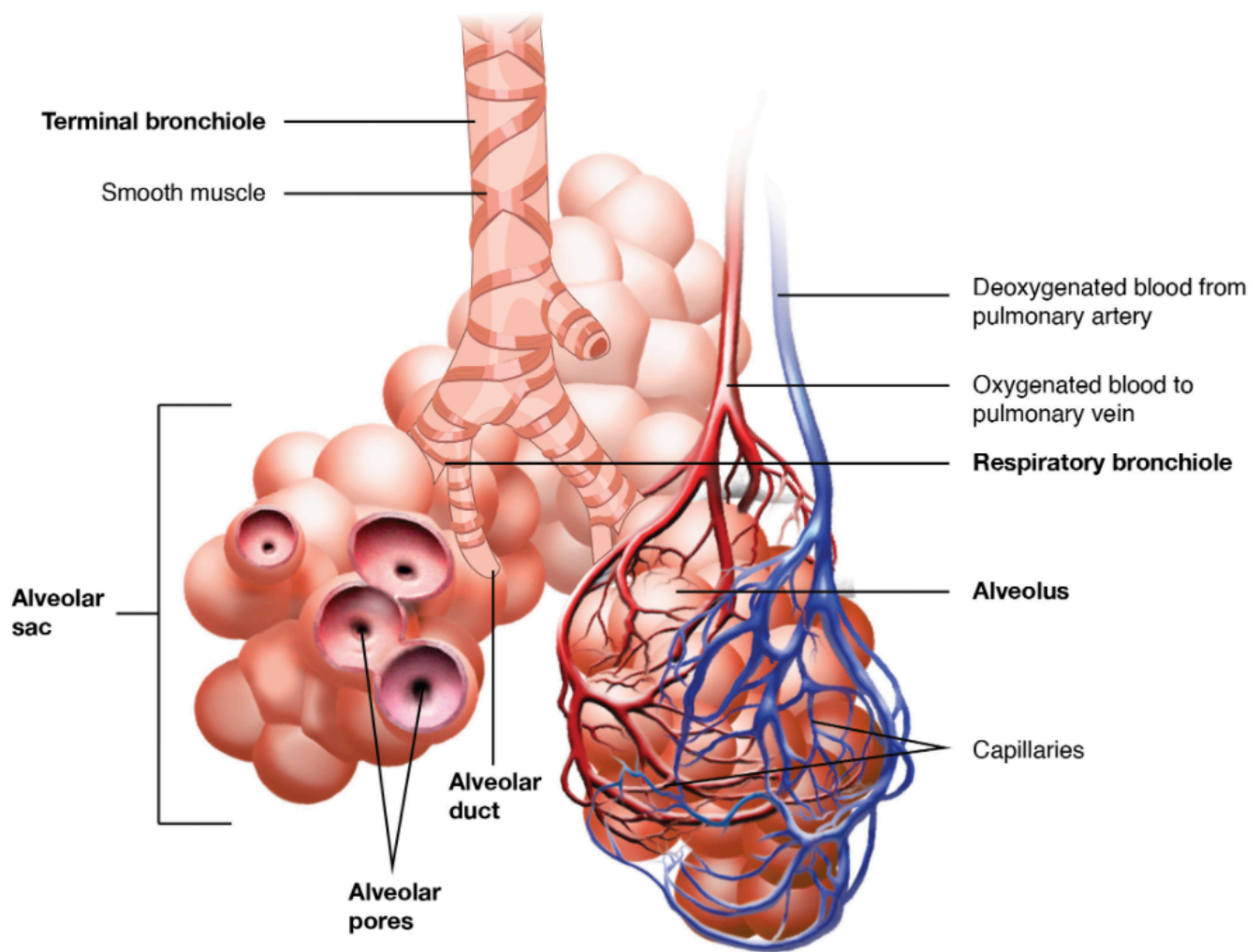


Figure 3.5.2 “[Anatomy of an alveolus](#)” by [Fundamentals of Anatomy and Physiology](#), CC BY-SA 4.0.



The Lungs

The lungs reside in the thoracic cavity and are protected by the ribcage. The right lung has three lobes, and the left lung has two lobes (one less to accommodate for the heart).



The Diaphragm

The diaphragm is a dome-shaped muscle and is the driving force of ventilation.

Specialized Cells

The respiratory tract is lined with specialized respiratory epithelium that helps protect the body from pathogens, debris, and particles in inhaled air. Many portions of the conducting airways, including the trachea and bronchi, are lined with goblet cells.

Goblet cells produce mucus, which traps dust, bacteria, and other particles. Tiny hair-like projections called **cilia** beat rhythmically to move mucus upward toward the pharynx, where it can be swallowed or expelled. Together, mucus and cilia help warm, humidify, filter, and protect the respiratory system.

3.6.2 Gas Exchange and Hemoglobin

In the Lungs, External Respiration

The pulmonary artery transports deoxygenated blood carrying carbon dioxide from the heart to the lungs. Within the lungs, gas exchange occurs across the thin respiratory membrane between the alveoli and surrounding capillaries. Carbon dioxide diffuses from the blood into the alveoli to be exhaled, while oxygen diffuses from the alveoli into the blood.

Most oxygen does not dissolve directly in plasma. Instead, it binds to hemoglobin within red blood cells to form oxyhemoglobin. Oxygenated blood then returns to the heart through the pulmonary veins before being circulated throughout the body.

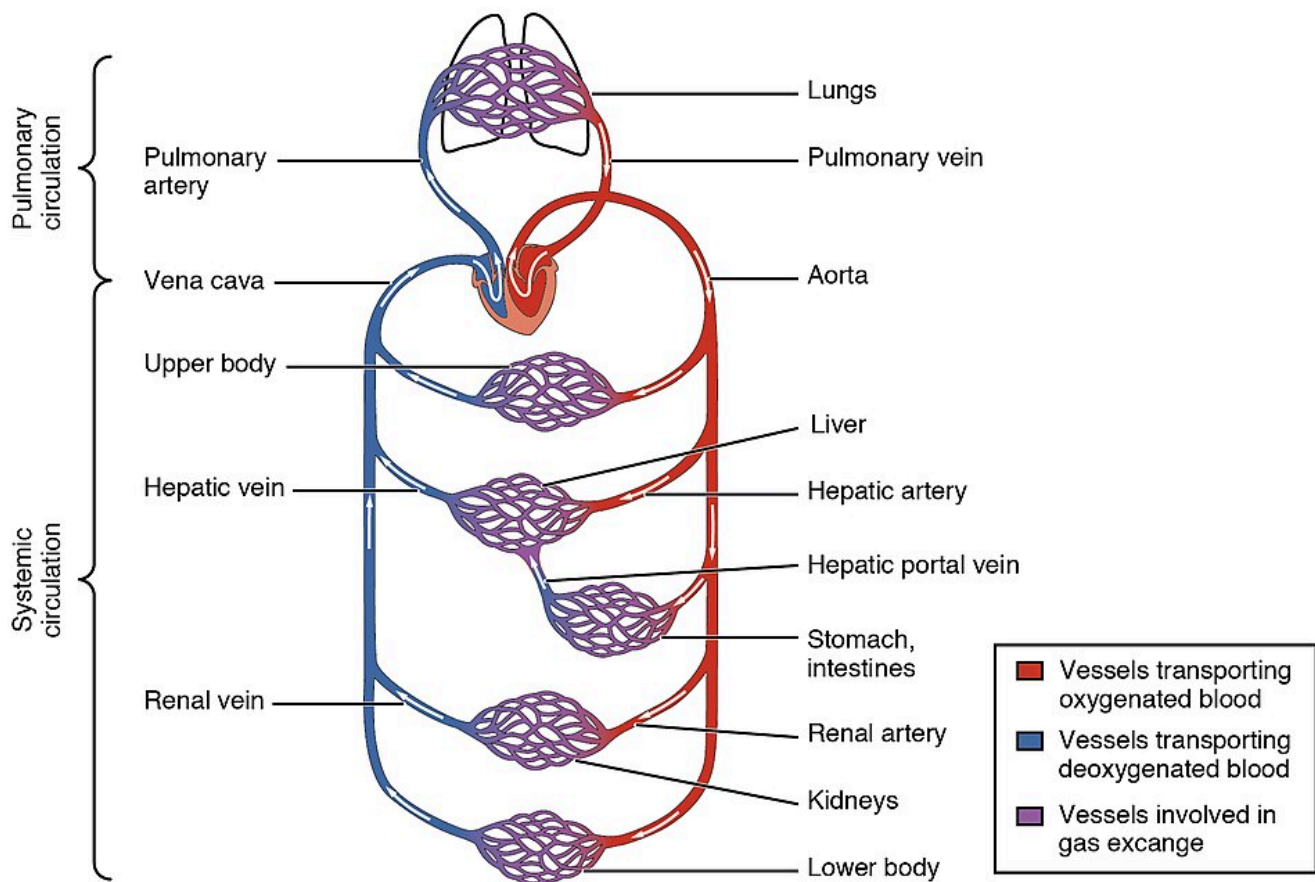


Figure 3.5.3 “Circulation” by OpenStax, CC BY 3.0.

Image Description

The image is a labelled diagram showing blood flow through the heart and body. It separates pulmonary circulation, occurring in the lungs, from systemic circulation, occurring through the rest of the body. The diagram shows blood moving between the heart, lungs, upper body, liver, stomach and intestines, kidneys, and lower body.

Image labels:

- Pulmonary circulation
 - Vessels transporting deoxygenated blood
 - Pulmonary artery
 - Vessels transporting oxygenated blood
 - Pulmonary vein
- Systemic circulation
 - Vessels transporting deoxygenated blood
 - Vena cava
 - Hepatic vein
 - Renal vein

- Vessels transporting oxygenated blood
 - Aorta
 - Hepatic artery
 - Hepatic portal vein
 - Renal artery

Throughout the Body, Internal Respiration

In the tissues, oxygen dissociates from hemoglobin and diffuses into the interstitial spaces and cells, where it is used for energy production. At the same time, carbon dioxide produced by cellular metabolism diffuses into the blood to be transported back to the lungs.



Life Connection

The fetus depends entirely on the placenta and maternal circulation for oxygen. Fetal hemoglobin (HbF) has a stronger affinity for oxygen than adult hemoglobin, allowing fetal blood to bind oxygen more effectively even when oxygen levels are relatively lower in the placenta.

This physiological adaptation supports oxygen transfer from maternal blood to fetal blood across the chorion and placenta.

3.6.3 The Process of Breathing, “Ventilation”



“Inhalation” or Inspiration

Air flow: nose → pharynx → larynx → trachea → bronchi → bronchioles → alveoli

- The diaphragm contracts and moves down
- As the thoracic cavity increases in size, air is pulled into the lungs
- Oxygen moves from the alveoli to the pulmonary capillaries and into the blood



“Exhalation” or Expiration

Air flow: alveoli → bronchioles → bronchi → trachea → larynx → pharynx → nose/mouth

- Carbon dioxide moves from the blood through the pulmonary capillaries to the alveoli
- The diaphragm relaxes and moves up
- As the thoracic cavity gets smaller, the air that is full of CO₂ is forced out of the lungs through the trachea, nose or mouth

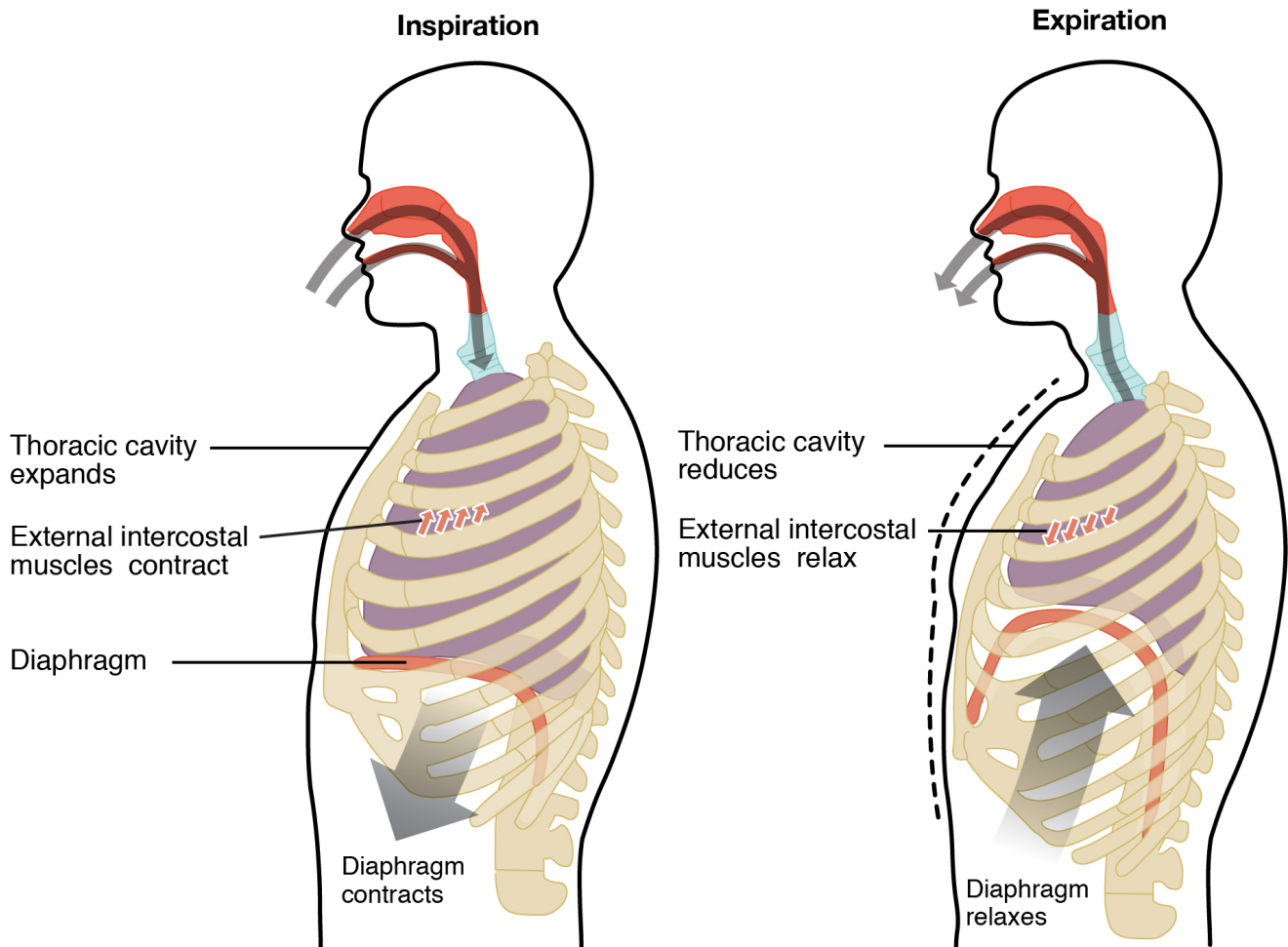


Figure 3.5.4 “[Inspiration and Expiration](#)” by [Medical Terminology for Healthcare Professionals](#), CC BY 4.0.

A deep breath, called diaphragmatic breathing, requires the diaphragm to contract and move downward, increasing the volume of the thoracic cavity and drawing air into the lungs. As the diaphragm relaxes, air passively leaves the lungs.

A shallow breath, called costal breathing, relies more heavily on contraction of the intercostal muscles between the ribs. As these muscles relax, air again passively exits the lungs.

In contrast, forced breathing occurs during exercise, coughing, vocalization, or other activities requiring active control of respiration. In addition to the diaphragm and intercostal muscles, accessory muscles assist respiration. During forced expiration, abdominal muscles contract, increasing intra-abdominal pressure and pushing abdominal organs upward against the diaphragm. This forces the diaphragm higher into the thoracic cavity and helps expel air more forcefully from the lungs.



Intra-Abdominal Pressure and Pushing in Labour

During the pushing phase of labour, the respiratory, abdominal, and pelvic systems work together to generate force. When a labouring person takes a deep breath, holds it, and contracts the abdominal muscles while bearing down, intra-abdominal pressure increases. This pressure can assist the downward movement of the fetus through the pelvis.

Some pushing approaches involve prolonged breath-holding (closed-glottis pushing), while others encourage exhalation, vocalization, or spontaneous pushing (open-glottis pushing). These approaches influence pressure, oxygenation, muscle tension, and pelvic floor dynamics differently. Doulas may observe instinctive vocalization, breath changes, grunting, or shifts in body positioning as the body coordinates respiration and muscular effort during birth.

Cessation of breathing is called apnea and can result from hyperventilation or obstruction of the airway. If breathing stops for an extended time, insufficient oxygen in the blood can cause cyanosis, which is when the skin appears blue.



Peripheral Cyanosis

Peripheral cyanosis, a bluish colour of the hands and feet, is common in newborns during the first hours after birth. This occurs because circulation is still adapting from fetal to newborn life. Blood flow is prioritized to vital organs such as the heart, lungs, and brain, while circulation to the extremities may temporarily be reduced.

As oxygenation and circulation stabilize, the hands and feet typically become pinker and warmer. In contrast, central cyanosis involving the lips, tongue, or torso may indicate inadequate oxygenation and requires immediate medical assessment.

3.6.4 Regulation of the Respiratory System

Breathing is unique because it can occur both voluntarily (somatic control) and involuntarily (autonomic control). For example, you can consciously slow your breathing, hold your breath, sing, or speak, while at the same time your body continues breathing automatically when you are asleep or unconscious.

Involuntary breathing is regulated by respiratory control centres in the brainstem, primarily the medulla oblongata and pons. These structures continuously adjust breathing rate and depth to help maintain homeostasis, the body's state of internal balance.

Because the body's oxygen demands constantly change, respiration must adapt accordingly. During exercise, stress, labour, illness, or rest, the respiratory system responds by altering breathing patterns to maintain homeostasis. This regulation depends on sensory receptors located in the brain, blood vessels, muscles, and lungs that monitor the body's internal environment.

One of the most important mechanisms regulating breathing is chemical control. Central chemoreceptors in the brain are highly sensitive to rising carbon dioxide and hydrogen ion levels in the blood and cerebrospinal fluid. When carbon dioxide levels increase, breathing rate and depth typically increase as the body works to restore homeostasis by removing excess carbon dioxide.



Breathing at the End-of-Life

In dying, as neurological control, circulation, and muscular strength decline, respirations may become irregular, shallow, slowed, or punctuated by pauses. Some people may experience periods of rapid breathing alternating with stillness, known as Cheyne–Stokes respirations.

These changes are often a natural part of the body's final physiological transitions. Doulas and companions may observe how breath reflects both autonomic nervous system activity and the gradual slowing of body systems during dying.

“[8.7 Embryonic Development of the Respiratory System](#)” from [Fundamentals of Anatomy and Physiology](#) by Anna Chruścik, Kate Kauter, Louisa Windus & Eliza Whiteside is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#), except where otherwise noted.

3.6 Filtration & Balance: The Urinary System

Much like the lungs, the kidneys are responsible for homeostatic acid/base balance. Every day, the kidneys filter gallons of blood, allowing wastes and excess ions/electrolytes to leave the body in urine, while preserving desirable substances (like water) at perfect proportions. They also help regulate blood volume (Marieb & Keller, 2022).

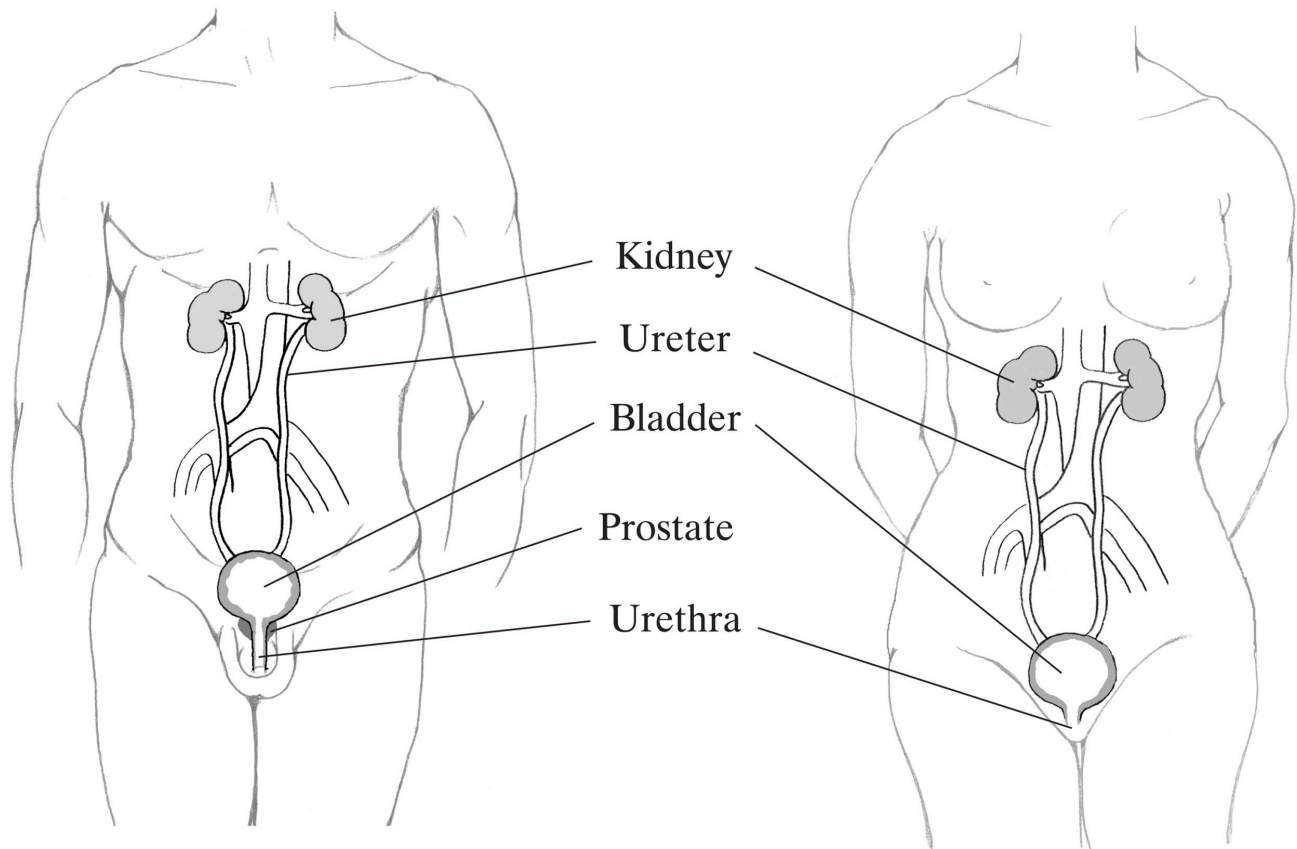


Figure 3.6.1 “[Male and Female Urinary Tracts](#)” by [National Institute of Diabetes and Digestive and Kidney Diseases](#), National Institutes of Health. Used under [NIH Terms of Use](#).

Image Description

The image is a labelled diagram titled “Urinary System” with the subtitle “Urinary tract.” It compares the male urinary system with the female urinary system. Both diagrams show the kidneys, ureters, bladder, and urethra. The male diagram also labels the prostate, shown below the bladder around the upper urethra.

Image labels:

- Kidneys
- Ureters

- Bladder
- Prostate
- Urethra



Learning Objectives

By the end of this section, you will be able to:

- Identify and describe the structures and functions of the urinary system.



The Urinary or Renal System At-a-glance

- Includes the kidneys, ureters, urinary bladder, and urethra
- Eliminates nitrogenous wastes and flushes them from the body as urine
- Maintains acid-base balance
- Regulates water and electrolytes

Video: Urinary System

Video: “[Urinary System – Human Body](#)” by [Professor Inamdar](#) [5:56] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

3.6.1 Gross Anatomy of Urine Transport

Urine

Urine is a fluid of variable composition that requires specialized structures to remove it from the body safely and efficiently. Generally, urine is sterile, with a pale, straw colour. It is slightly aromatic and should not be strong or sweet-smelling. Urine normally has sodium, potassium, urea, uric acid, creatinine, ammonia and

bicarbonate and should not normally contain glucose, proteins, red blood cells, hemoglobin, pus (WBCs) or bile.

Urethra

The **urethra** transports urine from the bladder to the outside of the body for disposal. The urethra is the only urinary organ that shows any significant anatomic difference between males and females; all other urine transport structures are identical (Figure 3.6.1).

The female urethra's short length (about 4 cm) is less of a barrier to fecal bacteria than the longer male urethra, and the best explanation for the greater incidence of UTI in women.

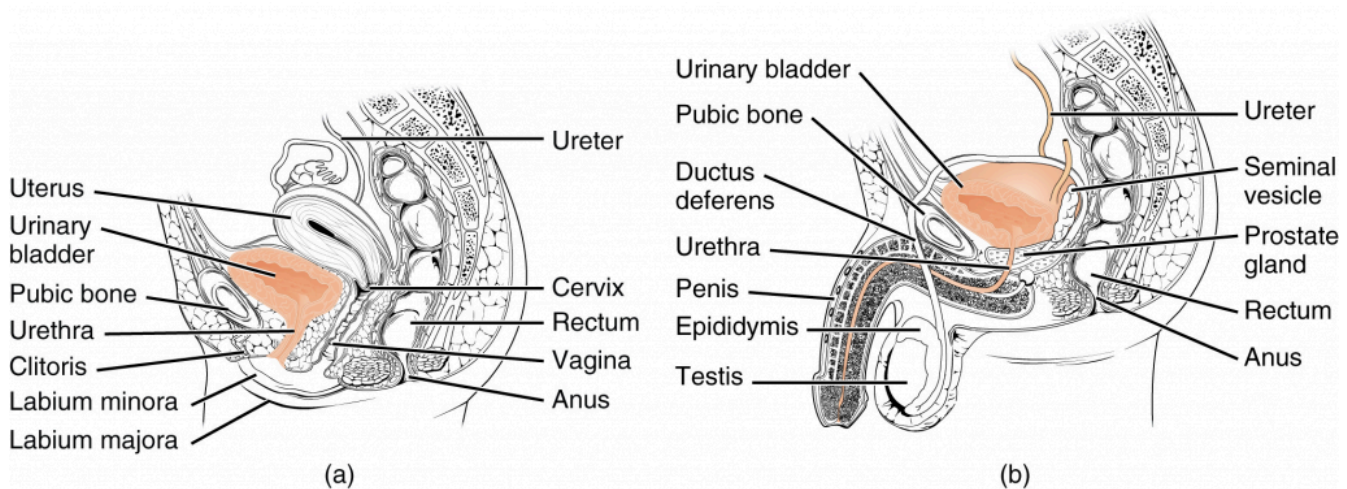


Figure 3.6.2 “Urethras” by [Fundamentals of Anatomy and Physiology](#), CC BY-SA 4.0.

Image Description

The image shows two side-view anatomical diagrams comparing the lower urinary tract in female and male pelvic anatomy. In both diagrams, the urinary bladder is highlighted, with the ureter entering from above and the urethra leading away from the bladder. The left diagram, labelled (a), shows the bladder and urethra in relation to the uterus, vagina, rectum, and external genital structures. The right diagram, labelled (b), shows the bladder and urethra in relation to the penis, prostate gland, seminal vesicle, ductus deferens, rectum, and testes.



Urinary tract infections (UTIs)

Urinary tract infections (UTIs) are common during pregnancy because hormonal and physical changes can slow the flow of urine and increase the chance of bacteria travelling up the urethra. Signs of a UTI can include burning during urination, frequent urination, pelvic discomfort, cloudy or foul-smelling urine, blood in the urine, or feeling unable to fully empty the bladder. Because

the urethra is close to the anus, bacteria can more easily enter the urinary tract, which is why prevention strategies such as wiping front to back and urinating after intercourse are often recommended.

If left untreated, a UTI can spread to the kidneys and cause a kidney infection called pyelonephritis. During pregnancy, kidney infections are associated with increased risks such as preterm labour and low birth weight. Routine urine testing during pregnancy can help identify infections early, even when symptoms are mild or absent.

Bladder

The urinary bladder collects urine from both ureters (Figure 3.6.2). It is a hollow organ composed of four layers: the mucous membrane, the submucosa, smooth muscle (AKA the detrusor muscle), and serosa.

When the bladder is empty, the mucosa has numerous folds called **rugae**. The rugae allow the bladder to expand as it fills. The bladder can hold up to 1000 mL; However, the urge to urinate activates around 200mL of urine.

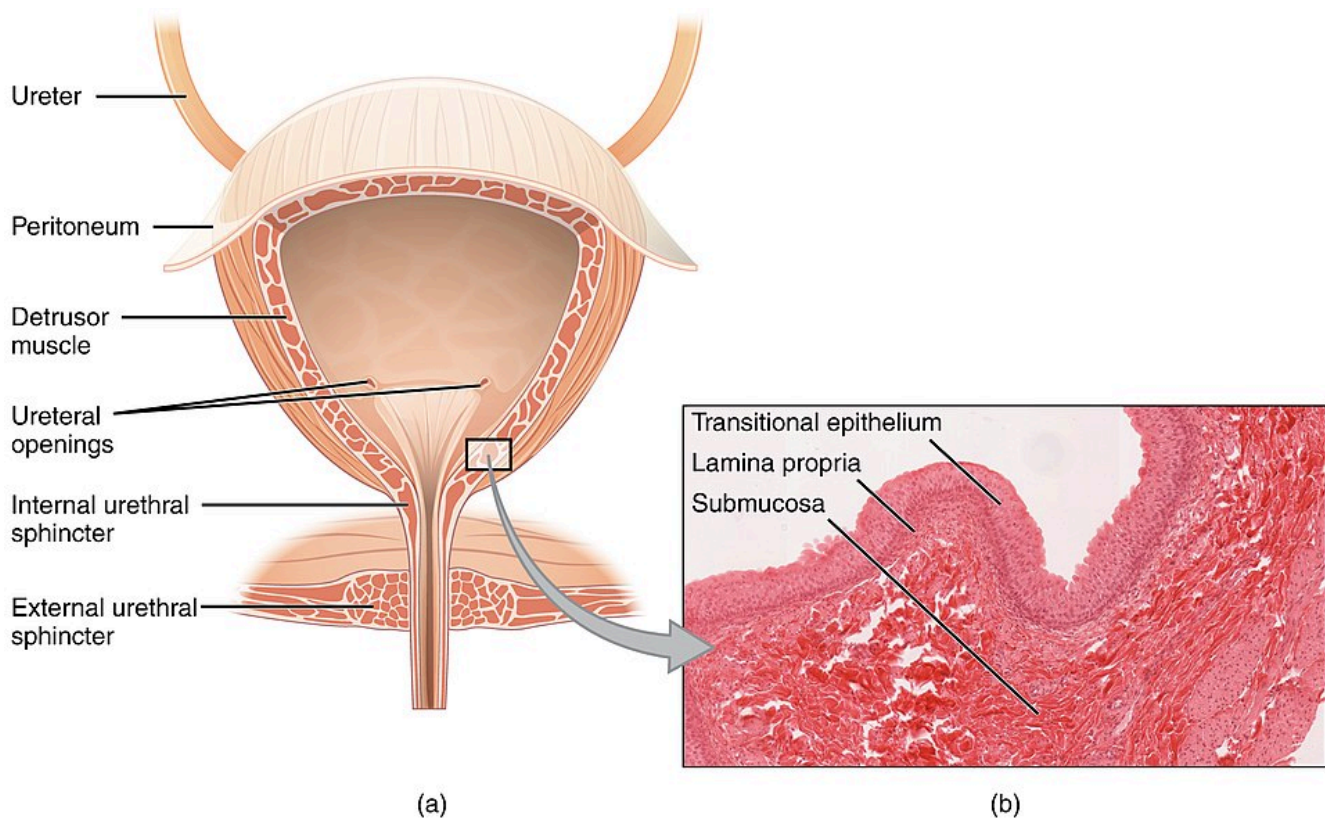


Figure 3.6.3 “The Bladder” by OpenStax, CC BY 3.0.

Image Description

The image is a two-part anatomical diagram of the urinary bladder. Panel (a) shows a cross-section of the bladder, including the ureters entering from above, the bladder wall, ureteral openings, and the internal and

external urethral sphincters at the base. Panel (b) shows a magnified tissue sample from the bladder wall, identifying the transitional epithelium, lamina propria, and submucosa.

All labels in the image:

panel (a):

- Ureter
- Peritoneum
- Detrusor muscle
- Ureteral openings
- Internal urethral sphincter
- External urethral sphincter

panel (b):

- Transitional epithelium
- Lamina propria
- Submucosa

The bladder lies anterior to the uterus in females, posterior to the pubic bone and anterior to the rectum. During late pregnancy, its capacity is reduced due to compression by the enlarging uterus, resulting in increased frequency of urination. In males, the anatomy is similar, minus the uterus and with the addition of the prostate inferior to the bladder.

Micturition is a less often used, but proper term for urination or voiding. It results from an interplay of involuntary and voluntary actions by **the internal and external urethral sphincters**. When bladder volume reaches about 150 mL, an urge to void is sensed but is easily overridden. Voluntary control of urination relies on consciously preventing relaxation of the external urethral sphincter to maintain urinary continence. As the bladder fills, subsequent urges become harder to ignore. Ultimately, voluntary constraint fails and may result in incontinence, which will occur as bladder volume approaches 300 to 400 mL.



Life Connection

Emptying the bladder during labour helps create more space for the uterus and baby in the pelvis. A full bladder can cause discomfort and may make it harder for the baby to descend. During labour, the urge to urinate or the ability to empty the bladder can change due to the stage of labour, baby's position, pelvic floor tension, or pain medication such as an epidural. Regular bathroom trips are often encouraged during labour, and if a person is unable to empty their bladder on their own, clinicians may place a catheter to drain the urine and support comfort, labour progress, and bladder health.

Ureters

Slender muscular tubes that use **peristalsis** to deliver urine from the kidneys to the bladder.

Kidneys

The kidneys are located high on the posterior wall of the abdominal cavity. They are cushioned and protected by renal fascia, adipose tissue (fat) and the lower ribs. Just like the bean variety, the organ is reddish-brown and bean-shaped. Each kidney has two main components – the cortex (Latin for 'shell'), which offers blood supply, and the medulla (Latin for 'pith' or 'marrow') that offers structure and function.

The renal artery supplies arterial blood to the kidney, while the renal vein returns the blood to the inferior vena cava.

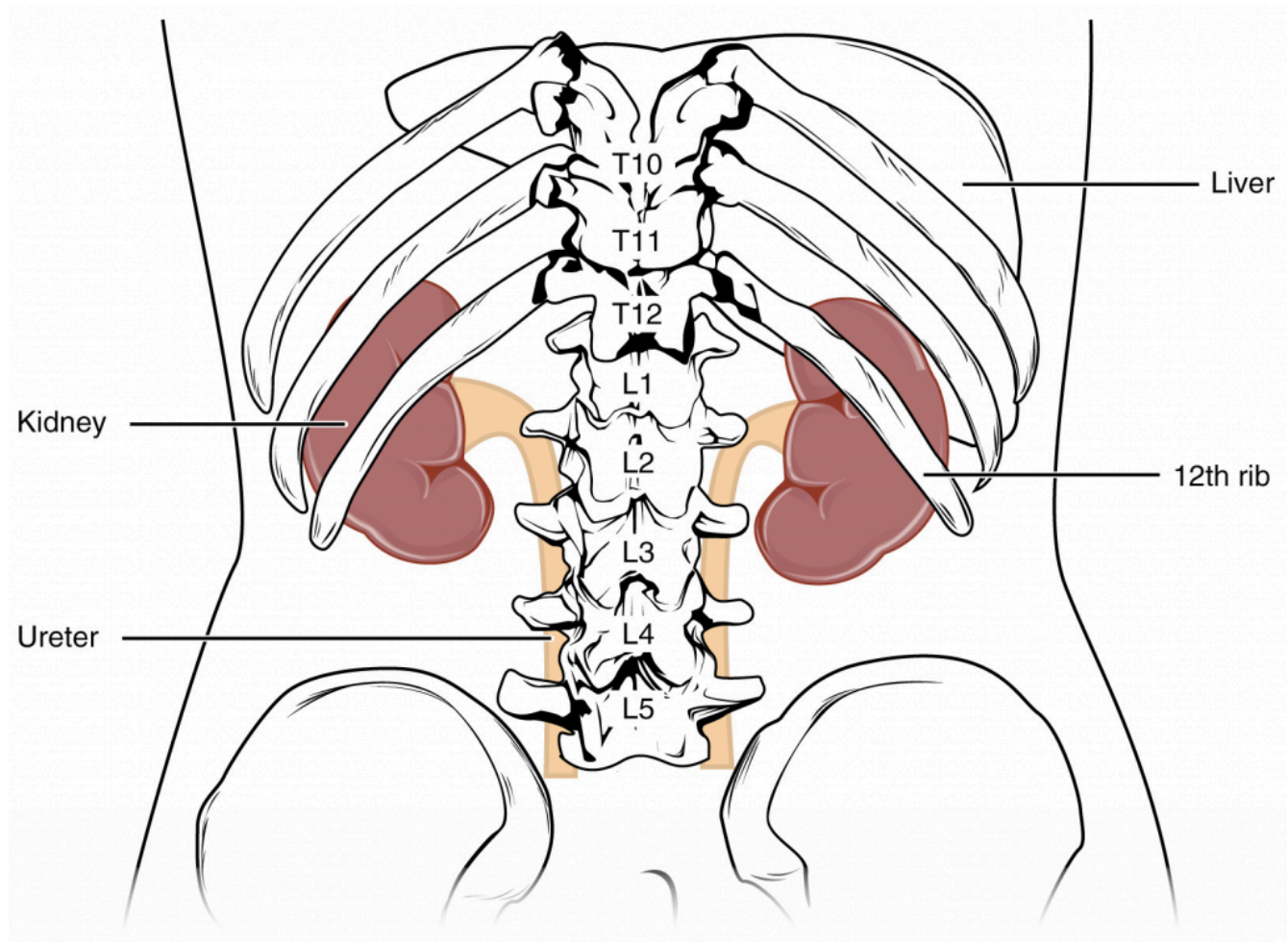


Figure 3.6.4 “[Kidneys](#)” by [Fundamentals of Anatomy and Physiology](#), CC BY-SA 4.0.

Image Description

The image is a posterior anatomical diagram showing the location of the kidneys in relation to the lower ribs, spine, liver, and ureters. The kidneys are shown on either side of the lumbar spine, partially protected by the

lower ribs. The vertebrae are labelled from T10 through L5, showing the kidneys positioned around the lower thoracic and upper lumbar region. The liver is shown on the viewer's right side, above the right kidney. The ureters extend downward from the kidneys toward the pelvis.

3.6.2 Physiology of the Kidneys

Video: How Kidneys Work

Video: "[How do Your Kidneys Work? – Emma Bryce](#)" by [TED-Ed](#) [3:54] is licensed under the [Standard YouTube License](#). Captions and transcripts are available on YouTube.

The kidneys perform several essential functions, including:

- Regulating the body's water balance
- Helping maintain the pH balance of the blood (acids and bases)
- Regulating electrolytes in the blood and body fluids
- Filtering and removing metabolic wastes such as urea, uric acid, creatinine, and ammonia
- Helping regulate blood pressure
- Producing hormones involved in red blood cell production and regulation

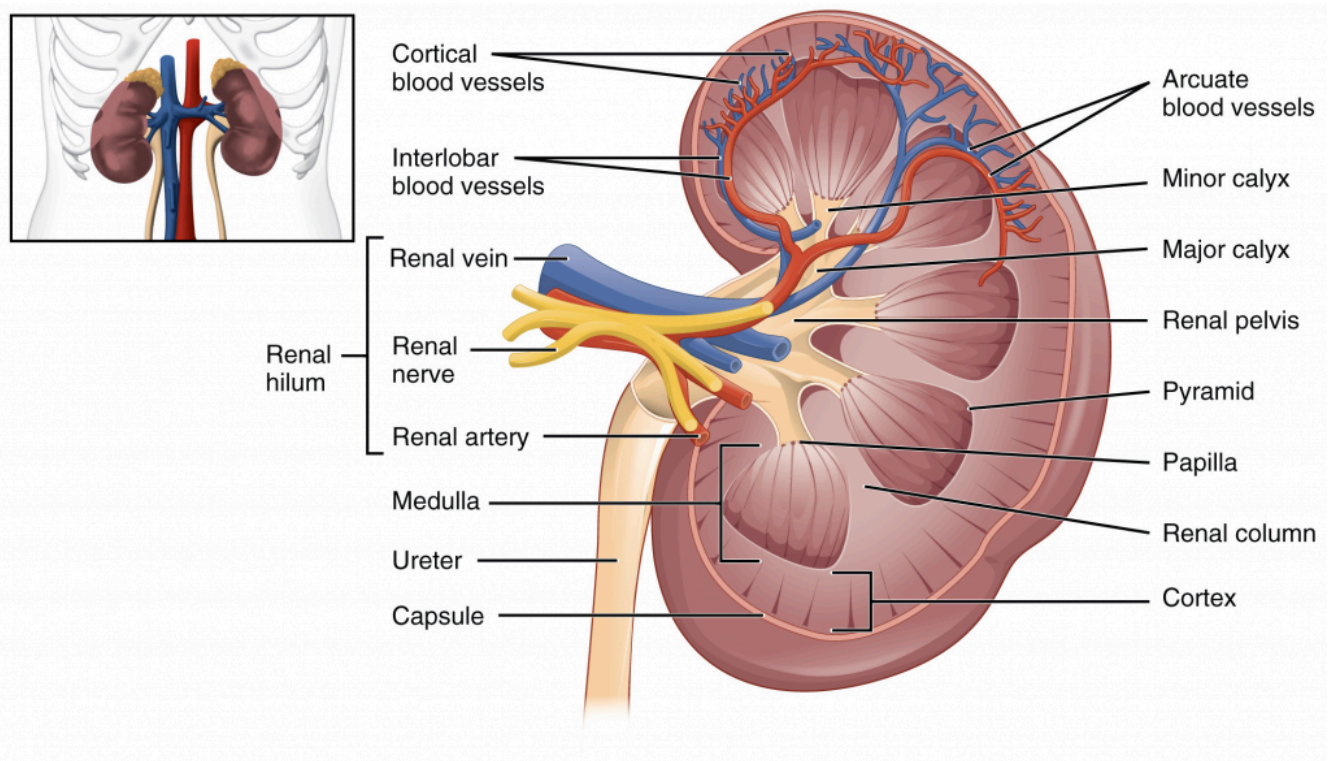


Figure 3.6.5 "[Anatomy of a Kidney](#)" by [Fundamentals of Anatomy and Physiology](#), CC BY-SA 4.0.

Nephrons

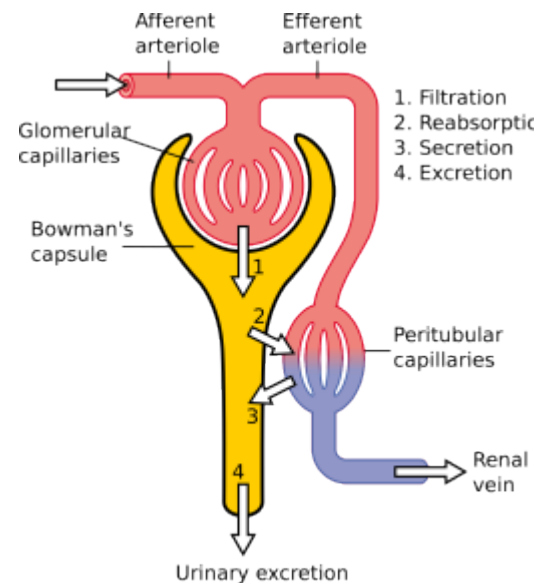
Image Description

The image is a diagram showing the main physiological processes of a nephron. A blood vessel enters and forms a capillary network inside the renal corpuscle. Fluid is filtered from this capillary network into the nephron tubule, labelled as the first step of the process. The tubule continues downward, representing the pathway of filtrate through the nephron. A nearby capillary network exchanges substances with the tubule. A label indicating reabsorption from the tubule to the vessel indicates the second step of the process. Another label indicates secretion back from the vessel to the tubule, the third step in the process. The movement of urine or filtrate out of the nephron is labelled as the fourth step.

Nephrons are the functional units of the kidneys. Their job is to filter the blood, remove waste, and help maintain balance in the body. Each kidney contains about one million nephrons.

Blood enters the nephron through a small blood vessel called the afferent arteriole. This vessel leads to a bundle of tiny capillaries called the glomerulus. The glomerulus acts like a **filter**, allowing water and small molecules to move out of the blood while keeping larger components, like blood cells and proteins, inside the bloodstream. Surrounding the glomerulus is Bowman's capsule, a cup-shaped structure that collects the filtered fluid. Together, the glomerulus and Bowman's capsule form the renal corpuscle.

After filtration, the blood leaves through another small vessel called the efferent arteriole. As the filtered fluid moves through the nephron, these capillaries **reabsorb** most of the water, nutrients, and electrolytes back into the bloodstream. Waste products remain behind to be **excreted** as urine.



$$\text{Excretion} = \text{Filtration} - \text{Reabsorption} + \text{Secretion}$$

Figure 3.6.6 "Physiology of a Nephron" by Madhero88, CC BY 3.0.

F.R.E. THE PEE
F – Filtration
R –
Reabsorption
E – Excretion

Nephrons can not be replaced if damaged – we do not grow more.



Kidney Health and Pregnancy

During pregnancy, blood pressure and urine are routinely monitored to assess kidney function and overall health. Conditions such as gestational hypertension and preeclampsia can reduce blood flow to the kidneys and damage the filtering structures of the nephrons. One warning sign

is protein in the urine, which suggests the kidneys are allowing larger molecules to pass through the filtration system when they normally would not. Severe preeclampsia can become life-threatening for both the pregnant person and the baby if left untreated.



Dialysis

When the kidneys can no longer filter the blood effectively, waste products and excess fluid build up in the body. Dialysis is a medical treatment that filters the blood when the kidneys are unable to do so. Some people receiving palliative or end-of-life care may continue dialysis to reduce discomfort and symptoms caused by the buildup of toxins in the blood. End-of-life doulas may support individuals and families as they navigate decisions about continuing, changing, or stopping dialysis treatment.



Exercise

Activity Description

The activity is a fill-in-the-blanks activity that asks you to associate the indicated organs and structures with descriptions of their functions. The potential answers are:

- Ureters
- Urinary Bladder
- Kidneys
- Urethra

And the descriptions are:

1. Two long tubes empty urine into the urinary bladder
2. The urine-making organs
3. Urine leaves the bladder through this structure
4. The external urinary sphincter is located at the distal end of this
5. Its walls contain the detrusor muscle
6. Tubes that receive urine from the renal pelvis
7. An enlarged prostate gland prevents the emptying of this structure
8. Cystitis is an inflammation of this structure
9. Renal failure is most associated with these structures
10. Urinary retention is most associated with this

Answers:

1. Ureters
2. Kidneys
3. Urethra
4. Urethra
5. Urinary Bladder
6. Ureters
7. Urinary Bladder
8. Urinary Bladder
9. Kidneys
10. Urinary Bladder

[“17.2 Gross Anatomy of Urine Transport”](#) & [“17.3 Gross Anatomy of the Kidney”](#) from [Fundamentals of Anatomy](#)

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3.7 The Body's Invisible Orchestra: The Endocrine System

Imagine an orchestra without a conductor — each musician talented, each section capable, but unable to coordinate across the hall. The **endocrine system** is that conductor. Through chemical messengers called **hormones**, it coordinates processes as varied as how we grow, how we sleep, how we respond to fear, and how we conceive, carry, and nourish new life. Unlike the nervous system, which communicates in milliseconds with electrical impulses, the endocrine system works through the bloodstream — slower, but capable of sustaining effects across hours, days, and months.

For doulas, the endocrine system is not background knowledge — it is the foundation of everything. The hormones of labour, the delicate cascade of bonding after birth, the physiology of grief after pregnancy loss, and the supply-and-demand of milk production are all endocrine events. Understanding this system means understanding why environment, safety, and human presence matter physiologically, not just emotionally.



Learning Outcomes

By the end of this section, you will be able to:

- Identify the major glands and hormones of the endocrine system and explain how they function.
- Define endocrine vs. exocrine glands, hormones, and target organs.
- Explain the hormonal events of the menstrual cycle, ovarian function, sperm production, and pregnancy.
- Examine hormonal changes from conception through postpartum, including lactation.

3.7.1 Homeostasis and the Body's Two Communication Systems

Homeostasis is the body's ability to maintain a stable internal environment within the narrow ranges required for life. Two systems share primary responsibility



The Nervous System

Communicates via rapid electrical signals and neurotransmitters. Responses are immediate and short-lived.

Think: reflex, pain, fight-or-flight.



The Endocrine System

Communicates via hormones released into the bloodstream. Responses are slower but sustained.

Think: menstrual cycle, pregnancy, metabolism, growth.

Crucially, these two systems are **not independent**. The **hypothalamus** — a small region of the brain — sits at their interface, receiving nervous system signals and translating them into hormonal responses. This is why psychological states (fear, safety, grief, joy) have measurable hormonal consequences, and why the emotional environment of a birth room, a clinical procedure, or a deathbed has genuine physiological effects.

Table 3.7.1: Comparison of the Nervous and Endocrine Systems

Nervous System	Endocrine System
Electrical + Chemical (neurotransmitters)	Chemical (hormones in the bloodstream)
Milliseconds to seconds	seconds to days
Localised, precise	Widespread, sustained
Reflexes, sensation, movement	Metabolism, reproduction, growth, mood
Nerve fibres carry signals	Blood carries signals



3.7.2 Key Terms: Endocrine vs. Exocrine

- **Endocrine glands** are **ductless**: they secrete **hormones** directly into the bloodstream to travel to **target cells** anywhere in the body. Examples: thyroid, pituitary, ovaries, adrenal glands.
- **Exocrine glands** secrete through **ducts** to a surface or organ. Examples: salivary glands, sweat glands. Mammary glands are also exocrine, though hormonally controlled.
- Some organs are **both**: the **pancreas** secretes digestive enzymes through ducts (exocrine) and insulin/glucagon into the blood (endocrine).

A **hormone** is a chemical messenger produced by an endocrine cell and transported in the blood to act on **target cells** — cells with specific **receptors** for that hormone. The interaction works like a **lock and key**: only the correct hormone (key) can bind to the matching receptor (lock). Many hormones operate in rhythmic patterns called **biorhythms** — the monthly fluctuation of reproductive hormones is one example.

Types of Hormones

Water-soluble hormones (amino acid-based: amines, peptides, proteins): include catecholamines (adrenaline), insulin, oxytocin, prolactin, and pituitary hormones. Act quickly on cell-surface receptors.

Fat-soluble hormones (steroids, derived from cholesterol): include estrogen, progesterone, cortisol, and testosterone. Cross cell membranes to act on internal receptors; effects are longer-lasting.

3.8.3 Feedback Loops: The Body's Self-Regulating Thermostats



Negative feedback

The most common mechanism. When a hormone reaches sufficient levels, it signals the system to slow or stop production. Like a thermostat: when the room reaches temperature, the heater turns off.

Example:

blood glucose rises → pancreas releases insulin → glucose falls → insulin secretion slows.



Positive feedback

The output amplifies the original stimulus, driving a process to completion. Used for rapid, all-or-nothing events.

Example:

uterine contractions release oxytocin → oxytocin intensifies contractions → more oxytocin released — continuing until birth removes the stimulus



Why the Birth Environment is Not Just “Nice to Have”

When the thinking brain is highly activated by fear, observation, or unfamiliar stimuli, it can suppress the instinctive hormonal processes of physiological labour. The doula's role in creating a calm, private, undisturbed environment is not merely supportive — it is **neurohormonal**. Dim

lights, familiar voices, reduced interruptions, and a felt sense of safety all help sustain the oxytocin feedback loop and suppress the cortisol/epinephrine stress response. This is the physiological mechanism behind the evidence that continuous support improves birth outcomes

3.7.4 The Major Endocrine Glands

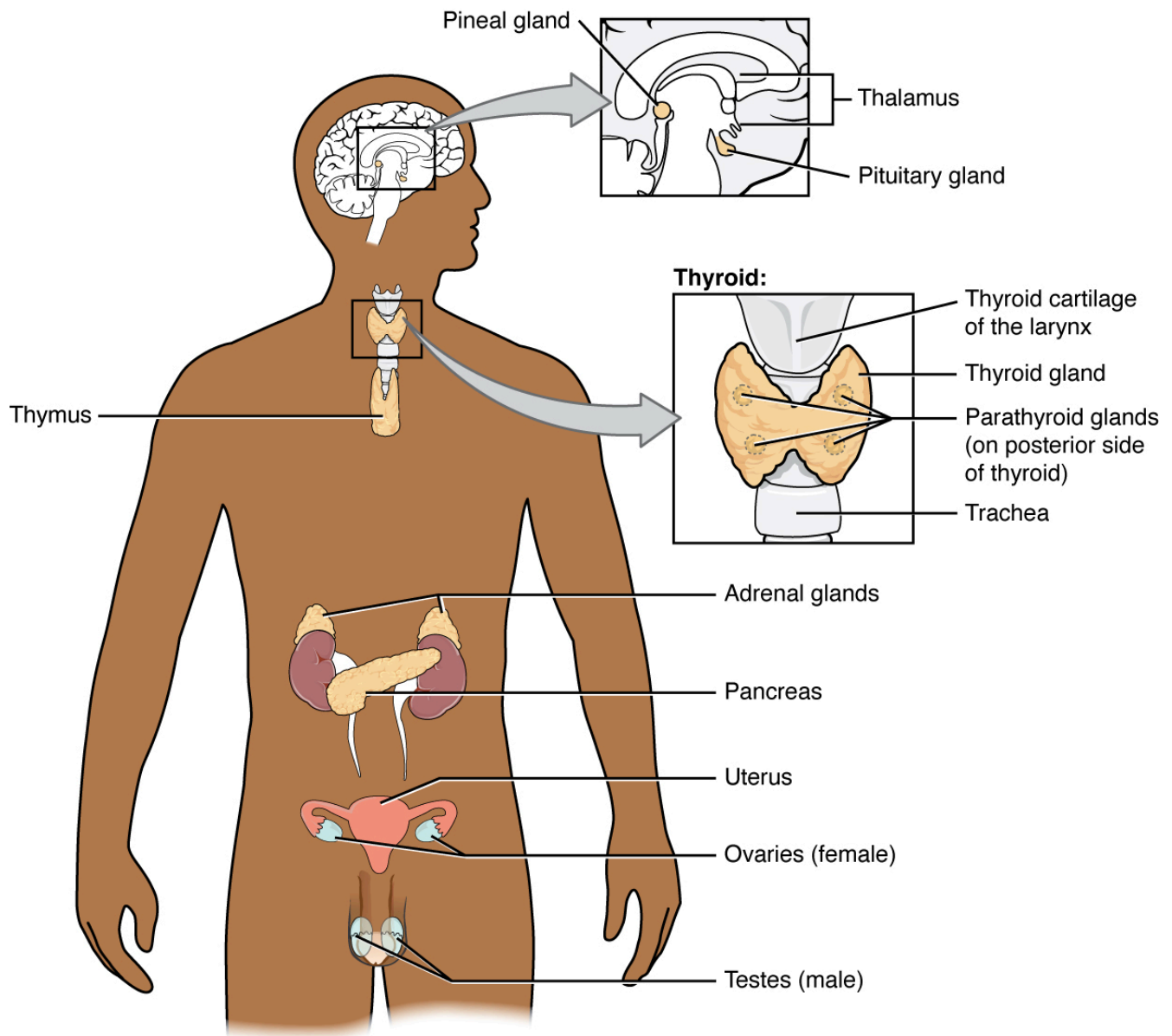


Figure 3.7.1. "The Endocrine System" by OpenStax, CC BY-NC-SA 4.0.

Image Description

Diagram of the endocrine system in a human body. The pineal gland, thalamus, and pituitary gland are

located in the brain. The thyroid gland surrounds the upper trachea, just below the thyroid cartilage of the larynx; the parathyroid glands lie on the thyroid's posterior surface. The thymus is in the upper chest below the thyroid. The adrenal glands sit on top of the kidneys, and the pancreas extends horizontally between them. In the pelvis, the ovaries lie on either side of the uterus in females, while the testes are below the pelvic cavity in males. Enlarged insets show the positions of structures in the brain and around the thyroid.

The Hypothalamus

Located at the base of the brain, the **Hypothalamus** is the master regulator – it receives nervous system signals (including emotional states and circadian rhythms) and translates them into hormonal instructions for the pituitary gland.

- **GnRH (gonadotropin-releasing hormone)** — stimulates FSH and LH release from the pituitary.
- **CRH (corticotropin-releasing hormone)** — stimulates ACTH release; also produced by the placenta near term and may contribute to labour initiation.
- **TRH (thyrotropin-releasing hormone)** — stimulates TSH release.
- **Oxytocin** — produced here; stored and released via the posterior pituitary.
- **ADH (antidiuretic hormone)** — regulates water reabsorption by the kidneys.

The Pituitary Gland

About the size of a pea, the **pituitary** sits below the hypothalamus, connected by the infundibulum. It has two distinct lobes:

Anterior Pituitary (Adenohypophysis) — glandular tissue

- **FSH** — stimulates follicle maturation and sperm production.
- **LH** — triggers ovulation; stimulates corpus luteum (progesterone) and testosterone production.
- **Prolactin** — stimulates milk synthesis; supports attachment and stress reduction.
- **Beta-endorphins** — natural opioids; pain relief, pleasure, altered consciousness in labour.
- **ACTH** — stimulates cortisol from adrenal cortex; precursor to endorphins.
- **TSH** — stimulates thyroid hormone production.
- **GH (growth hormone)** — stimulates growth and tissue repair.

Posterior Pituitary (Neurohypophysis) — nervous tissue

- **Oxytocin** — produced in hypothalamus, stored and released here. Drives labour contractions, milk ejection, and bonding.
- **ADH** — signals kidneys to retain water; regulates blood pressure.

The Thyroid and Parathyroid Glands

The **thyroid** (butterfly-shaped, anterior neck) produces **thyroid hormones (T3 and T4)**, which regulate metabolic rate, energy, temperature, and development. Thyroid hormone requirements increase significantly in pregnancy; deficiency can affect fetal neurological development.

Four tiny **parathyroid glands** embedded behind the thyroid produce **parathyroid hormone (PTH)**, regulating blood calcium — essential for uterine muscle contraction, nerve function, and bone density.

The Pineal Gland

A small structure deep in the brain, the **pineal gland** produces **melatonin** in response to darkness, regulating the sleep-wake cycle. Melatonin may enhance uterine sensitivity to oxytocin; labour most commonly begins at night.

The Pancreas

Beta cells → insulin — lowers blood glucose after meals; signals cells and liver to take up and store glucose.

Alpha cells → glucagon — raises blood glucose when it falls; signals the liver to release stored glucose.



Gestational Diabetes

Gestational diabetes can develop when pancreatic insulin production cannot meet pregnancy's increased demands. Placental hormones (including human placental lactogen) increase insulin resistance as a normal adaptation, which becomes pathological in some individuals.

The Thymus

Located in the upper chest, the **thymus** produces **thymosin**, which matures **T lymphocytes** (immune cells). Most active in childhood; it bridges the endocrine and immune systems.

The adrenal gland and hormones of the reproductive systems will be addressed in further depth later in the chapter.

Table 3.8.2: An Overview of Endocrine Glands and Their Major Hormones

Endocrine Gland	Associated Hormones	Chemical Class	Effect
Pituitary (anterior)	Growth hormone (GH)	Protein	Promotes growth of body tissues
	Prolactin (PRL)	Peptide	Promotes milk production
	Thyroid-stimulating hormone (TSH)	Glycoprotein	Stimulates thyroid hormone release
	Adrenocorticotrophic hormone (ACTH)	Peptide	Stimulates hormone release by adrenal cortex
	Follicle-stimulating hormone (FSH)	Glycoprotein	Stimulates gamete production
	Luteinizing hormone (LH)	Glycoprotein	Stimulates androgen production by gonads
Pituitary (Posterior)	Antidiuretic Hormone (ADH)	Peptide	Stimulates water reabsorption by kidneys
	Oxytocin	Peptide	Stimulates uterine contractions during childbirth
Thyroid	Thyroxine (T ₄), triiodothyronine (T ₃)	Amine	Stimulates basal metabolic rate
	Calcitonin	Peptide	Reduces blood Ca ²⁺ levels
Parathyroid	Parathyroid hormone (PTH)	Peptide	Increases blood Ca ²⁺ levels
Adrenal (cortex)	Aldosterone	Steroid	Increases blood Na ⁺ levels
	Cortisol, corticosterone, cortisone	Steroid	Increases blood glucose levels
Adrenal (medulla)	Epinephrine, norepinephrine	Amine	Stimulates fight-or-flight response
Pineal	Melatonin	Amine	Regulates sleep cycles
Pancreas	Insulin	Protein	Reduces blood glucose levels
	Glucagon	Protein	Increases blood glucose levels
Testes	Testosterone	Steroid	Stimulates development of sec characteristics including a deeper voice, increases muscle mass, development of body hair, and sperm production
Ovaries	Estrogens and progesterone	Steroid	Stimulates development of sec characteristics including the development of adipose and breast tissue, and prepares the body for childbirth

3.7.5 The Adrenal Glands and the Nervous System

The **adrenal glands** sit atop each kidney and bridge the endocrine and nervous systems more directly than any other gland. Each has two distinct regions:

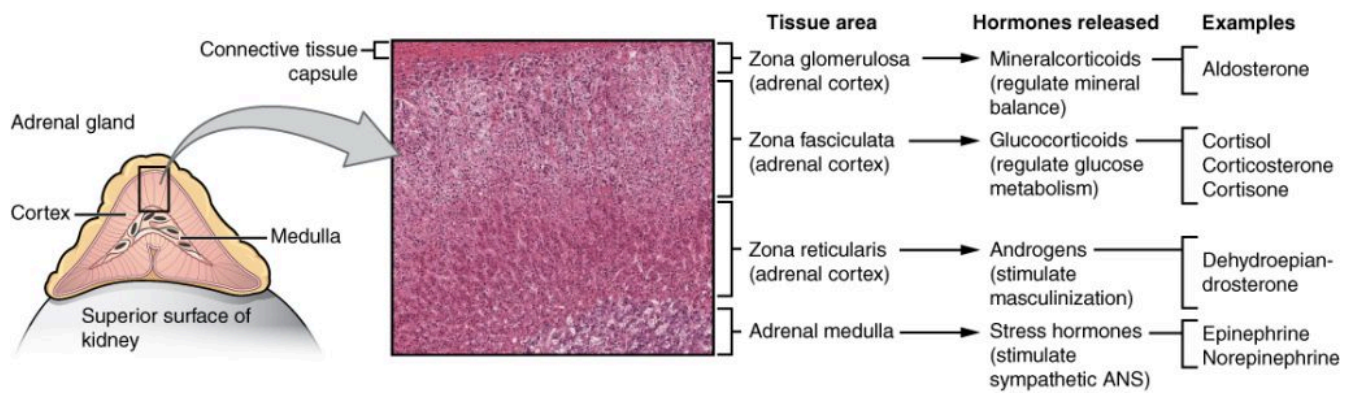


Figure 3.7.2 “Adrenal Glands” in *Anatomy and Physiology II at Cambrian College*, CC BY 4.0. Micrograph provided by the Regents of University of Michigan Medical School © 2012. *Reproduced for educational purposes under fair dealing.* Both adrenal glands sit atop the kidneys and are composed of an outer cortex and an inner medulla, all surrounded by a connective tissue capsule. The cortex can be subdivided into additional zones, all of which produce different types of hormones. LM × 204.

The Adrenal Cortex — Three Layers

Zona glomerulosa (outer) — produces **aldosterone** (mineralocorticoid): signals kidneys to retain sodium and water, raising blood volume and blood pressure. Relevant during hemorrhage and fluid shifts in pregnancy.

Zona fasciculata (middle) — produces **cortisol** (glucocorticoid): the primary stress hormone. Raises blood glucose and suppresses inflammation and immune function. Regulated by the HPA axis via negative feedback through ACTH and CRH. Chronic elevation suppresses reproductive hormones, immune function, and digestion.

Zona reticularis (inner cortex) — produces **androgens** (including DHEA and testosterone), which contribute to libido and are partly converted to estrogen in adipose tissue. Overproduction in conditions like congenital adrenal hyperplasia (CAH) can affect sex characteristics.

The Adrenal Medulla

The **adrenal medulla** consists of **modified sympathetic neurons**. When activated by sympathetic nerve signals, it releases **catecholamines** directly into the bloodstream:

- **Epinephrine (adrenaline)** (~80%): increases heart rate, dilates airways, redirects blood to muscles, raises blood glucose. Produces the fight-or-flight response.
- **Norepinephrine (noradrenaline)**: constricts blood vessels; maintains blood pressure.

The HPA Axis: Hormones, Brain, and Stress

The Hypothalamic-Pituitary-Adrenal (HPA) axis is the central stress-response pathway:

- Perceived threat → **hypothalamus** releases **CRH**
- CRH → **anterior pituitary** releases **ACTH**
- ACTH → **adrenal cortex** releases **cortisol**
- Simultaneously, the **sympathetic nervous system** directly triggers the **adrenal medulla** to release **epinephrine** within seconds
- Rising cortisol **negatively feeds back** to the hypothalamus and pituitary — turning off the response when the threat passes

This is why the nervous and endocrine systems cannot truly be separated. The brain's assessment of a situation — safe or dangerous, known or unknown, in control or helpless — directly determines adrenal output and, through cortisol, shapes metabolism, immunity, and reproductive hormone balance.



The Stress Axis in Labour, Loss, and Dying

Birth

High epinephrine in early and active labour can reduce uterine blood flow and slow contractions — the body's way of delaying birth if the environment seems unsafe. However, a **natural epinephrine surge at transition** (~7–10 cm) is physiologically normal and facilitates the fetal ejection reflex. After birth, epinephrine helps the parent stay alert for bonding but can temporarily inhibit the milk ejection reflex if stress remains elevated.

Abortion and Pregnancy Loss

Grief activates the same neurological pathways as physical danger. Chronically elevated cortisol after loss can suppress the menstrual cycle, immune function, and sleep. A doula's calm presence, breath support, and grounding techniques are **neurobiologically effective** at dampening the HPA axis — not just emotionally comforting.

Death and Dying

As the body approaches death, sustained cortisol and catecholamine release in response to physiological stress can produce **terminal restlessness** — agitation and altered consciousness that can distress families. A doula who understands this as a physiological stress response can help normalize what is happening and model the calm, regulated presence that has a measurable effect on those in the room.

3.7.6 Hormones of Reproduction

Estrogen

Produced primarily by **ovarian follicles**, with additional production from the **adrenal cortex**, **adipose tissue**, and the **placenta** in pregnancy. A fat-soluble steroid.

- **Puberty:** drives secondary sex characteristics — breast development, hip widening, pubic hair, fat distribution.
- **Menstrual cycle:** stimulates endometrial growth (proliferative phase); triggers the LH/FSH surge causing ovulation; assists follicle maturation.
- **Pregnancy:** grows the uterus; increases uterine sensitivity to oxytocin as labour approaches.
- **General:** protects bone density, supports cardiovascular health, and influences mood and brain function.

Progesterone

The “**hormone of pregnancy**” (*pro-gestation*). Produced by the **corpus luteum** after ovulation and then by the placenta from approximately 8–10 weeks.

- **Implantation:** causes cervical mucus plug formation; thickens endometrium; quiets (inhibits) uterine contractions.
- **Pregnancy maintenance:** prevents premature labour; stimulates mammary glandular tissue growth.
- **Inhibits ovulation:** high levels prevent new cycles — basis for progesterone-only contraception and lactational amenorrhea.

Testosterone

Produced by **the ovaries and adrenal glands** in people with ovaries (~10–15% of testes levels); mostly converted to oestradiol. Contributes to libido and energy. Elevated levels may indicate **PCOS**, CAH, or androgen resistance.

In male anatomy, produced by **interstitial (Leydig) cells** of the testes, regulated by LH. Essential for secondary sex characteristics and **spermatogenesis**.

Relaxin

Secreted by the **corpus luteum** and then the placenta. Relaxes the uterine muscle in early pregnancy; rises through the first trimester, supporting implantation. Near term: **softens pelvic ligaments**, including the symphysis pubis and sacroiliac joints, to allow pelvic widening during birth. Accounts for pelvic girdle pain in some pregnancies.

Gonadotropins: FSH and LH



FSH

Female anatomy:
stimulates follicular maturation. Male anatomy:
stimulates spermatogenesis.



LH

Female anatomy:
triggers ovulation and corpus luteum development. Male anatomy:
stimulates testosterone production.

Human Chorionic Gonadotropin (hCG)

Secreted by **trophoblast cells** after implantation; detected by pregnancy tests. Maintains the corpus luteum (and its progesterone) until the placenta takes over at ~8–10 weeks. Levels peak ~10 weeks then decline. A rapid hCG rise is associated with nausea of early pregnancy.

3.7.7 Hormonal Events of the Ovarian and Menstrual Cycles

Driven by the interplay of **GnRH**, **FSH**, **LH**, **estrogen**, and **progesterone** in a precisely timed sequence of negative and positive feedback. A typical cycle is 28 days; normal range 21–32 days.

Phase 1: Menstruation (Days 1–5)

Corpus luteum degrades → progesterone falls → spiral arteries constrict → endometrial functional layer sheds. FSH and LH begin rising as negative feedback releases.

Phase 2: Follicular Phase (Days 1–14)

Rising FSH stimulates follicle development. Growing follicles secrete estrogen, rebuilding the endometrium (proliferative phase). One dominant follicle produces enough estrogen to switch the pituitary to **positive feedback**, triggering the **LH surge**, which causes ovulation (~Day 14).

Ovulation

The dominant follicle ruptures, releasing the **secondary oocyte**. Some people experience **mittelschmerz** (mid-cycle pain).

Phase 3: Luteal Phase (Days 14–28)

Ruptured follicle becomes the **corpus luteum**, secreting **progesterone** to thicken and maintain the endometrium (secretory phase) for implantation. High progesterone inhibits FSH/LH. If no pregnancy occurs, the corpus luteum degrades, progesterone falls, and menstruation restarts.

The menstrual cycle is revisited in [Section 3.8.2](#)



The Cycle Beyond Fertility

Postpartum

After birth, estrogen and progesterone drop sharply as the placenta delivers. This shift signals the body to initiate lactation and may contribute to the “**baby blues**” (days 2–5) or postpartum mood disorders. Understanding this as a hormonally driven transition — not a personal failure — is a normalizing insight doulas can offer.

Abortion and Pregnancy Loss

Following abortion or pregnancy loss, the hormonal cycle gradually resumes: menstruation typically returns within 4–6 weeks. Medication abortion uses **mifepristone** to block progesterone receptors, followed by **misoprostol** to stimulate contractions — mimicking the physiology of early miscarriage. Emotional recovery does not follow the same timeline as the hormonal one.

Variations of Hormonal Regulation in the Ovarian And Menstrual Cycles

The cycle described above reflects a textbook 28-day pattern, but hormonal experience varies widely across

individuals with female reproductive anatomy — shaped by genetics, stress, body composition, age, and underlying conditions.

People with **endometriosis** experience progesterone resistance, heightened prostaglandin activity and estrogen sensitivity that drives tissue growth outside the uterus, intensifying pain and inflammation across the cycle. Those with **adenomyosis** live with endometrial tissue embedded in the myometrium itself, often producing heavier bleeding and more painful contractions. People with **PMOS** (Polyendocrine Metabolic Ovarian Syndrome — formerly PCOS) often have disrupted LH/FSH ratios, elevated androgens, insulin resistance, and irregular or absent ovulation, reflecting a broader metabolic picture than the older name suggested. And those with **PMDD** (Premenstrual Dysphoric Disorder) experience an abnormal neurological sensitivity to the normal hormonal fluctuations of the luteal phase, rather than abnormal hormone levels themselves. For doulas, awareness of these variations matters: a client's cycle, fertility history, pain experience, and hormonal responses may differ significantly from the textbook model, and that difference deserves to be received without surprise.

3.7.8 The Hormonal Cascade of Labour, Birth, and the Early Postpartum

Labour and birth involve one of the most sophisticated hormonal cascades in human physiology. Four key hormones — **oxytocin**, **beta-endorphins**, **epinephrine/norepinephrine**, and **prolactin** — work in concert to facilitate birth and the transition to parenthood, and evolved over millions of years to support reproductive success across three domains: birth, attachment, and feeding (Buckley, 2015).

Oxytocin: The Connecting Hormone

Produced in the **hypothalamus** and released from the **posterior pituitary**. Its effects span physiology and psychology:

- **Physical:** uterine contractions; milk ejection reflex; pelvic muscle contraction (orgasm).
- **Psychosocial:** attachment, maternal behaviour, reduced fear, increased trust, feelings of reward. Released with skin-to-skin contact, eye contact, and pleasant social interactions.

Oxytocin in Labour

- Released in a **pulsatile** (wave-like) pattern — not continuously. This is critical for effective uterine response.
- Uterine **oxytocin receptors increase substantially** in early labour, making the uterus progressively more responsive.
- Pulse frequency increases up to **sixfold** at the pushing stage, producing stronger, sustained contractions.
- As the fetal head descends, pressure on cervical/vaginal nerves triggers more oxytocin release: the **positive feedback loop of labour** (Ferguson Reflex).

Oxytocin After Birth

- Skin-to-skin contact and newborn suckling elevate oxytocin in the parent for approximately **60 minutes**
- Contracts the uterus, reducing postpartum hemorrhage
- Vasodilates the chest wall, warming the newborn during skin-to-skin
- Skin-to-skin is associated with reduced postpartum depression, mediated in part by this oxytocin response



Synthetic Oxytocin (Synthocinon/Pitocin)

Synthetic oxytocin is administered intravenously in a **continuous** infusion — not pulsatile — producing longer, stronger, closer contractions than the physiological pattern. It does not cross the blood-brain barrier in the same way as endogenous oxytocin, so it does not produce the psychological (bonding, pleasure, fear-reduction) effects. Research has found reduced breastfeeding initiation in the first hours after augmented labour (Wiklund et al., 2009; Bell et al., 2013). In Ontario, induction rates are approximately **33%**, with ~50% of inductions leading to cesarean birth. These statistics are context for doulas to understand the hormonal implications when supporting clients through these experiences.

Beta-Endorphins: The Body's Natural Opioids

Released from the **hypothalamus and anterior pituitary** in response to pain and stress:

- Provide natural pain relief throughout labour; levels rise gradually.
- May create an **altered state of consciousness** — “labourland” or “the zone” — supporting the instinctive, inward-focused nature of active labour.
- The baby secretes endorphins during labour; may protect the fetal brain from reduced oxygen during contractions.
- Present in **breastmilk**; thought to help the newborn manage the stress of birth.
- **Epidural analgesia** reduces endorphin production by reducing the pain signal that drives it — context for understanding the postpartum hormonal cascade, not a reason to discourage pain relief.

Epinephrine and Norepinephrine: The Alert Hormones

During Labour

- High levels in early/active labour can **reduce uterine blood flow and slow contractions** when the environment feels unsafe.
- A **natural surge at transition** (~7–10 cm) is normal and may contribute to the **fetal ejection reflex**.

After Birth

- Helps the parent stay **alert and energized** for bonding
- Can temporarily **inhibit the milk ejection reflex** if stress remains elevated
- Prepares the **newborn**: improves breathing, thermoregulation via brown fat, and facilitates initial bonding alertness

Prolactin: The Nourishing Hormone

- Rises near the end of pregnancy; surges with each breastfeeding session in response to **nipple stimulation**.
- Directly stimulates **milk synthesis** in the mammary glands.
- Supports **maternal attachment** and reduces stress responses.
- High levels **suppress ovulation** via GnRH inhibition — the basis of **lactational amenorrhea**. Not a reliable contraceptive unless LAM criteria are met.
- Early, frequent feeding in the first hours establishes **prolactin receptor density** — critical for long-term milk supply.

Prostaglandins

Lipid compounds with hormone-like effects are produced **locally at the site of action**, not secreted from a gland:

- Regulate smooth muscle contraction and relaxation, including the uterus.
- **Cervical ripening**: facilitates softening and effacement.
- Play a critical role in initiating and sustaining labour contractions.
- Synthetic prostaglandins (misoprostol, dinoprostone) are used clinically for cervical ripening, induction, pregnancy termination, and uterine evacuation after pregnancy loss.



Prostaglandins Across the Full Spectrum

Prostaglandins appear at every point the full-spectrum doula supports: **menstrual cramping**, **miscarriage**, **medication abortion** (misoprostol), **cervical ripening for induction**, and **active management of the third stage**. For individuals who have used misoprostol for pregnancy loss or abortion, being offered the same medication for cervical ripening may feel triggering. Doulas can help clients communicate this to their care team and support informed, patient-centred conversations.

3.7.9 Hormonal Changes from Conception Through Postpartum

Conception and Implantation

- Fertilization → **hCG** production maintains the corpus luteum and its progesterone output
- Progesterone **quiets the uterus**, thickens the endometrium, and forms the mucus plug
- Relaxin rises, supporting implantation and placental development

First Trimester (Weeks 1–12)

- hCG peaks ~8–10 weeks; rapid rise associated with **nausea of pregnancy**

- Placenta begins producing estrogen and progesterone, taking over from the corpus luteum ~8–10 weeks
- **Thyroid hormone** requirements increase; deficiency can affect fetal brain development

Second and Third Trimesters (Weeks 13–40)

- Estrogen and progesterone continue rising, produced primarily by the **placenta**
- **Human placental lactogen (hPL)**: promotes fetal growth; increases maternal insulin resistance (normal adaptation)
- Placental **CRH** rises exponentially near term — thought to act as a biological clock for **labour initiation**
- Progesterone maintains high levels, **suppressing uterine contractility**

Labour (see 3.8.8 for full cascade)

- Oestrogen-to-progesterone ratio shifts, **increasing uterine sensitivity to oxytocin**
- Oxytocin, endorphins, epinephrine, and prostaglandins coordinate to establish, **sustain, and complete labour**

Third Stage and Immediate Postpartum

- Delivery of placenta → abrupt drop in **estrogen and progesterone**
- Progesterone's inhibition of prolactin is removed → **milk production begins**
- Oxytocin surges with skin-to-skin and suckling — contracting the uterus and promoting bonding
- The “**golden hour**”: peak oxytocin and endorphin availability makes the first 60 minutes after birth optimal for skin-to-skin, early breastfeeding, and uninterrupted bonding

Postpartum and Lactation

- **Prolactin**: rises with each feeding; milk synthesis on a supply-and-demand basis
- **Oxytocin**: released with suckling, triggering milk ejection and supporting uterine involution
- Low estrogen/progesterone during exclusive breastfeeding: **lactational amenorrhea, vaginal dryness**
- Prolactin suppresses GnRH, delaying ovulation — not a reliable contraception unless LAM criteria are strictly met



Hormones as the Mechanism of Doula Impact

Evidence consistently shows that continuous labour support improves birth outcomes: shorter labours, fewer caesareans, reduced pain medication use, improved satisfaction. The mechanism is supported by **hormones (in addition to information and advocacy)**. A doula's calm, consistent presence helps sustain the **oxytocin loop**, regulate the **stress response (HPA axis)**, support the **endorphin rise**, and protect the **golden hour** after birth. Creating a warm, safe, undisturbed atmosphere during labour is not just a comfort measure; it is a **neurohormonal intervention!**

3.7.10 Summary: Key Hormones at a Glance

Table 3.7.3: Key Hormones

Hormone	Produced By	Key Roles in Reproductive / Doula Context
Oestrogen	Ovaries, adrenal cortex, placenta, adipose	Endometrial growth, follicle maturation, sensitizes the uterus to oxytocin, and secondary sex characteristics
Progesterone	Corpus Luteum, Placenta	Maintains pregnancy, quiets uterus, mucus plug, lactation readiness
Relaxin	Corpus Luteum, Placenta	Uterine muscle relaxation (early pregnancy), loosens pelvic ligaments near term
FSH	Anterior Pituitary	Follicle growth; Sperm production
LH	Anterior Pituitary	Ovulation trigger, corpus luteum; testosterone production
hCG	Trophoblast	Maintains corpus luteum; detected by pregnancy tests; peaks at ~10 weeks
Oxytocin	Hypothalamus / Posterior pituitary	Labour contractions, milk ejection, bonding, positive feedback loop of birth
Prolactin	Anterior pituitary	Milk synthesis, maternal attachment, suppresses ovulation during lactation
Beta-endorphins	Hypothalamus / anterior pituitary	Natural pain relief, altered consciousness in labour, present in breastmilk
Epinephrine / Norepinephrine	Adrenal medulla	Fight-or-flight; can slow labour if elevated in first stage; natural surge at transition; newborn alertness
Cortisol	Adrenal cortex	stress response, blood glucose; chronic elevation suppresses reproductive hormones
Aldosterone	Adrenal cortex	Sodium / water retention; blood pressure regulation
Prostaglandins	Local tissue synthesis	Cervical reaping, uterine contractions, labour initiation; used in induction, abortion, miscarriage
Testosterone	Testes, ovaries, adrenal cortex	Libido, spermatogenesis, secondary sex characteristics
Melatonin	Pineal gland	Circadian rhythm; may enhance uterine oxytocin sensitivity; labour often begins at night
ADH (vasopressin)	Hypothalamus / posterior pituitary	Water retention by kidneys; Blood pressure regulation
Thyroid Hormone (T ₃ / T ₄)	Thyroid gland	Metabolic rate, energy, temperature; Increased requirements in pregnancy
hPL (human placental lactogen)	Placenta	Fetal growth; Increases maternal insulin resistance; Gestational diabetes risk
Placental CRH	Placenta	Rises exponentially near term; Biological clock for labour initiation

[“An Overview of the Endocrine System”](#), [“The Adrenal Glands”](#), [“The Pituitary Gland and Hypothalamus”](#), [“Gonadal and Placental Hormones”](#) and [“Hormones”](#) in [Anatomy and Physiology II at Cambrian College](#) by J. Gordon Betts; Kelly A. Young; James A. Wise; Eddie Johnson; Brandon Poe; Dean H. Kruse; Oksana Korol; Jody E. Johnson; Mark Womble; and Peter DeSaix, edited by Lynn Kabaroff is licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise indicated.

The section *The Stress Axis in Labour, Loss, and Dying*: Anthropic. (2026). [Claude AI](#) [Large language model]. Prompt

Balance LIFE CONNECTION examples roughly 60% birth/postpartum, 25% abortion/pregnancy loss, 15% death/dying. Based on the current section, provide short and relevant examples for the doula students

3.8 Reproductive Systems

Sex characteristics present along a continuum, with different combinations of sex chromosomes and anatomical presentations. This section introduces the structures and functions of **female** and **male** reproductive anatomy, while recognizing that **intersex** bodies represent a natural and important variation in human anatomy. The overview here does not represent an exhaustive account of all the ways human reproductive anatomy and physiology can present.



Learning Outcomes

By the end of this section, you will be able to:

- Identify and describe the structures and functions of the female and male reproductive systems.
- Demonstrate familiarity with reproductive organs, including the uterus, ovaries, vagina, and male reproductive structures.
- Explain the function of blood supply, nerve supply, muscular supports, and organ layers within the reproductive system.

3.8.1 Overview of Reproductive Structures

All reproductive systems share the same broad organization, regardless of anatomy. They consist of: **gonads** (the primary sex organs, which produce gametes and hormones), **accessory glands and organs** (which secrete fluids that support reproduction), and **perineal structures** (the external genitalia).

The **gonads** are the testes in people with male reproductive anatomy and the ovaries in people with female reproductive anatomy. In some intersex individuals, a combination of gonadal tissue may be present. Gonads produce **gametes** — **spermatozoa (sperm)** or **ova (eggs)** — and secrete sex hormones that regulate development, the menstrual cycle, and fertility.

3.8.2 The Female Reproductive System

The female reproductive system is located primarily within the **pelvic cavity**. Its functions include producing gametes (ova), secreting reproductive hormones, receiving sperm, providing a site for fertilization, supporting embryonic and fetal development, and delivering the fetus at birth.

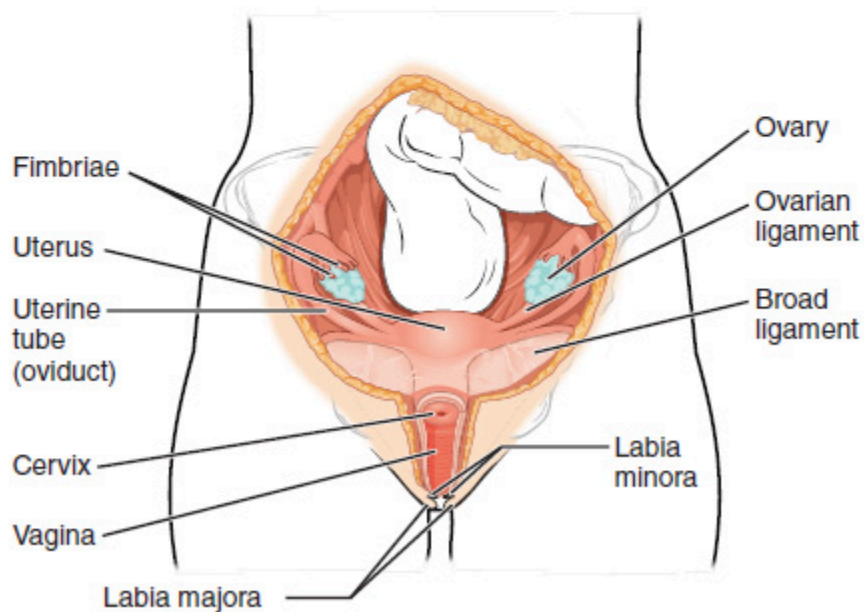
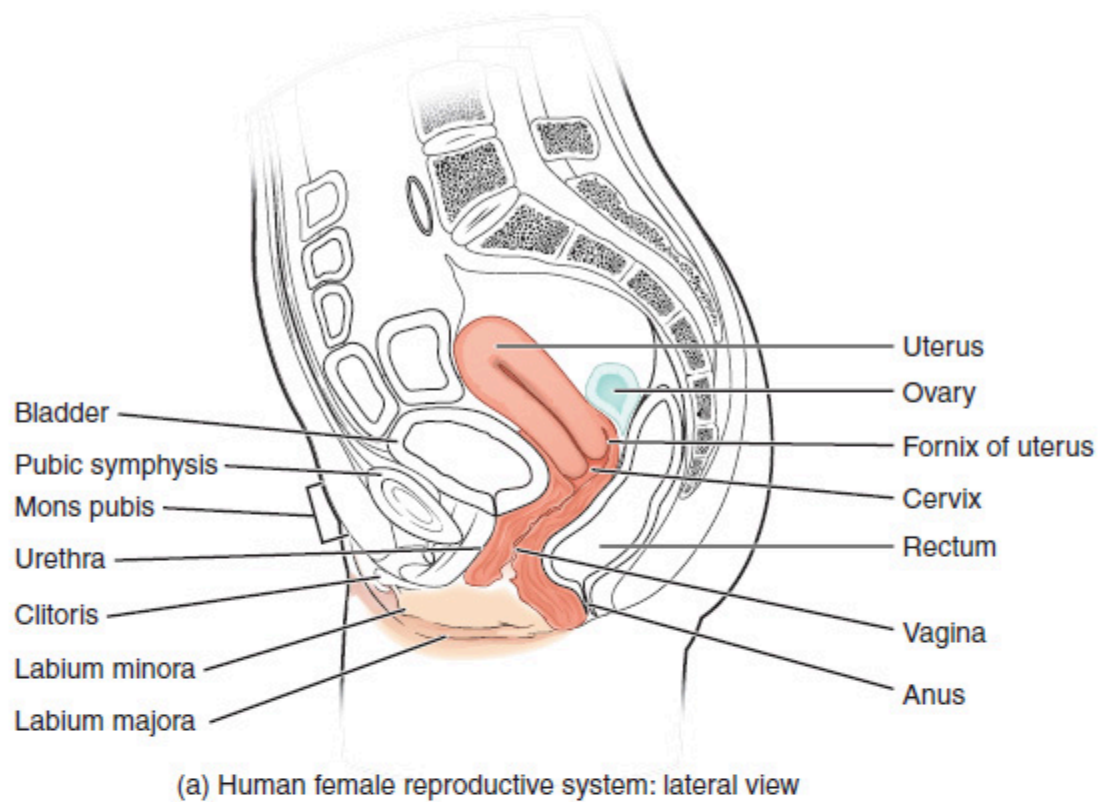


Figure 3.8.1 Image by OpenStax, CC BY 3.0.

Image Description

Two diagrams of the female reproductive system. The upper diagram is a side view: the uterus lies between the bladder in front and the rectum behind. An ovary is positioned beside the upper uterus. The cervix forms the narrow lower end of the uterus and opens into the vagina, which extends downward to the external genital area. The urethra runs from the bladder and opens in front of the vagina; the clitoris and labia are also anterior to the vaginal opening, while the anus is posterior.

The lower diagram is a front view: the uterus is centred in the pelvis, with a uterine tube extending from each upper side toward an ovary. Fimbriae lie at the outer end of each tube beside the ovary. The ovarian and broad ligaments support these structures. The cervix projects downward from the uterus into the vagina, and the labia lie below and outside the vaginal opening.

External Genitalia: The Vulva

The external female genitalia are collectively referred to as the **vulva**. The structures of the vulva include:

- **Mons pubis** — a pad of adipose (fatty) tissue over the pubic bone, covered in pubic hair after puberty.
- **Labia majora** — prominent folds of hair-covered skin that encircle and partially conceal the other vulval structures. (Labia = “lips”; majora = “larger”.)
- **Labia minora** — smaller, thinner folds of skin medial to the labia majora that protect the urethra and the entrance to the vagina. These naturally vary in shape and size.
- **Clitoris** — a small, rounded structure at the superior junction of the labia minora. It originates from the same embryological tissue as the glans penis and contains erectile tissue with dense nerve endings, making it central to sexual sensation and orgasm.
- **Vestibular bulbs** — masses of erectile tissue on either side of the vaginal canal.
- **Greater vestibular glands (Bartholin’s glands)** — located at the vaginal opening; secrete mucus to keep the vestibular area moist. They function similarly to the bulbourethral glands in male anatomy.
- **Hymen** — a thin, partial membrane that may partially cover the vaginal opening. It is naturally perforated (to allow menstrual flow) and is not an indicator of sexual experience.

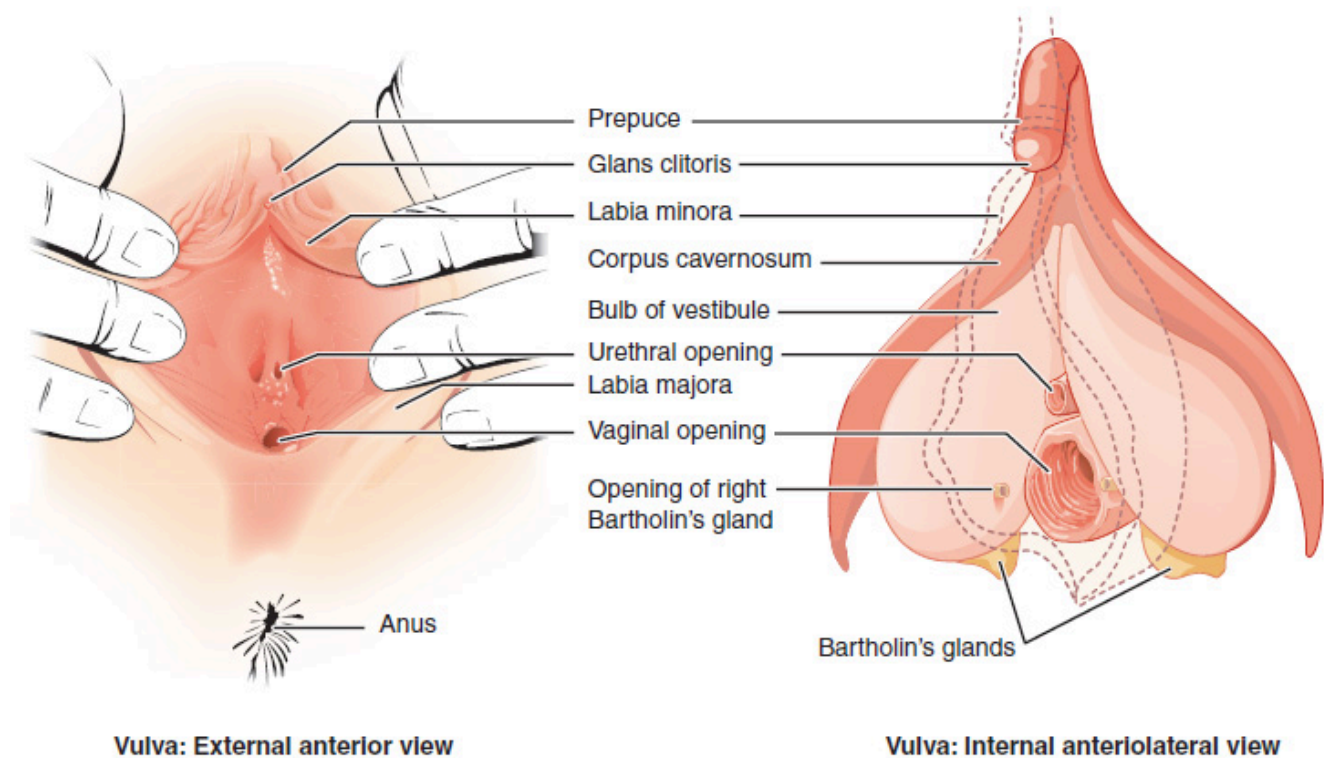


Figure 3.8.2 “Vulva” by OpenStax, CC BY 3.0.

Image Description

Two views of the vulva. The left diagram shows the external anatomy from the front. At the top, the prepuce covers the glans clitoris. The labia minora lie inside the larger labia majora. The urethral opening is below the clitoris and above the vaginal opening. The opening of the right Bartholin's gland is beside the lower vaginal opening, and the anus is located farther below and behind it.

The right diagram shows the internal structures from an angled front view. The clitoral corpus cavernosum extends upward from the glans clitoris beneath the prepuce. The bulbs of the vestibule lie internally on both sides of the urethral and vaginal openings. The Bartholin's glands are positioned on either side of the lower vaginal opening, with ducts opening into the vestibule.

The Vagina

The **vagina** is a muscular canal approximately **7.5–10 cm long**, extending from the **cervix** to the exterior of the body. It is positioned between the urinary bladder and the rectum and is usually angled slightly posteriorly. It functions as:

- A passageway for menstrual flow to leave the body.
- A canal for intercourse.
- The birth canal during vaginal birth.

Layers of the Vaginal Wall

The vaginal wall has three layers, from the outermost to innermost:

- **Fascia (adventitia)** — the outer fibrous layer of connective tissue; allows some movement relative to surrounding structures.
- **Muscularis** — a middle layer of smooth muscle (inner circular and outer longitudinal fibres); allows the vagina to expand during intercourse and childbirth.
- **Mucosa** — the innermost layer, lined with transverse folds called **rugae** that allow significant stretching. It contains no glands; lubrication comes from the vestibular glands and from fluid that transudes through the vaginal wall.

The vagina has no glands of its own. It maintains an **acidic environment** (pH below 4.5) due to lactic acid secreted by beneficial **Lactobacillus** bacteria that form part of the normal vaginal microbiome. This acidity protects against infection. The semen's alkalinity helps neutralize this acidity temporarily around the time of intercourse.

Blood supply to the vagina comes from the **vaginal arteries**. Motor and sensory nerves communicate with the vaginal walls; arousal is initiated via the **parasympathetic nervous system**, which causes erectile tissue in the clitoris and vaginal walls to fill with blood, and stimulates the vestibular glands to secrete lubrication.

The Uterus

The **uterus** is a hollow, pear-shaped, muscular organ situated between the urinary bladder (anteriorly) and the rectum (posteriorly). When non-pregnant, it is approximately **7.5 cm long, 5 cm wide, and 2.5 cm thick**, weighing 30–40 g. Its primary functions are to receive a fertilised egg, support implantation, nourish the developing embryo and fetus, and contract during labour to facilitate birth.

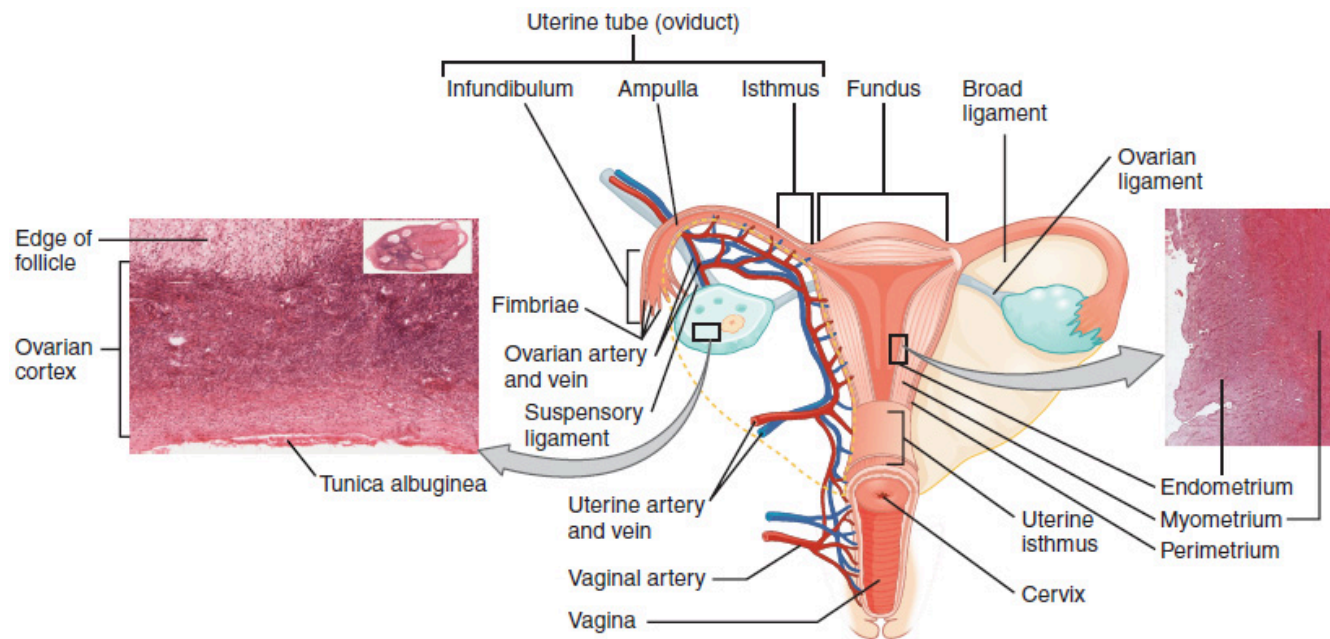


Figure 3.8.3. Image by OpenStax, CC BY 3.0.

Image Description

Diagram of the uterus, uterine tubes, ovaries, supporting ligaments, and blood vessels. The uterus is centred, with its rounded fundus at the top, its narrower isthmus below the main body, and the cervix extending downward into the vagina. Each uterine tube curves outward from the upper uterus. From the uterus toward the ovary, the tube consists of the isthmus, ampulla, and funnel-shaped infundibulum; fimbriae extend from the infundibulum beside the ovary.

The broad ligament extends from the sides of the uterus, while the ovarian ligament connects each ovary to the uterus, and the suspensory ligament supports the ovary from the outer side. Ovarian arteries and veins approach the ovaries laterally, uterine vessels run along the uterus, and vaginal vessels supply the lower reproductive tract. Enlarged tissue views show the ovary's outer tunica albuginea and cortex with a follicle, and the uterine wall's inner endometrium, middle myometrium, and outer perimetrium.

Regions of the Uterus

- **Fundus** — the rounded upper portion of the uterus, superior to where the fallopian tubes enter.
- **Body (corpus)** — the main central portion; the upper two-thirds of the uterus.
- **Cervix** — the narrow inferior portion, approximately 2.5 cm long, that projects into the vagina. It surrounds the **cervical canal** and the **external os** (the opening into the vagina). The cervix produces mucus whose consistency changes across the menstrual cycle and thins around ovulation to facilitate sperm passage.

Layers of the Uterine Wall

The uterine wall has three distinct layers:

- **Perimetrium** — the outermost serous membrane (a fold of peritoneum) that covers most of the uterine surface.
- **Myometrium** — the thick middle layer of **smooth muscle**. Muscle fibres run in horizontal, vertical, and diagonal directions, allowing the powerful, coordinated contractions of labour. The myometrium also produces the milder contractions (cramps) that expel menstrual flow.
- **Endometrium** — the innermost mucosa. It has two sub-layers:
 - **Stratum basalis** — the deeper, permanent base layer adjacent to the myometrium; it does not shed during menstruation.
 - **Stratum functionalis** — the thicker, glandular functional layer that thickens each cycle in preparation for implantation. This is the layer that is shed during menstruation if fertilization does not occur.

Ligamentous Supports of the Uterus

The uterus is maintained in position within the pelvic cavity by several ligaments:

- **Broad ligament** — a wide fold of peritoneum that extends laterally from the uterus to the pelvic walls; the primary suspensory support.
- **Round ligament** — anchors the uterus anteriorly, attaching near the uterine tubes and extending toward the labia majora. It can be felt as a pulling sensation in pregnancy as it stretches.
- **Uterosacral ligament** — stabilizes the uterus posteriorly by connecting the cervix to the pelvic wall.

Uterine Position and Variation

The most common uterine position is **anteverted** — tipped slightly forward toward the bladder. Other positions include **retroverted** (tipped backward, occurring in approximately 20–30% of people and often referred to as a “tilted” uterus), **retroflexed**, and **anteflexed**. Positional variation is normal and rarely has clinical significance.

Structural variations in uterine shape (such as a bicornuate, septate, or arcuate uterus) can occur due to differences during embryological development and are seen in approximately 6.7% of the population. Some variations may affect the ability of the uterus to expand during pregnancy.

Blood and Nerve Supply

- **Uterine artery** — supplies the uterus; branches into **spiral arteries** that supply the endometrium.
- **Ovarian artery** — supplies the ovaries.
- **Vaginal artery** — supplies the vagina.
- The **autonomic nervous system** controls the uterus and cervix (involuntarily). Motor and sensory nerves supply the vagina. Parasympathetic stimulation drives arousal responses; sympathetic stimulation influences uterine tone and is involved in labour.

The Fallopian Tubes (Uterine Tubes)

The **fallopian tubes** (also called uterine tubes or oviducts) are hollow, muscular tubes, each approximately **13 cm long**, that extend from the uterus toward, but are not directly connected to, each ovary. They have three regions:

- **Isthmus** — the narrow medial end that connects to the uterus.
- **Ampulla** — the wider middle region; the most common site of fertilization.
- **Infundibulum** — the flared distal end, fringed with finger-like projections called **fimbriae**, which sweep the ovulated oocyte from the peritoneal cavity into the tube.

The inner lining of the tubes contains **ciliated cells** that beat in the direction of the uterus, combined with smooth muscle contractions, to move the oocyte slowly toward implantation. Because the oocyte has no means of self-propulsion, this ciliary and muscular action is essential. Estrogen stimulates both the ciliary beat and the rate of smooth muscle contractions, particularly around ovulation.

Fertilization most commonly occurs in the **ampulla**. If fertilization does not occur, the oocyte degrades. If it does, the resulting zygote divides as it travels toward the uterus, arriving as a blastocyst ready for implantation.

The Ovaries

The **ovaries** are the female gonads — paired, almond-shaped organs approximately **4–5 cm long** and weighing 6–8 g. They are located within the pelvic cavity, secured by several ligaments:

- **Mesovarium** — an extension of the peritoneum that connects the ovary to the broad ligament.
- **Suspensory ligament** — anchors the ovary laterally to the pelvic wall and carries the major ovarian blood and lymph vessels.
- **Ovarian ligament** — anchors the ovary medially to the uterus.

Structure of the Ovary

- **Medulla** — the inner supporting framework of fibrous tissue containing blood vessels, lymphatics, and nerves.
- **Cortex** — the functional outer layer containing follicles in various stages of development: primary oocytes, developing follicles, the mature follicle, and the corpus luteum.

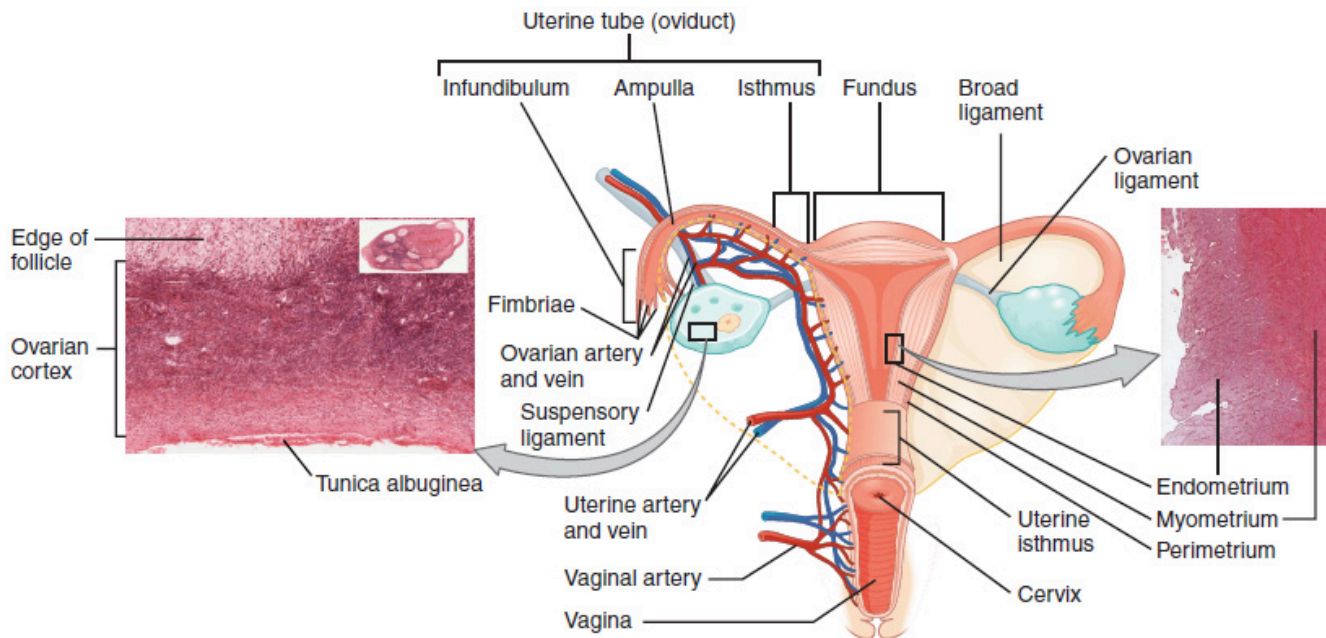


Figure 3.8.4. Image by OpenStax, CC BY 3.0.

The Ovum and Oogenesis

The female gamete is called an **ovum** (plural: **ova**). Before it is fully mature, it is referred to as an **oocyte**. The process of producing ova is called **oogenesis**.

Unlike sperm, which are produced continuously from puberty onward, a person with ovaries is born with their complete lifetime supply of **primary oocytes** — up to **1–2 million at birth**. Through a natural process of degeneration called **atresia**, this number declines to approximately **400,000 at puberty** and roughly **400** will mature and ovulate over a lifetime. The rest undergo atresia.

A primary oocyte is surrounded by supporting cells to form an **ovarian follicle**. Each cycle, a cohort of follicles develops under hormonal stimulation. Typically, one becomes the **dominant follicle** and is released at ovulation; the others undergo atresia.

The Ovarian and Menstrual Cycles

The ovarian and menstrual cycles are two interlocking monthly cycles governed by hormones from the **hypothalamus**, the **anterior pituitary gland**, and the **ovaries** themselves. A typical cycle is **28 days**, though individual variation (21–32 days) is normal.

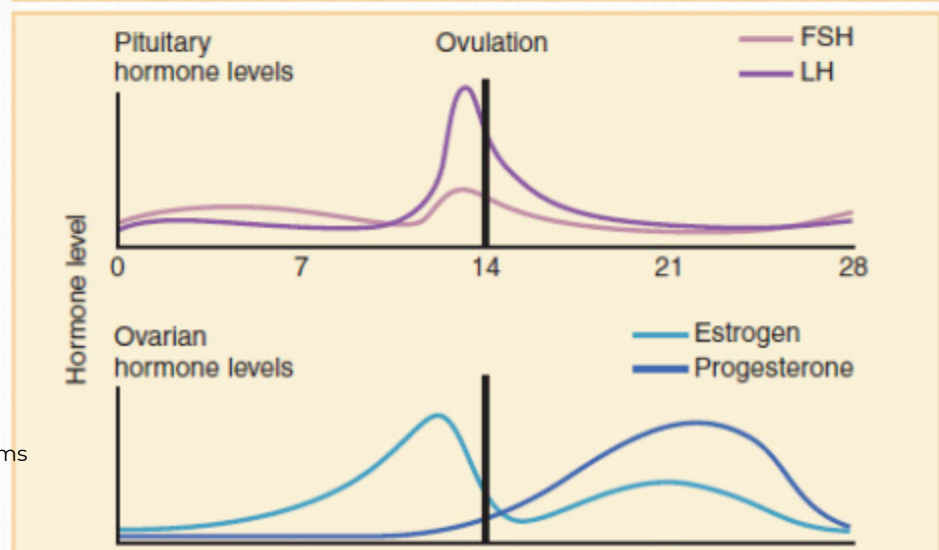
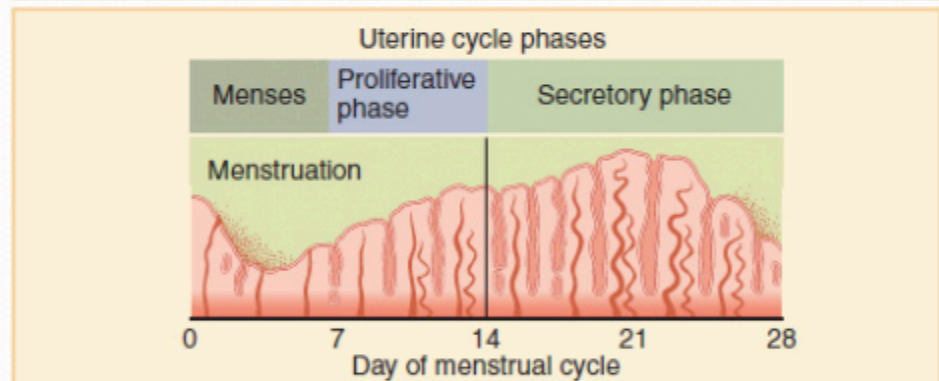
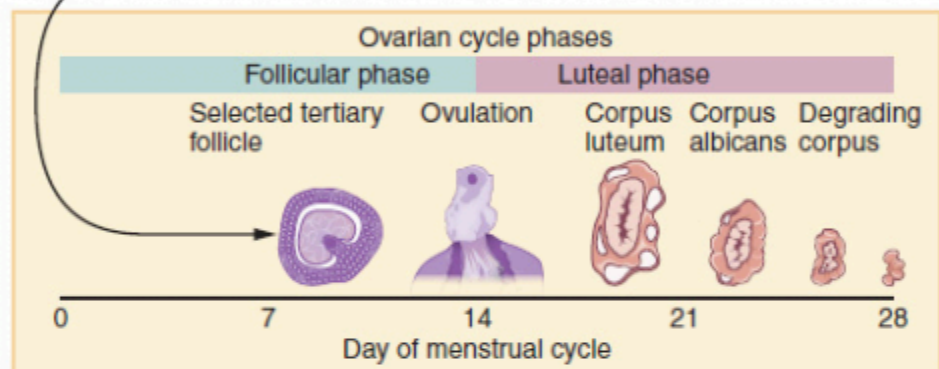
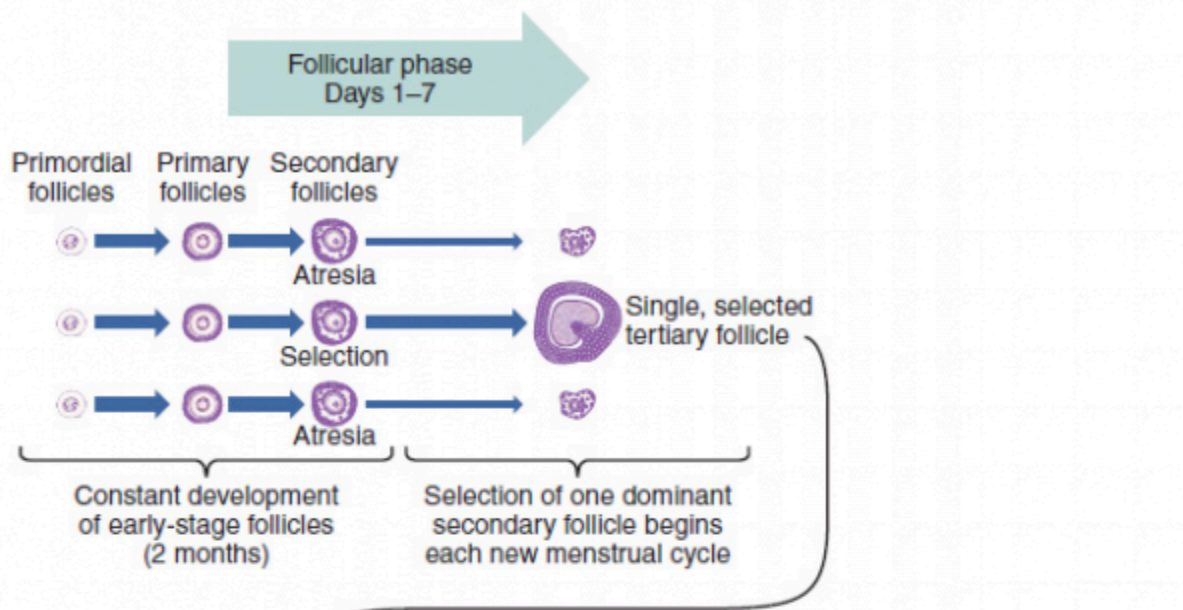


Figure 3.8.5. [Image by OpenStax, CC BY 4.0](#). The correlation of the hormone levels and their effects on the female reproductive system is shown in this timeline of the ovarian and menstrual cycles. The menstrual cycle begins at day one with the start of menses. Ovulation occurs around day 14 of a 28-day cycle, triggered by the LH surge.

Image Description

Diagram relating follicle development, ovarian and uterine changes, and hormone levels during a 28-day menstrual cycle. Before each cycle, follicles develop from primordial to primary and secondary stages; most undergo atresia, while one is selected as the dominant tertiary follicle.

During the ovarian cycle, the selected follicle matures from days 1–14. Ovulation occurs near day 14, releasing the oocyte. The remaining follicular tissue becomes the corpus luteum, which later forms the corpus albicans and degrades by about day 28 if pregnancy does not occur.

During the uterine cycle, menstruation occurs at the beginning as the uterine lining is shed. The lining rebuilds during the proliferative phase before ovulation, then becomes thicker and more developed during the secretory phase after ovulation.

Pituitary hormone levels remain relatively low except near day 14, when luteinizing hormone rises sharply, and follicle-stimulating hormone rises more moderately. Estrogen increases before ovulation, falls around day 14, and rises again slightly afterward. Progesterone remains low before ovulation, rises during the luteal phase, and falls with estrogen near day 28.

Hormones Involved

- **GnRH** (gonadotropin-releasing hormone) — released by the **hypothalamus**; signals the pituitary to release FSH and LH.
- **FSH** (follicle-stimulating hormone) — stimulates follicle growth.
- **LH** (luteinizing hormone) — triggers ovulation and the formation of the corpus luteum.
- **Estrogen** — produced by developing follicles; triggers endometrial thickening and, at high concentrations, the LH surge.
- **Progesterone** — produced by the corpus luteum after ovulation; maintains the endometrium in preparation for implantation.

Phases of the Ovarian Cycle



Follicular phase

Days 1–14 (variable). FSH stimulates a cohort of follicles to grow. Rising estrogen triggers endometrial rebuilding. One dominant follicle produces a surge of estrogen, triggering the **LH surge** (positive feedback). The LH surge causes **ovulation** — the release of the secondary oocyte from the dominant follicle, usually around Day 14.



Luteal phase

Days 14–28. The collapsed follicle transforms into the **corpus luteum**, which secretes progesterone to maintain the endometrium. If pregnancy does not occur within 10–12 days, the corpus luteum degrades, progesterone falls, and menstruation begins.

Phases of the Menstrual Cycle

- **Menses (Days 1–5)** — The stratum functionalis of the endometrium sheds. Triggered by declining progesterone as the corpus luteum degrades.
- **Proliferative phase (Days 6–14)** — Rising estrogen stimulates the endometrium to thicken and rebuild. Ends with ovulation.
- **Secretory phase (Days 15–28)** — Progesterone from the corpus luteum stimulates endometrial glands to secrete glycogen-rich fluid in preparation for implantation. If no fertilization occurs, the corpus luteum degrades, and the cycle begins again.

Arousal

Sexual arousal in people with female reproductive anatomy is mediated by the **parasympathetic nervous system**. Arousal causes: erectile tissue in the **clitoris** and **vaginal walls** to engorge with blood; secretions from

the **vestibular glands** to increase, providing lubrication; and, during orgasm, rhythmic contractions of the **perineal muscles**, uterine walls, and fallopian tubes.



Hormonal Contraception and the Reproductive Cycle

Understanding the hormonal cycle makes it possible to understand **how hormonal contraception works**. Most combined hormonal contraceptives (pills, patches, rings) contain synthetic estrogen and progestin (a synthetic progesterone). They prevent pregnancy primarily by:

- **Suppressing the LH surge** — without the LH surge, ovulation does not occur, and no egg is released.
- **Thickening cervical mucus** — making it harder for sperm to reach any egg that might be released.
- **Thinning the endometrium** — making implantation less likely.

Progestin-only methods (the mini-pill, hormonal IUDs, implants, injectable contraceptives) work mainly by thickening cervical mucus and thinning the endometrium; they may or may not suppress ovulation depending on the specific method and individual response.

Copper IUDs are non-hormonal. Copper ions are toxic to sperm and affect their motility; the IUD also creates an inhospitable environment for fertilization and implantation.

Birth

Clients who have used long-term hormonal contraception may have questions about how their cycle returns postpartum or post-discontinuation. Hormonal contraception is also relevant to postpartum care: progestin-only methods are generally considered safe during breastfeeding and are often initiated in the early postpartum period.

Abortion and Pregnancy Loss

Medication abortion (“the abortion pill”) uses **mifepristone** (which blocks progesterone receptors, destabilizing the endometrium) followed by **misoprostol** (which stimulates uterine contractions). Understanding how progesterone maintains the endometrium helps explain the mechanism of medication abortion. Doulas supporting clients through medication abortion can draw on this knowledge to explain what clients are experiencing physiologically.

Emergency contraception (e.g. Plan B / levonorgestrel) works primarily by delaying or preventing ovulation. It is most effective when taken as soon as possible after unprotected intercourse.

3.9.3 The Male Reproductive System

The male reproductive system produces and delivers **spermatozoa (sperm)** and the hormone **testosterone**. Its structures include the testes, a series of ducts, accessory glands, and the external genitalia.

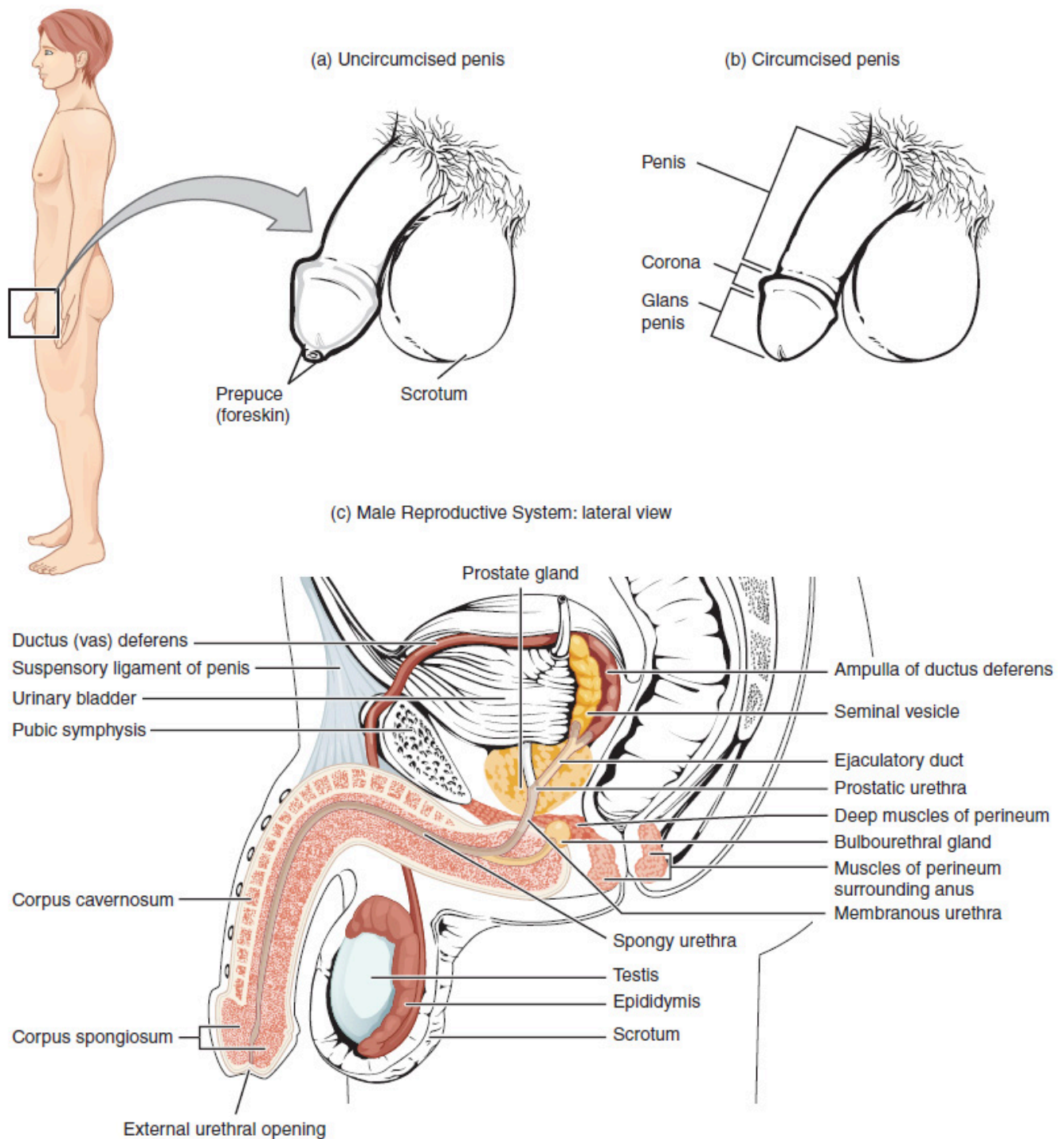


Figure 3.8.6. *Image by OpenStax, CC BY 3.0.* The structures of the male reproductive system include the testes, the epididymides, the penis, and the ducts and glands that produce and carry semen. Sperm exit the scrotum through the ductus deferens, which is bundled in the spermatic cord. The seminal vesicles and prostate gland add fluids to the sperm to create semen.

Image Description

Three diagrams of external and internal male reproductive anatomy. The upper diagrams compare an uncircumcised penis, in which the prepuce covers the glans, with a circumcised penis, in which the glans and its raised border, the corona, are exposed. The scrotum hangs behind and below the penis.

The lower diagram is a side view of the male reproductive system. Each testis lies within the scrotum, with the epididymis along its posterior surface. The ductus deferens travels upward from the epididymis, passes around the bladder, and widens into an ampulla behind it. The seminal vesicle is also behind the bladder. Its duct joins the ductus deferens to form the ejaculatory duct, which passes through the prostate gland below the bladder and empties into the urethra.

The urethra continues from the bladder through the prostate, the deep muscles of the perineum, and the penis to the external opening. The bulbourethral gland lies below the prostate beside the membranous urethra. Within the penis, paired corpora cavernosa lie above the corpus spongiosum, which surrounds the spongy urethra.

External Genitalia

- **Penis** — the external organ containing **spongy erectile tissue** surrounding the urethra. It can deliver sperm into the vagina during intercourse. The **glans penis** is the sensitive distal tip.
- **Scrotum** — a sac of skin and muscle that surrounds and protects the testes, maintaining them at approximately **3°C below core body temperature** — a temperature range required for healthy sperm production.

The Testes

The **testes** (singular: testis) are the male gonads. They produce sperm and secrete androgens, primarily **testosterone**. Within each testis are tightly coiled **seminiferous tubules** — the site of **sperm production (spermatogenesis)**. Each testis may contain up to half a mile of these tubules.

- **Seminiferous tubules** — site of sperm production. Sperm produced here are not yet motile.
- **Interstitial (Leydig) cells** — located between the seminiferous tubules; produce **testosterone** and other androgens.
- **Rete testis** — a network of channels that receives sperm from the seminiferous tubules.
- **Efferent ductules** — carry sperm from the rete testis to the epididymis.

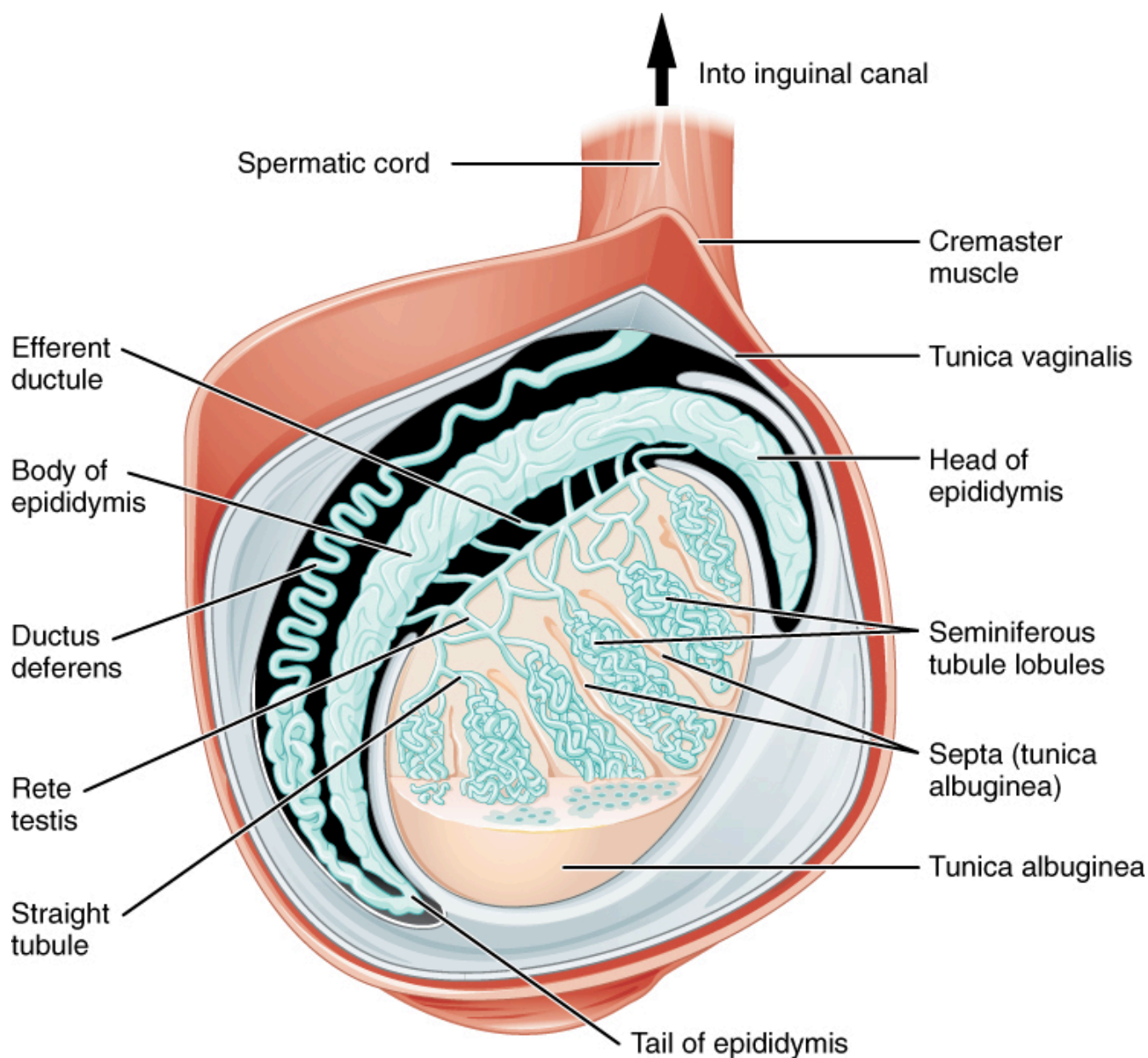


Figure 3.8.7. [Image by OpenStax, CC BY 3.0.](#) This sagittal view shows the seminiferous tubules, the site of sperm production. Formed sperm are transferred to the epididymis, where they mature. They leave the epididymis during an ejaculation via the ductus deferens.

Image Description

Cutaway diagram of a testis, epididymis, and surrounding structures. The testis is enclosed by the tunica albuginea, which sends septa inward to divide the testis into lobules. Each lobule contains coiled seminiferous tubules. These connect through straight tubules to the rete testis near the posterior side of the testis.

Efferent ductules carry sperm from the rete testis into the head of the epididymis at the upper posterior surface. The epididymis continues downward along the posterior side as its body, curves around the lower end as its tail, and then becomes the ductus deferens, which ascends toward the spermatic cord and inguinal canal.

The tunica vaginalis surrounds most of the testis and epididymis. The cremaster muscle lies outside this covering and extends upward around the spermatic cord.

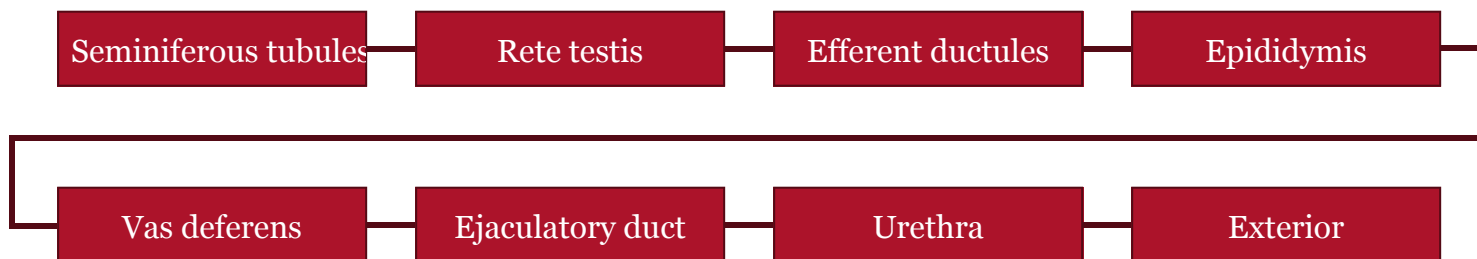
The Epididymis

The **epididymis** is a tightly coiled tube resting on the posterior surface of each testis. It is the site of **sperm maturation**: sperm spend approximately **two weeks** in the epididymis, developing the ability to swim (motility). Sperm are stored here until ejaculation.

The Vas Deferens and the Path of Spermatozoa

The **vas deferens** (also called the sperm duct or ductus deferens) carries sperm from the epididymis toward the prostate gland via **peristaltic contractions** during ejaculation. A **vasectomy** is a surgical procedure that cuts the vas deferens to prevent sperm from reaching the semen.

Path of Spermatozoa



Accessory Glands

The accessory glands add fluids to sperm to form **semen**. Semen is the complete mixture of sperm and secretions released during ejaculation (typically 2–5 ml).

- **Seminal vesicles (seminal glands)** — produce a thick, yellowish secretion that forms approximately **70% of semen volume**. This fluid contains **fructose** (energy for sperm flagella), vitamin C, and prostaglandins.
- **Prostate gland** — produces a milky fluid accounting for **20–30% of semen volume**; contains an antibiotic enzyme that helps protect against urinary tract infections. It surrounds the urethra just below the bladder.
- **Bulbourethral glands (Cowper's glands)** — located just below the prostate; secrete a thick, **alkaline** mucus that neutralizes any residual acidity in the urethra before ejaculation and provides lubrication.

Functions of Semen

- **Fructose** provides energy for sperm motility.
- The **alkalinity** of semen neutralizes the acidic environment of the vagina.
- Semen contains **antimicrobial substances** that inhibit bacterial growth.
- Elements of semen **enhance sperm motility**.

Spermatozoa (Sperm)

A **spermatozoon** is a male gamete whose function is to deliver chromosomes to the ovum. Sperm are highly specialized cells: they have shed most of their organelles and intracellular structures to reduce mass and maximize swimming efficiency. Key structures include:

- **Head** — contains the **nucleus** (haploid chromosomes) and the **acrosome**, a cap containing enzymes needed to penetrate the egg's zona pellucida.
- **Midpiece** — packed with mitochondria that provide ATP energy for motility.
- **Tail (flagellum)** — the propulsive structure driven by fructose from seminal vesicle secretions.

Note: at fertilization, sperm contribute **only nuclear DNA** — no cytoplasm. All cytoplasmic organelles in the embryo, including **mitochondria**, are of maternal origin. This is the basis of mitochondrial DNA inheritance, which traces exclusively through the maternal line.

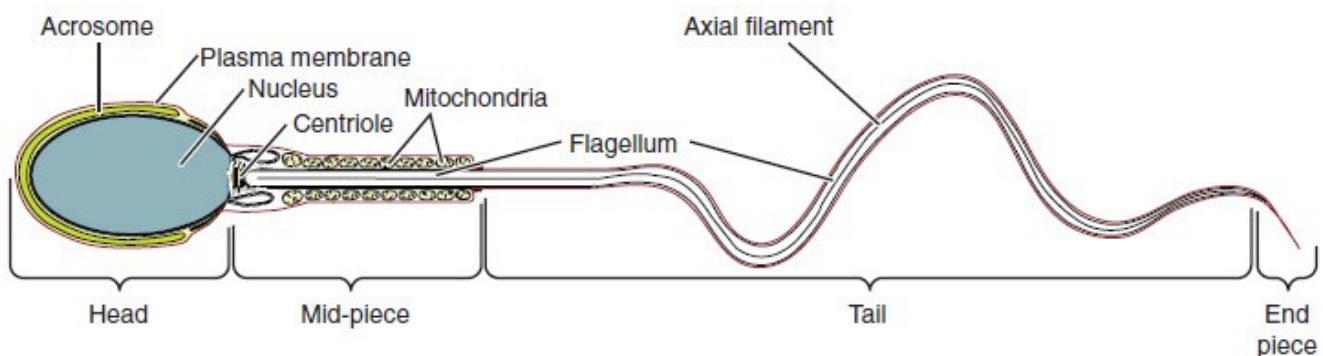


Figure 3.8.8. [Image by OpenStax, CC BY 3.0](#). Sperm cells are divided into a head, containing DNA; a mid-piece, containing mitochondria; and a tail, providing motility. The acrosome is oval and somewhat flattened.

Image Description

Diagram of a sperm cell divided into the head, mid-piece, tail, and end piece. The head contains the nucleus and is enclosed by the plasma membrane, with the acrosome covering its front portion. A centriole lies at the junction between the head and mid-piece. The mid-piece contains mitochondria arranged around the beginning of the flagellum. The flagellum continues through the long tail, supported internally by an axial filament, and narrows at the terminal end piece.

Arousal, Emission, and Ejaculation

Sexual arousal and ejaculation involve the coordinated action of both the parasympathetic and sympathetic branches of the autonomic nervous system:

- **Arousal (parasympathetic)** — parasympathetic nerves cause dilation of penile arteries; erectile tissue fills with blood, producing an erection. The bulbourethral glands begin secreting lubricating fluid.
- **Emission (sympathetic)** — peristaltic contractions of the vas deferens propel sperm into the prostatic urethra. The seminal vesicles and prostate contract, adding their secretions to form semen.
- **Ejaculation (somatic motor nerves)** — rhythmic contractions of the erectile tissue expel semen to the exterior. After ejaculation, sympathetic stimulation constricts penile arteries, reducing blood flow and

returning the penis to a flaccid state.

3.8.4 Summary: Key Structures at a Glance

Table 3.8.1: Reproductive System Overview

Female Reproductive System	Male Reproductive System
Ovaries (gonads)	Testes (gonads)
Fallopian tubes – conduit for oocyte	Epididymis – Sperm maturation and storage
Uterus – receives, nourishes fetus	Vas deferens – transports sperm
Cervix – inferior uterus, secretes mucus	Seminal vesicles, prostate, bulbourethral glands
Vagina – birth canal, intercourse	Urethra – carries urine and semen
Vulva – external genitalia	Penis and scrotum – external genitalia
Ova (oocytes) – female gametes	Spermatozoa – male gametes
Estrogen and progesterone – key hormones	Testosterone – key androgen

“[15.2 Anatomy and Physiology of the Female Reproductive System](#)”, and “[15.1 Anatomy and Physiology of the Male Reproductive System](#)” in [Fundamentals of Anatomy and Physiology](#) by Anna Chruścik, Kate Kauter, Louisa Windus, and Eliza Whiteside is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#), except where otherwise indicated.

3.9 The Body's Defence: The Immune System

The immune system is one of the most sophisticated defence networks in the human body. Unlike the cardiovascular or digestive systems, it has no single organ as its home: it is woven through the blood, lymph, and tissues everywhere. For doulas, the immune system matters in ways that extend well beyond infection prevention. It governs whether a pregnancy continues or fails, whether a newborn can survive the transition to the microbial world, and whether chronic illness shapes a client's reproductive experience. Understanding immunity means understanding some of the most profound and nuanced biology of human reproduction.



Learning Outcomes

By the end of this section, you will be able to:

- Identify the components of the immune system and distinguish between innate and specific (adaptive) immunity.
- Explain how pregnancy affects immune responses and why fetal rejection does not occur.
- Outline Rhesus incompatibility (Rh Factor) and maternal–fetal immune conditions that may complicate pregnancy.
- Explore how maternal immunity is transferred to the fetus and how neonatal immune vulnerability is managed.

Video: How does your immune system work?

Video: "[How does your immune system work? – Emma Bryce](#)" by [TED-Ed](#) [5:22] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

3.10.1 Blood Types and the Rh Factor

Blood type was introduced in Section [3.2.3](#) as part of blood composition. This section builds on that foundation to address blood compatibility and the Rh factor — concepts with direct clinical relevance in pregnancy and birth

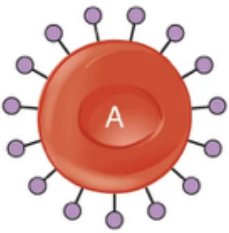
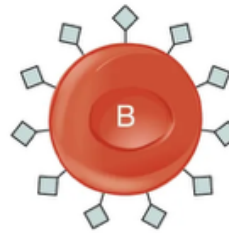
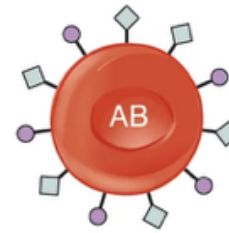
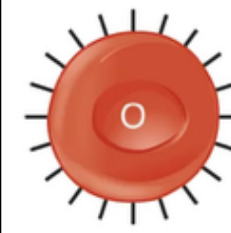
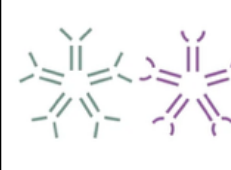
ABO Blood Types

Red blood cells carry protein markers on their surface called **antigens**. The **ABO blood typing system** classifies blood by which of two antigens — **A** and **B** — are present on the surface of red blood cells:

- **Type A** — A antigens on red blood cells; anti-B antibodies in plasma
- **Type B** — B antigens on red blood cells; anti-A antibodies in plasma
- **Type AB** — both A and B antigens; no ABO antibodies; universal recipient
- **Type O** — neither antigen; both anti-A and anti-B antibodies; universal donor for red blood cells

ABO antibodies are **preformed** — they are present from birth without prior exposure to incompatible blood. This is why transfusing the wrong blood type can cause a rapid, life-threatening immune reaction: the recipient's antibodies attack the donated red blood cells.

Table 3.9.1: ABO Blood Types “[ABO Blood Groups](#)” by [OpenStax](#), [CC BY 3.0](#).

	A	B	AB	O
Red Blood Cell Type				
Antibodies in Plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in Red Blood Cell	 A antigen	 B antigen	 A and B antigens	None
Blood Types Compatible in an Emergency	A, O	B, O	A, B, AB, O (AB is the universal recipient)	O (O is the universal donor)

The Rh Factor

A separate antigen system, the **Rhesus (Rh) factor**, determines whether someone is **Rh-positive (Rh+)** or **Rh-negative (Rh-)**. Approximately 85% of people are Rh+. Unlike ABO antibodies, **anti-Rh antibodies are not preformed** — they are produced only after an Rh- person is exposed to Rh+ blood, a process called **sensitisation**.

This distinction matters enormously in pregnancy. If a person who is Rh- carries an Rh+ fetus (which can occur

when the other biological parent is Rh+), the two blood types coexist without problem in a first pregnancy, because fetal blood cells rarely cross the placenta during gestation. However, **during or immediately after birth**, a small amount of fetal blood may enter the parent's circulation. Research shows this occurs in approximately 13–14% of such pregnancies.

Once exposed, the Rh– person's immune system produces **anti-Rh IgG antibodies**. In a **subsequent pregnancy** with another Rh+ fetus, these antibodies can cross the placenta and attack the fetal red blood cells, causing **hemolytic disease of the newborn (HDN)**, also called **erythroblastosis fetalis**. Severity ranges from mild anemia to hydrops fetalis (severe fluid accumulation) and fetal death.

RhoGAM (Rh Immune Globulin)

RhoGAM (Rh immune globulin) is an injection of anti-Rh antibodies given to Rh– pregnant people to **prevent sensitisation**. It works by destroying any fetal Rh+ red blood cells before they can trigger the parent's immune system to produce its own anti-Rh antibodies. RhoGAM is typically administered:

- At approximately 28 weeks of pregnancy.
- Within 72 hours of the birth of an Rh+ baby.
- After any event that could cause feto-maternal hemorrhage, including **miscarriage, ectopic pregnancy, amniocentesis, chorionic villus sampling (CVS), abdominal trauma, or abortion**

Video: How Rh factor affects a pregnancy

Video: "[How Rh factor affects a pregnancy](#)" by [Toronto Star](#) [2:20] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.



RhoGAM Across the Full Spectrum

Birth

Routine RhoGAM at 28 weeks and within 72 hours of birth is standard practice for Rh– pregnant people. Doulas can help clients understand **why** this injection is offered and what it prevents, so it is an informed rather than a routine consent.

Abortion and Pregnancy Loss

RhoGAM is indicated after **pregnancy loss at any gestational age** in Rh– people, and after induced abortion. In 2024, the Society for Maternal-Fetal Medicine updated guidance suggesting

RhoGAM may not be necessary after spontaneous or induced abortion before 12 weeks, though practice varies. Clients navigating this may feel overwhelmed by decisions in moments of grief. Doulas can provide calm, non-directive information and support clients in asking questions of their care providers.

For some clients, particularly those who have experienced multiple pregnancy losses, the pattern of Rh sensitisation may become part of their reproductive history. Acknowledging this with sensitivity — without catastrophizing — is part of full-spectrum doula care.

3.9.2 Anatomy of the Lymphatic and Immune Systems

The immune system is unusual among body systems in that it has no single home. It cannot be pointed to on an anatomy diagram the way the heart or liver can. Instead, it is woven through two overlapping networks: the **lymphatic system**, which provides its physical infrastructure, and a constantly circulating population of specialized **immune cells** that patrol the blood, lymph, and tissues of the entire body.

The Lymphatic System

Every day, blood pressure pushes approximately **20 litres of plasma** out of capillaries and into the spaces between body cells (the interstitial space). About 17 litres return directly to the capillaries; the remaining **3 litres** are collected by **lymphatic capillaries** and returned to the bloodstream as **lymph**. Along the way, lymph passes through **lymph nodes** — small, bean-shaped structures distributed throughout the body, concentrated in the neck, armpits, groin, and abdomen. Lymph nodes filter lymph, trap pathogens, and are the primary sites where immune responses are mounted and coordinated.

The two major collecting ducts — the **thoracic duct** and **right lymphatic duct** — return filtered lymph to the bloodstream at the subclavian veins in the upper chest. The **spleen**, the largest lymphoid organ, performs a similar filtering function for blood rather than lymph, removing aged red blood cells and mounting immune responses to blood-borne pathogens. Lymphoid tissue is also found throughout the mucosal surfaces of the gut, lungs, and urogenital tract, collectively called **mucosa-associated lymphoid tissue (MALT)** — the frontline immune surveillance at every surface where pathogens might enter.

Anatomy of the Immune System: Not Just Organs

This is where the immune system departs from every other system you have studied. The cardiovascular system has a heart. The respiratory system has lungs. The immune system has lymph nodes and a spleen — but its real anatomy is **cellular**.

The immune system is, at its core, a **population of cells** that are continuously produced in the **bone marrow**, matured in specialized organs (primarily the **thymus**), and then deployed into circulation. Some patrol the blood. Some take up residence in specific tissues. Some lie dormant for decades, waiting for a pathogen they encountered once before. When you feel the lymph nodes in your neck swell during a throat infection, you are feeling the immune system at work — local immune cells recognizing and responding to a pathogen, right there in the node.

Understanding immune function, then, means understanding these cells: what they are, what they recognize, and what they do when they find it. The cells of the innate and adaptive immune systems — neutrophils,

macrophages, T lymphocytes, B lymphocytes, natural killer cells, and others — are covered in detail in Section 3.10.3. That cellular cast is the real anatomy of this system.

3.9.3 Three Lines of Defence

The immune response works in temporal layers. The first defences are physical barriers; behind them is the rapid, non-specific innate immune response; and finally, the slower, highly specific adaptive response. All three operate simultaneously, each informing the next.

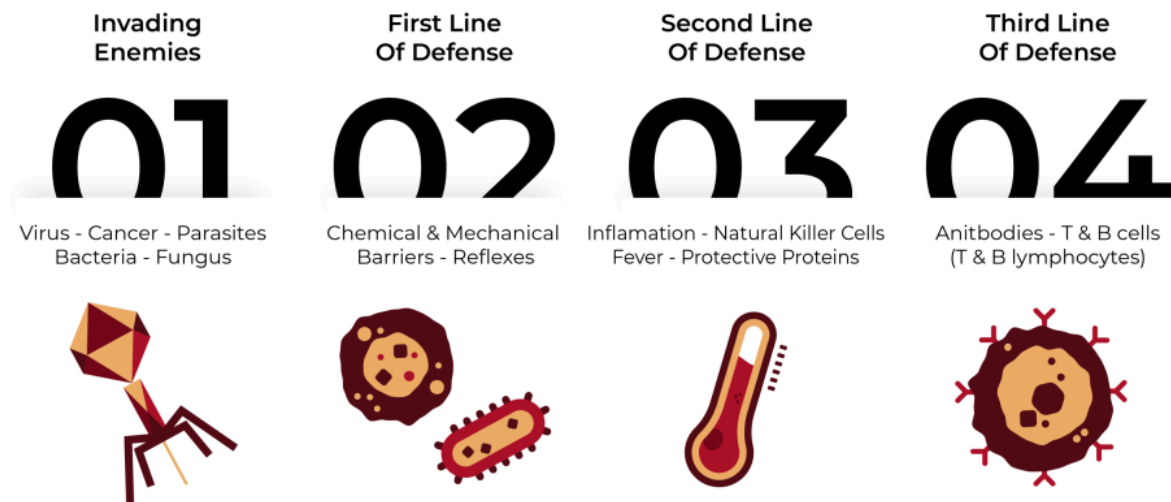


Figure 3.9.1 "Hierarchy of Immune Responses" by Koen Liddiard, [CC BY-CA-SA 4.0](#).

The First Line: Barrier Defences

Barrier defences are immediate and non-specific — they act to prevent pathogens from entering tissues in the first place:

- **Skin** — the most extensive barrier; its dry, slightly acidic surface is hostile to most pathogens; dead outer cell layers prevent penetration
- **Mucous membranes** — line all body cavities open to the outside world (respiratory, GI, urogenital tracts); mucus traps pathogens; cilia sweep them out (see respiratory system, Section 3.6)
- **Vaginal microbiome** — Lactobacillus species maintain an acidic pH (<4.5) in the vagina, hostile to pathogenic bacteria and yeast. Disrupting this flora (through douching, antibiotics, or hormonal changes) increases infection risk
- **Stomach acid** — denatures most pathogens ingested with food
- **Lacrimal (tear) glands** — secrete **lysozyme**, an enzyme that breaks down bacterial cell walls; also present in saliva and breastmilk

If a pathogen breaches barrier defences and enters tissues, the **innate immune response** is activated within minutes to hours. It is **non-specific** — it responds to broad patterns associated with pathogens (called **pathogen-associated molecular patterns, PAMPs**) rather than to specific antigens. It has no memory.

Phagocytosis

The primary mechanism of innate immunity is **phagocytosis** — engulfing and destroying pathogens.

Inflammation

Tissue injury or infection triggers **inflammation** — characterized by **redness, heat, swelling, and pain**. This is a coordinated protective response:

- **Mast cells** release **histamine**, causing blood vessels to dilate and become more permeable
- Increased permeability allows plasma proteins and phagocytes to flood into the infected area
- **Cytokines** (chemical messengers including **interleukins** and **tumour necrosis factor**) are released, signalling other immune cells to the site
- Systemic fever results from pyrogens acting on the hypothalamus — elevated temperature slows pathogen replication and speeds immune cell activity

The Complement System

The **complement system** is a series of proteins constitutively present in blood plasma. When activated by pathogens, they trigger a **cascade** of reactions that:

- **Opsonize** pathogens (coat them to make them attractive targets for phagocytes)
- Attract phagocytes to the site of infection (**chemotaxis**)
- Directly **lyse (rupture)** pathogen cell membranes through the membrane attack complex (MAC)



Inflammation in Reproductive Contexts

Postpartum

Mastitis — inflammation of the breast tissue — is one of the most common reasons people discontinue breastfeeding in the early postpartum period, affecting approximately 10–20%

of lactating people. Understanding it as an **immune and inflammatory event**, rather than a failure of breastfeeding technique, changes how it can be supported.

Mastitis typically occurs when milk stasis (milk that is not being drained effectively) allows bacteria — most commonly *Staphylococcus aureus* from the infant's mouth or the skin — to enter the breast tissue through small cracks in the nipple. The **innate immune response** activates: phagocytes flood the area, mast cells release histamine, blood vessels dilate, and cytokines signal a systemic response. The result is the classic presentation: redness, heat, swelling, and pain in a wedge-shaped area of the breast, often accompanied by fever, chills, and flu-like symptoms — the systemic signature of significant inflammatory activity.

The Third Line: Adaptive Immune Response

The **adaptive (specific) immune response** is slower than innate immunity (days rather than minutes), but it is far more **specific and powerful**. It learns from each encounter, creating immunological memory that enables faster, stronger responses to pathogens encountered before. This is the principle underlying vaccination. The key cell types of adaptive immunity are **T lymphocytes (T cells)** and **B lymphocytes (B cells)**. Both recognize specific antigens — molecular markers that identify foreign or abnormal material.

T Cells: Cell-Mediated Immunity

T cells recognize antigens only when presented on the surface of other cells via **major histocompatibility complex (MHC)** molecules.

- **Helper T cells (CD4+)** — the coordinators of adaptive immunity. They activate cytotoxic T cells, stimulate B cells to produce antibodies, and recruit innate immune cells. Their loss is the central tragedy of HIV/AIDS.
- **Cytotoxic T cells (CD8+)** — the killers; they directly destroy cells that display foreign antigens (virus-infected cells, cancer cells)
- **Regulatory T cells (Tregs)** — suppress immune activity to prevent overreaction and autoimmunity; critically important in pregnancy tolerance (see Section 3.10.5)
- **Memory T cells** — long-lived cells that remember specific pathogens; enable rapid secondary responses

B Cells and Antibodies: Humoral Immunity

B cells mature in bone marrow. When activated by antigens (usually with helper T cell assistance), they differentiate into **plasma cells** that secrete **antibodies** (also called **immunoglobulins**). Antibodies are Y-shaped proteins that bind to specific antigens and:

- Neutralize pathogens (block their ability to infect cells).
- **Opsonize** pathogens (flag them for phagocytosis)
- Activate the complement system.
- Agglutinate (clump) pathogens for easier removal.

The Five Classes of Antibodies (Immunoglobulins)

Table 3.9.2: Classes of Antibodies

Class	Location / Route	Key Function
IgG	Blood; crosses placenta	Main Blood antibody; Provides passive immunity to a fetus via placenta; Antiviral, antibacterial
IgA	Secretions (saliva, tears, breast milk, mucus)	Mucosal protection; critical in breast milk for neonatal gut immunity
IgM	Blood (pentamer)	First antibody produced in a new infection; Activates complement; ABO blood group antibodies are IgM
IgE	Mast cells and basophils	Allergic responses; Elevated in parasitic infections
IgD	B Cell surface	Involved in B cell activation; Function less well understood

Immunological Memory and Vaccination

After an adaptive immune response, some B and T cells become **memory cells** that persist for years or decades. On re-exposure to the same pathogen, these cells mount a **faster and more robust secondary response**, often eliminating the pathogen before symptoms develop.

Vaccination exploits this principle: a **vaccine** introduces a harmless form of a pathogen (attenuated, inactivated, or a fragment) to generate memory without causing disease. Vaccines given to pregnant people can provide protection to both parent and — through **IgG transfer across the placenta** — to the fetus and newborn.



Vaccination in Pregnancy

Several vaccines are recommended during pregnancy in Canada precisely because **maternal IgG crosses the placenta**, providing the newborn with passive immunity during the early months of life before the infant's own immune system matures. These include:

- **Influenza (flu) vaccine** — recommended in every pregnancy; protects the pregnant person

(who is at higher risk of severe influenza) and provides passive protection to the newborn, who cannot receive the flu vaccine until 6 months of age

- **Tdap (tetanus, diphtheria, pertussis)** — recommended at 27–32 weeks of each pregnancy; the pertussis (whooping cough) component is most critical, as newborns are highly vulnerable to **Bordetella pertussis**

Doulas can support clients in understanding the immunological reasoning behind these recommendations without being prescriptive. The decision to vaccinate is the client's; the doula's role is to help them access accurate information and feel supported in whatever decision they make.

3.9.4 The Immune System in Pregnancy

Pregnancy presents one of the most remarkable immunological puzzles in human biology. The fetus carries **paternally inherited genes** that are foreign to the pregnant person's immune system. In any other context — organ transplantation, for instance — genetically foreign tissue is recognized and attacked by the immune system, requiring lifelong immunosuppression to prevent rejection. Yet in pregnancy, the semi-foreign fetus is **tolerated** for nine months. How?

The Fetus as a Semi-Allograft

The fetus can be described as a **semi-allograft**, meaning genetically half-foreign. Normal organ transplants are rejected unless the recipient takes immunosuppressive drugs. The fetus avoids this through a sophisticated set of local and systemic immune modifications at the **maternal-fetal interface** (the decidua of the uterus and the trophoblast cells of the placenta).

Rather than simply suppressing immunity, pregnancy shifts the immune system into a carefully calibrated **tolerogenic state** — one that tolerates the fetus while still protecting against infection. This is not immune suppression in a simple sense: it is **immunological negotiation**.

Pregnancy-Specific Immune Changes

Pregnancy modifies the immune system in ways that affect susceptibility to disease and clinical presentation:

- **Increased susceptibility to intracellular pathogens:** Pregnant people are at higher risk of severe influenza, listeriosis, and varicella
- **Reduced inflammatory responses:** the overall anti-inflammatory state of pregnancy may mask signs of infection (lower fever response, less marked inflammatory signs)
- **Changes in autoimmune disease activity:** many autoimmune conditions **improve** during pregnancy (e.g. rheumatoid arthritis, as the Th2 shift dampens Th1-mediated inflammation) but may **flare in the postpartum** period when the immune system returns toward Th1 dominance



When Immune Tolerance Breaks Down

Miscarriage and Recurrent Pregnancy Loss

Some cases of **recurrent pregnancy loss** may involve immune factors. Insufficient Treg expansion or excessive Th1 activity has been associated with implantation failure and early pregnancy loss in some individuals. This is an area of active research. Clients who have experienced multiple losses and are curious about immune factors may benefit from referral to a reproductive immunologist. Doulas can validate this curiosity without overstepping into clinical territory.

3.9.5 Transfer of Maternal Immunity to the Fetus and Newborn

The fetal immune system is immature at birth. While the structural components are present, the newborn has had limited exposure to antigens and has few **immunological memories** of its own. To survive the microbial world outside the womb, the newborn relies on **passive immunity** — immunity transferred from the pregnant person rather than generated by the baby itself.

IgG Transfer via the Placenta

Of the five antibody classes, only **IgG** is small enough to cross the placenta. Beginning in the second trimester and increasing substantially in the third trimester, maternal IgG is actively transported across the placenta to the fetal circulation. By birth, the newborn's IgG levels may **exceed the mother's** — a remarkable feat of immune transfer. This transferred IgG provides the newborn with **passive protection** against pathogens to which the pregnant person has been exposed or vaccinated, including viruses, bacteria, and toxins. This protection wanes over the first **3–6 months of life** as the maternal IgG is gradually broken down and replaced by the infant's own antibodies.

This is why vaccines given in the **third trimester** of pregnancy (such as Tdap and influenza) are timed to maximize the maternal IgG response and therefore the quantity of antibody transferred to the fetus.

IgA in Breastmilk: The Gut Immune Gift

Breastmilk — particularly **colostrum** (the first milk, produced in the first 2–5 days after birth) — is rich in **secretory IgA (sIgA)**. Unlike IgG, sIgA is not absorbed into the bloodstream. Instead, it lines the **newborn's gastrointestinal tract**, providing a protective coating against pathogens that might enter through feeding. sIgA in breastmilk:

- Is targeted at pathogens present in the breastfeeding parent's environment, providing local protection relevant to the baby's immediate world.
- Helps establish the infant's gut microbiome by selectively inhibiting certain pathogens.
- Also contains lysozyme, lactoferrin (which sequesters iron from bacteria), and immune cells.

The combination of **placentally transferred IgG** and **breastmilk IgA** provides a layered immune bridge during the period when the infant's own adaptive immune system is developing. It is one of the physiological rationales for supporting breastfeeding access and continuation.

The Neonatal Immune System: Vulnerability and Development

The newborn's immune system is functional but immature:

- **Innate immunity** is largely intact at birth, though neutrophil function is less efficient than in adults
- **Adaptive immunity** requires antigen exposure to develop; the newborn has few memory cells
- The **neonatal period** (first 28 days) carries the highest infection risk; the transition from the sterile womb to the microbial world is managed by maternal passive immunity, skin-to-skin contact (which promotes colonization with parents' commensal organisms), and colostrum
- Infant **immunization schedules** are timed to provide vaccine-acquired immunity as maternal IgG wanes



Neonatal Immunity and Doula Support

Birth and the Golden Hour

Skin-to-skin contact immediately after birth promotes the newborn's colonization with the parent's commensal microorganisms — the “good” bacteria that help calibrate the infant's immune system. Delaying or preventing skin-to-skin contact (e.g. in cesarean birth, NICU admission) has implications for this microbial seeding. This is not a reason for parents to feel guilt, but it is a context for why initiatives like **gentle cesarean protocols** (immediate skin-to-skin in theatre) and **vaginal seeding** are areas of clinical interest.

Preterm Birth

Preterm infants receive less placental IgG transfer (the bulk of transfer occurs in the third trimester) and are more immunologically vulnerable. Supporting parents of preterm infants in understanding their baby's immune status — and the value of breastmilk even in small amounts — is part of NICU doula support.

Pregnancy Loss

Parents who have lost a pregnancy may grieve the immunological relationship that was forming — the antibodies being built, the protection being prepared. While this language may not be clinically common, acknowledging that pregnancy is an immunological as well as physical relationship may resonate with some clients.

3.9.6 Autoimmune Conditions and Reproductive Health

In **autoimmune conditions**, the immune system fails to distinguish self from non-self and begins attacking the body's own tissues. This breakdown of **immunological tolerance** is the central pathology. There are more than 80 recognized autoimmune diseases, collectively affecting approximately 5–10% of the population and disproportionately affecting women and people with female reproductive anatomy (who account for roughly 80% of autoimmune cases). The reasons for this sex disparity are not fully understood but likely involve hormonal and genetic factors.

Triggers are often unknown. Treatments typically focus on **immunosuppression** — dampening the immune response to reduce damage — using corticosteroids (e.g. prednisone), disease-modifying drugs (e.g. methotrexate), or biologics (e.g. TNF inhibitors). These treatments carry their own implications for pregnancy.

Common Autoimmune Conditions and Their Reproductive Implications

Systemic Lupus Erythematosus (SLE / Lupus)

Lupus is a **systemic autoimmune condition** in which form immune complexes that deposit in blood vessel walls, kidneys, joints, skin, and the brain. The classic presentation includes a butterfly rash across the cheeks, fatigue, joint pain, kidney involvement, and photosensitivity. Lupus is highly relevant to reproductive health. It predominantly affects people of reproductive age and is more common in women and in Black, Asian, and Indigenous people. In pregnancy:

- Pre-eclampsia risk is elevated — lupus nephritis (kidney involvement) increases this risk significantly
- **Antiphospholipid syndrome (APS)** frequently co-occurs with lupus and is associated with recurrent pregnancy loss, placental insufficiency, and thrombosis
- Neonatal lupus — maternal anti-Ro/SSA and anti-La/SSB antibodies can cross the placenta and cause transient neonatal rash, liver dysfunction, and in rare cases, congenital heart block
- Lupus activity can flare in the postpartum period as immune shifts reverse

Rheumatoid Arthritis (RA)

Rheumatoid arthritis is a chronic inflammatory condition targeting joints. Characterized by morning stiffness, bilateral joint swelling and pain, and eventual joint deformation. The hands and feet are most affected. Many people with RA experience **remission** during pregnancy; however, postpartum flare is common, often within 3 months of birth, as autoimmunity returns. Some RA medications (e.g. methotrexate) are contraindicated in pregnancy and require planning around conception.

Thyroid Autoimmune Conditions

- **Hashimoto's thyroiditis** — autoimmune destruction of the thyroid gland; the most common cause of **hypothyroidism** in countries with adequate iodine. Antibodies attack thyroid tissue. Poorly controlled hypothyroidism in pregnancy can impair fetal neurological development. Many people with Hashimoto's are first diagnosed when thyroid function is tested in pregnancy
- **Graves' disease** — autoimmune stimulation of the thyroid causing **hyperthyroidism**; associated with thyroid storm risk in pregnancy and neonatal hyperthyroidism (maternal TSH receptor antibodies can cross the placenta)
- **Postpartum thyroiditis** — an autoimmune thyroid condition occurring in the first year postpartum, affecting 5–10% of people. Often presents as temporary hyperthyroidism followed by hypothyroidism, then usually resolves. Symptoms overlap with postpartum depression; thyroid function testing is part of the postpartum mental health assessment

Antiphospholipid Syndrome (APS)

APS is an autoimmune condition in which antibodies attack phospholipid-binding proteins, promoting blood clotting and placental dysfunction. It is directly relevant to doula practice as a cause of:

- Recurrent pregnancy loss (typically second trimester, due to placental thrombosis).
- Preterm birth and placental insufficiency.
- Thrombosis (DVT, pulmonary embolism) — risk is elevated in pregnancy.

Treatment typically involves **low-dose aspirin** and/or **low-molecular-weight heparin (LMWH)** in pregnancy. Clients with APS may carry significant pregnancy anxiety based on prior losses.

Type 1 Diabetes

Type 1 diabetes is caused by autoimmune destruction of pancreatic beta cells, resulting in insulin deficiency. It is distinct from Type 2 diabetes (insulin resistance) and gestational diabetes. In pregnancy, Type 1 diabetes requires careful blood glucose management, as both hyperglycemia and hypoglycemia carry risks for fetal development. Maternal IgG antibodies against beta cells can occasionally cross the placenta, though neonatal diabetes from this mechanism is rare.

Inflammatory Bowel Disease (IBD)

Crohn's disease and ulcerative colitis are autoimmune inflammatory conditions of the GI tract. Activity during pregnancy varies: many people remain stable or improve; others experience flares. IBD medications vary in their safety profiles in pregnancy and breastfeeding, and clients may have questions about navigating this. IBD can also affect nutritional absorption, which has implications for fetal growth.



Autoimmune Conditions and the Doula Role

Clients with autoimmune conditions navigating pregnancy, birth, loss, or dying may have complex medical histories, heightened health anxiety, and experiences of being disbelieved or dismissed in medical settings. Many autoimmune conditions, particularly lupus and RA, are more common in Black, Asian, and Indigenous communities, and are sometimes diagnosed later due to systemic biases in healthcare.

A doula's role is not to interpret lab results or adjust medications. It is to:

- Listen without minimizing ("your immune system is literally attacking itself while also keeping a baby alive" is a profound thing to hold)
- Help clients articulate their questions to their care team
- Understand the physiological basis of symptoms so you can be present without alarm
- Recognize postpartum flare risk in conditions like RA, lupus, and thyroiditis as part of the postpartum watch

Doula support may be particularly valuable for clients with autoimmune conditions because their labours and postpartum periods may be more medically managed, and having a consistent, informed non-medical presence can be grounding.

3.9.7 Summary: Key Immune Concepts for Doula Practice

Table 3.9.3: Immune System Key Concepts

Concept	Key Terms	Doula Relevance
Blood typing	ABO, Rh factor, antigens	Blood compatibility in transfusion; Rh incompatibility in pregnancy
Rh sensitisation	Anti-Rh IgG, HFN, erythroblastosis fetalis	Risk in Rh- clients with Rh+ fetus; Manages with RhoGAM
RhoGAM	Rh immune globulin	Given at 28 weeks, after birth, after loss/abortion in Rh- clients
Innate immunity	Phagocytosis, inflammation, complement	First response to infection; labour involves physiological inflammation
Adaptive immunity	T cells, B cells, antibodies, memory	Specific, learned; Basis of vaccination; Transfers passive immunity to fetus
IgG (placental transfer)	Passive immunity, third trimester	Fetal protection; Rationale for Tdap and flu vaccines in pregnancy
IgA (breastmilk)	Colostrum, secretory IgA	Protects newborn gut; Supports immune development
Fetal tolerance	HLA-G, Tregs, Th2 shift	Why the fetus is not rejected; Disruption linked to miscarriage/ pre-eclampsia
Autoimmunity	SLE, RA, APS, thyroiditis	Common in reproductive-age people; Affects pregnancy; Often improves in pregnancy, flares postpartum
Infection susceptibility	Th2 dominance	Pregnant people more vulnerable to influenza, listeria, varicella

[“18.6 Blood Typing”](#), [“21.1 Anatomy of the Lymphatic and Immune Systems”](#), [“21.2 Barrier Defenses and the Innate Immune Response”](#), [“21.3 The Adaptive Immune Response: T lymphocytes and Their Functional Types”](#), [“21.4 The Adaptive Immune Response: B-lymphocytes and Antibodies”](#), [“21.5 The Immune Response against Pathogens”](#), [“21.6 Diseases Associated with Depressed or Overactive Immune Responses”](#) and [“21.7 Transplantation and Cancer Immunology”](#) in [Anatomy and Physiology 2e](#) by J. Gordon Betts, Kelly A. Young, James A. Wise, Eddie Johnson, Brandon Poe, Dean H. Kruse, Oksana Korol, Jody E. Johnson, Mark Womble, Peter DeSaix is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](#), except where otherwise noted.

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3.10 The Tree of Life: The Placenta

Of all the organs in the human body, the placenta is perhaps the most extraordinary and the most temporary. It grows from scratch, performs the functions of lungs, liver, kidneys, intestine, immune system, and endocrine gland simultaneously, sustains a separate human life for nine months, and then is born and discarded. No other organ does this. No other organ could.

For doulas, the placenta is not just anatomy; it is a site of cultural reverence, clinical monitoring, and practical knowledge. Understanding its structure and function connects everything learned across this course: circulation, gas exchange, digestion, hormones, immunity, and filtration all converge at this remarkable interface between two people.



Learning Outcomes

By the end of this section, you will be able to:

- Describe the anatomy and structure of the placenta, membranes, and umbilical cord, and understand how variations affect fetal development.
- Outline the physiology and functions of the placenta.
- Explain why the placenta is closely monitored throughout pregnancy and birth.
- Recognize placental abnormalities and the role of the placenta in multiple pregnancy.

3.10.1 Development of the Placenta

The placenta begins forming within days of fertilization and is fully established by weeks 14 to 16. Understanding how it develops clarifies both its structure and its vulnerabilities.

From Fertilization to Implantation

After fertilization, the resulting **zygote** begins dividing as it travels along the fallopian tube toward the uterus. This cell division, called **cleavage**, produces smaller cells called **blastomeres**. By approximately Day 3, the cluster of blastomeres is called a **morula**. By Days 4 to 6, the cells reorganize into a hollow sphere called a **blastocyst**, which reaches the uterus and implants in the endometrium around Day 7.

The blastocyst has two distinct cell populations:



Inner cell mass (embryoblast)

The cluster of cells that will become the embryo and, eventually, the fetus



Trophoblast

The outer layer of cells that surrounds the inner cell mass and will form the placenta and other extraembryonic structures

The Trophoblast and Chorionic Villi

During implantation, the trophoblast cells multiply and invade the uterine mucosa and blood vessels, anchoring the blastocyst to the endometrial wall.

The trophoblast differentiates into two layers:



Syncytiotrophoblast

A fused outer layer without cell boundaries that directly contacts maternal blood; it manages nutrient exchange and hormone production



Cytotrophoblast

An inner layer of individual cells that supports the syncytiotrophoblast and contributes to spiral artery remodelling

The trophoblast forms finger-like projections called **chorionic villi** that burrow into the endometrium like tree roots. These villi become vascularized — blood vessels grow into them from the embryo — and they are bathed in maternal blood in spaces called **intervillous spaces**. It is across the surfaces of the chorionic villi that all exchange between maternal and fetal blood takes place.

By week 3, nutrients can begin diffusing across the early villi. By weeks 14 to 16, **placentation** is complete: the placenta is a fully functioning organ.

Structure of the Mature Placenta

The fully developed placenta is a disc-shaped organ approximately **20 cm in diameter, 3 cm thick, and 500 to 600 g in weight** at term.

It has two distinct sides:



Fetal side (chorionic plate)

Smooth and shiny, covered in the amnion; the umbilical cord attaches here; fetal blood vessels branch visibly across its surface



Maternal side (basal plate/decidua basalis)

Rough and lobulated, divided into 15 to 30 segments called cotyledons; this is the side that was attached to the uterine wall

The **placental membrane** (sometimes called the placental barrier) consists of the syncytiotrophoblast, cytotrophoblast, fetal connective tissue, and the endothelium of fetal blood vessels. This membrane separates maternal and fetal blood, which **never directly mix**. All exchange occurs by diffusion, active transport, or pinocytosis (cellular engulfment) across this membrane.

3.10.2 Functions of the Placenta: A Body System in One Organ

The placenta performs more physiological roles simultaneously than any other organ in the human body. Every major body system covered in this chapter has its equivalent in placental function. The mnemonic **SERPENT** provides a useful framework: **S**torage, **E**ndocrine, **R**espiration, **P**rotection, **E**xcretion, **N**utrition, **T**ransfer.

Table 3.10.1: Functions of the Placenta

Placental Function	Description and Body System Parallel
Respiration (Gas Exchange)	Oxygen diffuses from maternal blood in the intervillous space across the placental membrane into fetal capillaries. Carbon dioxide moves in the reverse direction. The placenta performs the function of the lungs (Section 3.5) for the fetus, who cannot breathe in utero. Fetal hemoglobin (HbF) has a higher affinity for oxygen than adult hemoglobin, allowing it to extract oxygen from maternal blood even at lower partial pressures.
Nutrition and Digestion	Glucose, amino acids, fatty acids, vitamins, minerals, and water pass from maternal to fetal blood. The placenta processes and regulates nutrient transfer much as the digestive system and liver do for a born individual (Section 3.5). Glucose crosses by facilitated diffusion; amino acids by active transport; oxygen and fat-soluble vitamins by simple diffusion
Excretion (Waste Removal)	Fetal metabolic waste products, including carbon dioxide, urea, uric acid, and bilirubin, pass across the placental membrane into maternal blood for elimination by the maternal kidneys and lungs. The placenta performs the renal function (Section 3.7) of filtering the fetal blood supply.
Endocrine Function	The placenta is a major endocrine organ, producing: hCG (maintains corpus luteum until placenta takes over at 8-10 weeks), oestrogen and progesterone (from approximately 10 weeks; maintains pregnancy, suppresses ovulation, prepares for lactation), human placental lactogen (hPL, promotes fetal growth and maternal insulin resistance), and placental CRH (rises near term; thought to initiate labour). See Section 3.8.
Protection and Immunity	The placental membrane acts as a selective barrier against many (though not all) pathogens. Maternal IgG antibodies cross the placenta by active transport, providing the fetus with passive immunity (see Section 3.10.6). The syncytiotrophoblast expresses HLA-G to protect fetal tissue from maternal immune attack (Section 3.10.5). However, some pathogens and substances do cross: rubella, cytomegalovirus, HIV, syphilis, alcohol, and many drugs can all pass to the fetus.
Storage	The placenta stores glucose (as glycogen), iron, fat-soluble vitamins (A, D, E, K), and other nutrients, releasing them to the fetus as needed. This buffering function protects the fetus during periods of maternal nutritional variation.
Transfer (Selective)	The placenta selectively controls what passes between maternal and fetal circulations. Some substances pass freely; others are blocked; others are actively transported. This selectivity is what makes placental health so critical to fetal development.



The Placenta as Integration Point

The functions listed above are not independent. They are the same functions as the body systems covered throughout this course, now compressed into a single temporary organ. When studying the placenta, you are revisiting:

- **Cardiovascular (3.3):** blood flow, pressure gradients, vessel remodelling
- **Respiratory (3.6):** gas exchange, oxygen binding, fetal hemoglobin
- **Digestive (3.5):** nutrient absorption and transfer
- **Urinary (3.7):** metabolic waste excretion
- **Endocrine (3.8):** hormone production that governs the entire pregnancy
- **Immune (3.10):** selective barrier, immune tolerance, passive antibody transfer

The placenta does not replace the maternal systems — it works in *parallel* with them. The pregnant person's lungs, kidneys, liver, and heart all work harder in pregnancy to supply and support the placenta's functions on behalf of the fetus.

3.11.3 The Fetal Membranes and Amniotic Fluid

The fetus does not float free in the uterus. It is enclosed in a layered sac of specialized membranes filled with fluid, which together create a protected, temperature-stable, mechanically cushioned environment for development.

The Chorioamniotic Membranes

Two distinct membranes enclose the fetus, together called the chorioamnion:



Amnion (inner membrane)

A thin, translucent, flexible membrane that directly surrounds the fetus and contains the amniotic fluid. It is continuous with the umbilical cord along its outer surface.



Chorion (outer membrane)

A thicker membrane that lies outside the amnion and fuses with the decidua (uterine lining). The chorionic villi of the early placenta develop from this layer.

These two membranes fuse together around weeks 14 to 16 and are examined together after birth as a unit. Intact membranes at the onset of labour are normal; premature rupture of membranes (**PROM**), which occurs before the onset of labour, is associated with infection risk. Membranes are examined after the placenta is delivered to confirm they are complete; retained membrane fragments can cause infection or hemorrhage.

Amniotic Fluid

The **amniotic fluid** that fills the amniotic sac is a dynamic, living fluid that changes in composition throughout pregnancy. Its volume increases throughout pregnancy, reaching a **normal volume of approximately 500 to 1000 ml by term**.

Amniotic fluid serves several functions:

- **Mechanical protection:** cushions the fetus against external pressure and impacts
- **Symmetrical growth:** allows the fetus to move freely, which is essential for normal limb and lung development
- **Lung development:** the fetus practices breathing movements by inhaling and exhaling amniotic fluid; this stimulates alveolar development
- **Swallowing and gut development:** the fetus swallows amniotic fluid, which stimulates gastrointestinal development and contributes to fetal urine production
- **Temperature regulation:** maintains a stable thermal environment for the fetus
- **Diagnostic testing:** amniotic fluid can be sampled via amniocentesis for chromosomal analysis, fetal lung maturity testing, and infection assessment

Amniotic Fluid Volume Variations

- **Oligohydramnios:** too little amniotic fluid (below 500 ml at term); associated with fetal renal problems (fetal urine contributes to fluid volume), intrauterine growth restriction, and post-term pregnancy
- **Polyhydramnios:** too much amniotic fluid (above 2000 ml); associated with fetal swallowing difficulties, gestational diabetes (excess fetal urination), or fetal structural abnormalities



Membranes, Waters, and Birth

Birth

The spontaneous rupture of membranes (“the waters breaking”) is one of the most recognizable events of labour, but it is also one of the most misunderstood. Membranes can rupture before, during, or — in rare cases — not at all during labour (a **caul birth**, considered auspicious in many cultures). Some people rupture membranes days before labour begins; others not until transition or pushing.

Amniotic fluid is typically clear to pale yellow and may have a faint sweet smell. Greenish or brown

fluid may indicate **meconium**, which has clinical significance and should be communicated to the care team. Foul-smelling fluid may indicate infection.

Doulas can help clients understand that the amount of fluid seen at rupture does not predict how much remains — the sac continues to produce fluid, and the fetus is not suddenly unprotected. However, once membranes are ruptured, infection risk increases, and most care providers recommend birth within 18 to 24 hours

3.10.4 The Umbilical Cord

The **umbilical cord** connects the fetus to the placenta and is the physical lifeline between them. It forms by the fifth week of pregnancy and grows to an average length of **50 to 60 cm** and a diameter of approximately **2 cm** at term. It has no nerves.

Structure of the Umbilical Cord

- **Two umbilical arteries:** carry deoxygenated blood and metabolic waste products from the fetus to the placenta. Note that these are arteries because they carry blood away from the fetal heart, even though that blood is oxygen-depleted.
- **One umbilical vein:** carries oxygenated, nutrient-rich blood from the placenta back to the fetus. The vein carries blood toward the fetal heart.
- **Wharton's jelly:** a gelatinous mucous connective tissue that surrounds and cushions the blood vessels, protecting them from compression and kinking
- **Amnion:** the innermost membrane of the fetal membranes surrounds the cord along its entire length

A useful memory aid is **AVA: Artery, Vein, Artery**. Two arteries and one vein.

Cord Variations and Knots

- **Cord length:** varies considerably. Longer cords are more prone to wrapping around the fetus (nuchal cord); shorter cords may restrict fetal movement or cause tension during birth
- **Loose nuchal cord:** Cord presents around the fetus/baby's neck at birth. Common (found in approximately 20% of births); usually of no clinical significance
- **Loose knots:** relatively common; rarely cause problems
- **True knots:** rare (0.3 to 2% of pregnancies); occur when the fetus moves through a loop of cord; can restrict blood flow if pulled tight during delivery
- **Two-vessel cord (single umbilical artery):** one artery instead of two; associated with increased risk of fetal anomalies and intrauterine growth restriction; typically identified on ultrasound



The Umbilical Cord After Birth

Birth and Postpartum

The timing of **umbilical cord clamping** is a significant clinical and physiological decision. Immediate cord clamping (within 30 seconds) was once standard practice but has been largely replaced by **delayed cord clamping** (waiting at least 60 seconds) in current guidelines from the World Health Organization and most obstetric bodies.

Delayed cord clamping allows continued transfer of oxygenated blood from the placenta to the newborn after birth, increasing the newborn's **blood volume by up to 30%** and providing a substantial boost to iron stores that may protect against anemia in the first year of life. For preterm infants, the evidence is particularly strong.

Some families choose **lotus birth** (leaving the cord attached until it naturally dries and falls away) or have cultural and ceremonial practices around the cord and placenta. Doulas can hold space for these choices with curiosity and respect, while being familiar enough with the physiology to support informed conversations.

3.10.5 Fetal Circulation

Fetal circulation is fundamentally different from the circulation of a born person. Because the fetus cannot breathe air or eat food in utero, the circulatory system must route blood through the placenta for gas exchange and nutrition, while diverting blood **away from the non-functioning lungs and the relatively inactive liver**. This is achieved through three temporary structures called **shunts**.

The Three Fetal Shunts

Table 3.10.2: Fetal Shunts

Shunt	Function	What Happens at Birth
Ductus venosus	Bypasses liver; Connects umbilical vein to IVC	Closes as umbilical flow stops; Becomes ligamentum venosum
Foramen ovale	Opening between right and left atria; Bypasses lungs	Closes as lung pressure drops and left atrial pressure rises; Becomes fossa ovalis
Ductus arteriosus	Connects pulmonary artery to aorta; Bypasses lungs	Constricts in response to rising oxygen levels; Becomes ligamentum arteriosum

Transition to Newborn Circulation

The most dramatic cardiovascular event in human life happens in the first moments after birth. When the umbilical cord is clamped, and the newborn takes its first breath:

- The lungs expand, and pulmonary vascular resistance drops sharply, allowing blood to flow through the lungs for the first time
- The **ductus venosus** closes as blood flow from the umbilical vein ceases
- Increased oxygen levels in the blood cause the **ductus arteriosus** to constrict and close (functional closure within hours; complete closure within days to weeks)
- Rising pressure in the left atrium closes the **foramen ovale** (functional closure is immediate; anatomical closure takes weeks to months)

This transition is why the first breath matters so profoundly, and why conditions that delay or impair it — prematurity, respiratory distress, meconium aspiration — require immediate clinical support. Delayed cord clamping supports this transition by allowing continued placental blood flow during the first breaths.



Fetal Circulation and Doula Knowledge

Birth

Understanding fetal circulation helps doulas make sense of several clinical observations and interventions:

- Why a low fetal heart rate (bradycardia) during labour is concerning: any restriction of umbilical blood flow reduces oxygen delivery to the fetus, and the fetal heart rate drops in response to hypoxia
- Why **meconium in the amniotic fluid** is monitored: fetal distress (often from oxygen compromise) can cause relaxation of the anal sphincter in utero
- Why **delayed cord clamping** supports the cardiovascular transition: blood continuing to flow from the placenta during the first breaths supplements the newborn's blood volume at the moment the lungs take over
- Why **skin-to-skin contact** supports circulatory stability in the newborn: warmth from the parent's body reduces the metabolic demand for thermoregulation and supports stable heart rate and temperature

Pregnancy Loss

When a pregnancy ends before the third trimester, the fetal circulatory system will not have had the benefit of substantial placental IgG transfer (which peaks in the third trimester) — relevant for understanding neonatal vulnerability in very preterm births, and for explaining to families why immune support (breastmilk, colostrum) is so valuable for early arrivals.

3.10.6 Placental Health and Monitoring in Pregnancy

Because the placenta performs the functions of so many organ systems for the fetus, any disruption to placental structure or function can have profound consequences for fetal growth, development, and survival.

Placental health is monitored throughout pregnancy through ultrasound, fetal movement tracking, and indirect markers such as blood pressure and urine protein.

Pre-eclampsia and Placental Perfusion

Pre-eclampsia is one of the most important placental-origin conditions in pregnancy. It is characterized by **hypertension (high blood pressure) and proteinuria (protein in urine)** developing after 20 weeks, often with systemic involvement of the liver, kidneys, and clotting system.

Current understanding views pre-eclampsia as fundamentally a **placental disease**. In normal early pregnancy, trophoblast cells remodel the spiral arteries of the uterus — converting them from narrow, high-resistance vessels into wide, low-resistance channels that can accommodate the tenfold increase in uterine blood flow required by term. In pre-eclampsia, this **spiral artery remodelling fails** or is incomplete, leaving the placenta chronically underperfused. The placenta responds by releasing signals (including anti-angiogenic factors) that cause widespread maternal vascular dysfunction.

Pre-eclampsia is therefore a window into the cardiovascular, renal, and immunological relationship between the pregnant person and the placenta. NK cells (Section 3.9.5) normally assist trophoblast invasion of spiral arteries; impaired NK cell function is associated with pre-eclampsia risk.



Pre-eclampsia and Doula Support

Pre-eclampsia affects approximately 2 to 8% of pregnancies and is a leading cause of maternal and perinatal mortality worldwide. It is significantly more common in people who are Black, Indigenous, and people of colour, reflecting both biological factors and systemic inequities in monitoring and care. A 2023 Health Quality Ontario report found that Black people in Ontario are 70% more likely to develop severe maternal morbidity than white people, with hypertensive disorders being a major contributor.

Doulas cannot diagnose pre-eclampsia, but they can be aware of warning signs that warrant urgent attention: sudden severe headache, visual changes (flashing lights or blurred vision), upper right abdominal pain, sudden severe swelling of the face or hands, or significantly elevated blood pressure readings at prenatal visits. Supporting clients in accessing timely care when these signs appear is within the doula's scope.

3.10.7 Placental Abnormalities

The placenta is the product of thousands of years of evolution and is remarkably well-adapted. Like any organ, however, it is not always perfect. The following conditions reflect abnormalities of placental location, attachment, or separation. While their diagnosis and management are outside the doula's scope, awareness of their existence, presentation, and clinical significance allows doulas to support clients who are managing or recovering from these complications.

Conditions of Placental Location

- **Placenta Previa:** the placenta implants low in the uterus, partially or completely covering the internal cervical os (opening). This means the placenta lies in the path of the baby and the birth canal. Incidence: 0.5 to 1% of pregnancies. Low-lying placentas identified early in pregnancy often resolve as the uterus grows. Those that persist may require a cesarean birth. Painless vaginal bleeding in the second or third trimester is a characteristic sign.

Conditions of Placental Separation

- **Placental Abruption:** the placenta partially or completely separates from the uterine wall before the birth of the baby. This reduces or stops oxygen and nutrient delivery to the fetus and causes internal (and sometimes external) bleeding. Incidence: 0.5 to 1% of pregnancies. Associated with hypertension, trauma, smoking, cocaine use, and prior abruption. Can present as sudden onset of abdominal pain and vaginal bleeding; a concealed abruption may have pain without visible bleeding. Significant abruptions require emergency delivery.
- **Placenta Accreta Spectrum (PAS):** a group of conditions in which the placenta abnormally adheres to (accreta), invades into (incretta), or penetrates through (percreta) the myometrium. This prevents normal placental separation after birth, leading to severe hemorrhage. Risk factors include prior cesarean births and placenta previa. Incidence has risen in parallel with cesarean rates. Management may include a planned cesarean hysterectomy. PAS is a leading cause of obstetric hysterectomy and maternal mortality.

Conditions of Placental Function

- **Placental Insufficiency:** the placenta fails to provide adequate oxygen and nutrients to the fetus, most often due to reduced blood flow. Results in **fetal growth restriction (FGR)** or intrauterine growth restriction (IUGR), low birth weight, and increased risk of stillbirth. Associated with pre-eclampsia, maternal hypertension, smoking, thrombophilia, and placental infarcts.
- **Placental Infarcts:** areas of dead tissue resulting from blood vessel occlusion and reduced blood flow. Small infarcts are common and clinically insignificant. Extensive infarction suggests significant vascular disease and is associated with placental insufficiency.

Structural Variations (for awareness, not assessment)

The following structural variations are noted in the slides as informational rather than testable. Awareness of their existence prepares doulas to understand clinical conversations, but assessment is outside the doula's scope:

- **Succenturiate (extra) lobes:** additional placental lobes separate from the main disc; associated with increased risk of retained placenta and hemorrhage
- **Bipartite placenta:** placenta in two approximately equal lobes
- **Circumvallate placenta:** a ring-like folded margin; associated with increased risk of growth restriction or abruption
- **Battledore placenta:** umbilical cord attaches at the very edge of the placenta; associated with increased risk of pregnancy loss
- **Velamentous cord insertion:** cord vessels travel unprotected through the membranes before reaching the placenta; associated with risk of vessel rupture, especially if over the cervix (vasa praevia)

3.10.8 The Placenta in Multiple Pregnancy

Multiple pregnancies — twins, triplets, and higher-order multiples — present unique placental configurations that directly affect fetal risk. The key variable is whether the fetuses share a placenta and/or a chorion.

Placental Configurations in Twin Pregnancy

- **Dichorionic-Diamniotic (DCDA):** each twin has its own placenta and amniotic sac. This is the configuration of all dizygotic (fraternal) twins and about one-third of monozygotic (identical) twins. Carries the lowest risk among twin configurations.
- **Monochorionic-Diamniotic (MCDA):** twins share one placenta and one chorion, but each has a separate amniotic sac. Occurs in approximately two-thirds of monozygotic twins. The shared placenta creates risk of **twin-to-twin transfusion syndrome (TTTS)**
- **Monochorionic-Monoamniotic (MCMA):** twins share both placenta and amniotic sac. Very rare and carries the highest risk, including cord entanglement.

Twin-to-Twin Transfusion Syndrome (TTTS)

TTTS occurs in approximately 10 to 15% of monochorionic-diamniotic twin pregnancies. It arises from **unequal blood sharing through vascular connections (anastomoses)** within the shared placenta. One twin (the donor) pumps blood through the placenta to the other (the recipient), resulting in:

- **Donor twin:** anemia, growth restriction, oligohydramnios (too little fluid)
- **Recipient twin:** polycythemia (too many red blood cells), enlarged heart, polyhydramnios (too much fluid), risk of heart failure

TTTS is a serious condition requiring specialist monitoring and potentially fetal intervention (laser ablation of placental anastomoses). Monochorionic twin pregnancies are monitored more frequently with ultrasound than singleton or dichorionic pregnancies for this reason.



Supporting Families with Multiple Pregnancies

Birth

Multiple pregnancies are often associated with increased medical monitoring, higher rates of cesarean birth, preterm delivery, and NICU admission. Families expecting multiples may have heightened anxiety and more complex birth planning. Doula supporting these families benefit from understanding placental chorionicity (the number of chorions), as this is the primary driver of risk stratification in twin pregnancy, not just the number of babies.

Twins born via cesarean section — common in monochorionic pregnancies — may receive less exposure to the maternal microbiome during birth, less delayed cord clamping, and sometimes

more immediate separation. Doulas can advocate for and support practices like skin-to-skin in theatre, early breastfeeding, and kangaroo care where these are clinically feasible.

3.10.9 The Placenta After Birth: The Third Stage

The birth of the placenta is the **third stage of labour**. After the baby is born, uterine contractions continue, causing the placenta to separate from the uterine wall and be expelled. The third stage typically lasts between 5 and 30 minutes in a physiological birth.

Physiological vs. Active Management of the Third Stage

- **Physiological (expectant) management:** waiting for the placenta to separate and be delivered with maternal effort and gravity, without drugs; typically takes longer but avoids pharmacological intervention
- **Active management:** administration of a uterotonic drug (most commonly **oxytocin or ergometrine**) immediately after birth to stimulate uterine contraction, followed by controlled cord traction. Significantly reduces the risk of postpartum hemorrhage (PPH). This is the recommended approach in most clinical settings.

After delivery, the placenta and membranes are examined by the midwife or clinician to confirm they are **complete**. Any retained placental fragments can cause hemorrhage or infection and must be removed.

Cultural and Ceremonial Significance

Across many cultures, the placenta holds deep cultural, spiritual, and ceremonial significance. It is known by many names — *whenua* (Maori), *ari* (multiple West African traditions), *buri* (Balinese) — and practices around its care after birth include burial, tree-planting, drying and encapsulation (placentophagy), ceremonial burning, and returning it to the earth.

Some families wish to keep the placenta for ceremony, burial, encapsulation, or inspection. Doulas can support families in communicating this wish to their care team and understanding hospital policies around placental retention. Many hospitals will accommodate this request with advance notice.



The Placenta Across the Full Spectrum

Pregnancy Loss

In pregnancy loss, the passage of placental and trophoblastic tissue is part of the physiological process, whether the loss is spontaneous or facilitated by medication or surgery. Following a pregnancy loss, clients may be offered inspection of the expelled tissue to confirm completion of the miscarriage; some clients find this distressing, and some find it meaningful. Doulas can help

clients understand they have choices about this, and that whatever they feel in this moment is valid.

Following a mid-trimester or late loss, the third stage — delivery of the placenta — still occurs. This can be a physically and emotionally complex experience. Having a doula present who understands that the placenta must be delivered and examined, and who can hold space for the grief of this moment, is a meaningful part of full-spectrum support.

Death and Dying

The placenta as a metaphor can be a powerful tool in conversations about the end of life. Just as the placenta sustains life in one context and is released in another, so too the body at the end of life gradually releases its sustaining functions. This is not meant as clinical content, but as an invitation: the biological literacy that comes from understanding the placenta can deepen a doula's capacity for presence at the threshold of life in all its forms.

3.10.10 Summary: The Placenta at a Glance

Table 3.10.3: The Placenta – Summary

Topic	Key Points
Development	From trophoblast of blastocyst; chorionic villi form by week 3; placentation complete by weeks 14-16
Structure	Disc-shaped; 20 cm diameter, 500-600 g at term; fetal side smooth, maternal side rough (cotyledons)
Placental Membrane	Separates maternal and fetal blood; maternal and fetal blood never mix directly
Functions (SERPENT)	Storage, Endocrine, Respiration, Protection, Excretion, Nutrition, Transfer
Umbilical Cord	2 arteries (waste from fetus) + 1 vein (oxygen to fetus); protected by Wharton's jelly; AVA
Fetal Shunts	Ductus venosus (bypasses liver), foramen ovale (bypasses lungs, right to left atria), ductus arteriosus (bypasses lungs, pulmonary artery to aorta); all close at birth
Fetal Haemoglobin	Higher oxygen affinity than adult Hb; allows oxygen extraction at lower partial pressures
Membranes	Chorion (outer) + amnion (inner) = chorioamnion; examined after birth for completeness
Amniotic Fluid	500-1000 ml at term; cushions, supports development, enables practice breathing and swallowing
Pre-eclampsia	Placental origin; impaired spiral artery remodelling; systemic vascular consequences
Placenta Previa	Low implantation covering cervix; risk of hemorrhage; may require cesarean
Placental Abruptio	Premature separation, hemorrhage, and fetal oxygen compromise
Placenta accreta spectrum	Abnormal deep attachment; risk of severe hemorrhage
TTTS	In monochorionic twins, unequal blood sharing through placental anastomoses
Third Stage	Delivery of placenta after birth; examined for completeness; cultural significance across many traditions

Section 3.11.5 is partially adapted from "[20.6 Development of Blood Vessels and Fetal Circulation](#)", and sections 3.11.1, 3.11.2, 3.11.3, 3.11.4, 3.11.6, and 3.11.7 from "[28.2 Embryonic Development](#)" in *Anatomy and Physiology 2e* by J. Gordon Betts, Kelly A. Young, James A. Wise, Eddie Johnson, Brandon Poe, Dean H. Kruse, Oksana Korol, Jody E. Johnson, Mark Womble, Peter DeSaix licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](#), except where otherwise noted.

3.11 The Passageway: The Pelvis

Understanding the musculoskeletal system (including connective tissues) helps doulas appreciate how positioning, movement, comfort measures, and body mechanics can influence comfort, pelvic space, fetal positioning, and labour progress. Rather than viewing the body as a rigid structure, doulas learn to recognize it as a dynamic landscape that continuously adapts to support pregnancy, birth, and postpartum recovery.



Learning Outcomes

By the end of this section, you will be able to:

- Explore functions of the Musculoskeletal System
- Detail the microscopic anatomy of the musculoskeletal system
- Describe the gross anatomy of a typical pelvis.
- Appreciate the variations in pelvic anatomy
- Identify pelvic floor muscles and function

3.11.1 Function of the Musculoskeletal System

Support, Movement, and Protection

The musculoskeletal system forms the body's structural landscape. Bones provide the framework that supports the body's weight and creates the spaces through which organs, blood vessels, nerves, and eventually a baby must pass. Muscles, joints, ligaments, and connective tissues allow this framework to move, adapt, and respond to changing demands throughout pregnancy and birth.

In addition to providing support, the musculoskeletal system facilitates **movement**. Bones act as levers, joints act as pivot points, and muscles generate force to create motion. Together, these structures allow us to walk, squat, bend, lift, and change positions throughout daily life and labour. Cartilage, intervertebral discs, and connective tissues also help absorb shock and distribute forces throughout the body, reducing wear and tear on joints and protecting delicate structures.

The skeleton also serves as a bridge between the upper and lower body. The spine, pelvis, and surrounding muscles coordinate movement, transfer weight, and maintain balance. During pregnancy, this relationship becomes especially important as the growing uterus shifts the body's centre of gravity and changes posture, movement patterns, and weight distribution.

For doulas, the pelvis is of particular importance. The bony pelvis forms the passageway through which a baby navigates during labour, while the pelvic floor muscles provide support for the pelvic organs and help guide fetal descent. Ligaments act like suspension systems, connecting bones and stabilizing joints while allowing for the flexibility needed during pregnancy and birth.

Pregnancy hormones, including relaxin, contribute to changes in connective tissues throughout the body. These adaptations can increase mobility in the pelvis, alter posture, and affect comfort and movement. Muscles of the abdomen, back, diaphragm, and pelvic floor work together to support the growing uterus, maintain balance, and generate pressure during labour and birth.

3.11.2 Anatomy of the Musculoskeletal System: Cells and Tissues

Although bones, ligaments, tendons, and muscles may appear static, they are living tissues that are constantly adapting to the demands placed upon them. Throughout life—and especially during pregnancy—the musculoskeletal system undergoes continuous growth, repair, and remodelling. This work is carried out by specialized cells that build, maintain, and repair the structures responsible for support, movement, and stability.

Bone Cells

Bone is a dynamic tissue that is continuously being broken down and rebuilt.

- **Osteogenic cells** are stem cells found within bone tissue that can develop into bone-forming cells.
- **Osteoblasts** are the builders of bone. They produce the collagen-rich matrix that forms the framework of new bone tissue.
- **Osteocytes** are mature bone cells that maintain existing bone and help regulate the remodelling process by sensing mechanical stress and communicating with other bone cells.
- **Osteoclasts** break down old or damaged bone tissue so that new bone can be formed in its place.

Together, these cells allow bones to adapt to changing physical demands, heal after injury, and respond to hormonal changes throughout life.

Muscle Cells

There are three types of muscles: Cardiac, smooth, and skeletal. In this section, we will focus on skeletal muscles. Skeletal muscles are composed of specialized cells called **muscle fibres** (myocytes).

- **Skeletal muscle cells** are long, multinucleated cells (yes, cells with more than one nucleus) capable of voluntary contraction (somatic nervous system).
- These cells work together to generate movement, maintain posture, stabilize joints, and support organs.
- Important muscles for doulas to understand include the abdominal muscles, diaphragm, deep spinal stabilizers, and pelvic floor muscles.

Connective Tissue Cells

Ligaments, tendons, fascia, and many supportive structures throughout the pelvis are composed primarily of connective tissue. The primary cells found within connective tissues are **fibroblasts**.

- **Fibroblasts** produce and maintain the extracellular matrix, including collagen and elastin fibres.
- They play a critical role in tissue repair, wound healing, and maintaining the strength and flexibility of ligaments, tendons, and fascia.



Life Connection

During pregnancy, hormonal changes influence connective tissues throughout the body. Increased levels of relaxin, progesterone, and estrogen can alter the properties of collagen-rich tissues, contributing to increased joint mobility and changes in posture and movement.

3.11.3 Gross Anatomy of the Pelvis

The **pelvic girdle** (also called the **hip girdle**) is formed by two large **hip bones**, known anatomically as the **coxal bones** (coxal = hip). These bones serve as the attachment points for the lower limbs and help transfer weight between the upper and lower body.

Each coxal bone is firmly connected to the **sacrum**, a triangular bone located at the base of the spine. At the front of the body, the right and left hip bones meet at a joint called the **pubic symphysis**.

Together, the two coxal bones, the **sacrum**, and the **coccyx** (tailbone) form the **bony pelvis**. This basin-shaped structure provides support and protection for the pelvic organs and creates the passageway through which a baby navigates during birth.

The bones of the pelvis are strongly united to each other to form a largely immobile, weight-bearing structure. This is important for stability because it enables the weight of the body to be easily transferred laterally from the vertebral column, through the pelvic girdle and hip joints, and into either lower limb whenever the other limb is not bearing weight. Thus, the immobility of the pelvis provides a strong foundation for the upper body as it rests on top of the mobile lower limbs.

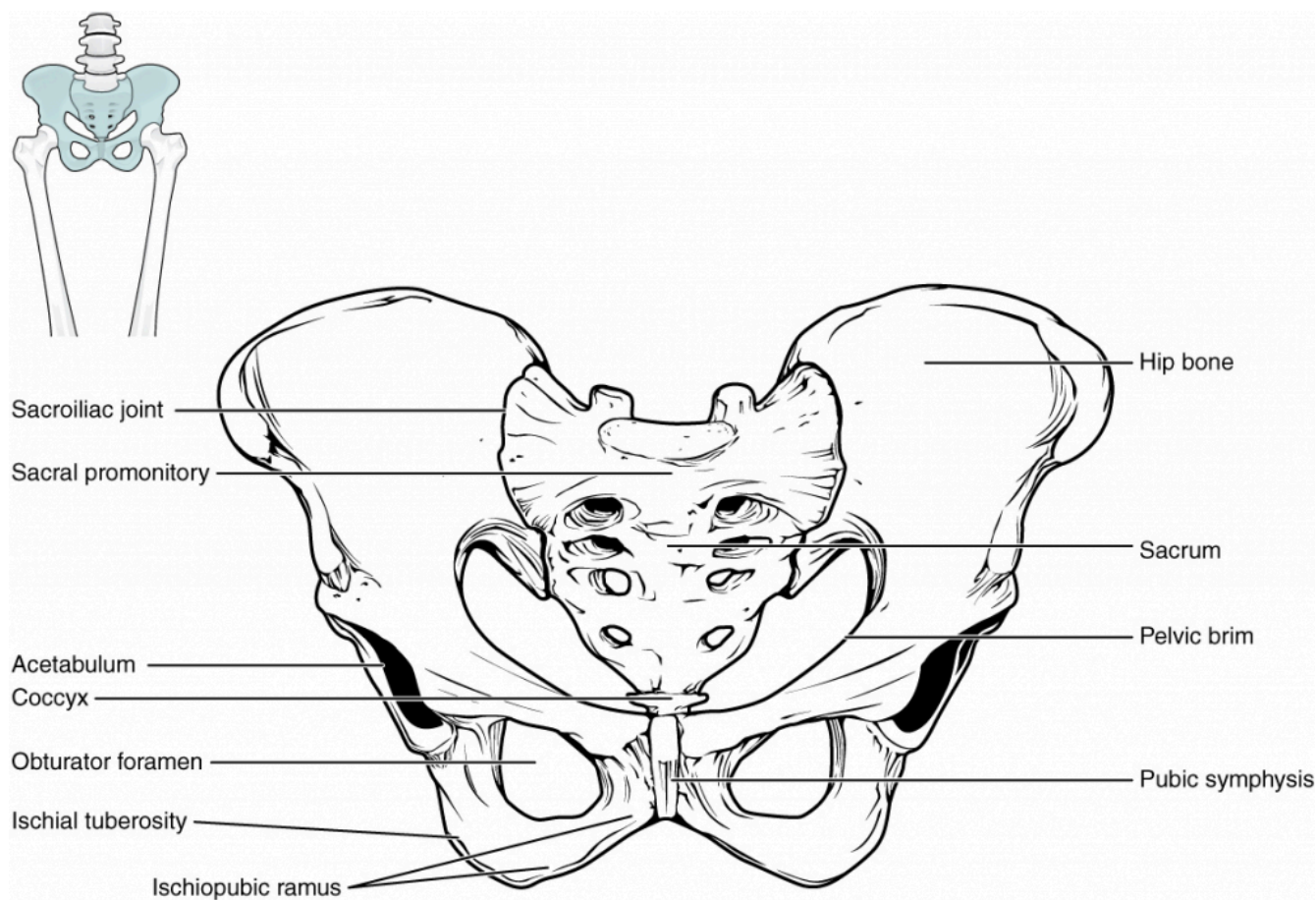


Figure 3.11.1 “Pelvis” from [Fundamentals of Anatomy and Physiology](#), CC BY-SA 4.0.

Hip Bones

Each adult hip bone is formed by three separate bones that fuse together during the late teenage years. These bony components are the ilium, ischium, and pubis. These names are retained and used to define the three regions of the adult hip bone.

1. **Ilium:** The large, fan-shaped upper portion of the hip bone that connects to the sacrum at the sacroiliac (SI) joint.
2. **Ischium:** The lower, back portion of the hip bone that forms the “sit bones” and supports the body when sitting.
3. **Pubis:** The front portion of the hip bone that joins with the pubic bone on the opposite side at the **pubic symphysis**, forming the front of the pelvis.

Pelvis

The **pelvis** consists of four bones: the right and left hip bones, the sacrum, and the coccyx (see Figure 3.11.1). The pelvis has several essential functions. Its primary role is to support the weight of the upper body when sitting and to transfer this weight to the lower limbs when standing. It serves as an attachment point for trunk and

lower limb muscles and protects the internal pelvic organs. When standing in the anatomical position, the pelvis is tilted anteriorly.

Several ligaments unite the bones of the pelvis (Figure 3.11.2). The largely immobile sacroiliac joint is supported by a pair of strong ligaments that are attached between the sacrum and ilium portions of the hip bone. These are the **anterior sacroiliac ligament** on the anterior side of the joint and the **posterior sacroiliac ligament** on the posterior side. Also spanning the sacrum and hip bone are two additional ligaments. The **sacrospinous ligament** runs from the sacrum to the ischial spine, and the **sacrotuberous ligament** runs from the sacrum to the ischial tuberosity. These ligaments help to support and immobilize the sacrum as it carries the weight of the body.

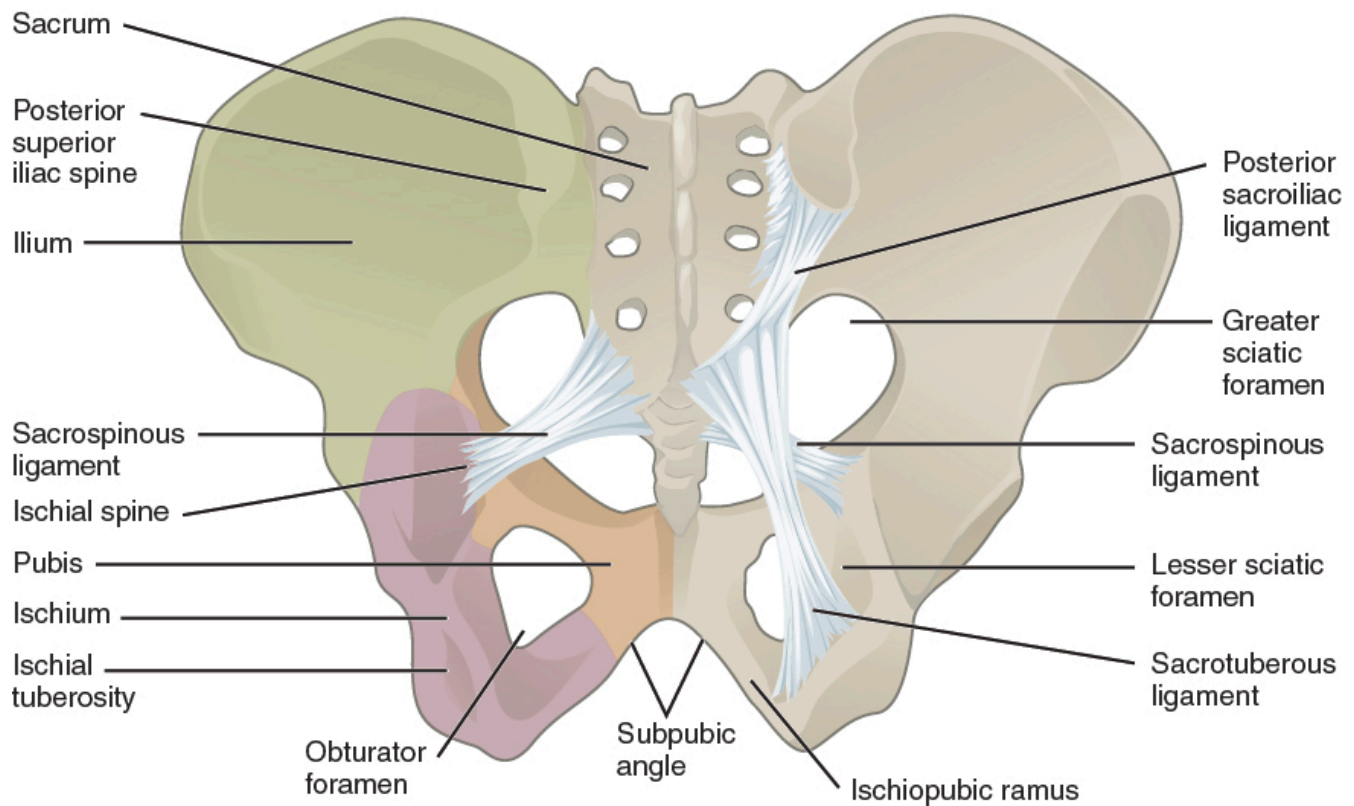


Figure 3.11.2 “[Ligaments of the Pelvis](#)” from [Fundamentals of Anatomy and Physiology, CC BY-SA 4.0](#). The posterior sacroiliac ligament supports the sacroiliac joint. The sacrospinous ligament spans the sacrum to the ischial spine, and the sacrotuberous ligament spans the sacrum to the ischial tuberosity.

The space enclosed by the bony pelvis is divided into two regions.

Greater Pelvis

The broad, superior region, defined laterally by the large, fan-like portion of the upper hip bone, is called the **greater pelvis** (greater pelvic cavity; false pelvis). This broad area is occupied by portions of the small and large intestines, and because it is more closely associated with the abdominal cavity, it is sometimes referred to as the false pelvis.

Lesser Pelvis

More inferiorly, the narrow, rounded space of the **lesser pelvis** (lesser pelvic cavity; true pelvis) contains the bladder and other pelvic organs, and thus is also known as the true pelvis. The **pelvic brim** (shown in red in Figure 3.11.3) is also known as the pelvic inlet. It forms the superior margin of the lesser pelvis, separating it from the greater pelvis. The inferior limit of the lesser pelvic cavity is called the pelvic outlet. This large opening is defined by the inferior margin of the pubic symphysis anteriorly, and the ischiopubic ramus, the ischial tuberosity, the sacrotuberous ligament, and the inferior tip of the coccyx posteriorly. Because of the anterior tilt of the pelvis, the lesser pelvis is also angled, giving it an anterosuperior (pelvic inlet) to posteroinferior (pelvic outlet) orientation.

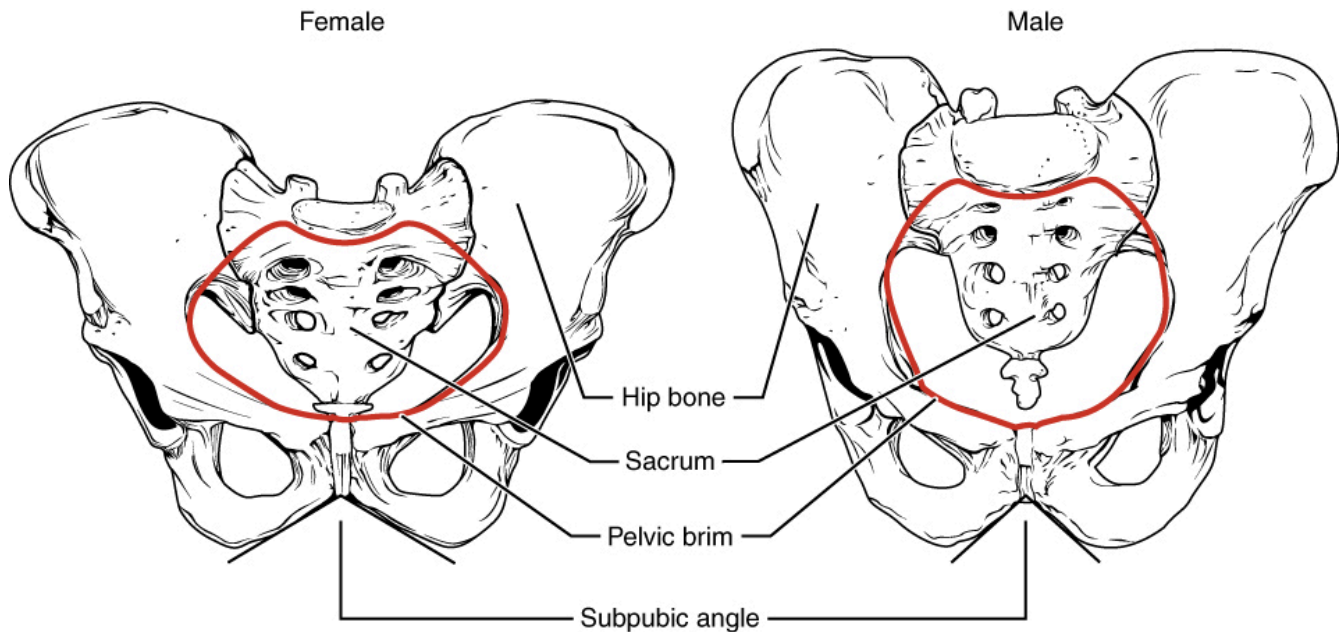


Figure 3.11.3 “Male and Female Pelvis” from [Fundamentals of Anatomy and Physiology, CC BY-SA 4.0](#). The female pelvis is adapted for childbirth and is broader, with a larger subpubic angle, a rounder pelvic brim, and a wider and shallower lesser pelvic cavity than the male pelvis.

Comparison of the Female and Male Pelvis

The differences between the adult female and male pelvis relate to function and body size. In general, the bones of the male pelvis are thicker and heavier, adapted for support of the male’s heavier physical build and stronger muscles. The greater sciatic notch of the male hip bone is narrower and deeper than the broader notch of females. Because the female pelvis is adapted for childbirth, it is wider than the male pelvis, as evidenced by the distance between the anterior superior iliac spines (see Figure 3.11.2). The ischial tuberosities of females are also farther apart, which increases the size of the pelvic outlet. Because of this increased pelvic width, the subpubic angle is larger in females (greater than 80 degrees) than it is in males (less than 70 degrees). The female sacrum is wider, shorter, and less curved, and the sacral promontory projects less into the pelvic cavity, thus giving the female pelvic inlet (pelvic brim) a more rounded or oval shape compared to males. The lesser pelvic cavity of females is also wider and shallower than the narrower, deeper, and tapering lesser pelvis of males. Because of the obvious differences between female and male hip bones, this is the one bone of the body that allows for the most accurate sex determination. Table 3.11.1 provides an overview of the general differences between the female and male pelvis.

Table 3.11.1: Comparison of Female and Male Pelvises

Trait	Female Pelvis	Male Pelvis
Pelvic weight	Bones of the pelvis are lighter and thinner	Bones of the pelvis are thicker and heavier
Pelvic inlet shape	Pelvic inlet has a round or oval shape	Pelvic inlet is heart-shaped
Lesser pelvic cavity shape	Lesser pelvic cavity is shorter and wider	Lesser pelvic cavity is longer and narrower
Subpubic angle	Subpubic angle is greater than 80 degrees	Subpubic angle is less than 70 degrees
Pelvic outlet shape	Pelvic outlet is rounded and larger	Pelvic outlet is smaller

Overview

- Pelvis consists of the two hip bones, the sacrum, and the coccyx (4 bones total)
- The hip bone is composed of the Ilium, Ischium, and Pubis
- Joints: 2 x Sacroiliac (SI) joints, and the pubic symphysis
- Pelvic Inlet: Pelvic brim
- Pelvic Outlet: Iliac Spines



Review: Pelvis

Quiz Text Description

1. How many bones fuse in adulthood to form the hip bone?
 - a. 2
 - b. 3
 - c. 4
 - d. 5
2. Which component forms the superior part of the hip bone?
 - a. Ilium
 - b. Pubis
 - c. Sacrum
 - d. Ischium

Solution:

1. b. 3
2. a. Ilium

3.11.4 Pelvic Variation

The pelvis varies in shape and size between individuals — this is normal, common, and not a predictor of birth outcome. Several features of pelvic anatomy influence how a fetus moves, rotates, and descends during labour, and understanding this variation helps doulas provide informed, responsive support.

What Varies and Why It Matters

Four structural features are most relevant to fetal movement through the pelvis:

- The **shape of the pelvic inlet (brim)** — whether it is rounder, more oval, or narrower affects how the fetal head initially engages
- The **depth and width of the pelvic cavity** — a shallower or wider cavity may allow more freedom of movement; a deeper or narrower one may require more rotation
- The **prominence of the ischial spines** — more prominent spines reduce the space at mid-pelvis and may affect how the fetal head rotates internally
- The **curve and position of the sacrum** — a well-curved sacrum creates a roomier posterior space; a straighter sacrum may reduce room for descent

Variation in these features is not pathological. It reflects the natural diversity of human bodies and can result from genetics, prior trauma (such as pelvic fractures), or spinal differences such as scoliosis or kyphosis — all of which may gently shift the dimensions of the pelvic cavity.



Historical Classification x Racism

The four-type pelvic classification system (developed in the 1930s) has been taught in obstetric training for decades (See figure 3.11.4). However, this taxonomy was built on racialized categories and has since been used to pathologize the bodies of Black, Indigenous, and other racialized people — framing certain pelvic shapes as less “ideal” in ways that contributed to discriminatory clinical decision-making.

The evidence base for using pelvic shape to predict birth outcomes is also poor. Pelvimetry, the clinical measurement of pelvic dimensions, has been largely abandoned as a routine practice because pelvic shape alone does not reliably predict whether a vaginal birth will be possible or safe.

As doulas, being aware of this history matters. When clients are told their pelvis is “too small” or “wrong shaped,” they deserve support in asking questions, seeking second opinions, and understanding that anatomy alone rarely tells the whole story.

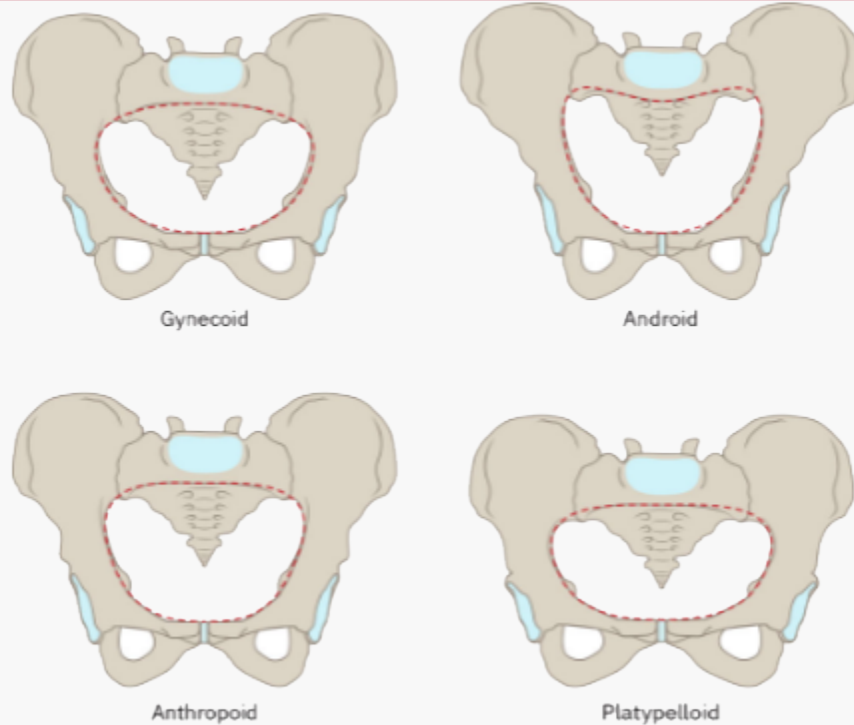


Figure 3.11.4. “[The four types of Female pelvis](#)” from [Nursing Health Promotion, CC BY 4.0](#).

3.11.5 Pelvic Floor Muscles

The Pelvic Floor

The pelvic floor — also called the pelvic diaphragm — is a hammock-like sheet of muscle that forms the base of the pelvic cavity. It stretches from the pubic bone at the front to the coccyx (tailbone) at the back and is made up of two main muscles: the levator ani and the ischiococcygeus. The pelvic floor has openings for the structures that pass through it: the anal canal and urethra in all people, and additionally the vagina in people with female anatomy.



Key Term: Pelvic viscera

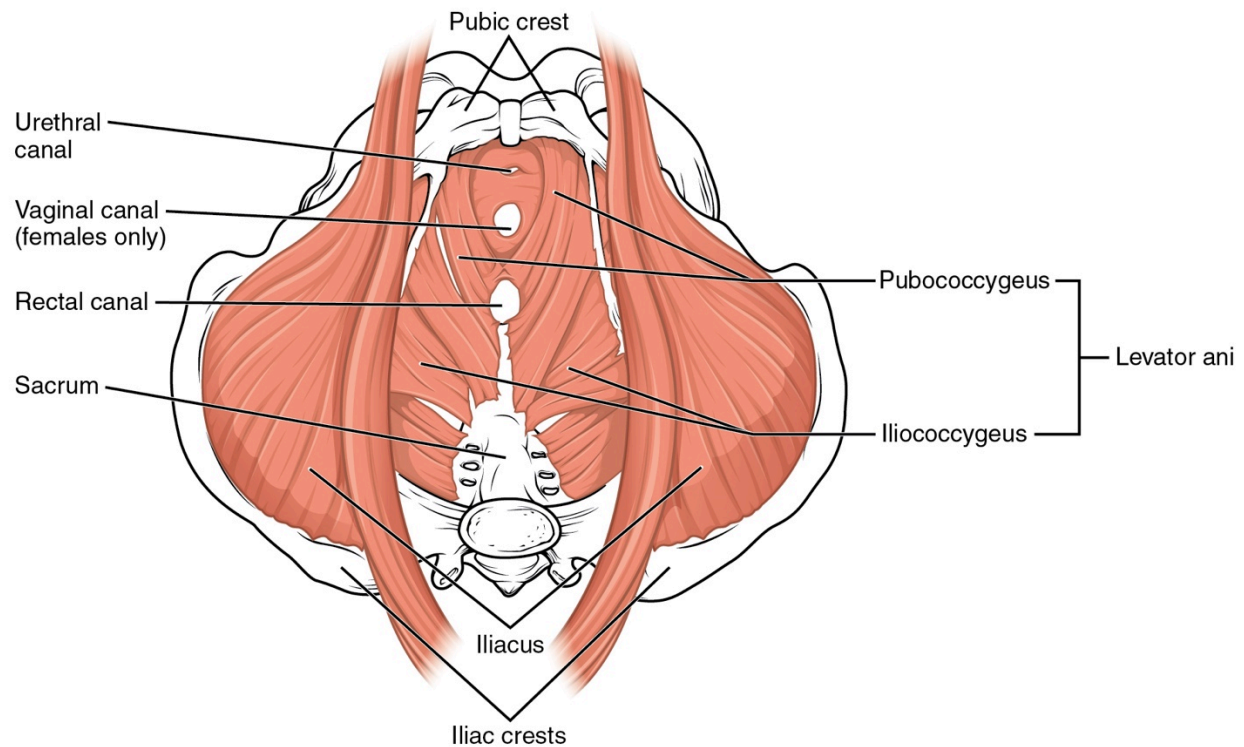
The internal organs housed within the pelvic cavity include the bladder, rectum, uterus (in people with female anatomy), and related structures. The pelvic floor muscles sit beneath these organs and bear their weight.

The Levator Ani

The **levator ani** is the largest and most important muscle of the pelvic floor. It is made up of two parts: the **pubococcygeus** (running from the pubic bone to the coccyx) and the **iliococcygeus** (attaching from the ischium to the coccyx). Together, they form a broad supportive shelf beneath the pelvic organs. The levator ani does several important things:

- **Supports the pelvic organs** — bearing the weight of the bladder, uterus, and rectum
- **Resists intra-abdominal pressure** — when we cough, laugh, or strain, the abdomen compresses inward. The levator ani pushes back, directing that force appropriately: toward the colon to assist with defecation, and toward the uterus to assist with birth
- **Acts as a sphincter** — it creates voluntary closure around the urethra and anus

The **ischiococcygeus** assists the levator ani and also draws the coccyx slightly forward — a movement relevant during the pushing phase of labour.



Pelvic diaphragm (superior view)

Figure 3.11.5 “[Muscles of the Pelvic Floor](#)” from [Anatomy and Physiology 2E](#), CC BY-SA 4.0. Superior view of the pelvic diaphragm, showing the pubococcygeus and iliococcygeus portions of the levator ani, and the ischiococcygeus. These muscles support the pelvic organs, resist intra-abdominal pressure, and form sphincters around the urethra, rectum, and vagina.

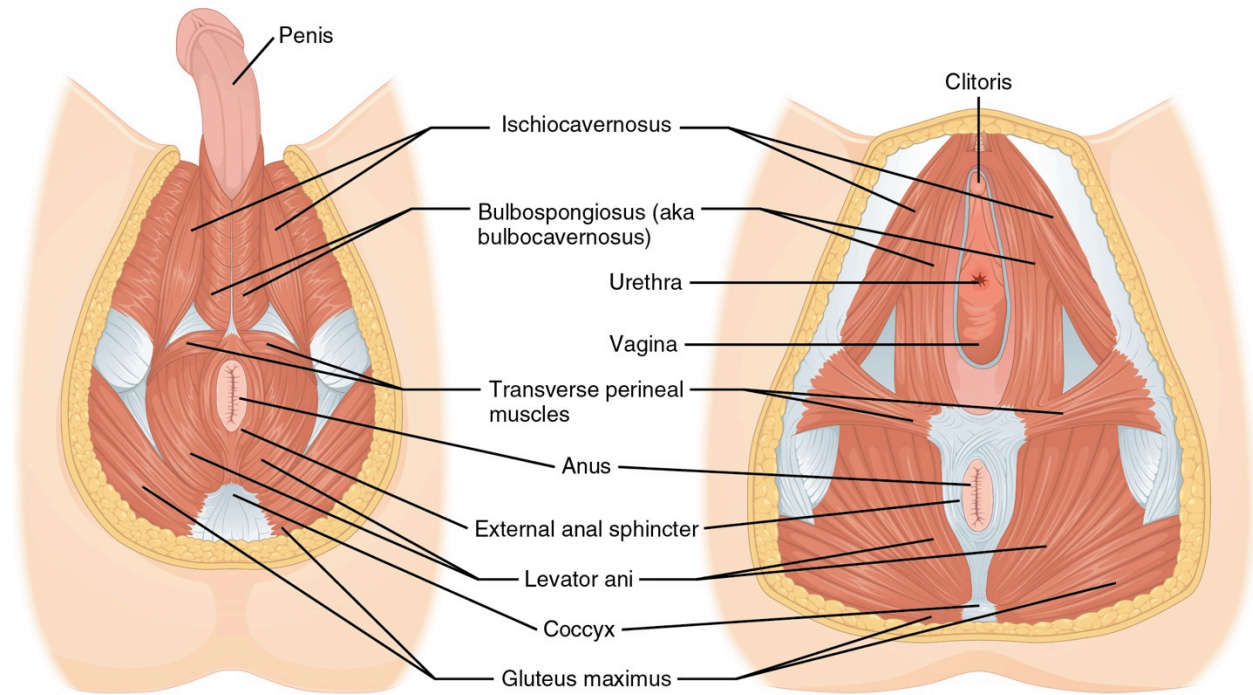
The Perineum

The perineum is the diamond-shaped region located just below (inferior to) the pelvic floor. Its boundaries are the pubic symphysis at the front, the coccyx at the back, and the ischial tuberosities (the “sit bones”) on each side. It is divided into two triangles by an imaginary line drawn across the body:

- **Urogenital triangle** (front) — contains the external genitals and urethral opening
- **Anal triangle** (back) — contains the anus and its surrounding muscles

The perineum is also described in two layers — superficial and deep — each containing distinct muscles. Some muscles are shared across sexes; others are specific to anatomy.

In people with female anatomy, the deep layer includes the **compressor urethrae** and the **sphincter urethrovaginalis**, which function to close the vagina. In people with male anatomy, the **deep transverse perineal muscle** plays a role in ejaculation.



Male perineal muscles: inferior view

Female perineal muscles: inferior view

Figure 3.11.6. "[Muscles of the Perineum](#)" from [Anatomy and Physiology 2E](#), CC BY-SA 4.0. The perineum muscles are involved in urination in all people, ejaculation in those with male anatomy, and vaginal contraction in those with female anatomy. Superficial and deep layers are both shown.

Table 3.11.2: Functions of the Pelvic Muscles

Muscle Type	Muscle	Action	Innervation
Pelvic floor muscles	Levator ani pubococcygeus; levator ani iliococcygeus	Compresses anal canal; defecation; urination; birth; coughing	Pudendal nerve; Spinal nerves S2-S3
Superficial muscle	Superficial transverse perineal	None- supports perineal body maintaining anus at centre of perineum	Pudendal nerve
	Bulbospongiosus	Involuntary response that compresses urethra when excreting urine in both sexes or while ejaculating in males; also aids in erection of penis in males	
	Ischiocavernosus	Compresses veins to maintain erection of penis in males; erection of clitoris in females	
Deep muscle	External urethral sphincter	Voluntarily compresses urethra during urination	Pudendal nerve spinal nerves S2-S4; pelvic splanchnic nerve
	External anal sphincter	Closes anus	



Abortion and Pregnancy Loss

In uterine procedures such as surgical abortion, uterine evacuation for pregnancy loss, or dilation and curettage (D&C), the muscles of the perineum and pelvic floor respond to cervical dilation and instrumentation. Cramping and pelvic heaviness after these procedures are the body's normal response to that stimulation — the same muscles that assist with birth are involved in uterine expulsion here, too.

Clients may experience involuntary pelvic floor tension — a guarding or bracing response — related to pain, anxiety, or past trauma. As a doula, you can support nervous system regulation through breath cuing, positioning, and calm presence, all of which help the external urethral and anal sphincters and the levator ani release rather than hold. This is also relevant when supporting clients through miscarriage at home, where passage of tissue involves the same muscular activity as labour on a smaller scale.

3.11.6 Summary: The Passageway at a Glance

3.11.3: Summary – The Pelvis

Topic	Key Points
Musculoskeletal functions	Support, movement, protection; bones as levers, joints as pivots, muscles as force generators; pregnancy shifts the centre of gravity and increases ligament laxity via relaxin
Bone cells	Osteoblasts (build), osteoclasts (break down), osteocytes (maintain); continuous remodelling throughout life and pregnancy
Muscle cells	Skeletal muscle fibres (myocytes) are long, multinucleated, voluntarily contracted; pelvic floor, abdominals, diaphragm, and deep spinal stabilizers are key for doulas
Connective tissue cells	Fibroblasts produce collagen and elastin; pregnancy hormones alter collagen properties, increasing joint mobility
Pelvic bones	4 bones: 2 hip bones (each formed by ilium, ischium, and pubis), sacrum, and coccyx
Pelvic joints	2 sacroiliac (SI) joints and 1 pubic symphysis; largely immobile but influenced by relaxin in pregnancy
Greater pelvis (false pelvis)	Superior, broad region; contains lower abdominal organs; not the birth passageway
Lesser pelvis (true pelvis)	Inferior, narrower region; contains bladder, uterus, rectum; the passageway for birth
Pelvic inlet/outlet	Inlet = pelvic brim (superior opening); outlet = bounded by ischial spines and coccyx (inferior opening)
Pelvic variation	Normal diversity in inlet shape, cavity depth, ischial spine prominence, sacral curve; not pathological; does not determine birth outcome; historical classification has a racialized history
Levator ani	Two parts; supports pelvic organs, resists intra-abdominal pressure, creates sphincters around urethra and anus
Perineum	Diamond-shaped region inferior to pelvic floor; divided into urogenital triangle (anterior) and anal triangle (posterior); superficial and deep muscle layers
Perineum muscles	Shared: levator ani, superficial transverse perineal, bulbospongiosus, ischiocavernosus, external urethral sphincter, external anal sphincter. Female anatomy: compressor urethrae, sphincter urethrovaginalis. Male anatomy: deep transverse perineal
Innervation	Primarily pudendal nerve (S2–S4) and pelvic splanchnic nerves
Clinical relevance	Pelvic floor supports birth and expulsion; perineal body is the central anchor point; tears and episiotomies affect this region; postpartum pelvic floor physiotherapy supports recovery

This section is partially adapted from “[9.2 Skeletal Muscle](#)”, “[10.1 the Functions of the Skeletal System](#)”, “[10.3 Bone Structure](#)”, and “[11.3 The Pelvic Girdle and Pelvis](#)” in [Fundamentals of Anatomy and Physiology](#) by Anna Chruścić, Kate Kauter, Louisa Windus, and Eliza Whiteside licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](#), except where otherwise noted.

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3.12 The First Food: Lactation and the Mammary Glands

Human milk is the only substance designed, over millions of years of evolution, specifically for human infants. It is not simply nutrition: it is an immunological bridge, a microbiome seeding agent, a hormonal signal, and a dynamic biological fluid that changes composition within a single feeding session and across the months of lactation. For doulas, understanding lactation means understanding one of the most physiologically complex and emotionally charged aspects of the early postpartum experience.

A note on language: this section uses the terms breastfeeding and chestfeeding interchangeably where appropriate. **Chestfeeding** is the term preferred by many non-binary and transmasculine people, and is inclusive of all who feed from the chest. Top surgery (removal of breast tissue) can limit or prevent milk production. Breast reductions and augmentations may also affect ductal anatomy and milk supply. Doulas serve people with a wide range of body configurations and feeding experiences, and this section is written with that breadth in mind.



Learning Outcomes

By the end of this section, you will be able to:

- Identify the general anatomy of the mammary gland.
- Describe the hormones associated with lactation and explain how they work.
- Explore the physiology of milk production and infant feeding.
- Describe the properties and components of human milk across its stages.

3.12.1 Anatomy of the Mammary Gland

Mammary glands are modified sweat glands and, as noted in [Section 3.7.2](#), are classified as exocrine glands: they secrete milk through ducts to an external surface. They are present in all people regardless of assigned sex, though their functional development is hormonally driven and most pronounced in people with female reproductive anatomy.

In a non-pregnant, non-lactating person, the breast is composed primarily of **adipose (fatty) tissue** and **collagenous connective tissue**, with mammary glandular tissue making up a relatively small proportion of total breast volume. Breast size in this state reflects primarily the amount of adipose tissue, not glandular capacity, and is not predictive of milk production potential.

Structural Organization: Lobe to Lactocyte

The glandular tissue of the breast is organized in a hierarchical structure, from large to small:

- **Lobes:** the mammary gland contains 12 to 20 tear-shaped lobes arranged radially around the nipple. Each lobe functions as a distinct secretory unit.
- **Lobules:** each lobe is subdivided into lobules, which are clusters of alveoli draining to a common duct.
- **Alveoli:** balloon-like sacs lined with milk-secreting cells. These expand and multiply significantly during pregnancy in response to hormonal stimulation (Riordan and Wambach, 2010).
- **Lactocytes:** the cuboidal epithelial cells lining the alveoli that synthesize and secrete the various components of milk.
- **Myoepithelial cells:** contractile cells that form a net around each alveolus. When stimulated by oxytocin, they squeeze the alveolus, propelling milk into the ducts. This is the physical mechanism of the let-down reflex.

Milk travels from the alveoli through a system of **lactiferous ducts** that converge toward the nipple, collecting in **lactiferous sinuses** before exiting through **4 to 18 nipple pores** at the surface of the nipple (Betts et al., 2022).

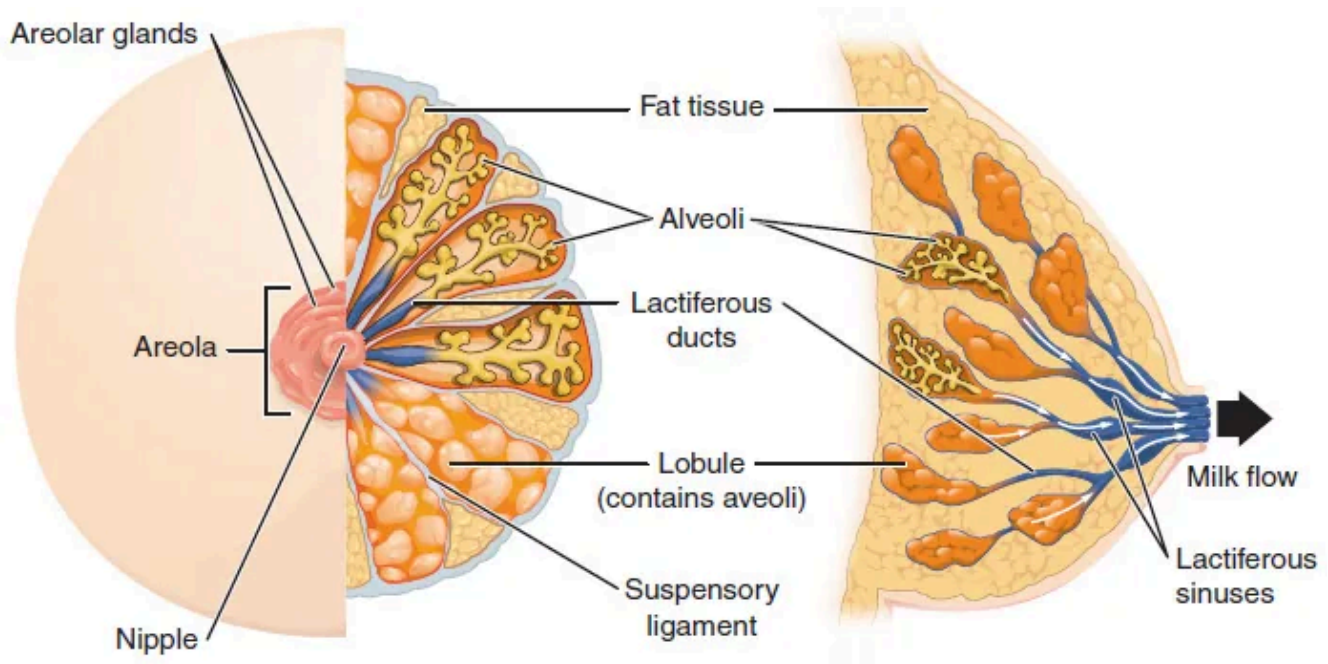


Figure 3.12.1 “[Anatomy of the Breast](#)” from [Anatomy and Physiology 2e](#), CC BY-NC-SA 4.0.

Supportive Structures

- **Pectoral and anterior serratus muscles:** lie beneath the breast tissue and form the chest wall base on which the breast rests.
- **Cooper’s ligaments** (suspensory ligaments): extend from the deep fascia of the chest wall outward to the skin overlying the breast, providing structural suspension. These stretch during pregnancy as the breast enlarges.
- **Montgomery’s tubercles** (Montgomery glands): small raised structures on the areola that secrete a fatty, antimicrobial oil. This oil lubricates the nipple, protects it from chapping and cracking during feeding, and may provide an olfactory cue to the newborn (Riordan and Wambach, 2010).

Blood Supply, Lymphatics, and Nerves

- **Blood supply:** the breast receives arterial blood primarily from the **subclavian artery** via the internal mammary artery, and from branches of the axillary artery. Rich vascularisation is essential to support the metabolic demands of milk synthesis.
- **Lymphatic drainage:** the breast drains primarily to the **axillary lymph nodes** (see [Section 3.9.2](#)). During lactation, this lymphatic network is relevant to the spread of infection in mastitis.
- **Nerve supply:** sensory nerves from the **fourth intercostal nerve** supply the nipple and areola. These nerves transmit the tactile stimulus of suckling to the hypothalamus and pituitary, initiating the hormonal cascade of prolactin and oxytocin release.

Changes During Pregnancy

The mammary glands undergo significant structural transformation during pregnancy, driven by the hormonal environment described in [Sections 3.7.6 and 3.7.9](#):

- **Estrogen:** stimulates growth and branching of the lactiferous duct system.
- **Progesterone:** drives proliferation of the alveolar clusters, preparing the glandular tissue for secretory function.
- **Prolactin, growth hormone, and cortisol:** further expand ductal architecture and stimulate glandular development.

Visible signs of these changes include breast enlargement, more prominent surface veining (reflecting increased blood flow), darkening and enlargement of the areola, increased nipple erectility, and noticeable enlargement of Montgomery's tubercles. From approximately the 16th week of pregnancy, the alveoli begin filling with **colostrum**, the first milk.



Anatomy, Surgery, and Feeding Capacity

Ductal anatomy is the key structural determinant of feeding capacity. **Breast augmentation** (implants placed behind or in front of the chest muscle) generally does not disrupt ductal anatomy if the incision avoids the areola, and most people can breastfeed after this surgery. However, **breast reduction surgery** that involves repositioning the nipple-areola complex, or **top surgery** involving mastectomy, may sever lactiferous ducts and significantly reduce or eliminate milk production capacity.

People who have had chest surgery and wish to feed should be supported in working with a lactation consultant early in pregnancy to assess capacity and set realistic expectations. Some people who have had top surgery do produce milk; others do not. A doula's role is to support the client's goals without assumption in either direction.

3.13.2 Hormonal Control of Lactation

Lactation is governed by a sequence of hormonal events that begins during pregnancy and continues for as long as feeding is maintained. The key hormones are **prolactin** (which drives milk production) and **oxytocin** (which drives milk delivery). Both have been introduced in Section 3.8.8; this section applies that knowledge specifically to lactation physiology.

Prolactin: Producing the Milk

Prolactin is secreted by the **anterior pituitary gland**. From approximately the fifth week of pregnancy, circulating prolactin rises steadily, eventually reaching 10 to 20 times its pre-pregnancy level. This rising prolactin, combined with estrogen and progesterone from the placenta, prepares the glandular tissue of the breast anatomically for secretion.

However, milk synthesis is actively suppressed during pregnancy by high circulating estrogen and progesterone, which inhibit prolactin's secretory effect at the level of the alveolar cell. It is only when the placenta is delivered, and these hormones drop sharply, that prolactin's inhibition is lifted and milk production begins. This is why milk "comes in" after birth, not before.

After birth, baseline prolactin falls, but each feeding session triggers a one-hour prolactin spike that stimulates production of milk for the next feed. This mechanism means that milk production is driven primarily by nipple stimulation and milk removal: the more frequently and effectively milk is removed, the more prolactin spikes occur, and the more milk is produced. This is the physiological basis of the **supply-and-demand principle** of lactation.

Prolactin levels are highest during night feeds, which is one physiological reason night feeding supports milk supply, particularly in the early weeks.

Oxytocin: Delivering the Milk

While prolactin causes milk to be synthesized in the alveoli, oxytocin causes it to be released into the ducts. Oxytocin is produced in the hypothalamus and released from the **posterior pituitary** in response to nipple stimulation. It binds to receptors on the myoepithelial cells surrounding the alveoli, causing them to contract and squeeze milk into the lactiferous ducts. This is the **let-down reflex**, also called the **milk ejection reflex**.

The let-down reflex typically occurs within one minute of the infant beginning to suckle. It can also be triggered by non-tactile cues: the sound of a baby crying, the sight of a baby, or even the thought of the infant. This reflects the deep integration of oxytocin with the **limbic (emotional) brain**.

Conversely, the let-down reflex can be inhibited by **stress, pain, embarrassment, or anxiety**, all of which activate the sympathetic nervous system and release epinephrine. As noted in Section 3.8.8, epinephrine competes with oxytocin and can delay or suppress milk ejection. This is one physiological mechanism through which a difficult or unsupportive feeding environment reduces milk transfer.

Increased milk production triggers increased suckling by infant (positive feedback loop).

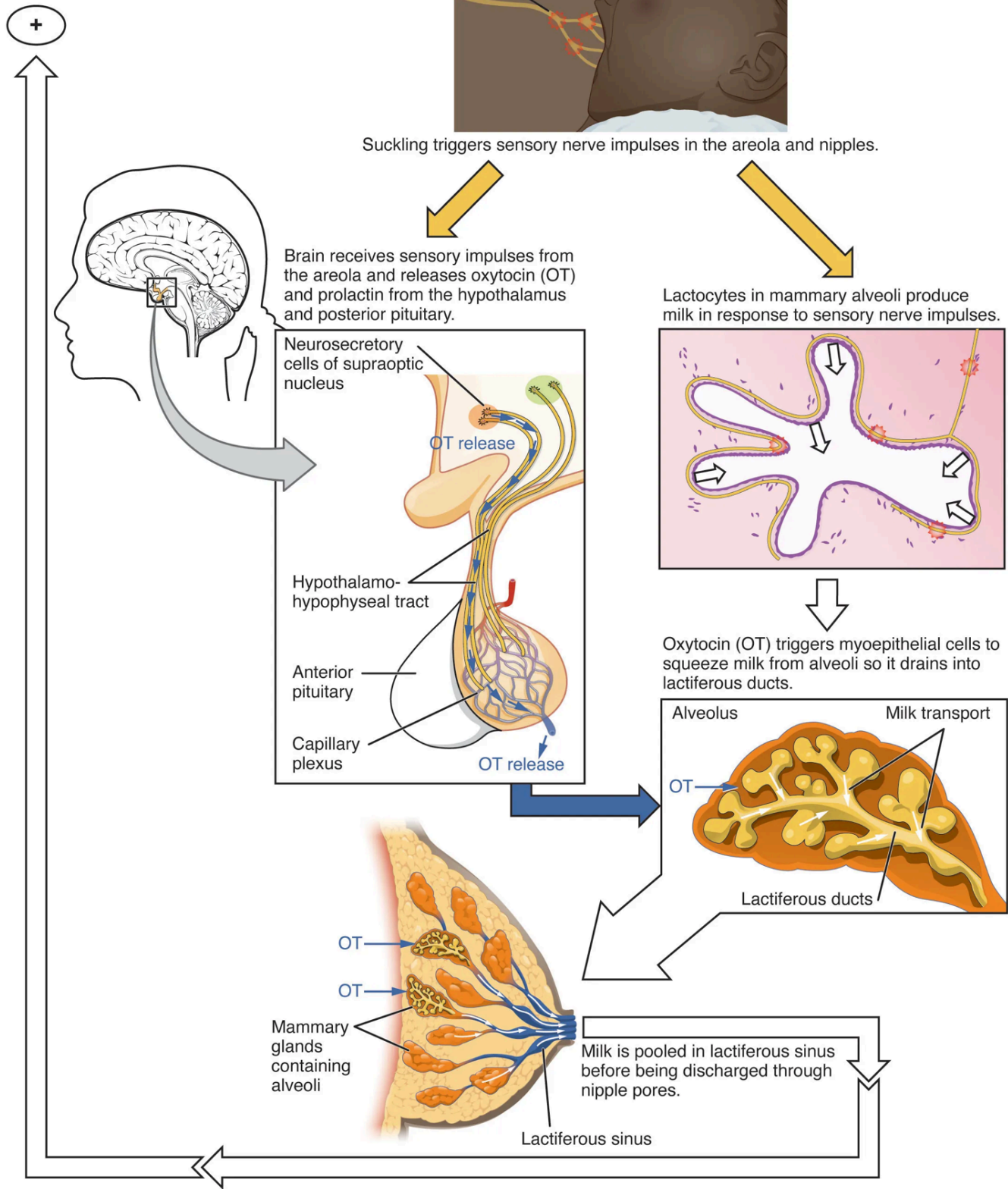


Figure 3.12.2. “The let-down (Milk Ejection) Reflex” from *Anatomy and Physiology 2e*, CC BY-NC-SA 4.0. Suckling sends sensory signals to the hypothalamus, triggering oxytocin release from the posterior pituitary. Oxytocin reaches the myoepithelial cells via the blood, causing alveolar contraction and milk ejection into the ducts. Prolactin, released in

parallel, stimulates the synthesis of milk for the next feed.

Supporting Hormones

Prolactin and oxytocin are the primary hormonal drivers, but several other hormones contribute to the full lactation physiology:

- **Growth hormone and cortisol:** facilitate transport of maternal amino acids, fatty acids, glucose, and calcium into breast milk (Betts et al., 2022).
- **Parathyroid hormone:** mobilizes maternal calcium stores to support the calcium content of milk (see Section 3.8.4). Calcium demands during lactation are significant, and maternal bone density temporarily decreases during this period.
- **Insulin:** supports glucose uptake in the lactating breast to meet the energy demands of milk synthesis.
- **Thyroid hormones (T3 and T4):** regulate the metabolic rate of lactocytes; hypothyroidism can reduce milk supply.



Stress, Oxytocin, and the Feeding Environment

Birth and Postpartum

A calm, private, supportive environment is a physiological prerequisite. The let-down reflex depends on oxytocin, which is suppressed by the stress hormones activated in an environment where the feeding person feels observed, judged, rushed, or unsafe. A doula who helps create calm in a NICU room, a difficult postpartum setting, or a busy household is not just offering emotional support: they are actively facilitating the neurohormonal conditions for milk transfer.

This is also why **skin-to-skin contact** in the immediate postpartum period supports feeding initiation. Skin-to-skin elevates oxytocin in both parent and infant, triggers the rooting reflex, and establishes the olfactory and tactile environment that primes the let-down reflex for future feeds (Riordan and Wambach, 2010).

3.12.3 Stages of Lactation (Lactogenesis)

Lactation does not begin at birth: it unfolds in a sequence of stages called lactogenesis, each governed by distinct hormonal shifts and characterized by changes in milk volume and composition.

Lactogenesis I: Secretory Differentiation (from approximately Week 16 of Pregnancy)

Beginning around the 16th week of pregnancy, rising prolactin, estrogen, and progesterone cause the

alveolar cells (lactocytes) to undergo secretory differentiation: they transition from ordinary epithelial cells into specialized milk-producing cells. The alveoli begin to fill with **colostrum**, the first milk. Some people notice small amounts of colostrum leaking from the nipples in the third trimester.

Lactogenesis I is hormonally driven and occurs regardless of whether the person intends to breastfeed or chest-feed. It does not require any preparation of the nipple or breast.

Lactogenesis II: Onset of Copious Milk Secretion (approximately Days 3 to 5 Postpartum)

The delivery of the placenta causes a sharp drop in estrogen and progesterone. This removes their inhibitory effect on prolactin, and milk production begins in earnest. Lactogenesis II typically occurs between 32 and 96 hours (approximately Days 3 to 5) postpartum. It is what people mean when they say the milk “comes in.”

During this phase, the mammary glands swell noticeably. **Engorgement** refers to the fullness, firmness, and sometimes tenderness of the breast as milk volume increases rapidly. Moderate engorgement is normal; severe engorgement can impede the infant’s ability to latch and should be relieved by frequent feeding or gentle expression. Engorgement involves not only increased milk but also increased blood flow and lymphatic activity in the breast tissue.

The timing of Lactogenesis II can be delayed by: cesarean birth, prolonged labour, significant postpartum hemorrhage, retained placental fragments (which maintain progesterone levels), stress, or pre-existing conditions such as hypothyroidism or polycystic ovary syndrome (Riordan and Wambach, 2010).

Lactogenesis III: Established (Autocrine) Milk Production (from approximately Day 10 Postpartum)

Once lactation is established, milk production transitions from primarily **endocrine control** (driven by circulating hormones) to primarily **autocrine control**: local regulation by **milk removal** and a biochemical signal within the milk itself.

A small whey protein called the **Feedback Inhibitor of Lactation (FIL)** accumulates in the breast when milk is not removed. FIL reduces the secretory activity of the lactocytes, slowing production. When milk is removed by feeding or pumping, FIL is removed with it, and production resumes. This is the molecular mechanism of supply and demand: the breast produces as much as is removed.

Established milk production averages approximately **750 to 800 ml per day** (approximately 24 to 32 oz), matching the typical caloric and fluid needs of a newborn. Stress and fatigue can reduce supply by suppressing oxytocin and altering cortisol levels. Adequate maternal hydration and caloric intake support production, though within a range: mild variations in maternal nutrition generally do not reduce milk volume, though they may affect composition (Riordan and Wambach, 2010).

Lactogenesis IV: Involution (Weaning)

When milk is no longer being removed, whether through intentional weaning or cessation of demand,

FIL accumulates, and milk production progressively decreases. The secretory cells undergo **apoptosis** (programmed cell death) and the glandular tissue gradually returns toward its pre-lactation state, a process called **involution**.

A person can sustain lactation for years if feeding continues. Once feeding has stopped for approximately one week, however, milk production is very difficult to re-establish, even with frequent pumping or suckling, because the secretory cell population has largely involuted. This underscores the clinical importance of early, frequent feeding in establishing supply before involution is triggered.



Lactogenesis Across the Full Spectrum

Birth and Postpartum

Understanding the stages of lactogenesis helps doulas anticipate and normalize the early postpartum feeding experience. Colostrum is present and sufficient in the first days; parents often worry that the small volume (3 oz or less in 24 hours) means they are not producing enough. The knowledge that colostrum is concentrated and physiologically appropriate for the newborn's stomach capacity (which begins at approximately 5 to 7 ml) is one of the most useful things a doula can offer in the early postpartum period.

Delayed Lactogenesis II (milk not coming in by Day 5) is associated with increased risk of early formula supplementation and feeding cessation. Doulas can help families understand this as a physiological issue requiring lactation support, not a personal failure, and can facilitate timely referral to a lactation consultant or midwife.

Pregnancy Loss

Lactogenesis I occurs from Week 16 of pregnancy, meaning that anyone who loses a pregnancy after approximately this point may experience milk coming in postpartum. Lactogenesis II may follow a mid-trimester or late loss. Milk arriving after pregnancy loss can be one of the most physically painful and emotionally confronting aspects of bereavement: the body continuing to prepare for a baby who is not there.

Doulas can prepare bereaved parents for this possibility and support them in accessing information about **lactation suppression** if they wish (cold compresses, binding, avoiding nipple stimulation, and, in some cases, medication prescribed by a care provider). Some bereaved parents choose to donate their milk; others choose to suppress it as quickly as possible. Both choices are valid and can be held with compassion.

3.13.4 Human Milk: Composition and Stages

Human milk is not a fixed substance. Its composition changes across the stages of lactation (colostrum,

transitional milk, and mature milk), across the course of a day, across the weeks and months of feeding, and even **within a single feed**. It is a living fluid that adapts dynamically to the needs of the individual infant.

Stages of Human Milk

Colostrum (from approximately Week 16 of Pregnancy through Days 2 to 3 Postpartum)

Colostrum is sometimes called **liquid gold**, both for its thick, yellowish colour and its extraordinary biological value. In the first 24 to 72 hours postpartum, only a small volume is produced: approximately 3 oz (7 to 125 ml) per day. This is matched to the stomach capacity of the newborn in the first days of life. Colostrum is distinctive in its composition:

- **Very high in protein**, particularly **immunoglobulins**, especially **secretory IgA (sIgA)**: as noted in Section 3.10.6, sIgA coats the newborn gut lining, blocking pathogen attachment and providing mucosal immune protection during the most vulnerable period of life.
- **Lactoferrin**: sequesters iron from bacteria, limiting bacterial growth in the gut.
- **Lysozyme**: an antimicrobial enzyme (also present in tears and saliva; see Section 3.10.3).
- **White blood cells**: live immune cells, including macrophages and lymphocytes.
- **Fat-soluble vitamins A, D, E, and K**: in higher concentrations than in mature milk.
- **Bifidus factor** (a prebiotic): promotes colonization of the infant gut with **Lactobacillus bifidus**, establishing a protective microbiome.
- **Laxative properties**: colostrum promotes the passage of **meconium** (the first stool) and facilitates excretion of bilirubin via bile, reducing the risk and severity of neonatal jaundice.



Figure 3.12.3. “From Colostrum to Breastmilk” by [Amada44](#), CC BY-SA 3.0. Visual comparison of colostrum, transitional milk, and mature breast milk. Colostrum is thick and yellowish; transitional milk is light yellow; mature milk appears white to blue-white. The shift reflects decreasing immunoglobulin concentration and increasing fat and lactose content.

Transitional Milk (approximately Days 3 to 10 Postpartum)

Transitional milk bridges colostrum and mature milk. It appears lighter yellow in colour and is produced in larger quantities, typically reaching approximately 2 cups (16 oz) per day by Day 5. Its composition shifts: immunoglobulin concentration decreases while **fat, lactose, water-soluble vitamins, and total caloric content increase**.

Mature Milk (from approximately Day 10 Postpartum)

Mature milk is white to blue-white in appearance and is composed of approximately **87% water and 13% solids** (carbohydrates, proteins, and fats). Its watery appearance often concerns parents who compare it to cow's milk, but it is nutritionally complete for the human infant. Mature milk separates into layers when cooled, with the cream rising to the top. By six months of exclusive feeding, production averages approximately 800 ml (about 27 oz) per day.

Macronutrients in Mature Milk

- **Carbohydrate:** **lactose** provides approximately 40% of caloric requirements. Lactose is the primary carbohydrate in human milk and supports brain development. Human milk contains more lactose than any other mammalian milk.
- **Fat:** provides more than 50% of caloric requirements. Human milk fat is rich in **long-chain polyunsaturated fatty acids**, particularly **DHA (docosahexaenoic acid)**, which are essential for brain development and retinal function. Cholesterol, present in human milk, also supports brain growth.
- **Protein:** human milk has less total protein than any other mammalian milk, which makes it **less likely to cause allergy** and easier for the immature infant's digestive system to process. Its transparency compared to cow's milk reflects this lower protein content. Key proteins include casein (structural) and whey proteins (including lactoferrin and alpha-lactalbumin).

Micronutrients and Functional Components

- **Vitamins:** A, C, D, E, K, and B complex are present. **Vitamin D** content is relatively low; supplementation for breastfed infants is recommended in many clinical guidelines.
- **Minerals:** iron, zinc, and calcium are present in lower concentrations than in cow's milk but in highly **bioavailable** forms. The iron in human milk is absorbed at approximately 50% efficiency by the infant gut, compared to approximately 10% for iron in formula.
- **Immune components:** sIgA, IgG (transferred from maternal circulation; see Section 3.10.6), lactoferrin, lysozyme, and live white blood cells.
- **Bifidus factor / Human Milk Oligosaccharides (HMOs):** complex carbohydrates that are not digested by the infant but selectively feed beneficial gut bacteria, establishing the microbiome.
- **Hormones and growth factors:** including insulin-like growth factor (IGF), epidermal growth factor (EGF), and leptin, which contribute to infant growth regulation and gut maturation.

Comparison of Human Colostrum, Mature Milk, and Cow's Milk

Table 3.12.1: Nutritional Comparison of Milk and Colostrum

Component (g/L)	Human Colostrum	Human Mature Milk	Cow's Milk*
Total protein	23	11	31
Immunoglobulins	19	0.1	1
Fat	30	45	38
Lactose	57	71	47
Calcium	0.5	0.3	1.4
Sodium	0.5	0.15	0.41

*Cow's milk is not suitable for infants and should never be given as a replacement for human milk or appropriate formula. Its proteins are difficult for the immature infant's gut to process.

Foremilk and Hindmilk: Within-Feed Variation

Milk composition changes not only across weeks of lactation but within a single feeding session:

- **Foremilk:** the milk available at the beginning of a feed. It is watery, translucent, and rich in **lactose and protein**. Its primary function is to quench thirst.
- **Hindmilk:** delivered as the feed progresses and the alveoli are more fully emptied. It is opaque, creamy, and up to five times higher in fat content than foremilk. It provides satiety and the majority of caloric density.

The foremilk/hindmilk distinction is not about time elapsed but about how fully the breast is drained. A **good latch** is therefore more important than the length of a feed: effective milk transfer empties the alveoli progressively, delivering the richer hindmilk, whereas a poor latch may mean the infant receives only the more watery foremilk regardless of feeding duration (Riordan and Wambach, 2010).

3.12.5 The Mechanics of Nursing

Effective milk transfer depends on the coordinated mechanics of the infant's oral anatomy and the structure of the breast. Understanding the mechanics helps doulas support latch without substituting for the expertise of a lactation consultant.

Latch and Milk Transfer

- **Deep latch:** the infant takes the nipple and a significant portion of the areola into the mouth, not just the nipple tip. A shallow latch compresses only the nipple, which causes pain and inefficient milk transfer.
- **Tongue action:** the infant's tongue compresses the nipple and areola against the hard palate. A peristaltic wave moves posteriorly along the tongue, stripping milk from the ducts and sinuses.
- **Nipple pore release:** milk is drawn from the nipple pores with each compression cycle.
- **Swallow:** milk passes to the posterior pharynx and is swallowed.

The rate of milk transfer is primarily determined by the effectiveness of latch and drainage, not by the duration of the feed. A well-latched infant who drains milk efficiently will have a shorter feed than a poorly latched infant who works for longer but transfers less. **Milk transfer appears more efficient in a second lactation**, likely because prolactin receptor density in the mammary tissue has already been established (Riordan and Wambach, 2010).

The mechanics of the latch are also relevant to the **tongue-tie (ankyloglossia)** assessment: restriction of the lingual frenulum (noted in Section 3.5) can impair the tongue's range of motion and reduce the peristaltic efficiency of the feeding wave. This is one of the most common structural reasons for painful or ineffective feeding.

Latch, Pain, and the Doula Role

Nipple pain in the early days of breastfeeding or chestfeeding is common and may reflect the initial adjustment period or a latch issue. Pain that persists beyond the first 30 to 60 seconds of a feed, or that is present throughout, is not normal and warrants lactation assessment. A doula's role is to normalize early discomfort while clearly identifying persistent pain as something that deserves professional attention, not stoicism.

Doulas can observe feeds with an educated eye (without diagnosing): noting whether the infant's chin is touching the breast, whether the lips are flanged, whether swallowing is audible, and whether the nipple exits

the mouth symmetrical and rounded. These observations can be shared with a midwife or lactation consultant as a starting point, not a conclusion.

3.12.6 Lactation as Integration of Body Systems

Lactation does not occur in isolation. Like the placenta (Section 3.11), it draws on nearly every body system covered in this chapter. The table below maps each system to its specific contribution to milk synthesis, delivery, or composition.

Table 3.12.2: The Roles of Body Systems in Lactation

Body System	Role in Lactation
Cardiovascular (3.3)	The breast receives rich arterial blood supply to support milk synthesis. Maternal blood volume increases during pregnancy partly to sustain this demand. Milk is approximately 87% water derived from plasma.
Digestive (3.5)	Maternal nutrition provides the substrates for milk composition: lactose from glucose, milk fats from dietary fatty acids, proteins from amino acids absorbed in the small intestine. Iron, zinc, calcium, and vitamins in milk are absorbed from the maternal gut.
Respiratory (3.6)	Oxygen delivered to lactocytes via hemoglobin supports the high metabolic activity of milk synthesis. Lactation increases the pregnant and postpartum person's caloric expenditure by approximately 500 kcal per day.
Urinary (3.7)	Adequate hydration (processed by the kidneys) is essential to maintain milk volume, which is approximately 87% water. Dehydration can reduce milk supply.
Endocrine (3.8)	Prolactin, oxytocin, estrogen, progesterone, cortisol, growth hormone, parathyroid hormone, insulin, and thyroid hormones all contribute to the initiation, maintenance, or composition of milk. See Sections 3.7.8 and 3.7.9 .
Immune (3.10)	Breastmilk contains sIgA, IgG, lactoferrin, lysozyme, and live immune cells that provide passive and mucosal immunity to the infant. The maternal immune system 'prints' antibodies to the pathogens in the mother's environment and transfers them to the infant through milk. See Section 3.9.6 .
Nervous System (3.4)	The sensory nerves of the nipple and areola transmit suckling signals to the hypothalamus, initiating the prolactin and oxytocin release cascade. The emotional and psychological state of the feeding person (mediated by the limbic system) modulates oxytocin and thus the let-down reflex.
Musculoskeletal (3.12)	Positioning during feeds affects comfort, latch depth, and sustainability of feeding. Cooper's ligaments support the breast; the pectoral muscles underlie it. Posture and neck/shoulder tension can affect how long a feeding person can hold their infant comfortably.

When Systems are Compromised

Birth and Postpartum

Conditions that affect any of the above systems can affect milk supply. Significant **postpartum hemorrhage** reduces circulating blood volume, which can delay Lactogenesis II (the pituitary receives less blood flow, and prolactin release may be impaired).

Thyroid conditions (see Section 3.10.7), particularly **hypothyroidism and postpartum thyroiditis**, can reduce milk supply and may be mistaken for insufficient glandular tissue. Any feeding difficulty that does not respond to latch improvement and increased feeding frequency warrants investigation of thyroid function.

People on **certain medications** (including some antidepressants, hormonal contraceptives containing estrogen, and some antihistamines) may notice effects on milk supply. Doula's can support clients in raising these concerns with their prescriber without advising on medication changes.

3.12.7 Summary: Lactation and the Mammary Glands

Table 3.12.3: Summary of Lactation Topics

Topic	Key Points
Mammary gland type	Modified exocrine (sweat) gland; present in all people; functional development is hormonally driven
Structural Hierarchy	Lobe > lobule > alveolus > lactocyte (milk-producing cell); myoepithelial cells surround alveoli and contract to eject milk
Ducts and nipple	Lactiferous ducts carry milk to lactiferous sinuses; 4-18 nipple pores at the surface; Montgomery's tubercles lubricate and protect the areola
Supportive structures	Adipose tissue (bulk of non-lactating breast), Cooper's ligaments (suspension), pectoral muscles (base)
Prolactin	Anterior pituitary; drives milk synthesis; suppressed by estrogen/progesterone during pregnancy; spikes with each feed for ~1 hour; highest at night
Oxytocin	Posterior pituitary; drives milk ejection (let-down reflex) via myoepithelial cell contraction; triggered by suckling and conditioned cues; inhibited by stress/epinephrine
Lactogenesis I	From ~Week 16 pregnancy: secretory differentiation, colostrum formation; hormonally driven
Lactogenesis II	Days 3-5 postpartum: estrogen/progesterone drop removes prolactin inhibition; copious milk begins; engorgement
Lactogenesis III	From ~Day 10: autocrine control via FIL (Feedback Inhibitor of Lactation) and supply-demand; ~750-800 ml/day
Lactogenesis IV	Involution/weaning: apoptosis of secretory cells; irreversible after ~1 week
Colostrum	Days 0-3; small volume but concentrated; very high sIgA and immune components; laxative (clears meconium, reduces jaundice risk); establishes bifidus flora
Transitional milk	Days 3-10; increasing volume, decreasing immunoglobulins, increasing fat and lactose
Mature milk	From Day 10; 87% water, 13% solids; white/blue-white; foremilk (watery, lactose-rich) and hindmilk (creamy, fat-rich) within each feed
Latch mechanics	Deep latch + tongue peristalsis = effective milk transfer; latch quality matters more than feed duration
Mastitis	Innate immune/inflammatory response to blocked duct or bacterial infection; treat with continued feeding; see Section 3.10.3

“28.6 Lactation” in [Anatomy and Physiology 2e](#) by J. Gordon Betts, Kelly A. Young, James A. Wise, Eddie Johnson, Brandon Poe, Dean H. Kruse, Oksana Korol, Jody E. Johnson, Mark Womble, Peter DeSaix is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](#), except where otherwise noted.

3.13 Sitting With it: Physiological Adaptations to Pregnancy



Learning Outcomes

By the end of this section, you will be able to:

- Describe the adaptations of each major body system during pregnancy, including the reproductive, cardiovascular, respiratory, urinary, digestive, integumentary, musculoskeletal, endocrine, and nervous systems
- Outline the role of hormones in driving physiological changes throughout pregnancy
- Connect physiological adaptations with the common signs, symptoms, and discomforts experienced during pregnancy
- Recognize why doulas need to understand these adaptations in order to support, educate, and advocate for their clients

Pregnancy involves profound physiological changes across virtually every body system. These changes are not complications or problems: they are purposeful adaptations that support fetal growth, prepare the body for labour, and sustain the pregnant person's own health across approximately 40 weeks. Hormones produced by the developing embryo, the placenta, and the maternal endocrine system drive most of these changes. Understanding them helps doulas anticipate their clients' experiences, offer accurate information, identify when a symptom warrants medical attention, and provide comfort and reassurance during one of the most physically transformative experiences a person can have (TED-Ed, 2020).

The table below provides an overview of the major body systems and the key changes that occur during pregnancy. Each system is explored in detail in the sections that follow.

Table 3.13.1: Effects of Pregnancy on Bodily Systems

System	Key Changes During Pregnancy
Reproductive	Uterus enlarges; cervix softens and forms mucous plug; vaginal secretions increase; breasts prepare for lactation
Cardiovascular	Blood volume increases 30-45%; heart rate rises 10-20 bpm; blood pressure temporarily decreases; hypercoagulability; risk of DVT
Respiratory	Diaphragm rises; thoracic breathing replaces abdominal; increased tidal volume; nasal congestion; shortness of breath (dyspnea) is common
Hematologic	Red blood cells and plasma increase; physiologic anemia of pregnancy; increased coagulability; white blood cell production rises
Urinary and Renal	Glomerular filtration rate increases up to 50%; kidneys enlarge; urinary frequency; increased UTI risk; small amounts of glucose and protein in urine are normal
Digestive	Slowed GI motility; nausea and vomiting (first trimester); heartburn; constipation; hemorrhoids; pregnancy gingivitis
Integumentary	Linea nigra; melasma; striae gravidarum (stretch marks); hyperpigmentation of nipples and perineum; increased sweating; PUPPP rash possible
Musculoskeletal	Lordosis; shift in centre of gravity; ligament relaxation; low back pain; diastasis recti; waddling gait; round ligament pain
Endocrine	Production of hCG, progesterone, estrogen, hPL, and relaxin; pituitary enlarges; prolactin and oxytocin increase; thyroid and adrenal activity increase
Nervous	Altered sleep; decreased concentration and memory; possible carpal tunnel and sciatica; vivid dreams

3.13.1 Reproductive System

The reproductive system undergoes some of the most dramatic changes of any body system during pregnancy. The uterus expands from approximately 70 grams to more than 1,000 grams at term. Changes in the vagina and cervix prepare for the passage of the fetus at birth. The ovaries cease ovulating, and the breasts develop in preparation for lactation.



Figure 3.13.1. Image by [Andrew Bardwell](#), CC BY-NC-ND 2.0.

The Uterus

The uterus is unique in its capacity for enlargement. It grows through both **hypertrophy** (increase in the size of individual muscle cells) and **hyperplasia** (formation of new cells), stimulated primarily by estrogen and progesterone. The myometrial cells stretch and thin as the fetus, placenta, and amniotic fluid grow. The uterine blood vessels enlarge significantly, directing the majority of increased blood flow toward the placenta. Blood supply to the uterus increases dramatically to support the uteroplacental-fetal unit. The **fundus** (top of the uterus) provides a reliable clinical landmark for gestational age: it is palpable at the symphysis pubis at around 12 weeks, reaches the umbilicus by 20 weeks, and rises to the xiphoid process (lower end of the sternum) by approximately 36 weeks before descending slightly as the fetus engages in the pelvis before birth.

As the uterus expands, it becomes erect and rotates slightly to the right around the large intestine. This places tension on the **round ligaments**, which can spasm and cause sharp groin or lower abdominal pain, particularly with position changes. This is a normal and common experience. The uterus also begins producing **Braxton-Hicks contractions** — spontaneous, irregular, mild uterine contractions that

occur throughout pregnancy. These contractions are non-rhythmic and do not typically cause cervical change until the final weeks of pregnancy.

The Cervix

During pregnancy, estrogen-induced changes cause the endocervical glands to secrete thick, tenacious mucus that accumulates to form the **mucous plug**. This plug seals the cervical canal, providing a barrier against bacterial ascent into the uterus. In the final weeks of pregnancy, **cervical ripening** occurs under hormonal influence: the cervix softens and becomes thinner, more elastic, and more pliable. The mucous plug is expelled when cervical dilation begins (sometimes called a 'bloody show'). During active labour, the cervix thins from approximately 2 cm thick to paper-thin through a process called **effacement**.

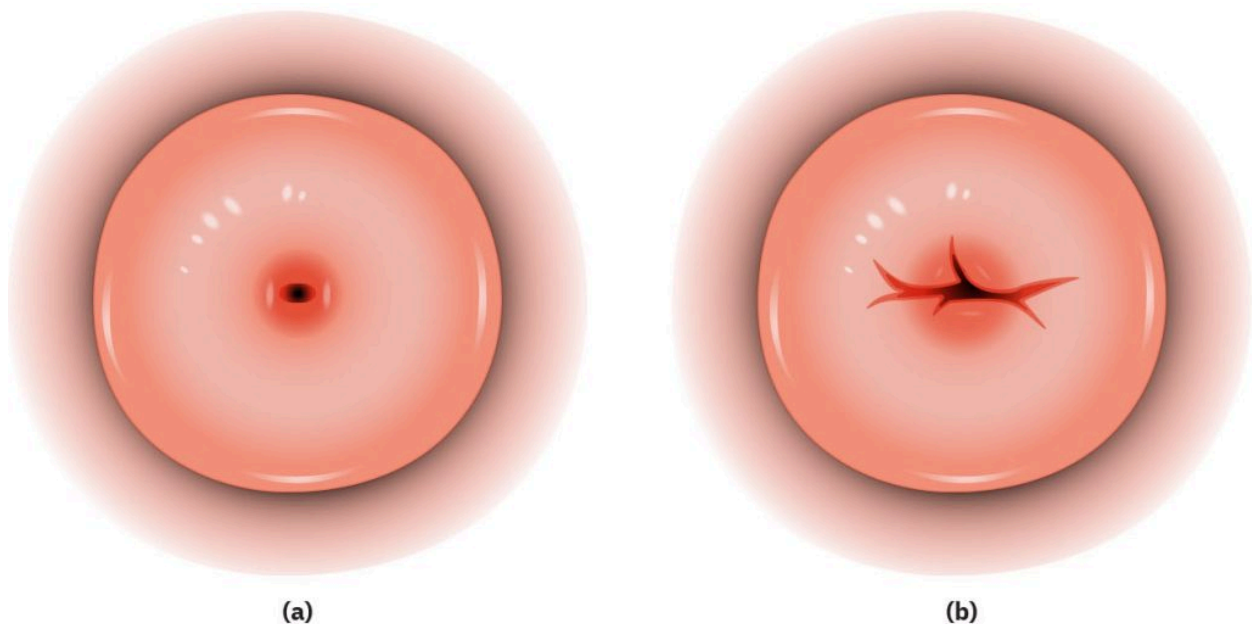


Figure 3.13.2 “Cervical Os” from [Maternal-Newborn Nursing, CC BY-NC-SA 4.0](#). (a) The cervical os of a person who has never given birth is round and small. (b) The cervical os of a person who has had one or more previous pregnancies appears like a slit.

The Vagina

Estrogen-induced changes cause increased vascularization and thickening of the vaginal wall mucosa. Smooth muscle hypertrophies, and connective tissue loosens, allowing for the distension required during birth. Vaginal secretions become thicker, whiter, and more acidic. This increased acidity, driven

by the dominant flora *Lactobacillus acidophilus*, is thought to protect against bacterial infection but also increases susceptibility to yeast infections. Increased white discharge, called **leukorrhoea**, is a normal feature of pregnancy.

Breasts and Chest

The breasts increase in size during pregnancy due to glandular **hyperplasia** caused by rising estrogen and progesterone. Blood supply increases significantly (superficial veins may be visible through fair skin), and the tissue may feel nodular as alveoli and ducts develop. The nipple skin thickens, and the nipple and areola darken, a change that typically persists after pregnancy. A secondary areola and prominent **Montgomery's tubercles** (the small bumps around the areola) may appear. By approximately 16 weeks, **colostrum**, an antibody-rich secretion that will nourish the newborn in the first days of life, may be expressed from the nipples.

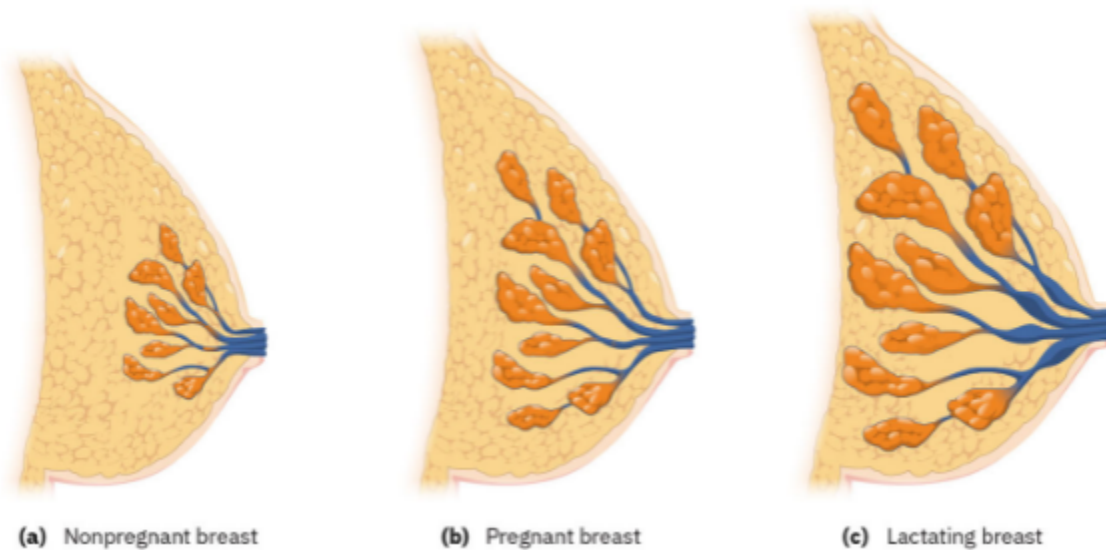


Figure 3.13.3 “Changes in the Breast” from *Maternal-Newborn Nursing*, CC BY-NC-SA 4.0.



What Your Client May Notice First

For many people, the earliest experiences of pregnancy are reproductive system changes: breast

tenderness and fullness, increased vaginal discharge, and the cessation of menstruation. These often appear before any other visible sign. As the pregnancy progresses, a client may ask about round ligament pain (that sharp catching sensation with movement), Braxton-Hicks contractions, or breast changes.

3.13.2 Cardiovascular System

[Section 3.2 \(Rivers and Currents: Cardiovascular System\)](#) described the anatomy of the heart, blood vessels, and blood at baseline. The adaptations described below build on that anatomy and explain why many of the most clinically significant symptoms of pregnancy originate in the cardiovascular system.

The cardiovascular system undergoes significant adaptation during pregnancy to meet three primary demands: supporting the physiological functions of the pregnant person, promoting the growth and development of the uteroplacental-fetal unit, and compensating for the blood loss that is expected at the end of labour.

Total **blood volume** increases by approximately 30 to 45 percent above pre-pregnancy levels by the third trimester (up to 50 percent in twin pregnancies). The **heart rate** rises by 10 to 20 beats per minute. The heart itself is pushed upward and to the left by the enlarging uterus, and a systolic murmur may be heard in approximately 90 percent of pregnant people. **Cardiac output** increases significantly to distribute the expanded blood volume. Peripheral vascular resistance decreases, contributing to lower blood pressure, particularly in the second trimester. Blood pressure typically returns toward pre-pregnancy baseline levels by the end of the third trimester.

The increased production of clotting factors, including a 40 percent rise in plasma fibrin and a 50 percent rise in fibrinogen, produces a state of **hypercoagulability**. This is the body's preparation for blood loss at birth, but it also places pregnant people at elevated risk for **deep vein thrombosis (DVT)** and **pulmonary embolism (PE)**. Signs of DVT include calf pain, swelling, and warmth in a leg; PE signs include sudden shortness of breath, chest pain, and a rapid heart rate. Both require immediate medical attention.

Peripheral vasodilation, driven by progesterone, increases blood flow to the skin. Body temperature rises by approximately 0.2 to 0.4 degrees Celsius, contributing to **heat intolerance**, sweating, nasal congestion, and nosebleeds.

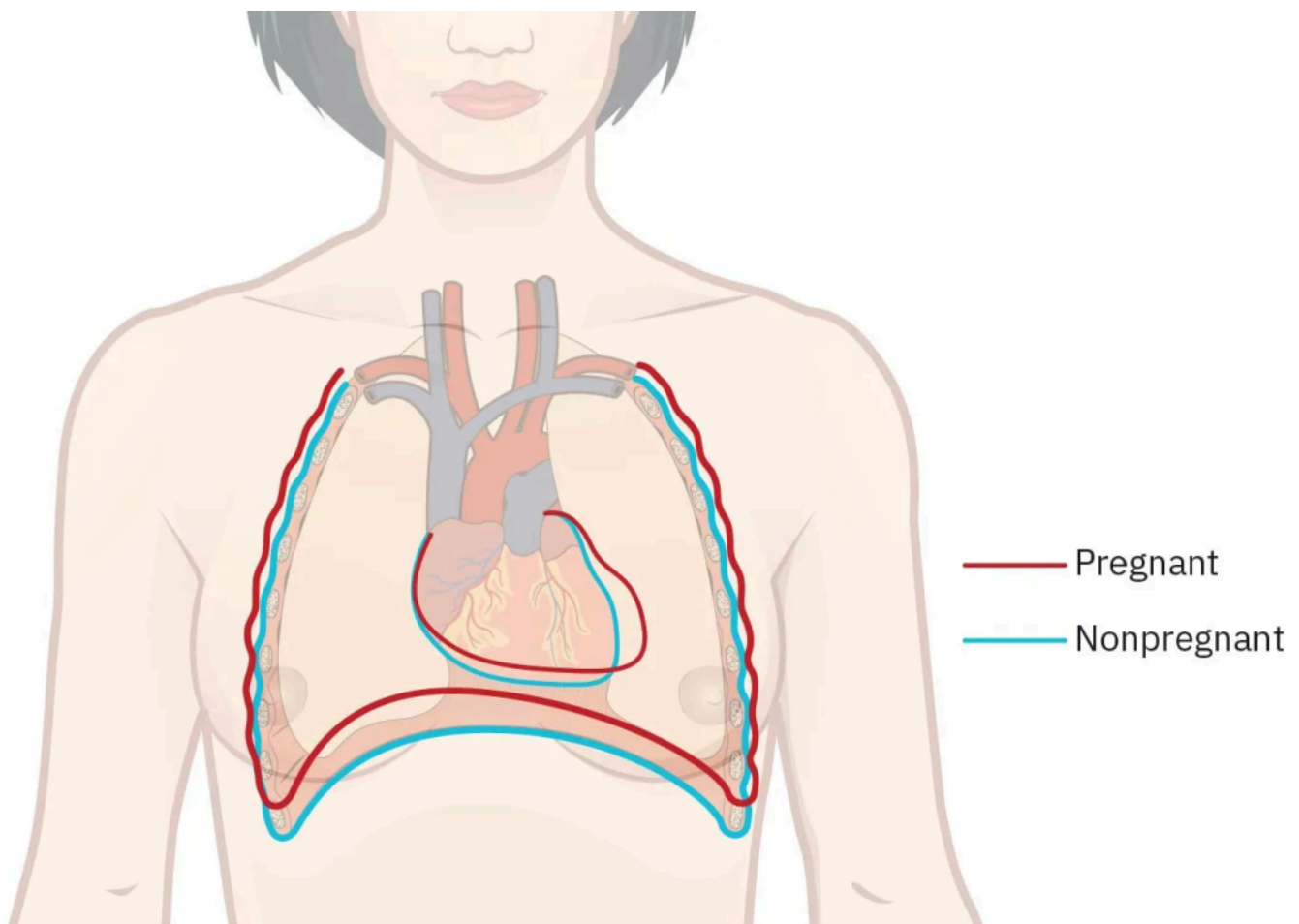


Figure 3.13.4 “[Heart and Diaphragm Displacement During Pregnancy](#)” from [Maternal-Newborn Nursing, CC BY-NC-SA 4.0](#). The enlarging uterus displaces the heart upward and to the left, and elevates the diaphragm, altering the anatomical relationship of thoracic organs by the third trimester

Common Cardiovascular Complaints

Supine hypotensive syndrome affects up to 10 percent of pregnant people. When lying on the back, the weight of the uterus compresses the inferior vena cava, reducing blood return to the heart and causing a drop in cardiac output of 10 to 30 percent. Symptoms include dizziness, light-headedness, nausea, and low blood pressure. Doula and birth workers should advise clients to sleep and rest on their side, or with a wedge under one hip. Turning from side-lying to supine during labour should be avoided where possible.

Varicose veins develop in approximately 40 percent of pregnant people, not only in the legs but also in the vulva and rectum (hemorrhoids). Progesterone, relaxin, the increased blood volume, and the weight of the growing uterus all contribute. Compression stockings and elevation of the lower extremities can provide relief.

Edema (swelling, especially in the lower extremities) is common and usually normal, resulting from the

extra fluid in the system and pressure of the uterus on pelvic veins. However, sudden onset of severe or generalized edema, particularly with headache or visual changes, can be a sign of **preeclampsia** and requires immediate medical assessment.

Iron requirements increase significantly during pregnancy. The combination of expanded plasma volume and relative insufficiency of red blood cells produces **physiologic anemia of pregnancy**, which is expected and not necessarily pathological. However, true iron-deficiency anemia can develop and requires monitoring.



When To Escalate

Cardiovascular changes create some of the most clinically important symptoms in pregnancy. Most are normal. Some are not. A doula's role is not to diagnose, but to understand the difference well enough to support appropriate decision-making.

Consider the following scenarios and identify which you would address with reassurance and comfort strategies, which you would suggest the client mention at their next prenatal appointment, and which you would encourage them to seek immediate medical attention for: leg swelling that worsens by the end of the day; sudden swelling in one calf with warmth and pain; heart palpitations after climbing stairs; dizziness when lying on the back; swelling in both hands and face with a severe headache. What does your reasoning reveal about your current knowledge of cardiovascular adaptations in pregnancy?

3.13.3 Respiratory System

[Section 3.5 \(The Power of Breath: Respiratory System\)](#) covered the anatomy and physiology of breathing, gas exchange, and the regulation of respiration. The adaptations below explain why breathing changes so substantially during pregnancy and why those changes produce some of the most common discomforts clients report.

Oxygen consumption increases by 20 to 30 percent during pregnancy to meet the needs of the pregnant person, the fetus, and the placenta. To accommodate this demand, respirations become deeper and more efficient. The lower ribs flare outward, and hormones (primarily relaxin) cause muscles and cartilage to relax, allowing the chest to broaden. Despite this expansion, the enlarging uterus elevates the diaphragm by approximately 4 centimetres, decreasing the space available for lung expansion. This leads to a shift from **abdominal breathing** to **thoracic breathing**.

Hyperventilation is normal in pregnancy, caused by an increased **tidal volume** (the volume of air per breath) and elevated sensitivity to carbon dioxide. This can produce mild **respiratory alkalosis**, which may be perceived as shortness of breath. The upper respiratory tract becomes congested due to estrogen-induced vasodilation and swelling of the nasal passages, contributing to nasal congestion, hoarseness, and nosebleeds (epistaxis).

Dyspnea (breathlessness or the sensation of running out of air) occurs in up to 75 percent of pregnancies. It is common when carrying multiples or when a client is 'carrying high.' Relief often occurs when the fetus drops lower into the pelvis in the final weeks. Support strategies include encouraging upright posture, side sleeping, and pacing activities. **Severe or sudden shortness of breath always requires medical attention**, as it can indicate pulmonary embolism.

3.13.4 Urinary and Renal System

Section 3.7 (Filtration and Balance: Urinary System) described the gross anatomy of the kidneys, ureters, bladder, and urethra, and the physiology of filtration. During pregnancy, the urinary system takes on the additional burden of filtering waste products from the fetus as well as the pregnant person, producing the changes described below.

The kidneys enlarge during pregnancy and increase their filtration rate: the **glomerular filtration rate (GFR)** rises by up to 50 percent, and renal blood flow increases substantially. The kidneys are now filtering waste products from both the pregnant person and the fetus, producing larger volumes of urine. Small amounts of **glucose and protein in the urine** can be normal during pregnancy due to the increased filtration overwhelming tubular reabsorption. This must be distinguished from elevated blood glucose (gestational diabetes) and from significant proteinuria (preeclampsia), both of which require clinical evaluation.

Progesterone causes dilation of the renal pelvis and ureters and relaxation of the bladder walls. This slows urine flow and can contribute to **urinary stasis**, increasing the risk of **urinary tract infection (UTI)**. UTI symptoms include burning urination, frequency, incomplete emptying, lower abdominal pain, and cloudy or foul-smelling urine. Untreated UTIs can ascend to the kidneys (**pyelonephritis**), which increases the risk of preterm labour and low birth weight. Prevention measures include wiping front to back and urinating after intercourse.

Bladder capacity is compromised in early pregnancy (when the fundus is still low and rests on the bladder) and again in late pregnancy as the fetus engages in the pelvis. Urinary frequency is a normal and expected consequence. **Stress urinary incontinence** (leakage with coughing, sneezing, laughing, or lifting) occurs in up to 46 percent of pregnancies and is more common with previous births, older age, and higher BMI. Pelvic floor exercises can help, and clients should be referred to pelvic floor physiotherapy as a standard of care.

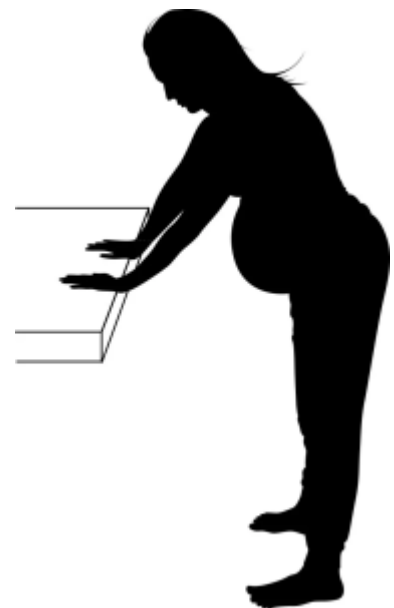


Figure 3.13.5 "[Positioning to Relieve Pressure on the Ureter](#)" from [Maternal-Newborn Nursing, CC BY-NC-SA 4.0](#).

3.14.5 Digestive System

[Section 3.4 \(Nourishment: The Digestive System\)](#) covered the anatomy and physiology of the GI tract from mouth to rectum, and the accessory organs, including the liver and gallbladder. The pregnancy adaptations below help explain why constipation, heartburn, and nausea are so common and why they worsen at different points in the pregnancy.

Progesterone relaxes smooth muscle throughout the body, and the gastrointestinal tract is no exception. **GI motility slows** significantly, extending transit time and contributing to a cluster of common symptoms: bloating, gas, constipation, and hemorrhoids. The gallbladder empties more slowly, increasing the risk of

gallstones. As the uterus enlarges, it displaces the intestines and pushes the stomach upward, exacerbating reflux.

Nausea and vomiting affect most pregnant people in the first trimester and are associated with rising hCG levels. While classically called 'morning sickness,' symptoms can occur at any time of day. Nausea is generally associated with a good pregnancy outcome. **Hyperemesis gravidarum** is a more severe form involving persistent vomiting, dehydration, and electrolyte imbalance that requires medical management.

Heartburn (gastroesophageal reflux) affects up to 85 percent of pregnant people. Progesterone relaxes the lower esophageal sphincter, allowing acidic stomach contents to reflux upward. Comfort strategies include eating smaller, more frequent meals; avoiding eating close to bedtime; sleeping with the head elevated; lying on the left side; and reducing caffeine, alcohol, and spicy foods.

Pregnancy gingivitis (swollen, bleeding gums) is caused by increased circulating estrogen and is common enough to warrant regular dental care throughout pregnancy.

Ptyalism (excessive saliva production) is driven by progesterone and hCG; swallowing the excess can contribute to nausea.

Constipation occurs in up to 40 percent of pregnant people, caused by slowed motility, dehydration, poor dietary intake, and iron supplements. Constipation contributes to hemorrhoids, which are also worsened by the pressure of the uterus on pelvic veins.

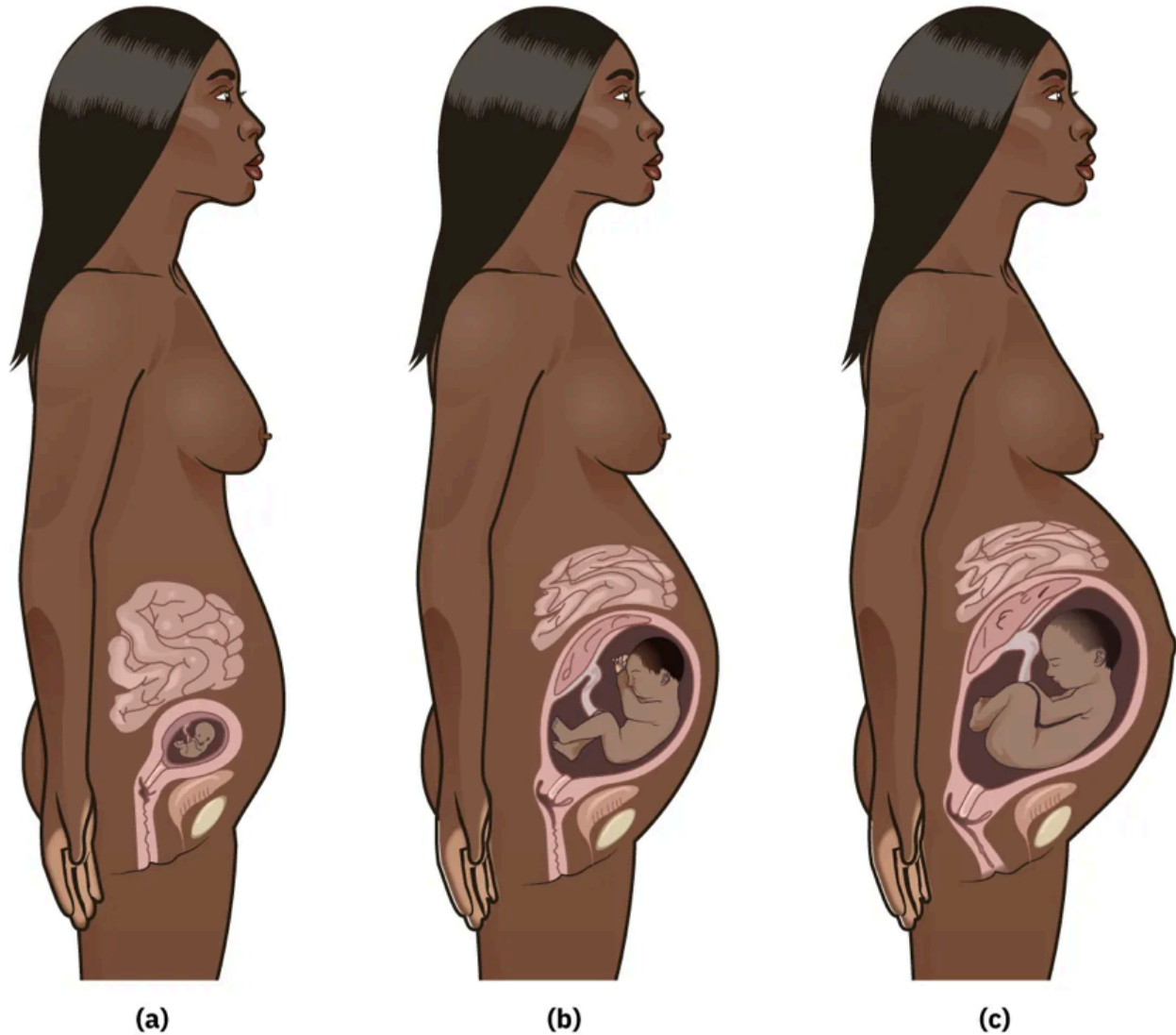


Figure 3.13.6 “[Displacement of the Intestines During Pregnancy](#)” from [Maternal-Newborn Nursing](#), CC BY-NC-SA 4.0.



Supporting a Client Through Nausea

Nausea and vomiting are among the most common and most debilitating experiences of early pregnancy. They are also often dismissed. A doula’s role here is practical and relational: helping clients identify what helps (cold foods, ginger, crackers before getting out of bed, small, frequent meals), advocating for their experience to be taken seriously, and recognizing the line between typical nausea and hyperemesis gravidarum.

What would you tell a client who says her provider told her to ‘just push through it’ and she has

not been able to keep fluids down for three days? What does the doula's non-clinical scope allow you to offer in this situation?

3.13.6 Integumentary System

Changes in skin pigmentation occur during pregnancy due to increased estrogen, progesterone, and melanocyte-stimulating hormone. The most clinically familiar changes include:

Linea nigra: A vertical line of darkened pigmentation running from the pubic hairline through the umbilicus to the xiphoid process. It appears in the second trimester and typically fades after birth.

Melasma: Hyperpigmentation on the face, sometimes called the 'mask of pregnancy,' occurring across the cheekbones and forehead. Exposure to sunlight darkens it, so shade and sun protection are recommended.

Hyperpigmentation: The nipples, areolae, vulva, and perianal area commonly darken. Freckles and scars may darken as well. Most changes lighten after birth but may not resolve completely.

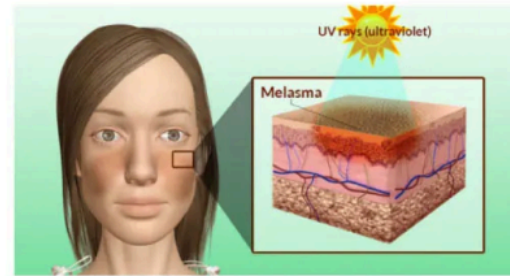
Striae gravidarum (stretch marks): Red or purple lines where the skin has stretched to accommodate growth in the breasts, abdomen, and buttocks. Estrogen, relaxin, and adrenocorticosteroids affect collagen strength, contributing to their formation. They typically fade to silvery lines after birth. Topical creams do not prevent striae but can reduce itching.



Figure 3.13.7 "[Striae Gravidarum \(Stretch Marks\)](#)" from [Maternal-Newborn Nursing, CC BY-NC-SA 4.0](#).



(a)



(b)

Figure 3.13.8 “[Linea Nigra and Melasma](#)” illustration from [Maternal-Newborn Nursing, CC BY-NC-SA 4.0](#). a) Linea nigra — the vertical pigmentation line extending from the pubic area to the navel (or higher) during pregnancy. b) Melasma — patchy hyperpigmentation on the face, commonly called the ‘mask of pregnancy,’ which darkens with sun exposure.

Additional integumentary changes include increased sweating and flushing (due to elevated temperature and vasodilation), thicker and faster-growing hair (hair loss may occur after delivery, which is also normal), faster nail growth, and possible development of **spider angiomas**, **palmar erythema** (reddened palms), and pruritus (itching) in up to 20 percent of pregnancies. A benign rash called **PUPPP** (pruritic urticarial papules and plaques of pregnancy) may develop on the abdomen and spread to limbs and back; it disappears after birth. Severe or generalized itching, particularly starting on the palms and soles, may indicate **cholestasis of pregnancy**, which is a serious condition requiring medical evaluation.



Body Image and the Changing Body

The body changes visibly and rapidly during pregnancy. Not all clients experience these changes with ease. Stretch marks, darkening skin, hair loss after birth, and persistent skin changes can affect body image and self-perception in ways that overlap with grief, loss of identity, or cultural expectations about what a body should look like.

As a doula, how do you hold space for a client who expresses distress about physical changes to their body during pregnancy or postpartum? What does it look like to support a client's autonomy and self-determination when it comes to how they talk about and relate to their own body?

3.13.7 Musculoskeletal System

[Section 3.11 \(The Passageway: The Pelvis\)](#) described the bony pelvis, pelvic variation, and the pelvic floor muscles that support reproductive structures and the birth process. The changes described below explain why the ligament relaxation that facilitates birth also produces some of the most persistent physical discomforts of pregnancy.

The musculoskeletal system adapts substantially during pregnancy, driven primarily by the hormones **relaxin** and **progesterone**, which cause relaxation and stretching of ligaments and joints throughout the body. This ligament laxity is purposeful: it increases the internal diameters of the pelvis in preparation for vaginal birth. However, it also reduces the stability of joints and can cause discomfort throughout pregnancy.

As the uterus grows and the centre of gravity shifts forward, a compensatory **lordosis** (exaggerated inward curvature of the lumbar spine) develops. This posture change puts increased strain on the muscles and ligaments of the lower back. By term, many pregnant people stand and walk with the back arched and their shoulders held back. The characteristic **waddling gait** of late pregnancy results from relaxed pelvic joints and the altered centre of gravity. Low back pain, round ligament pain, and hip discomfort are all expected consequences.

Diastasis recti is a separation of the rectus abdominis muscles along the midline, which can occur as the uterus expands. It can impair core support and may require physiotherapy. **Symphysis pubis separation** (diastasis symphysis pubis) involves widening of the pubic joint and can cause significant pain and mobility difficulties. **Leg cramps** are common, possibly related to calcium and phosphorus metabolism, and are not fully understood. Exercise before and during pregnancy can strengthen muscles to support posture and reduce the severity of musculoskeletal discomfort. Pelvic girdle support devices can also help.

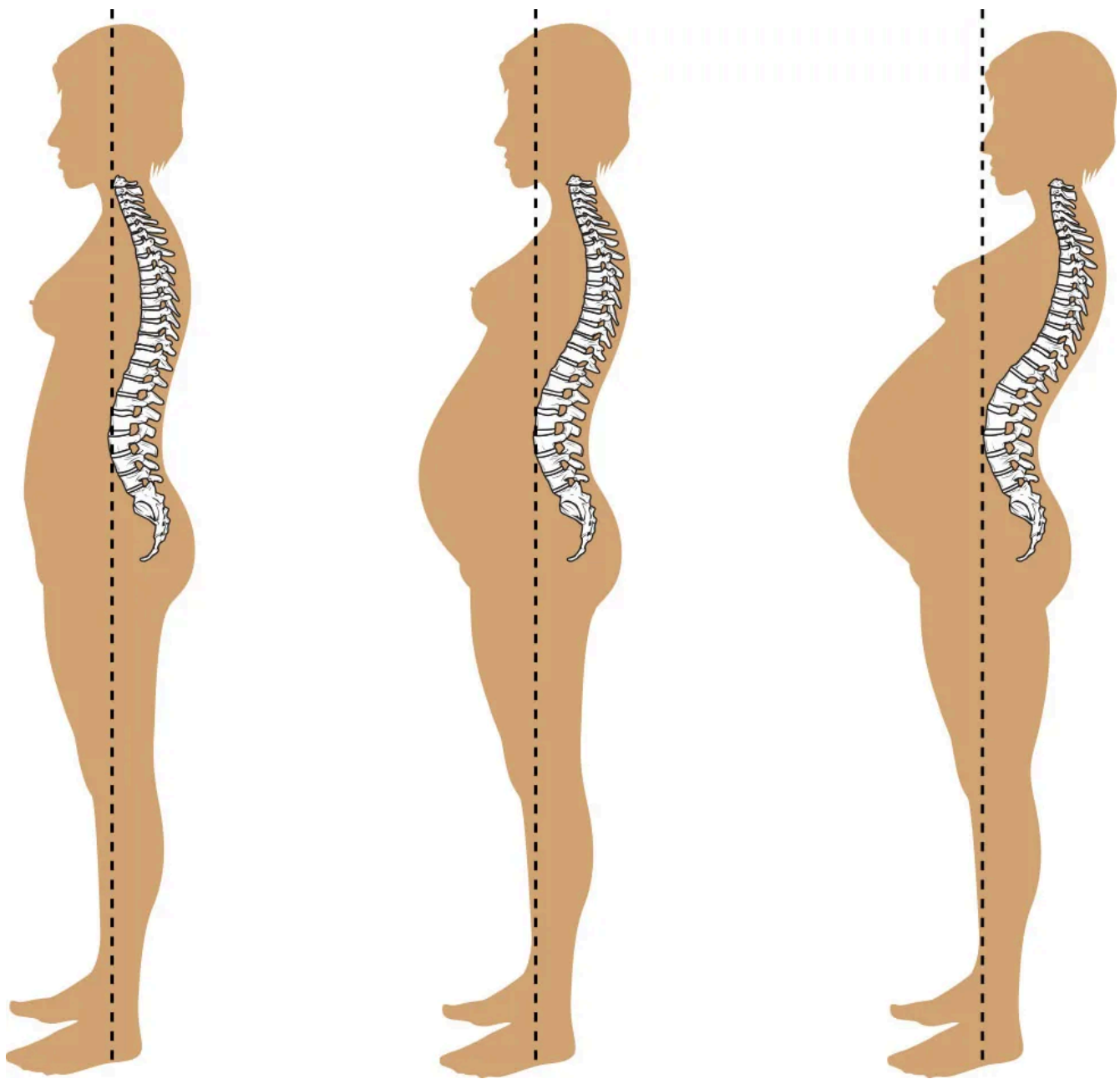


Figure 3.13.9 "[Lordosis During Pregnancy](#)" from [Maternal-Newborn Nursing](#), CC BY-NC-SA 4.0.

Back Pain and the Doula

Low back pain affects the majority of pregnant people at some point during their pregnancy. It is the most common physical complaint doulas hear about. Understanding the physiological mechanism (lordosis, shifted centre of gravity, relaxed ligaments, weakened abdominals) allows a doula to offer accurate information, suggest comfort strategies (positioning, gentle movement, heat, massage, referral to physiotherapy), and normalize the experience without dismissing it.

What comfort strategies would you suggest to a client in their third trimester with persistent low back pain? Which strategies are within your scope as a doula, and which would prompt you to refer to another provider?

3.13.8 Endocrine System and Hormones

[Section 3.7 \(The Body's Invisible Orchestra: The Endocrine System\)](#) introduced the major endocrine glands and the feedback loops through which hormones regulate the body. Sections 3.7.6 through 3.7.10 focused specifically on the hormones of reproduction, the ovarian and menstrual cycles, the hormonal cascade of labour and birth, and the key hormones across the full arc from conception through postpartum. The table below summarizes those hormones in the specific context of physiological adaptation during pregnancy.

The endocrine system is the engine of physiological adaptation during pregnancy. Hormones produced by the embryo, the corpus luteum, the placenta, and the maternal endocrine glands drive changes across every body system. The table below summarizes the major pregnancy hormones and their functions.

Table 3.13.2: Hormone Function During Pregnancy

Hormone	Key Functions During Pregnancy
Human Chorionic Gonadotropin (hCG)	Maintains the corpus luteum; thickens the uterine lining; stimulates the placenta to produce estrogen and progesterone; may be responsible for nausea and vomiting; peaks at 8-10 weeks
Progesterone	Essential for implantation and maintenance of pregnancy; inhibits uterine contractions; slows GI motility; relaxes smooth muscle; decreases bladder tone; increases cervical mucus
Estrogen	Stimulates uterine growth; increases blood flow; prepares breasts for lactation; increases vaginal discharge; causes nasal congestion; contributes to hyperpigmentation
Human Placental Lactogen (hPL)	Regulates maternal metabolism; increases glucose availability for the fetus; helps prepare breasts for lactation; promotes fat deposition
Relaxin	Softens ligaments and joints in preparation for labour; helps decrease peripheral vascular resistance; contributes to cervical ripening
Oxytocin	Low during pregnancy; rises in labour to stimulate uterine contractions; plays a role in bonding after birth
Prolactin	Stimulated by enlarging pituitary gland; promotes mammary gland growth and milk production

Key Glands and Structures

The **corpus luteum** (the remnant of the ovarian follicle after ovulation) is maintained by hCG and secretes progesterone for the first 8 weeks of pregnancy. The **placenta** takes over progesterone and estrogen production from the corpus luteum at approximately 8 to 10 weeks, and by mid-pregnancy is the dominant source of pregnancy hormones.

The **pituitary gland** enlarges 2 to 3 times its normal size during pregnancy. It increases secretion of **prolactin** (stimulating mammary gland growth and milk production), **ACTH** (increasing cortisol and adrenal activity), and **oxytocin** (which rises in labour to stimulate contractions and is involved in bonding after birth). Elevated cortisol has been linked to adverse fetal outcomes when levels become excessive.

The **thyroid gland** enlarges slightly. Critically, the fetal thyroid does not begin functioning until mid-pregnancy, so the fetus is dependent on the maternal thyroid for thyroid hormone during brain development. Pregnant people with pre-existing thyroid conditions require careful monitoring and medication adjustment.



Hormones and Mood

The hormonal landscape of pregnancy affects mood, cognition, and emotional regulation. Rising and fluctuating estrogen and progesterone influence neurotransmitter systems; elevated cortisol can increase anxiety; and the sleep disruption common in pregnancy compounds cognitive effects. 'Baby brain' (difficulty concentrating, forgetfulness) is a real and documented experience, likely associated with neuroplasticity changes and the cognitive shift toward baby-focused awareness.

Consider: if a client tells you she feels like she 'can't think straight' and is worried something is wrong, what do you say? How do you validate the experience without dismissing it, while also not catastrophizing what is most likely a normal adaptation? What would prompt you to suggest she speak to her provider about her mood?

3.13.9 Nervous System and Sleep

[Section 3.3 \(Communication: Nervous System\)](#) covered the anatomy of nervous tissue, the central and peripheral nervous systems, and how electrical and chemical signals govern the body's responses. During pregnancy, these systems are modulated by the hormones described in [sections 3.7](#) and 3.13.8, producing the changes below.

The nervous system is affected by the hormonal and physical changes of pregnancy in ways that are not fully understood. Estrogen, progesterone, relaxin, prolactin, and human placental lactogen all appear to have neurological effects. What is documented:

Altered sleep patterns: Fatigue and a strong desire for sleep are typical in the first trimester. REM sleep increases after 25 weeks. However, the second half of pregnancy often produces lighter, more disrupted sleep due to nocturia, dyspnea, heartburn, nasal congestion, muscle discomfort, fetal activity, and anxiety. Vivid dreams are common.

Decreased attention, concentration, and memory: Often described as 'baby brain,' these changes appear to reflect a real neurological shift, possibly toward right-brain, relational processing and heightened responsiveness to the infant.

Carpal tunnel syndrome: Increased fluid retention and vascular changes can compress the median nerve at the wrist, causing tingling, numbness, and pain in the hand and fingers. Splinting and positioning can help.

Sciatica: Pressure from the enlarging uterus or the fetal head on the sciatic nerve can produce shooting pain down the buttock and leg.

3.13.10 Metabolism, Weight Gain, and Exercise

The basal metabolic rate increases progressively during pregnancy: approximately 5 percent in the first trimester, 10 percent in the second, and 25 percent in the third. The total estimated energy cost of pregnancy is approximately 80,000 calories. The body accumulates energy stores for labour and lactation and redistributes resources for fetal growth. This does not mean 'eating for two': the additional caloric requirement varies by trimester and by individual baseline, and excessive weight gain is not the goal.

Based on a normal pre-pregnancy body mass index (BMI), the recommended gestational weight gain is approximately 25 to 35 pounds (11.3 to 15.9 kg), with different ranges recommended for those who begin pregnancy with lower or higher BMI. Weight gain is distributed across the pregnant person's blood volume, fluids, breast tissue, and fat stores, as well as the fetus, placenta, and amniotic fluid. **Weight checks can be refused.** A trauma-informed approach to weight monitoring recognizes that repeated weigh-ins can be harmful for clients with a history of disordered eating or body image concerns, and clients should always be informed that they have the right to decline.

Moderate **exercise** during pregnancy is generally safe and beneficial for most people. Current guidance recommends at least 150 minutes per week of moderate-intensity activity. Vigorous exercise is increasingly supported by evidence for those with healthy pregnancies in the third trimester (Beetham et al., 2019). Activities to avoid include those with risk of falling, contact sports, and jumping or jerky movements. Exercise should be stopped if pain, dizziness, or vaginal bleeding occurs. **Heat exposure** (hot tubs, saunas) is generally limited to 10 minutes or less, with water temperature kept below 39 degrees Celsius, due to associations with neural tube defects in early pregnancy (Duong et al., 2011).



Why Does a Doula Need to Know This?

A doula is not a clinician. You will not be diagnosing conditions, ordering labs, or prescribing treatments. But understanding the physiology of pregnancy is fundamental to your role for three reasons.

1. It allows you to provide accurate, evidence-informed information to your clients. A client who understands why they are experiencing round ligament pain, or what is causing their heartburn, or why their back hurts in the third trimester is better positioned to manage those experiences and make informed decisions about their care.
2. It allows you to recognize when something a client describes warrants medical attention. The difference between physiological edema and preeclampsia, between normal dyspnea and pulmonary embolism, between expected UTI symptoms and signs of a kidney infection is not always obvious. Knowing what is normal helps you recognize what is not.
3. It positions you as a credible advocate. When you understand why a client cannot sleep on their back, you can explain it clearly to a provider who has suggested they do so. When you understand why constipation is worsening in the third trimester, you can support your client's request for dietary guidance or a safe stool softener. Knowledge of physiology is the foundation of informed advocacy.

[“10.1 Physiologic Changes due to Pregnancy”](#) in [Maternal Newborn Nursing](#) by Amy Giles, Regina Prusinski, and Laura Wallace is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike License 4.0 International License](#), except where otherwise noted.

3.14 Development and Inheritance: Genetics, Embryology, and Diversity



Learning Outcomes

By the end of this section, you will be able to:

- Review the basics of cell biology, DNA, genes, and chromosomes
- Describe genetic inheritance, dominant and recessive traits, and chromosomal differences
- Explain embryonic and fetal stages, including gastrulation and early system development
- Explain the basis of pregnancy dating and estimated due dates
- Recognize congenital anomalies and the impact of teratogens on development
- Define intersex, understand variations in sex differentiation, and discuss implications for inclusive care
- Explore the intersection of genetics, diversity, and supportive care as part of the doula's role

[Section 3.1 \(Building Blocks\)](#) introduced the cell as the fundamental unit of life. [Section 3.8 \(Reproductive Systems\)](#) described how gametes are produced through meiosis. [Section 3.7 \(Endocrine System\)](#) covered the hormones that drive development. This section brings those foundations together to trace the full arc of human development: from the genetic information inside a gamete, through fertilization and embryogenesis, to the fully formed fetus — and the variations and vulnerabilities that arise along the way.

3.14.1 Genetics and Inheritance

[Section 3.1](#) established that the nucleus of each cell contains genetic material organized into chromosomes. To understand inheritance and development, it helps to be precise about what each of those terms means and how they relate to each other.

DNA, Genes, and Chromosomes

DNA (deoxyribonucleic acid) is the molecule that carries hereditary information. It is organized into segments called **genes**, each of which codes for the production of a specific protein. Genes are carried on **chromosomes** — tightly coiled strands of DNA housed in the cell nucleus. Chromosomes come in pairs: one from each parent, contributed through the egg and sperm.

Most human body cells contain **46 chromosomes** arranged in **23 pairs**. Of those, 22 pairs are autosomes — chromosomes that are the same regardless of sex. The 23rd pair are the **sex chromosomes**, typically XX in people assigned female at birth and XY in people assigned male at birth. Gametes (eggs and sperm) are

produced through meiosis and contain only 23 chromosomes — half the full set — so that when egg and sperm fuse at fertilization, the resulting zygote has the full 46.



Figure 3.14.1a “[Karyotype](#)” from [Anatomy and Physiology 2e](#), [CC BY-NC-SA 4.0](#).

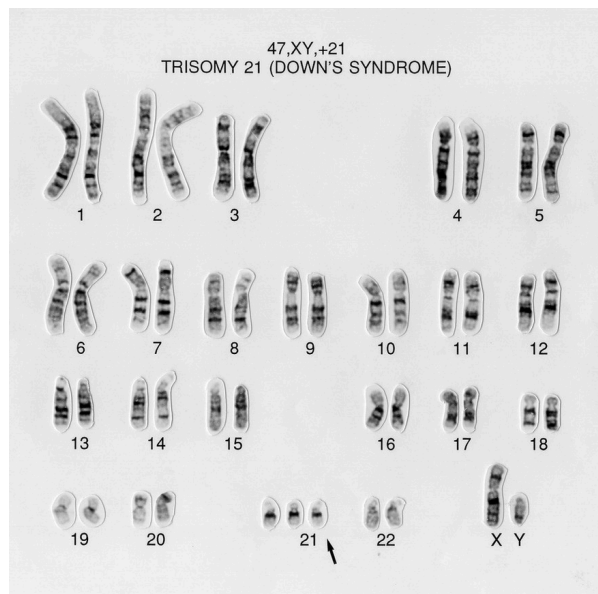


Figure 3.14.1b “[Down Syndrome Human Karyotype](#)” from [Wellcome Collection](#), [CC BY- 4.0](#).

Dominant and Recessive Inheritance

Inheritance patterns describe how traits pass from parent to child. Each person carries two copies of most genes (one per chromosome), called **alleles**. How those alleles interact determines which trait is expressed. In **dominant inheritance**, one copy of an allele is sufficient to produce a trait — you only need to inherit it from one parent for it to appear. In **recessive inheritance**, two copies are required — one from each parent. A person who carries one copy of a recessive allele without expressing the trait is called a **carrier**.

These patterns have practical implications for genetic counselling. If both parents carry a recessive allele for the same condition, each pregnancy has a one-in-four chance of a child inheriting two copies and expressing the condition. Knowing this helps families understand their risks and options before or during pregnancy.

Chromosomal Differences: Trisomy and Monosomy

Most chromosomal differences arise from errors during meiosis called nondisjunction — when chromosomes fail to separate properly during gamete production. If a gamete with an abnormal number of chromosomes participates in fertilization, every cell in the resulting individual will carry that chromosomal difference.

Trisomy occurs when three copies of a chromosome are present instead of two. The most common is **trisomy 21 (Down syndrome)**, where three copies of chromosome 21 produce characteristic features including intellectual differences, facial features, low muscle tone, and cardiac anomalies. Trisomy 18 (Edwards syndrome) and trisomy 13 (Patau syndrome) are less common and associated with more severe impacts.

Monosomy occurs when only one copy of a chromosome is present. Turner syndrome (45,X) is the most common viable monosomy.

It is important to note that a chromosomal difference is not the result of anything a parent did or did not do. This is among the most important things a doula can communicate when families are processing a diagnosis. Nondisjunction is a biological event with no identified cause in most cases.

Monogenic Conditions

Monogenic conditions arise from a mutation in a single gene. They follow predictable inheritance patterns. Examples relevant to prenatal and perinatal care include:

- **Cystic fibrosis:** An autosomal recessive; affects lungs and digestive system; both parents must be carriers for the child to be affected
- **Sickle cell disease:** An autosomal recessive; affects red blood cell shape and function; higher carrier frequency in populations of African, Mediterranean, and South Asian descent
- **Huntington's disease:** An autosomal dominant; affects the nervous system; one copy of the mutated gene is sufficient; onset typically in adulthood
- **BRCA1/2 mutations:** A dominant; significantly increases the risk of breast and ovarian cancer, relevant to reproductive decision-making



Genetics and the Doula's Role

Genetics can feel overwhelming to families — complicated terminology, probabilities expressed as fractions, and diagnoses that can carry profound implications. A doula's role in this context is not to explain genetics (that belongs to genetic counsellors and providers) but to support emotional processing, normalize questions, and help reduce the guilt and self-blame that many families carry after a genetic diagnosis or chromosomal finding.

Consider: a client calls you after their NIPT result came back flagged for a higher probability of trisomy 21. What do you say? What is your role in this conversation? What would it mean to affirm the pregnancy while holding space for what the family is going through?

3.14.2 Fertilization, Gametes, and the Start of Development

Fertilization occurs when a sperm cell penetrates and fuses with an oocyte (egg), combining their genetic material to form a **zygote** — a single cell containing 46 chromosomes. Fertilization typically takes place in the fallopian tube, within 24 hours of ovulation. Only one sperm can fertilize the egg: the moment of penetration triggers chemical changes in the egg's outer layer that create a barrier to further sperm entry.

The genetic sex of the resulting individual is determined at fertilization: the egg always contributes an X chromosome; the sperm contributes either an X or a Y. The sex chromosomes in the zygote are therefore either XX or XY — though, as section 3.14.11 will describe, the relationship between chromosomes and physical sex characteristics is considerably more complex than this pairing suggests.

3.14.3 Pregnancy Dating: Gestational Age, Embryonic Age, and EDD

There is an important distinction between how pregnancy length is measured clinically and how it is measured developmentally. Understanding both prevents confusion when reading medical records, talking to clients about their pregnancy progress, or understanding when specific developmental events occur.

Gestational age is the clinical standard. It is counted from the first day of the **last menstrual period (LMP)**, not from fertilization. Because ovulation typically occurs approximately 14 days after the LMP, gestational age is approximately two weeks longer than the actual age of the embryo or fetus. Human pregnancy is described clinically as approximately 40 weeks, 10 lunar months, or 280 days from the LMP. Gestational age is expressed as weeks and days (e.g., 34w2d).

Embryonic (post-conception) age is counted from fertilization and is approximately 38 weeks total — about two weeks shorter than gestational age. The **pre-embryonic stage** covers the first 14 days after fertilization. The **embryonic stage** runs from day 15 through the end of week 8. The **fetal stage** begins at week 9 (post-conception) and continues until birth. In this OER, developmental timelines are described using embryonic age.

$$\text{Embryonic Age} + 14 \text{ days (2 weeks)} = \text{Gestational Age}$$

Naegele's Rule and Estimated Due Date

Naegele's Rule is the traditional method for calculating an **estimated due date (EDD)**. It works as follows: take the first day of the LMP, subtract three months, and add seven days (plus one year if the result falls in the following calendar year). Example: LMP of November 26 → subtract 3 months = August 26 → add 7 days = September 2 as the EDD.



Explaining the Due Date

Clients are often told a single date and treat it as the arrival deadline. They may become anxious approaching it, distressed if they pass it, or confused if their midwife discusses a different date than what they calculated at home. A doula who understands both Naegele's Rule and the limitations of EDD calculation can help clients hold the EDD as a guide rather than a guarantee.

How would you explain the difference between gestational age and embryonic age to a client who is 10 weeks pregnant and asking why the embryo in the ultrasound seems smaller than she expected? What is the key concept she needs to understand?

3.14.4 Pre-Embryonic Development: Fertilization to Implantation (Days 0-14)

The first two weeks after fertilization are called the pre-embryonic stage. During this period, the zygote undergoes a series of rapid cell divisions while travelling along the fallopian tube toward the uterus.

Day 0

Fertilization — zygote forms (46 chromosomes)

Days 1–2

Cleavage — rapid cell division into 2, then 4 cells. Cells are now called blastomeres

Day 3

8-cell stage (early morula)

Day 4

16-cell morula — the cluster of cells reaches the uterus

Days 5–6

Blastocyst (blastula) forms — a hollow ball of approximately 100 cells with an inner cell mass (which will become the embryo) and an outer trophoblast layer (which will form the placenta and membranes)

Days 7–10

Implantation — the blastocyst burrows into the endometrial lining of the uterus. The trophoblast cells secrete human chorionic gonadotropin (hCG), which signals the corpus luteum to continue producing progesterone and maintains the pregnancy. hCG is what home pregnancy tests detect.

Day 10

Yolk sac forms — provides early nutrients before the placenta is functional

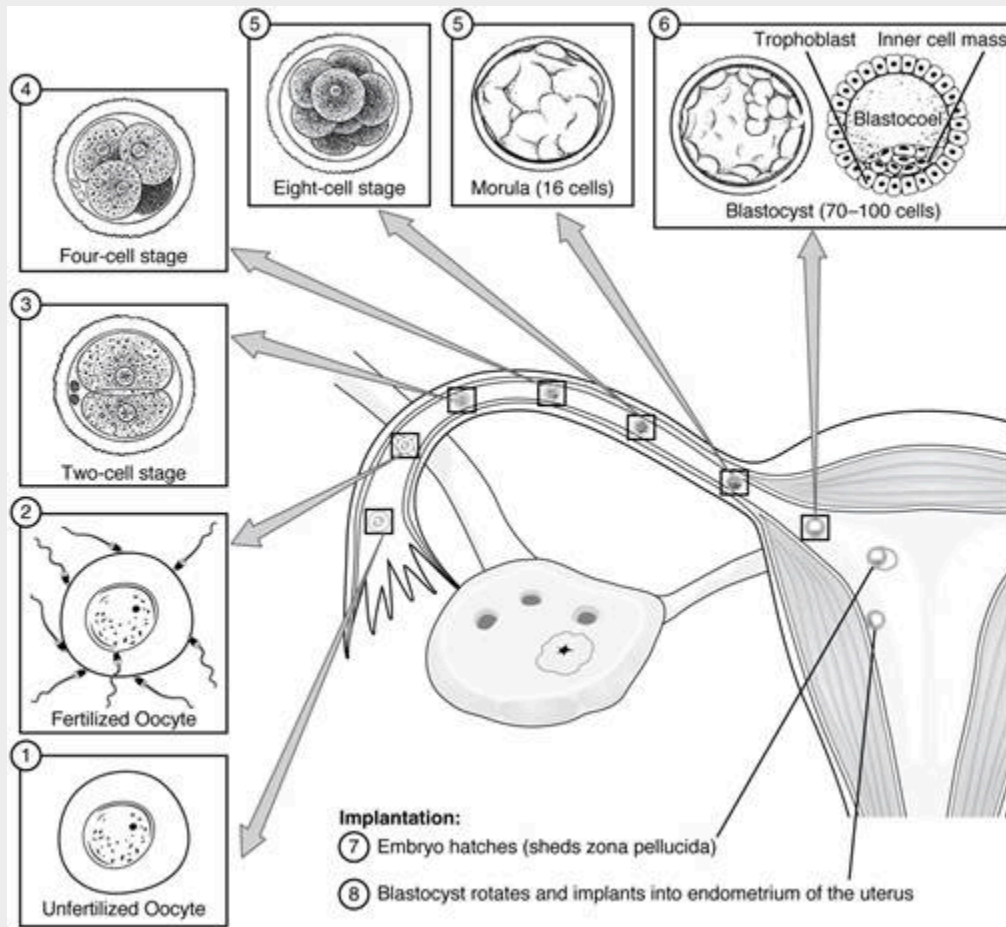


Figure 3.14.2 “Blastocyst” by OpenStax, CC BY 3.0. This diagram shows the journey from fertilization through the fallopian tube, including the stages of cleavage (2-cell, 4-cell, 8-cell, morula), blastocyst formation, and implantation into the endometrium. Labels indicate approximate days post-fertilization.

Video: Human Development

Video: “[human development](#)” by [incredibleleo](#) [2:18] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

3.15.5 The Embryonic Stage: Gastrulation and Germ Layers (Days 15–Week 8)

From day 15 onwards, the inner cell mass reorganizes in a process called **gastrulation**, which converts the

embryo from a flat disc of cells into a three-dimensional structure with distinct layers. These layers are the **three primary germ layers**: ectoderm (outer), mesoderm (middle), and endoderm (inner). Every tissue and organ in the human body develops from one of these three layers.

Table 3.14.1: Embryonic Development

Ectoderm (outer)	Mesoderm (middle)	Endoderm (inner)
Epidermis of Skin	Skeletal System	Epithelial Lining of Digestive Tract
Nervous System	Muscular System	Epithelial Lining of Respiratory System
Sensory Organs (cornea, lens, ear)	Circulatory and Lymphatic Systems	Liver and Pancreas
Adrenal Medulla	Reproductive System (except germ cells)	Thyroid, Parathyroid, Thymus
Tooth Enamel	Dermis of Skin	Urinary Bladder and Urethra Lining
Pituitary and Pineal Epithelium	Excretory System	Lining of Reproductive System

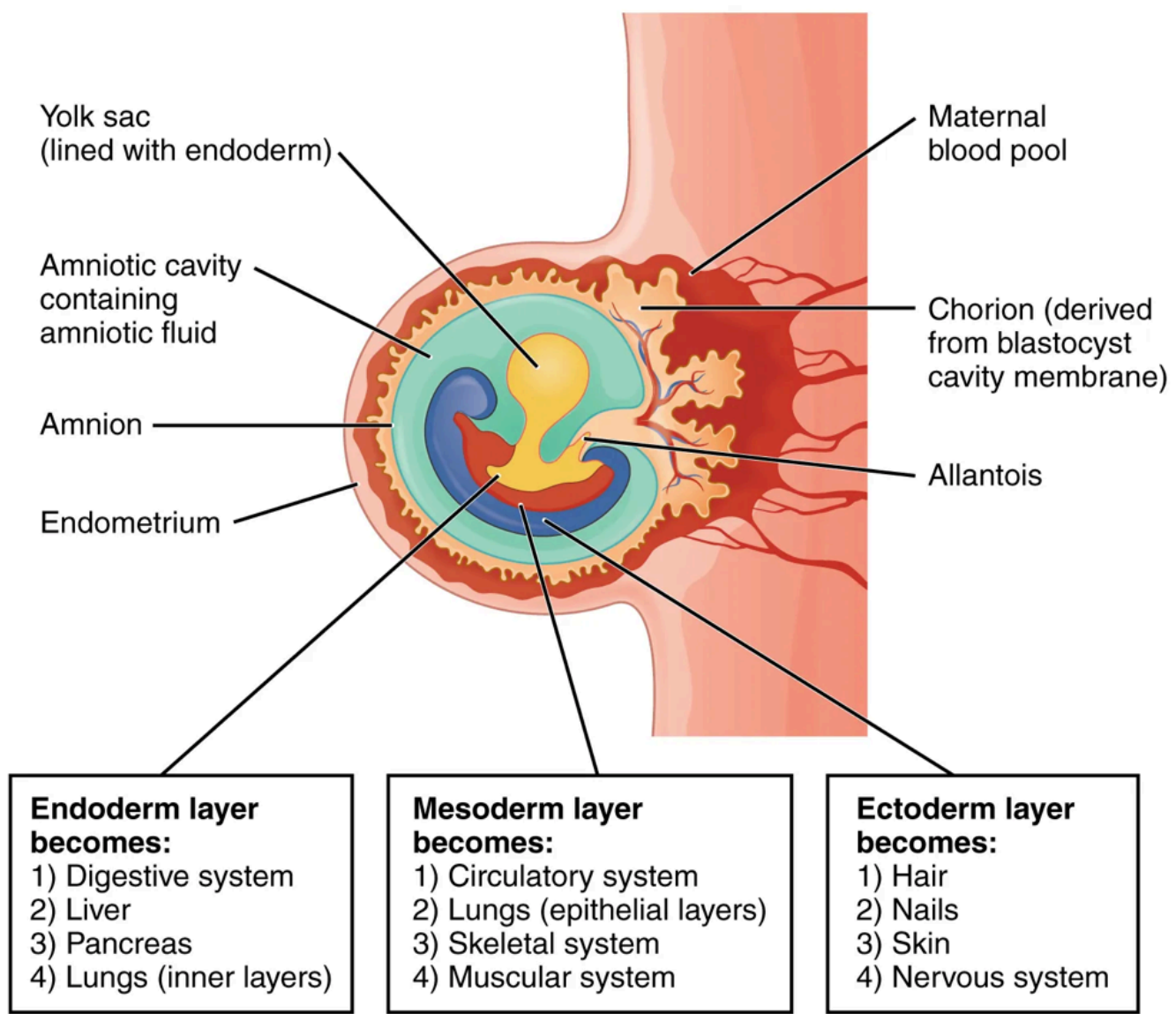


Figure 3.14.3 “Germ Layers at Approximately Week 3” from *Anatomy and Physiology 2e*, CC BY-NC-SA 4.0.

Early Embryonic Milestones (Weeks 3–8)

Week 3

The **neural tube** begins to form from the ectoderm layer — this is the precursor to the brain and spinal cord. It closes by week 4. Failure of the neural tube to close is the basis of **neural tube defects** such as spina bifida, which is why folic acid supplementation before and in early pregnancy is recommended.

Week 4

Arm and leg buds appear; the embryo is approximately 1.3 cm long. The **heart** has already begun beating at approximately day 22 (two paired tubes that fused and began pumping). The lungs, brain, digestive system, ears, nose, and mouth all show early structures.

Week 6

The **placenta** (via chorionic villi), amnion, and umbilical cord are visible. The embryo curls. All essential organ systems are present in primitive form.

Week 8

Sexual differentiation begins under hormonal influence. The placenta takes over the production of progesterone from the corpus luteum. The embryo is now approximately 3 cm and begins to look recognizably human. The embryonic stage ends and the fetal stage begins in the next week.

3.14.6 Embryology by System

Each organ system has its own developmental timeline, and each is vulnerable to disruption during its specific period of formation. This is the basis of the critical windows of teratogen exposure described in section 3.14.14.

Cardiovascular system. Develops first, as it is needed immediately to deliver oxygen and nutrients to the growing embryo. By week 3, a primitive tubular heart is visible. By day 22, the heart begins beating. All four chambers are formed by week 7 (see [section 3.2](#)).

Respiratory system. Development begins in week 3 from a “lung bud” that branches and subdivides to form the bronchial tree. The alveoli mature around week 36. Babies born before 36 weeks may experience respiratory distress due to insufficient surfactant (the substance that prevents alveoli from collapsing) (see [section 3.5](#)).

Nervous system. The brain begins forming around day 19 as three vesicles: the forebrain, midbrain, and hindbrain. The neural tube closes by week 4. Movement begins around week 8 but is not felt by the pregnant person until weeks 16–20 (quickening). Fetal REM sleep patterns develop later in the second trimester (see [section 3.3](#)).

Integumentary system. A thin layer of flattened cells covers the embryo by the end of week 4. **Vernix caseosa** — the creamy protective coating — begins to appear after week 18, protecting the skin from amniotic fluid. **Lanugo** (fine downy hair) appears at week 20 and is shed from week 36. Brown fat begins developing at week 18, helping the newborn regulate temperature (see [section 3.13.6](#)).

Skeletal system and the fetal skull. By week 12, cartilaginous precursors of the long bones are forming. **Ossification** (hardening of bone) proceeds from centres outward. The **fetal skull** is intentionally incompletely ossified at birth to allow for **moulding** — the overlapping of cranial bones during passage through the birth canal. The thin, pliable vault bones are joined by **sutures** (fibrous joints) and **fontanelles** (the soft spots where sutures intersect). During labour, the position and station of the fetal head can be assessed through suture and fontanelle landmarks.

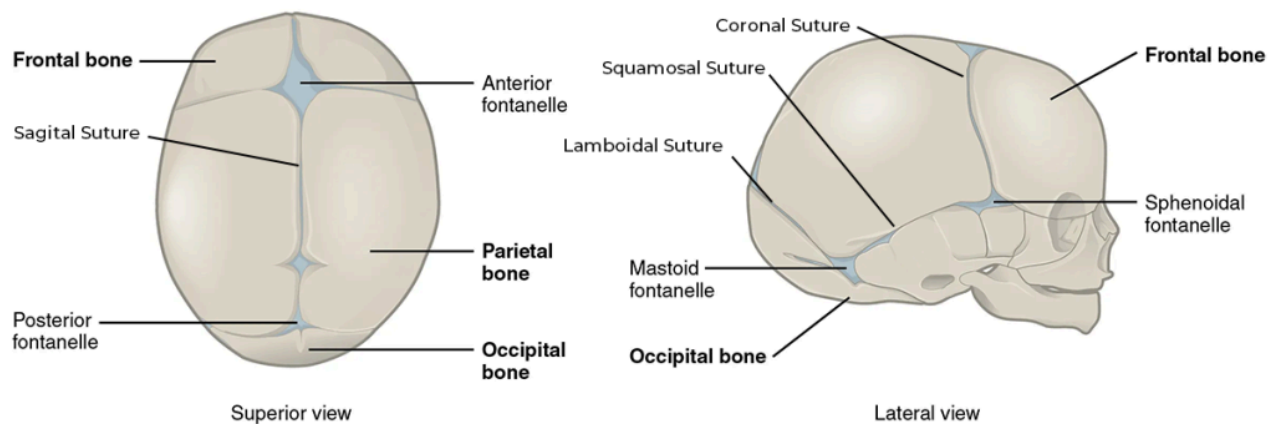


Figure 3.14.4a. “Newborn Skull” from [Anatomy and Physiology 2e](#), CC BY-NC-SA 4.0.



Figure 3.14.4b. “Moulding of the Fetal Head During Birth”. Shows the overlapping of parietal bones at the sagittal suture during birth, allowing the head to reduce its presenting diameter to fit through the birth canal. Moulding typically resolves within 24–48 hours after birth. Image by ChatGPT, Prompt below.

Reproductive system. Until approximately week 8, the internal reproductive structures in all embryos are identical, called the **indifferent stage**. The two duct systems present are the **Wolffian (mesonephric) ducts**, which develop into the epididymis, vas deferens, seminal glands, and ejaculatory ducts in the presence of testosterone; and the **Müllerian (paramesonephric) ducts**, which develop into the fallopian tubes, uterus, cervix, and upper vagina in the absence of Müllerian-inhibiting substance (MIS/AMH). Sex differentiation is explored in section 3.14.11 (see also [section 3.8](#)).

3.15.7 The Fetal Stage: Week 9 to Birth

The fetal stage begins at week 9 post-conception (approximately week 11 gestational age) and continues until birth. During this period, the organ systems formed in the embryonic stage mature, grow, and become functional. The fetus goes from approximately 5.3 cm at week 10 to approximately 50 cm at term.

Table 3.14.2: Key Milestones in Fetal Development

Week	Key Milestones
9	Beginning of fetal period; all major organ systems present in rudimentary form
10	Urine production begins; random movements; approximately 5.3 cm and 58 g
12	Genitals well differentiated; reflex activity; all major organs formed; urine is formed; palate is completely formed
14-16	Completely formed; 18–22 cm; suck and swallow begins; quickening may begin
18	Vernix covers skin; lanugo (downy hair) appears; fingernails present; brown fat developing
20	Quickening (16–20 weeks); sleep and activity pattern is present; hair (lanugo) and vernix cover body
24	Now viable because alveoli in the lungs are forming; survival rate approximately 87% with intensive support; capable of hearing
28	Eyelids open and close; sleep-wake cycles; 1,000 g
30	Movements peak; forming muscle; storing body fat; REM sleep
32-36	Bones are developed; breathing movements are rhythmic; testes descend in males; lungs maturing; alveoli fully functional by 36 weeks
38-40	Full term; approximately 3.0–3.5 kg; ready for extrauterine life

3.14.8 Sex Differentiation: The Biology of Development

Gonadal development begins around week 8. In embryos with a Y chromosome, the **SRY (sex-determining region Y) gene** triggers the development of testes. Testes produce **testosterone** and **Müllerian-inhibiting substance (MIS/AMH)**. Testosterone drives the Wolffian ducts to develop into male internal reproductive anatomy. MIS causes the Müllerian ducts to degenerate. In embryos without the SRY gene, the Müllerian ducts persist and develop into female internal anatomy; the Wolffian ducts degenerate.

External genitalia develop from the same set of undifferentiated structures (the genital tubercle, urogenital sinus, and labioscrotal swellings) in all embryos. With testosterone, these become the penis, scrotum, and associated structures. Without testosterone, they become the clitoris, vaginal opening, and labia. External differentiation is not complete until approximately week 12.

Videos: Sexual Differentiation and Function

Video: “[Sexual Differentiation and Function | Human Endocrine System Physiology](#)” by [sqadia.com](#) [6:36] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

Video: “[Inside Pregnancy Girl or Boy BabyCenter Video](#)” by [Alliance Healthcare](#) [1:59] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

3.14.9 Intersex: Variations in Sex Characteristics

Intersex is an umbrella term used to describe people who are born with sex characteristics — including genitals, gonads, hormone patterns, and chromosome patterns — that do not fit typical binary definitions of male or female bodies. Intersex is a natural and common variation in human biology. Estimates suggest approximately 1.7 percent of people are born with intersex traits — roughly the same proportion of people who are born with red hair (United Nations, 2015).

Intersex traits may be visible at birth, may not become apparent until puberty, or may never be physically apparent at all. Intersex is about physical biology, not gender identity. Intersex people may identify as any gender.

Types of Intersex Variations

5-Alpha-Reductase Deficiency (XY): The enzyme that converts testosterone to dihydrotestosterone (DHT) is absent or insufficient. At birth, external genitalia may appear more typically female; at puberty, testosterone surges can produce virilization. Gonads are testes.

Klinefelter Syndrome (XXY): An extra X chromosome. Typically not diagnosed until puberty or later. May include small testes, reduced sperm production, breast tissue development, and reduced testosterone. Most people with Klinefelter syndrome do not have an intersex identity.

Turner Syndrome (XO): One X chromosome, or a partial X. Generally assigned female at birth; typically infertile due to absence of functional ovaries. May include short stature, broad chest, and skeletal differences.

Congenital Adrenal Hyperplasia (XX): Excess androgen production in individuals with XX chromosomes causes virilization of external genitalia, which may appear more typically male. The internal reproductive structures (ovaries, uterus) are present.

Androgen Insensitivity Syndrome (XY): The body is fully or partially insensitive to androgens (testosterone). In complete AIS, external genitalia appear typically female; internal testes are present, and the uterus and fallopian tubes are absent due to MIS. In partial AIS, anatomy may be anywhere along a spectrum. Often not diagnosed until puberty, when menstruation does not begin.

Other variations include hypospadias (urethra located along the shaft rather than the tip of the penis), clitoromegaly, and vaginal agenesis. Many of these variations are minor and require no medical intervention. Some are associated with greater complexity.

Intersex and Medical Intervention

Historically, when intersex traits were identified at birth, medical and surgical interventions were performed on infants and children to produce anatomy that conformed to binary male or female norms — often without their knowledge or consent. These interventions, performed without clinical necessity, are now widely recognized as harmful. They can cause permanent damage to sensation, fertility, and psychological wellbeing. Intersex advocacy organizations, the United Nations, and major medical associations have called for an end to medically unnecessary interventions on intersex infants and children.

The current recommended approach centres the intersex person's own future consent — providing comprehensive information to families, offering supportive care, and deferring irreversible interventions until the individual is old enough to participate in decision-making.

Video: Intersex Children

Video: "[Intersex Children: Waiting to Decide on Sex Surgery?](#)" by [ABC News](#) [9:22] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.



An Intersex Child is Born

A client gives birth to a baby with ambiguous external genitalia. The obstetrical team is discussing next steps with the family, and the parents are overwhelmed and frightened. They have questions about what this means for their child's future.

What is the doula's role in this moment? How do you hold space for the parents' feelings while not directing medical decisions? What would it mean to advocate for the parents to have time, information, and support before making any decisions? What resources might you connect them with?

3.14.10 Genetic Screening and Testing

Genetic screening and testing during pregnancy have expanded significantly in the last two decades. Doulas need to understand what these options are, what a positive screen means (and does not mean), and how to support clients navigating results.

Before Pregnancy: Carrier Screening

Carrier screening is offered to individuals or couples before or early in pregnancy to determine whether they carry recessive alleles for specific conditions. If both partners are carriers for the same condition, each pregnancy has a 25 percent chance of inheriting both copies. Genetic counselling helps families understand their options and the range of outcomes for a child who inherits the condition.

During Pregnancy: Non-Invasive Prenatal Testing (NIPT)

NIPT analyzes small fragments of placental DNA that circulate in the pregnant person's bloodstream. It is available from approximately 10 weeks gestational age. NIPT tests for the probability of trisomies 21, 18, and 13, and can also detect sex chromosome differences. NIPT is a screening test, not a diagnostic test — a positive result means an increased probability, not a confirmed diagnosis. Confirmatory testing (CVS or amniocentesis) is required for diagnosis.

Enhanced First Trimester Screening (eFTS)

eFTS combines an ultrasound (measuring nuchal translucency — fluid at the back of the fetal neck) with blood markers (PAPP-A and hCG) to calculate the probability of trisomy 21 or trisomy 18. It is available from weeks 11 to 13. A screen-positive result indicates a probability of approximately 1 in 200 to 1 in 350 — meaning that many screen-positive pregnancies will not be affected.

Diagnostic Testing: CVS and Amniocentesis

Chorionic villus sampling (CVS) biopsies placental cells and is available from approximately 11 to 14 weeks. It provides a direct chromosomal and genetic diagnosis.

Amniocentesis removes a small sample of amniotic fluid (which contains fetal cells) after 15 weeks. It provides chromosomal analysis and can test for specific genetic conditions. Both procedures carry a small risk of pregnancy loss (approximately 0.5 to 1 percent).

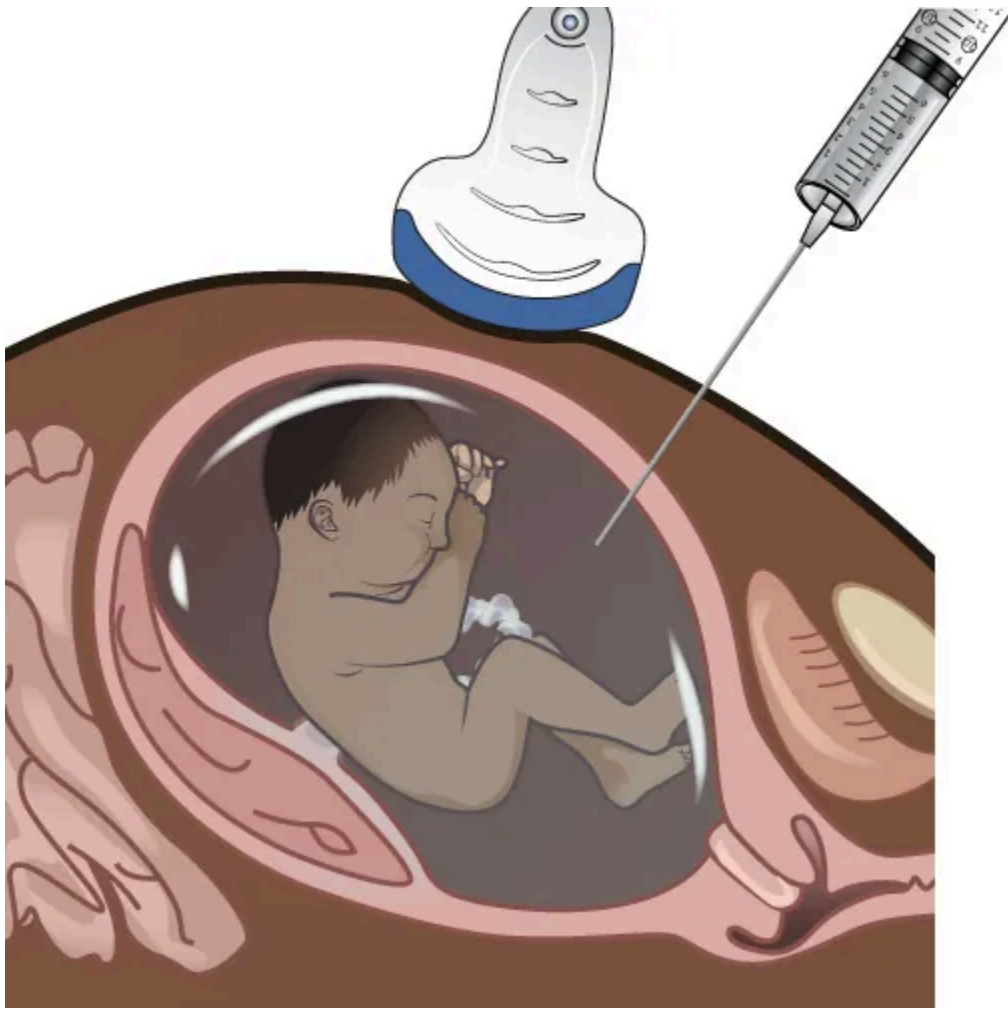


Figure 3.14.5 “Amniocentesis” from [Maternal-Newborn Nursing, CC BY-NC-SA 4.0](#).

3.14.11 Congenital Anomalies

A **congenital anomaly** is a structural or functional difference present from birth, arising during intrauterine development. Congenital anomalies can affect any body system and range from minor variations requiring no treatment to complex conditions requiring surgical intervention. Most congenital anomalies arise from a combination of genetic, environmental, and unknown factors — not a single identifiable cause.

Cardiac anomalies are among the most common, with chromosomal and genetic factors accounting for about 8 percent, and teratogen exposure between weeks 3 and 6 accounting for approximately 2 percent (Marshall & Raynor, 2014, as cited in the course slides). Signs of cardiac anomalies in the newborn include cyanosis (bluish colour), rapid breathing, respiratory distress, heart murmur, or poor peripheral pulses. Some infants appear well at birth and are discharged before signs become apparent. Doulas should advise families to seek immediate medical care if they notice difficulty breathing or poor colour in the newborn.

Oral clefts (cleft lip and cleft palate) form between weeks 6 and 9, when the facial structures are fusing. In

Canada, approximately 15 babies per 10,000 births are affected. The primary concern at birth is feeding. Surgical repair is typically performed in the first months of life, with ongoing support for language development.

Neural tube defects (NTDs) occur when the neural tube fails to close completely between days 17 and 30 post-conception. **Spina bifida** (failure of the vertebral column to fuse) is the most common survivable NTD. Folic acid supplementation before and during early pregnancy significantly reduces NTD risk. In Canada, the rate of NTDs is approximately 5.7 per 10,000 births (Canadian Institute of Child Health, 2020, as cited in the course slides).

Other examples include gastrointestinal malformations, diaphragmatic hernia, musculoskeletal conditions (club foot/talipes, hip dysplasia), genitourinary anomalies, and chromosomal conditions such as trisomies (described in section 3.15.1).

It is important that doulas understand congenital anomalies not to diagnose them but to support families who receive a prenatal diagnosis, to recognize signs that warrant medical referral in a newborn, and to hold the complexity of what families face without projecting guilt or blame.



Supporting Families After a Prenatal Diagnosis

A client at 16 weeks receives amniocentesis results confirming trisomy 21. They call you. They are crying. They do not know yet what they want to do. They are asking you what it means for the baby's life and whether they "should" continue the pregnancy.

What is the doula's role in this conversation? What does reproductive autonomy mean in this context? The right to have children, the right to not have children, and the right to parent in safety (Reproductive Justice framework, section 2.6.1) all intersect here. How do you hold the full complexity of this moment without directing a decision?

3.14.12 Teratogens and Other Prenatal Risks

A **teratogen** is any substance or exposure that can cause anomalies or developmental differences in an embryo or fetus. Teratogens include certain medications, recreational substances, tobacco, alcohol, some infections, and, in some cases, uncontrolled health conditions such as poorly managed diabetes. The **timing** of exposure is critical: the embryonic period (particularly weeks 3–8) is the most vulnerable because it is when organ systems are forming. The 'classic period of teratogenesis' for a 28-day cycle extends from approximately day 31 after LMP (day 17 after fertilization) to day 71.

FETAL DEVELOPMENT CHART

This chart shows vulnerability of the fetus to defects throughout 38 weeks of pregnancy.*
• = Most common site of birth defects

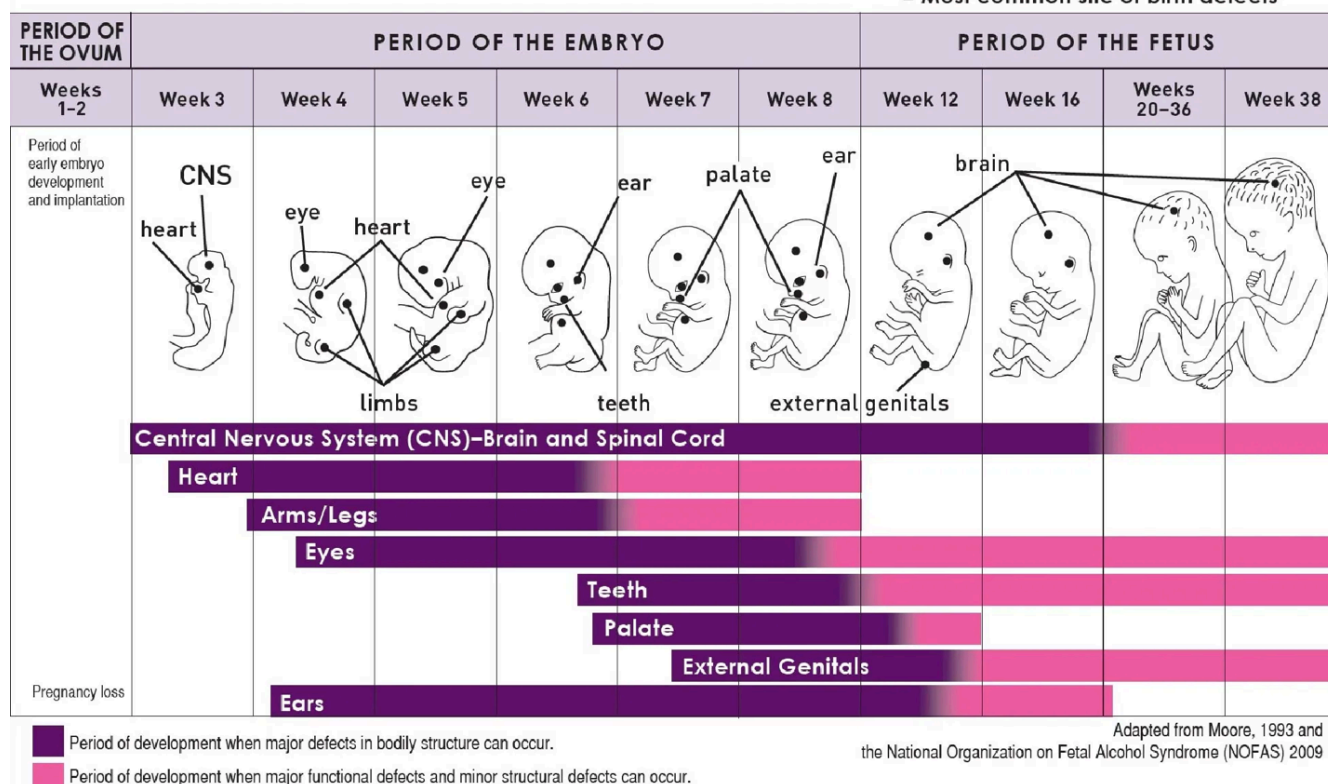


Figure 3.14.6 “Fetal Development Chart” from [Maternal-Newborn Nursing, CC BY-NC-SA 4.0](#).

Image Description

The fetal development chart shows fetal vulnerability to birth defects throughout 38 weeks of pregnancy. A dot marks the most common sites of birth defects.

During weeks 1–2, the period of the ovum, early embryo development and implantation occur. Exposure during this period may result in pregnancy loss.

The period of the embryo spans weeks 3–8. The central nervous system (CNS)—the brain and spinal cord—begins developing in week 3 and remains vulnerable throughout pregnancy. The heart begins developing around week 3; the arms and legs around week 4; the eyes and ears around weeks 4–5; the teeth around week 6; and the palate and external genitals around weeks 6–7.

The period of the fetus extends from approximately week 9 through week 38. During this period, the brain and other organs continue developing as the fetus grows and matures.

The chart distinguishes between two types of vulnerability:

Major defects in bodily structure can occur primarily during early organ development.

Major functional defects and minor structural defects can occur later and may remain possible through much of the fetal period.

The chart tracks the central nervous system, heart, arms and legs, eyes, teeth, palate, external genitals, and ears. It is adapted from Moore (1993) and the National Organization on Fetal Alcohol Syndrome (NOFAS, 2009).

Alcohol. Alcohol is the most fully documented teratogen in common use. Excessive alcohol exposure — particularly heavy or binge drinking — causes **Fetal Alcohol Spectrum Disorder (FASD)**, characterized by growth restriction, central nervous system dysfunction (affecting cognition, behaviour, and learning), and characteristic facial features. No safe level of alcohol consumption during pregnancy has been established (Health Canada, 2009). Exposure before pregnancy is known to be a concern.

As a doula, you are not responsible for surveillance or judgment of a client's alcohol use. You are responsible for providing accurate information when asked and referring clients who express concern about their use to supportive resources. Guilt and shame do not support change; connection and accurate information do.

Tobacco. Tobacco smoke reduces fetal oxygen delivery and is linked to intrauterine growth restriction (IUGR), low birth weight, preterm birth, premature rupture of membranes, perinatal mortality, placenta previa, and abruptio placentae. Postnatally, secondhand smoke is associated with sudden infant death syndrome (SIDS), middle ear infections, and respiratory illness.

Cannabis. Cannabis is the most frequently used substance in pregnancy in Canada. Frequent cannabis use in pregnancy is associated with low birth weight, preterm birth, and altered neurodevelopment. Evidence suggests long-term behavioural concerns in children. Cannabinoids pass through breast milk during lactation.

The current evidence does not support cannabis use during pregnancy or lactation. At the same time, a harm reduction framework recognizes that blanket prohibition without support or compassion does not serve clients who use cannabis — particularly those who use it to manage mental health symptoms, nausea, or pain.

[The Wading Through the Weeds project \[PDF\]](#) (Dr. Saara Greene, McMaster University) provides an evidence-based harm reduction toolkit for providers supporting pregnant and breastfeeding people who use cannabis. Developed using a participatory research approach with 23 mothers across Canada, it emphasizes stigma-free, trauma-informed, intersectional practice. Research from the project found that intersectional stigma and provider surveillance created barriers to information and support for racialized and marginalized parents — barriers that a doula's non-judgmental, relationship-based role is positioned to reduce (Greene, 2022).

Opioids and opioid use disorder. Untreated opioid use disorder in pregnancy carries significant risks.

Methadone maintenance treatment (MMT) is the standard of care, associated with better antenatal care, improved fetal outcomes, decreased risk of HIV transmission, and increased likelihood that the infant will go home with their parents. Babies born to opioid-dependent parents may experience **Neonatal Abstinence Syndrome (NAS)** — withdrawal symptoms requiring medical management. Skin-to-skin care, swaddling, minimizing stimulation, and breastfeeding support all help soothe infants with NAS.

Caffeine. Caffeine is not classified as a teratogen. Studies do not show increased risk of adverse pregnancy outcomes at 300 mg per day or less — approximately one to two cups of coffee. The main concern is that caffeine crosses the placenta and infants cannot metabolize it efficiently until approximately three months of age. Moderate consumption is generally considered safe; very high intake may be associated with reduced fetal growth (Morgan et al., 2013).

Medications. Many medications are safe in pregnancy; others are not. The general guidance is to avoid all non-essential medication during the first trimester and to consult a midwife or physician before taking any medication during pregnancy. Where medication is necessary (for example, to manage epilepsy, depression, hypertension, or thyroid conditions), the risk of not treating the condition often outweighs the teratogenic risk of the medication. Accutane (isotretinoin) is among the most potent known teratogens, causing cardiac, CNS, and facial anomalies; it requires strict pregnancy prevention protocols.



Cannabis Disclosure in a Prenatal Visit

You are meeting with a client at 14 weeks. She mentions, somewhat cautiously, that she has been using cannabis most evenings to manage anxiety and nausea. She says she knows ‘it’s probably bad’ and seems to expect judgment. She asks what you think.

What does a harm reduction approach look like in this moment? What is the difference between providing accurate information (which is your role) and surveillance or moral judgment (which is not)? What resources would you offer, and how would you offer them without shame? How does the Wading Through the Weeds framework support this conversation?

3.14.13 Supporting Families: The Doula’s Role

The content of this section covers some of the most emotionally charged territory in reproductive care: genetic diagnoses, congenital anomalies, intersex variations, and prenatal substance use. In all of these contexts, the doula’s role is not clinical but relational.

Affirm the complexity of development. Embryonic and fetal development is extraordinarily intricate. Congenital anomalies, chromosomal differences, and variations in sex characteristics arise from biological processes — not from parental failure, behaviour, or choices in most cases. This is one of the most important things a doula can communicate.

Hold the grief. A genetic diagnosis, an anomaly identified on ultrasound, or an intersex birth can be associated with grief, guilt, fear, and profound disorientation. Doulas who have studied this content can hold space for those feelings without being destabilized by them.

Check your biases. Assumptions about disability, about intersex conditions, about what makes a family, and about substance use are all present in reproductive care settings. A doula who has examined their own assumptions is better positioned to support clients without imposing them.

Refer. Connect families with genetic counsellors, intersex support organizations, disability-affirming communities, lactation consultants familiar with cleft palate care, neonatal abstinence support programs, and harm reduction services as appropriate.



What Carries Forward

This is the last content section of Chapter 3. You have now studied the anatomy and physiology of every major body system, how they adapt during pregnancy, and how the person you are is shaped from the moment of fertilization through the weeks of embryonic and fetal development.

The genetics section of this chapter is not just biology. It is the foundation for understanding why chromosomal conditions occur without blame, why intersex traits are natural rather than pathological, why some families face decisions that no textbook can fully prepare you for, and why a doula who understands the science is better equipped to hold the emotional weight of the room without being swept away by it.

What is one piece of content from this section that changed how you think about a population you will work with as a doula? Name it, and name what you will do differently because of it.

Note: Anti-oppressive frameworks for genetic diagnosis and disability, inclusive perinatal care for intersex families, and harm reduction approaches to substance use in the perinatal period are explored in greater depth in HLTH-3080, Weeks 3, 10, and 12.

“[13.1 Prenatal Testing during the First Trimester](#)” in [Maternal-Newborn Nursing](#) by Amy Giles, Regina Prusinski, and Laura Wallace is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](#), except where otherwise noted.

“[Introduction](#)”, “[28.1 Fertilization](#)”, “[28.2 Embryonic Development](#)”, and “[28.7 Patterns of Inheritance](#)” in [Anatomy and Physiology 2e](#) by J. Gordon Betts, Kelly A. Young, James A. Wise, Eddie Johnson, Brandon Poe, Dean H. Kruse, Oksana Korol, Jody E. Johnson, Mark Womble, Peter DeSaix licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](#), except where otherwise noted.

Fetal Head Moulding Image: OpenAI. (2026). [ChatGPT](#) [Large Language Model].
Prompt

Create an image showing the overlapping of parietal bones at the sagittal suture during birth, allowing the head to reduce its presenting diameter to fit through the birth canal. Moulding typically resolves within 24–48 hours after birth.

3.15 Physiology of Labour



Learning Outcomes

By the end of this section, you will be able to:

- Describe uterine and cervical changes during pregnancy that prepare the body for labour
- Discuss theories on how labour is initiated
- Identify early signs of labour and distinguish between Braxton-Hicks and true labour contractions
- Explain the phases and stages of labour, including the latent, active, transition, second, and third stages
- Describe the cardinal movements of labour and explain fetal stations, positions, and presenting parts
- Recognize variations in fetal presentation, including breech
- Describe the physiological mechanism of placental separation and the significance of the golden hours postpartum

Labour is the body's natural process of birth. It typically lasts 12 to 24 hours for a nulliparous birthing person (someone giving birth for the first time) and is often shorter for those who have given birth before. This section traces the physiology of labour from the earliest preparations in the uterus through to the delivery of the placenta, examining what drives each stage and what doulas need to understand to support and educate their clients effectively.

3.15.1 Preparing for Labour: Uterine and Cervical Changes

[Section 3.13.1](#) described how the uterus grows from approximately 70 grams to more than 1,000 grams during pregnancy. The changes described here build on that foundation to explain what must happen for the uterus to shift from its role of containing a pregnancy to its role of expelling one.

The Uterus

During pregnancy, the uterus grows exceptionally, increasing its weight approximately 20-fold, to between 800 and 1,200 grams, with a capacity of approximately five litres (Coad and Dunstall, 2011, as cited in Solomon, 2025). The uterine wall first thickens and then thins, and the shape shifts from a sphere to a cylinder. The myometrial cells organize into three distinct layers:

- **Innermost layer:** circular muscle fibres
- **Middle layer:** spiralling fibres that interweave around blood vessels; contraction of this layer controls postpartum bleeding by compressing the vessels after the placenta delivers
- **Outermost layer:** longitudinal and circular fibres that shorten with each contraction to drive the fetus downward

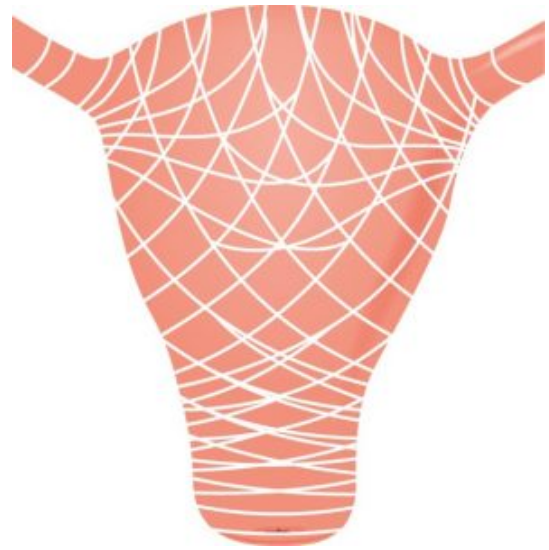


Figure 3.15.1 “[Uterine Muscles](#)” from [Nursing Health Promotion, CC BY 4.0](#).

During labour, the uterus contracts and elongates. Each contraction exerts downward pressure on the fetus, called **fetal axis pressure**, which drives the presenting part toward the lower uterine segment and cervix. The upper segment contracts most powerfully; the lower segment is thinner, more passive, and progressively pulled upward and thinned as labour progresses.

Between contractions, the uterus relaxes. This rest period serves two purposes: it allows the birthing person’s muscles to recover, and it restores uteroplacental circulation, which is essential for fetal oxygenation. Contractions are involuntary: the birthing person cannot control their frequency, duration, or intensity. They are sometimes called **surges** in some birth philosophies and communities.

The Cervix: Ripening, Effacement, and Dilation

At the start of pregnancy, the cervix is rigid, firm, and approximately 4 to 7 centimetres long. It acts as a seal and a barrier against infection. For the fetus to pass through, the cervix must soften, thin, and open.

Cervical ripening refers to the process by which collagen fibres in the cervix are broken down by enzymes, reducing their ability to hold together and increasing the water content of the tissue. The result is a cervix that is progressively softer, more pliable, and more anterior. Ripening may begin days or weeks before labour.

Effacement is the shortening and thinning of the cervical canal as the upper uterus exerts longitudinal pull on it, incorporating the cervical tissue into the lower uterine segment. Effacement is measured as a percentage from 0 (no thinning) to 100 (fully incorporated). In a nulliparous person, effacement typically occurs before dilation; in a multiparous person, they often occur simultaneously.

Dilation is the enlargement of the cervical os from 0 to 10 centimetres, the opening required for the passage of a full-term fetus. The cervix opens in response to contractions and to the direct pressure of the

presenting part. Together, effacement and dilation are the primary markers of labour progress.

Video: Cervical Effacement 3D Animation

Video: "[Cervical Effacement 3D Animation](#)" by [Obstetrics & Gynecology Associates](#) [1:09] is licensed under the [Standard YouTube License](#). *Transcript and closed captions available on YouTube.*

3.15.2 Theories on the Initiation of Labour

Why labour begins when it does is not fully understood. Several overlapping biological mechanisms are thought to contribute, and they are best understood as a cascade rather than a single trigger.

Progesterone withdrawal.

Progesterone maintains uterine quiescence throughout most of pregnancy by relaxing smooth muscle and inhibiting contractions. Near the end of pregnancy, biochemical changes reduce the availability of progesterone, allowing estrogen's stimulatory effects to predominate. As estrogen rises sharply in the final weeks, it stimulates both uterine contractions and the release of prostaglandins by the placenta (Blackburn, 2013, as cited in Solomon, 2025). The clinical relevance: progesterone can be used to help prevent preterm labour.

Prostaglandins and oxytocin.

The exact relationship between prostaglandins and the onset of labour remains an area of ongoing research, but labour can be successfully initiated using prostaglandin E, and preterm labour can sometimes be slowed using prostaglandin synthesis inhibitors. Oxytocin also plays a role: it stimulates uterine contractions directly and stimulates prostaglandin production by the amnion and endometrium, creating a positive feedback loop that intensifies as labour progresses.

Corticotropin-releasing hormone (CRH).

CRH, produced by the placenta, increases steadily throughout pregnancy and rises sharply at term. Elevated plasma CRH levels are seen before preterm labour and in multiple gestations. CRH stimulates prostaglandin production and triggers cortisol release through ACTH, which is related to fetal lung development and may also support the onset of labour. This represents another positive feedback loop: rising cortisol further increases CRH production (Kalantaridis et al., 2011, as cited in Solomon, 2025).

Fetal-maternal signalling.

Evidence suggests that the fetus itself communicates its readiness for birth through signals produced by the developing lungs. Surfactant protein-A (SP-A) and platelet-activating factor (PAF) are produced by the maturing fetal lung and trigger a cascade of responses in the uterus, including cervical dilation, membrane changes, and the onset of contractions (Mendelson et al., 2017). This signalling appears to be part of how the fetal brain indicates lung maturity.

3.15.3 Early Signs of Labour

Several signs may indicate that labour is approaching. They can occur hours, days, or weeks before labour begins, and no person will experience all of them. Doula's should help clients understand each sign, know which ones warrant immediate contact with their care provider, and feel confident reaching out when uncertain.

Lightening (engagement).

Lightening refers to the fetus settling lower into the pelvis as the presenting part engages. The fundus drops, relieving diaphragmatic pressure and making breathing easier. At the same time, increased pelvic pressure may cause leg cramps, greater urinary frequency, increased vaginal secretions, and lower extremity edema. In a nulliparous person, engagement often occurs two to four weeks before labour; in a multiparous person, it may happen during labour itself.

Cervical ripening and bloody show.

As the cervix softens and begins to efface, the mucous plug that has sealed the cervical canal throughout pregnancy is expelled. This may appear as increased mucus discharge, often tinged pink, brown, or red from exposed cervical capillaries. This is called bloody show and is generally considered a sign that labour may begin within 24 to 48 hours. Bright red bleeding or bleeding that resembles a period is different from show and warrants immediate contact with a care provider.

Rupture of membranes (ROM).

Approximately 10 percent of term pregnancies experience spontaneous rupture of the amniotic sac before labour begins. The fluid may appear as a gush or a slow trickle, which can be confused with urinary incontinence. Doula's can teach clients the **TACO** framework for assessing what happened: **T**ime (when did it occur), **A**mount (how much fluid), **C**olour (clear is normal; green or brown may indicate meconium), **O** odour (amniotic fluid has no odour). When membranes rupture, clients should contact their care provider regardless of whether contractions have begun, as there is an increased risk of infection with an open pathway to the uterus. After membranes rupture, approximately 90 percent of birthing people begin labour within 24 hours (Jazayeri, 2011, as cited in Solomon, 2025).

Nesting.

A sudden burst of energy, sometimes characterized by an urge to clean, organize, or prepare the home for the baby, is commonly reported in the days before labour. The cause is not fully understood (Anderson and Rutherford, 2013). Doulas can encourage clients to rest between activities if they experience this, so they conserve energy for labour.

True Labour and Braxton-Hicks Contractions

Braxton-Hicks contractions are mild, irregular contractions that occur throughout the second half of pregnancy. They can be strong enough to make a person believe they are in labour. The key distinction is that they do not produce cervical change and do not follow a progressively intensifying pattern. Often, the only definitive way to distinguish true labour from Braxton-Hicks is to assess the cervix. Doulas should reassure clients that seeking assessment is the right thing to do and that being sent home is not an embarrassment.

Table 3.15.1: Features of Labour

Feature	True Labour	Braxton-Hicks (False Labour)
Contractions	Regular; increasing in frequency, duration, and intensity	Irregular; unpredictable; no progression in pattern
Location	Usually begin in the lower back and radiate around to the abdomen	Generalized abdominal tightening; often lower abdomen and groin
Effect of activity or position change	Continue and may intensify with movement or walking	Often stop or ease with position change, a warm bath, or rest
Cervical change	Progressive effacement and dilation with each contraction	No cervical change
Duration	Gradually lengthening from 30 seconds to 60 seconds or longer	Variable; no pattern
Key point	The only way to confirm true labour is to assess cervical dilation and effacement	Common and normal; not a sign of complications



A Call at 2AM

A client calls you at 2am. She is 39 weeks pregnant with her first baby. She has been having contractions for about two hours. They are coming every 8 to 12 minutes, lasting about 40 seconds, and she can still talk through them. She is excited but also worried this might be a false alarm.

What do you tell her? How do you assess whether she should head to the hospital or birth centre now, call her midwife, or stay home and rest? What comfort suggestions might you offer for the next few hours? And how does your answer change if she tells you her membranes may have ruptured?

3.15.4 The Five Ps of Labour

For vaginal birth to occur, five key elements must work in synchrony: the Power of contractions, the Passageway of the pelvis, the Passenger (fetus), the Positioning of the birthing person, and the Psyche. Understanding these factors helps doulas anticipate challenges, support effective positioning, and recognize when progress may be slowing.

Power: Contractions and Pushing Effort

Power refers to the strength of uterine contractions as the primary force of labour, and to the pushing effort in the second stage. Uterine contractions are rhythmic, involuntary tightenings and relaxations of the myometrium that exert downward pressure on the fetus, driving effacement, dilation, and fetal descent. They are described by three measurements:

- **Duration:** from the beginning to the end of one contraction
- **Intensity:** the strength of the contraction at its peak (acme), described as mild, moderate, or strong
- **Frequency:** from the start of one contraction to the start of the next

The interval between contractions is the period of uterine relaxation. This rest is as important as the contraction itself: it restores uteroplacental blood flow and allows the fetus and the birthing person to recover.

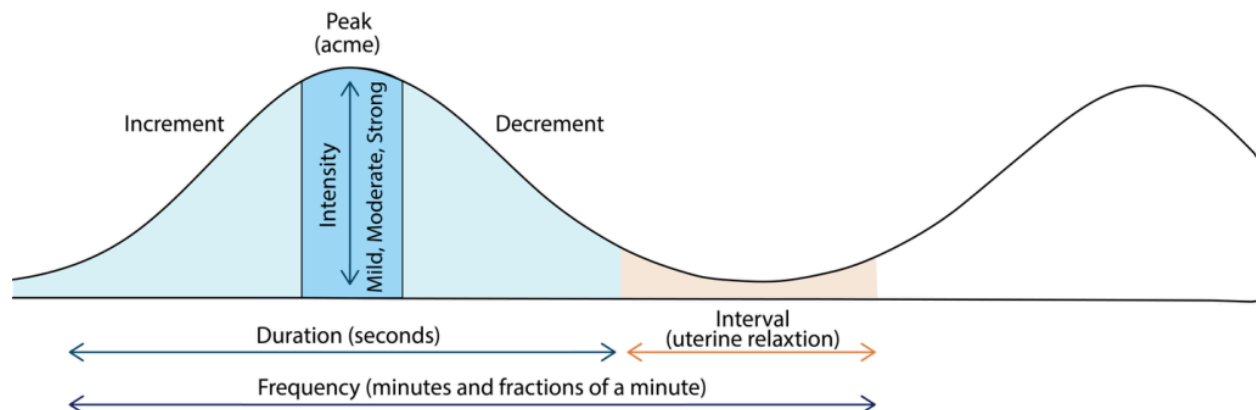


Figure 3.15.2 “The Contraction Cycle” from [Nursing Health Promotion, CC BY 4.0](#).

Second-stage power comes from both continued uterine contractions and the birthing person’s pushing effort. Effective pushing is influenced by muscular strength, fatigue, fetal position, and whether epidural anesthesia has reduced the sensation of the urge to push. The Ferguson reflex (also called the fetal ejection reflex) describes the compulsive, involuntary urge to bear down that occurs when the presenting part stimulates nerve receptors in the pelvic floor. When present without epidural anesthesia, this reflex engages the abdominal muscles and diaphragm in a powerful, instinctive pushing effort.

The passageway includes the bony structures of the pelvis and the soft tissues of the pelvic floor. The relaxin hormone softens pelvic ligaments during pregnancy, increasing joint flexibility and the effective diameters of the pelvis. The pelvis has three key zones the presenting part must navigate: the inlet (top opening), the pelvic cavity (mid-pelvis), and the outlet.

Pelvic shape is categorized into four types. The gynecoid pelvis, with its circular inlet, is generally most favourable for vaginal birth. The android, anthropoid, and platypelloid shapes each present a different inlet geometry. Recent research suggests that pelvic shape alone does not reliably predict birth outcomes or cesarean birth risk.

The pelvic floor muscles support the abdominal cavity and, during birth, become dynamic, stretching to allow the fetus to descend while guiding its rotation. Hypertonic (overly tight) pelvic floor muscles can increase resistance and may be associated with anxiety, prior pelvic trauma, or inadequate birth preparation. Hypotonic muscles may contribute to fetal malpositioning. Doulas familiar with pelvic floor physiology can encourage positions and movements that promote relaxation and descent.

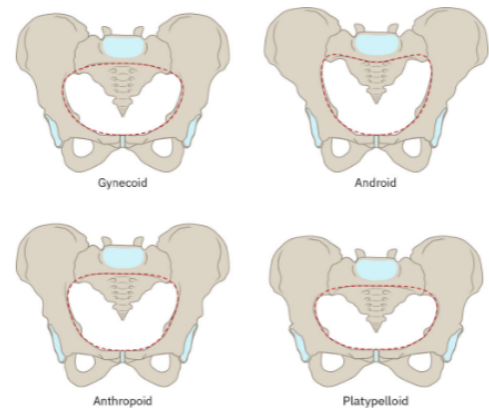


Figure 3.15.3 “The four types of female pelvis” from [Nursing Health Promotion, CC BY 4.0](#).

The fetus, called the passenger, affects labour through its size, position, and ability to adapt to the passageway. The features of the fetal head are particularly important because it is typically the largest part to navigate the birth canal.

Fetal head. The fetal skull has sutures (fibrous joints between bones) and fontanelles (soft spots where sutures intersect) that allow the cranial bones to overlap and compress during passage through the pelvis — a process called **moulding**. The **vertex** is the diamond-shaped area between the anterior and posterior fontanelles: this is the optimal presenting diameter for vaginal birth. Clinical landmarks on the fetal head include the **occiput** (occipital bone at the back of the head), the **bregma** (anterior fontanelle), the **sinciput** (forehead), and the **mentum** (chin). These landmarks are used to describe fetal position.

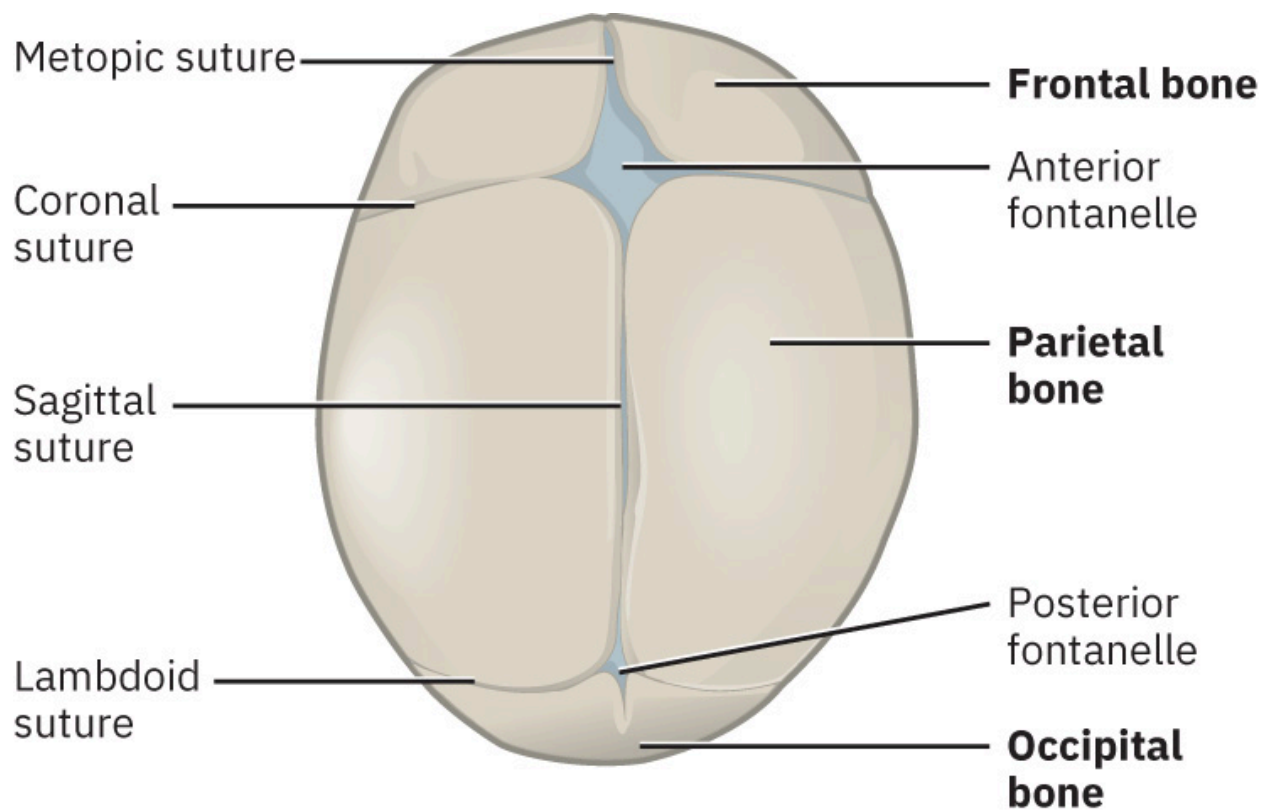


Figure 3.15.4 “Fetal Head” from [Nursing Health Promotion, CC BY 4.0](#).

Fetal attitude. Attitude describes the relationship of fetal body parts to one another. In the optimal position for birth, the fetus is in **complete flexion**: chin tucked to chest, arms folded, knees tucked. This presents the smallest possible diameter of the fetal head to the pelvis. Any degree of extension increases the presenting diameter.

Fetal lie. Lie describes the relationship of the fetal spine to the birthing parent’s spine. A **longitudinal lie** means the spines are parallel, with the fetal head (cephalic) or buttocks (breech) in the lower pelvis. Longitudinal lie is required for vaginal birth. A transverse lie means the fetal spine is horizontal, and vaginal birth is not possible. An oblique lie is diagonal and often converts to longitudinal with the onset of active labour.

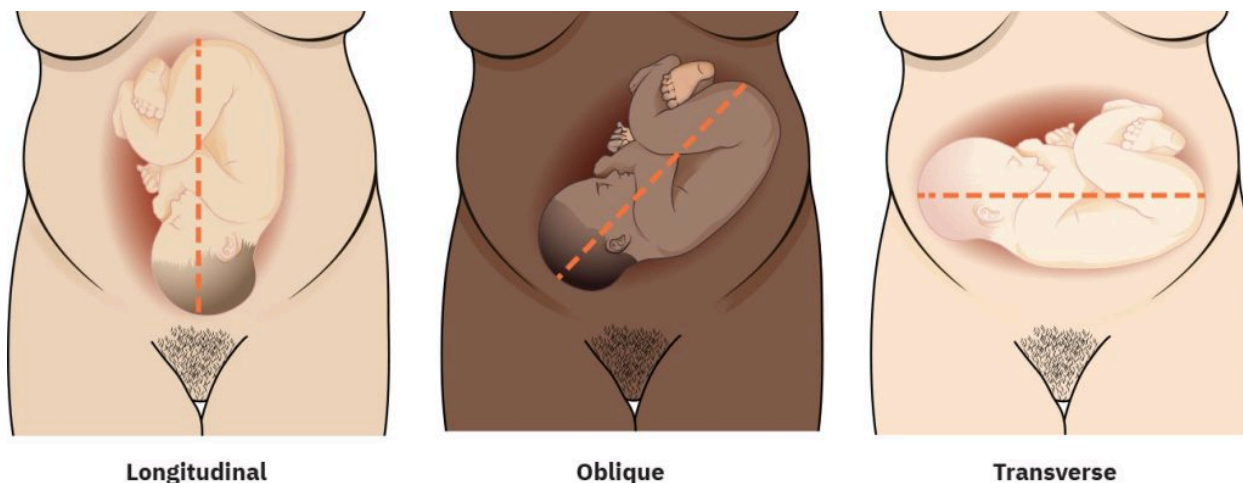


Figure 3.15.5 “[Fetal Lie](#)” from [Nursing Health Promotion, CC BY 4.0](#).

Fetal presentation. Presentation refers to the part of the fetus that enters the pelvis first. In **cephalic presentation** (approximately 97 percent of term births), the head leads. In **breech presentation** (approximately 3 to 4 percent), the buttocks or feet lead. In **shoulder presentation**, the fetus is in a transverse lie. Vertex presentation is the most common type of cephalic presentation and is optimal for vaginal birth.

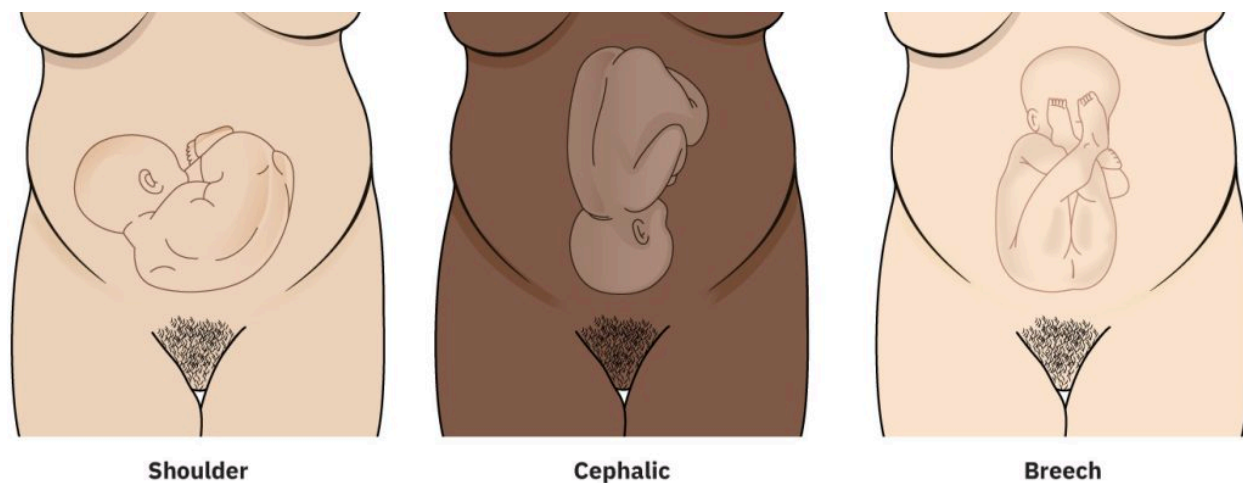


Figure 3.15.6 “[Shoulder, Cephalic and Breech Presentations](#)” from [Nursing Health Promotion, CC BY 4.0](#).

Fetal position. Position describes the relationship between a designated landmark on the presenting fetal part and the parental pelvis. In cephalic presentations, the landmark is the **occiput (O)**. Position is expressed as a three-letter abbreviation: the first letter indicates the maternal side (Right or Left), the second indicates the fetal landmark (Occiput, Mentum, or Sacrum), and the third indicates the quadrant of the pelvis (Anterior, Posterior, or Transverse). For example, **LOA (Left Occiput Anterior)** means the occiput is directed toward the left front of the pelvis. This is a common and favourable position.

Occiput anterior (OA) positions are optimal: the fetal face is toward the back of the birthing parent, and the back of the baby's head is toward the front. **Occiput posterior (OP) positions** are common and can result in vaginal birth, but often involve longer labours and more back pain. Families may describe this as “back labour” or “sunny side up.”

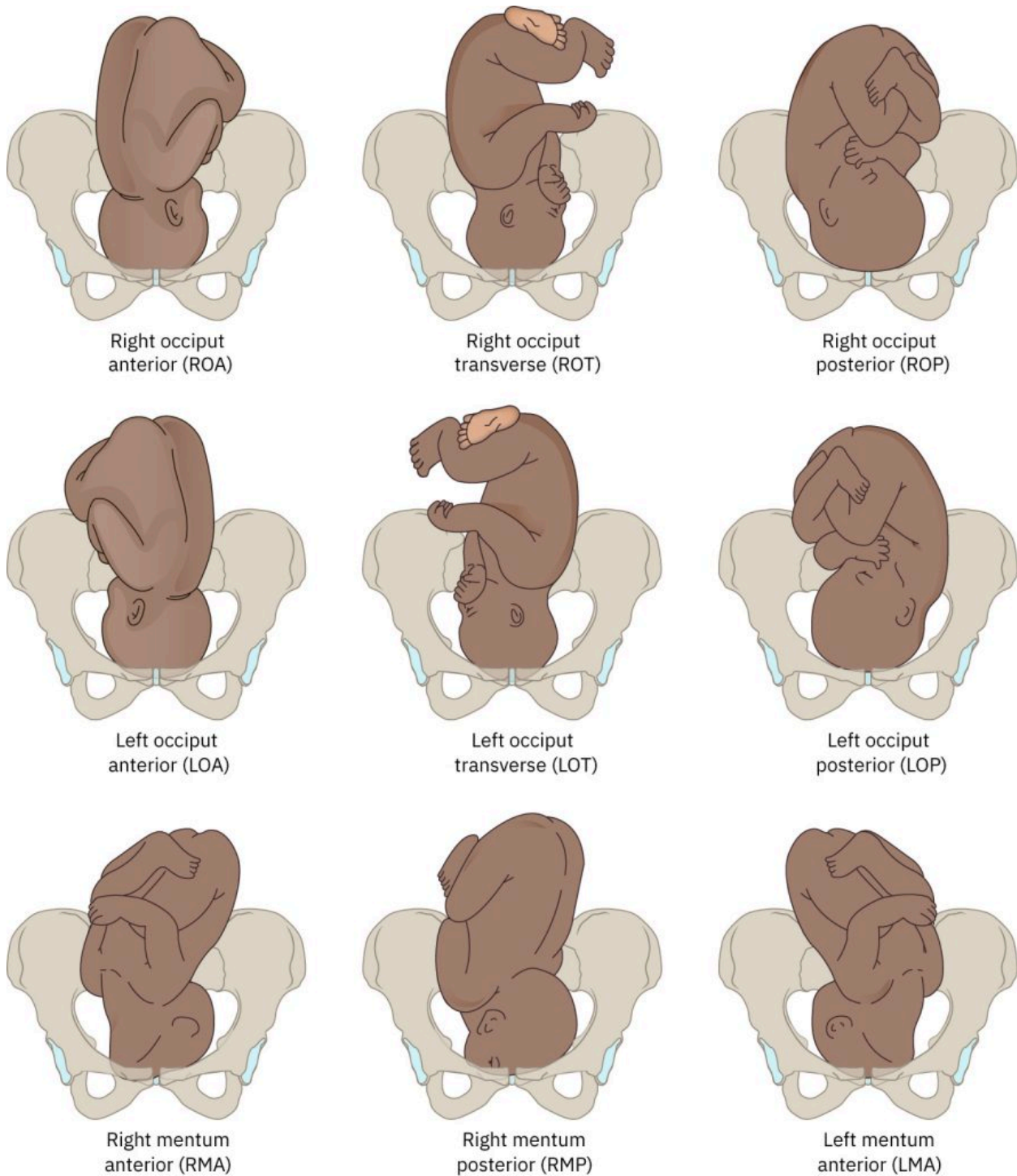


Figure 3.15.7 “Various Fetal Positions” from [Nursing Health Promotion, CC BY 4.0](#).

Fetal station. Station describes the level of the presenting part in relation to the ischial spines, the bony landmarks at the narrowest point of the mid-pelvis. The ischial spines are defined as station 0. Negative stations (from -5 to -1) describe the presenting part above the spines; positive stations (+1 to +5) describe

descent toward and through the pelvic outlet. Engagement occurs when the widest diameter of the presenting part passes through the pelvic inlet and reaches station 0.

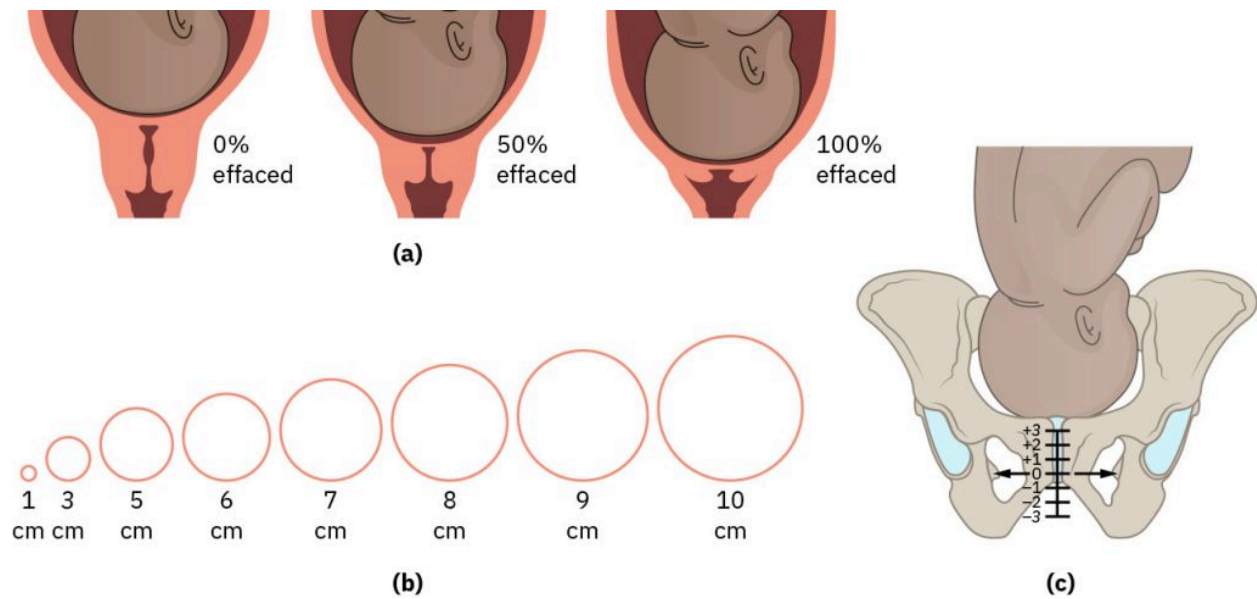


Figure 3.15.8 “Cervical Effacement” from [Nursing Health Promotion, CC BY 4.0](#).

Positioning

Positioning refers to the birthing person’s own body position throughout labour and birth. Frequent position changes promote fetal rotation, encourage descent, and can reduce pain. Upright positions use gravity to assist progress and are associated with shorter labours in some research. Hands-and-knees positioning can help rotate a posterior baby. Side-lying is useful for rest or when slowing a fast labour. Squatting or supported squatting opens the pelvic outlet. Sitting on a birth ball encourages pelvic movement and may reduce pressure on the sacrum.

In hospital settings, the lithotomy position (lying on the back, legs elevated) is commonly used for the second stage for care-provider convenience, but research suggests it may increase pelvic floor stress and restrict fetal descent. Doulas can advocate for the birthing person’s freedom of movement and encourage positions chosen by the birthing person rather than by institutional default.



Figure 3.15.9 “Common Positions During Active Labour” from [Maternal Newborn Nursing, CC BY 4.0](#).

Psyche

The psychological and emotional state of the birthing person influences labour. Fear, anxiety, and stress can inhibit the release of oxytocin and endorphins, slow labour progress, and intensify the experience of pain. Adrenaline (epinephrine) released under stress competes with oxytocin and can reduce the effectiveness of contractions. Creating a calm, safe, and supported environment is one of the most physiologically meaningful things a doula can do.

Endorphins are the body's natural pain-modulating hormones, released in increasing quantities during labour. High endorphin levels can create a sense of altered consciousness, sometimes described as a natural flow state, that helps the birthing person cope. The presence of a knowledgeable, calm support person is associated with shorter labours, reduced pain medication use, and greater birthing satisfaction (London et al., 2014, as cited in Solomon, 2025). Pain perception in labour is shaped by

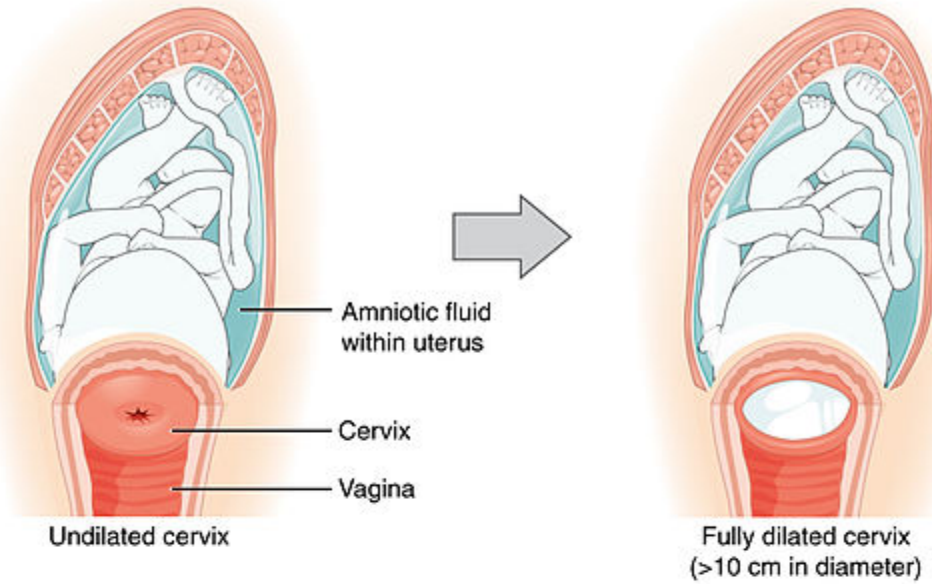
position, fetal position, anxiety, previous birth experiences, cultural values, and the quality of social support available.

The TENS (Transcutaneous Electrical Nerve Stimulation) unit is a non-invasive device that delivers low-level electrical pulses to the lower back through skin electrodes. It works through the pain gate theory: sensory nerve stimulation may block or reduce pain signals reaching the brain. It also stimulates endorphin release. TENS is often used in early and active labour and allows freedom of movement.

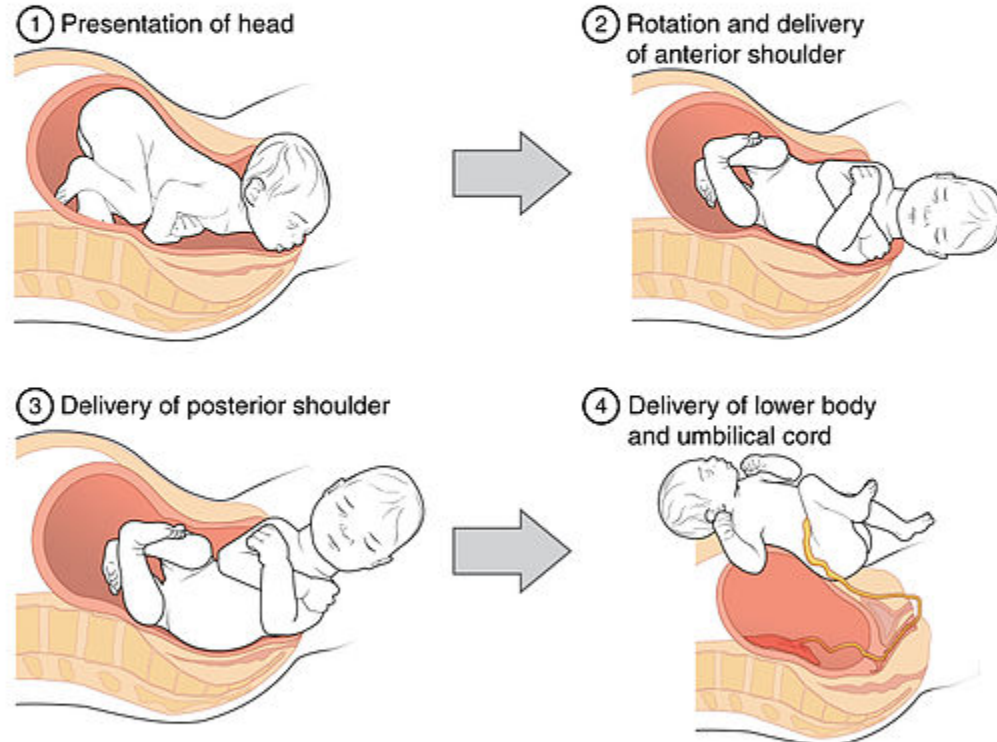
3.15.5 Stages of Labour

Labour is divided into three stages. The first stage begins with the onset of true labour and ends at full cervical dilation (10 cm). The second stage begins at full dilation and ends with the birth of the baby. The third stage begins after the birth of the baby and ends with the delivery of the placenta. A period of one to two hours following placental delivery is often called the golden hours.

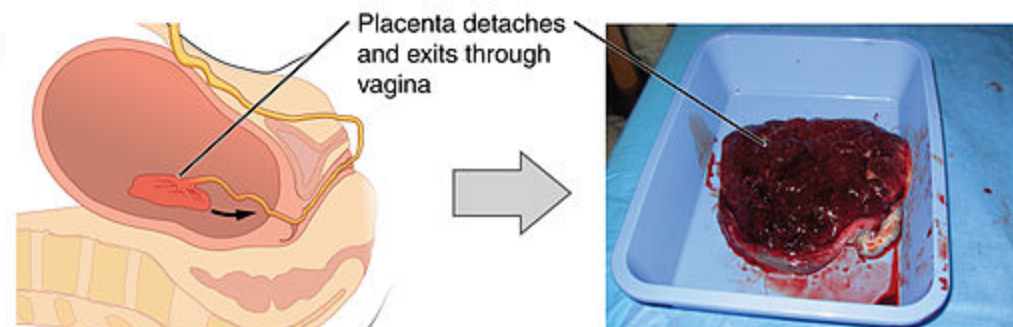
**Stage 1:
Dilation**



**Stage 2:
Birth**



**Stage 3:
Afterbirth
delivery**



First Stage: Latent Phase (0 to 6 cm)

The latent phase begins with regular contractions that produce the first cervical changes and ends when dilation reaches approximately 6 centimetres. Contractions last 30 to 45 seconds, are mild in intensity, and occur every 5 to 10 minutes. The birthing person is often excited, talkative, and able to cope with contractions comfortably. This phase averages 10 to 14 hours for a nulliparous person and is typically shorter for those who have given birth before.

For most people with straightforward pregnancies, this is a time to remain in a familiar environment, conserve energy, eat lightly, stay hydrated, rest when possible, and change positions frequently. The transition to hospital or birth centre is generally advised when contractions are five minutes or less apart, lasting at least one minute, and following that pattern for one hour — often called the 5-1-1 rule. The threshold may be adjusted based on distance, specific circumstances, or the care provider's guidance.

First Stage: Active Phase (6 to 10 cm)

The active phase begins at approximately 6 centimetres dilation and ends at 10 centimetres. Contractions are stronger, lasting 40 to 90 seconds, and occur every 2 to 5 minutes. The birthing person typically becomes more internally focused and may find it difficult to talk during contractions. Nausea, vomiting, and rectal and vaginal pressure are common. Fetal descent is progressive during the active phase. Duration varies significantly and may be measured in minutes for a multiparous person or in hours for a nulliparous person.

The care environment during the active phase is particularly important: people with available support report greater satisfaction and less anxiety (London et al., 2014). Frequent repositioning during the active phase promotes comfort and assists cervical dilation. The birth ball, hands-and-knees, side-lying, and upright standing or walking are all commonly used during this phase.

First Stage: Transition (8 to 10 cm)

Transition is the final and most intense phase of the first stage, typically covering the last 2 to 3 centimetres of dilation. Contractions reach their most frequent and longest duration: every 1.5 to 2 minutes, lasting 60 to 90 seconds. The birthing person may feel exhausted, overwhelmed, restless, irritable, or withdrawing. Rectal pressure, shaking and cramping in the legs, low back ache, and

increased bloody show are common. Transition is typically the shortest phase: less than 3 hours for a nulliparous person and less than 1 hour for a multiparous person.

From the doula perspective: Transition is the moment where the labouring person may say, “I can’t do this” or “what was I thinking?” This is a clinical marker: it often means birth is close. Doulas who recognize transition can name it and offer perspective: “This is the hardest part, and it usually doesn’t last long.” The arms of a birthing person in transition may feel heavy from clinging to support. They may be less responsive to coaching. The Rhombus of Michaelis, a diamond-shaped protuberance at the lower back that becomes visible as the sacrum moves posteriorly to create more space, may appear during transition and is recognized by birth-aware doulas as a sign of progress.

Table 3.15.2: Comparison of Labour Phases

Feature	Latent Phase	Active Phase
Contractions	Duration 30-45 sec; mild; 5-10 min apart	Duration 40-90 sec; moderate to strong; 2-5 min apart
Cervical Dilation	0-6 cm	6-10 cm
Physical Experience	Backache or menstrual-like cramping	Increasing pain in abdomen or back; nausea; vaginal or rectal pressure
Cervical Emotional State	Often excited, talkative, able to smile and cope	More inwardly focused; often unable to converse during contractions
Typical Duration	Average 10-14 hours (nulliparous); shorter for multiparous	Varies from minutes to hours; varies by parity and epidural status



The Hardest Moment in the Room

A client at 9 centimetres says she cannot do this anymore. She is crying between contractions, shaking, and refusing to move from the position she is in. Her support partner is looking at you, uncertain.

What do you do in the next 60 seconds? What does the doula’s role look like in transition, when instructions are hard to follow, support is physically and emotionally demanding, and birth may be imminent? How do you support the support partner at the same time as you support the birthing person?

Second Stage: Full Dilation to Birth

The second stage begins when the cervix is fully dilated (10 cm, 100% effaced) and ends with the birth of

the baby. Contractions during this stage last 60 to 90 seconds, occur every 2 to 3 minutes, and carry a strong urge to push. For a nulliparous person without epidural anesthesia, the second stage typically takes 2 to 3 hours; with epidural, 3 to 4 hours. For a multiparous person, it may take 15 minutes to 2 hours.

Spontaneous rupture of membranes often occurs near the end of the first stage or during the second stage if it has not happened earlier. Some births occur en caul, with membranes intact through delivery.

The presenting part of the fetus descends until it reaches the perineum. Without epidural anesthesia, pressure on the pelvic floor nerve receptors triggers the Ferguson reflex: a compelling, involuntary urge to push that engages the abdominal muscles and diaphragm alongside the uterus. As the fetal head becomes visible at the vaginal opening, crowning occurs. The head is born, followed by the shoulders and body.

The birthing person may feel relief that pushing has begun, or they may feel frightened and resist contractions. They may experience acute pain and a burning sensation as the perineum stretches over the fetal head. Doula's can offer encouragement, sips of water, cold or warm cloths, and support in the birthing person's chosen position.

Table 3.15.3: Characteristics of the Second Stage of Labour

Characteristic	Second Stage
Contractions	Duration 60-90 sec; strong; 2-3 min apart; urge to push present
Dilation	10 cm; fully effaced
Physical Experience	Pressure in pelvis and vagina; pain radiating to legs; burning sensation at perineum during crowning
Emotional State	May feel relief or fear; exhaustion intensifies; focus shifts to birth
Typical Duration	2-3 hrs nulliparous (no epidural); 3-4 hrs with epidural; 15 min-2 hrs multiparous

Third Stage: Delivery of the Placenta

The third stage begins after the birth of the baby and ends with the delivery of the placenta. It typically lasts between 5 and 30 minutes. The uterus retracts significantly after birth, decreasing its surface area. As the uterine walls approximate, the placenta is sheared from its attachment. A retroplacental hematoma forms and pushes the placenta toward the lower uterine segment and vaginal canal.

Signs that the placenta has separated include a gush of blood, lengthening of the umbilical cord, and the uterus rising in the abdomen and changing shape from disc-like to globular. The birthing person may feel a mild urge to push or cramping as the placenta is expelled. Skin-to-skin contact between the

newborn and the birthing person during the third stage promotes endogenous oxytocin release, which supports uterine contraction and reduces bleeding risk.

Oxytocic medications (uterotonics such as oxytocin, misoprostol) may be offered after birth to support uterine contraction and reduce the risk of postpartum hemorrhage. A placenta is generally considered retained if 30 minutes have elapsed following birth without delivery.

Table 3.15.3: Characteristics of the Third Stage of Labour

Characteristic	Third stage
Contractions	Irregular; less intense than labour; may feel like cramping
Signs of Placental Separation	Gush of blood; umbilical cord lengthens; uterus rises, and changes shape
Typical Duration	5-30 minutes; generally considered retained after 30 minutes
Physical Experience	Fatigue; cramping; sometimes shaking or chills from adrenaline release

3.15.6 Cardinal Movements (Mechanisms of Birth)

As the fetus passes through the birth canal, it makes a precise sequence of positional adjustments to navigate the changing diameters of the maternal pelvis. These seven movements are called the cardinal movements, or mechanisms of birth. They are not sequential in a rigid sense; they overlap and blend. The fetus is guided by the combined forces of uterine contractions, the birthing person’s pushing effort, gravity, and the anatomy of the pelvis itself.

Table 3.15.4: Mechanisms of Birth

Movement	What Happens	Significance
1. Engagement	The largest diameter of the presenting part (usually the biparietal diameter of the fetal head) passes through the pelvic inlet and reaches the level of the ischial spines (station 0)	Marks the beginning of the fetal journey through the pelvis; it often occurs in late pregnancy in a nulliparous person
2. Descent	The fetal head moves downward through the pelvis, driven by uterine contractions and, in the second stage, by the birthing person's pushing effort	Measured in fetal station, active descent is a marker of labour progress
3. Flexion	The fetal head flexes so the chin meets the chest, reducing the presenting diameter from approximately 12 cm to approximately 9.5 cm (suboccipitobregmatic)	Flexion occurs as the head meets resistance from the pelvic floor, cervix, and soft tissues
4. Internal Rotation	The fetal head rotates from a transverse position (ear to ear) to an anterior-posterior position as it navigates the curved pelvis	Required because the widest pelvic diameter shifts from transverse at the inlet to anterior-posterior at the outlet
5. Extension	After the head passes under the pubic arch (nape of neck at the symphysis pubis), the head extends, and the face and chin are born	Extension allows the fetal head to follow the curve of the birth canal; the occiput, bregma, face, and chin emerge in sequence
6. External Rotation / Restitution	After the head is born, it rotates back to face one of the inner thighs, realigning with the shoulders	The fetal shoulders must turn to a transverse position to pass under the pubic arch; the head mirrors this movement
7. Expulsion	The anterior shoulder delivers under the pubic bone, followed by the posterior shoulder and then the rest of the body	Completing delivery, the care provider may gently guide the delivery of the shoulders

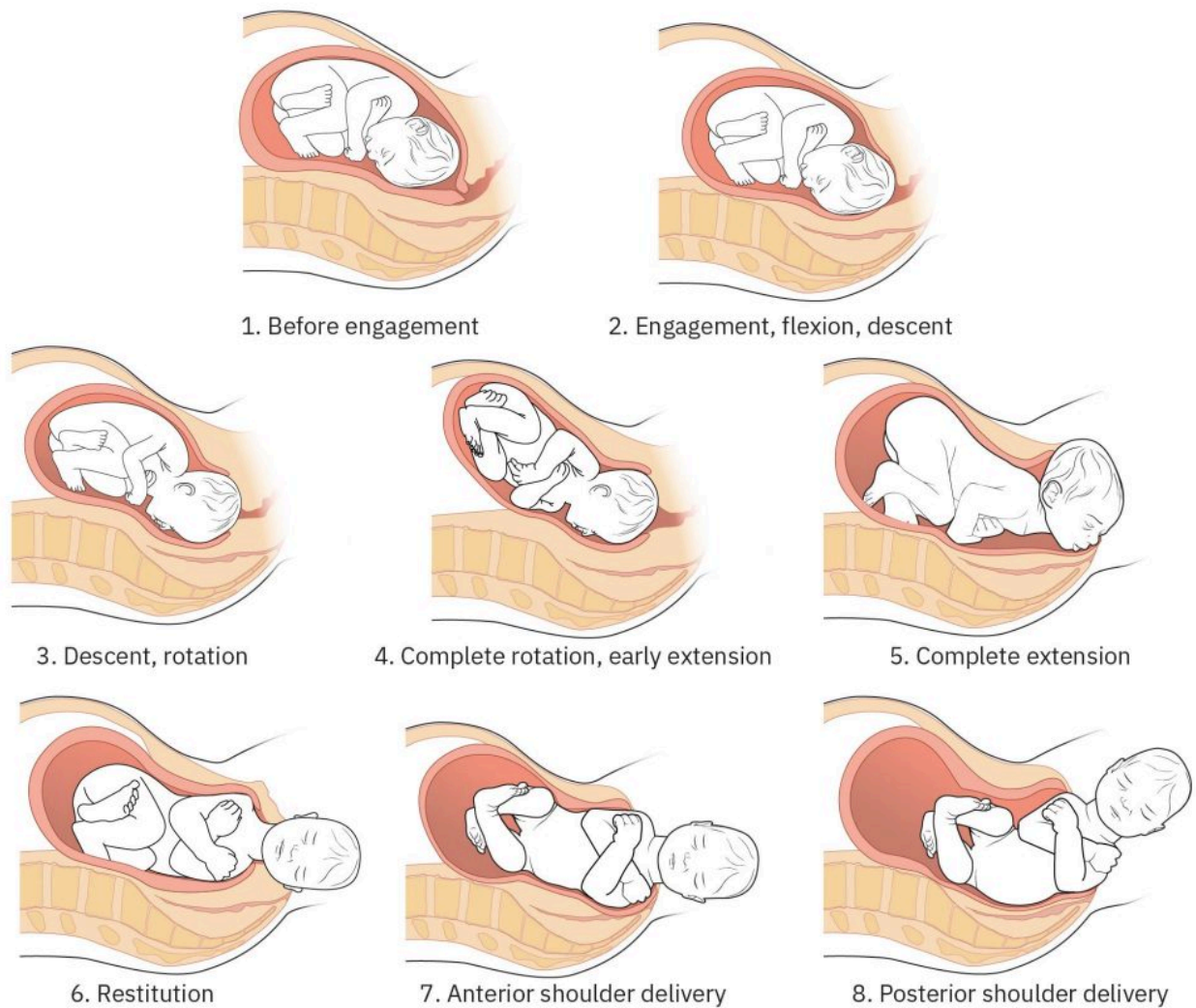


Figure 3.15.11 "[Mechanisms of Birth](#)" from [Nursing Health Promotion](#), CC BY 4.0.

Video: Cardinal Movement of Labour

Video: "[Cardinal Movement of labor](#)" by [Medicos Factz](#) [1:56] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.

3.15.7 Breech Presentation

Breech presentation occurs when the buttocks, feet, or knees enter the pelvis first rather than the fetal head. Approximately 3 to 4 percent of term pregnancies are breech. There are three main types:

- **Frank breech:** fetal hips are flexed, and knees are extended; buttocks present first. This is the most common type and, in some clinical settings, the most suitable for planned vaginal birth
- **Complete breech:** fetal hips and knees are flexed; buttocks and feet present together
- **Footling (incomplete) breech:** one or both feet present first, with hips and legs extended. This type carries a higher risk of cord prolapse

A breech presentation may be identified by the care provider during a prenatal visit or by ultrasound. External cephalic version (ECV) is a procedure offered around 36 to 37 weeks in which a care provider attempts to manually turn the fetus to a head-down position through the abdominal wall. Caesarean birth is the most common choice for breech presentations in Canadian hospitals, though planned vaginal breech birth is available in some settings with an experienced care provider. Breech birth at home with an experienced midwife is also a choice some families make.

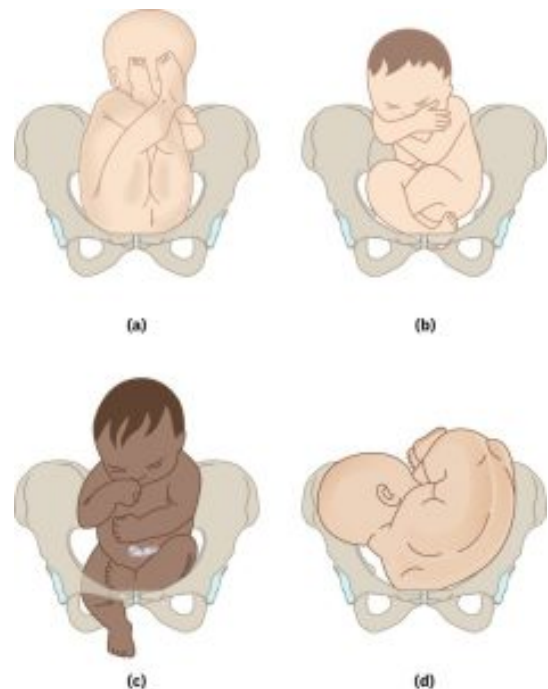


Figure 3.15.12 “Breech Presentations” from [Maternal Newborn Nursing, CC BY 4.0](#).

Video: Frank Breech Home Birth: Aurora

Video: “[Baby A's beautiful & inspiring Frank breech home birth \(unmedicated\)](#)” by [My Birth Movie](#) [8:11] is licensed under the [Standard YouTube License](#). Transcript and closed captions available on YouTube.



A Breech Discovery at 37 Weeks

A client at 37 weeks calls you. Their midwife has confirmed at today's visit that the baby is still in a frank breech position. They have been offered ECV but are uncertain. They have also been told that if the baby doesn't turn, a cesarean section will likely be scheduled. They are feeling scared and grieving the planned birth experience they had imagined.

What is the doula's role in this conversation? What information is helpful to offer, and what falls outside your scope? How do you support a client in making an informed decision without steering them toward a particular choice? And if they ultimately have a cesarean, what does doula support look like in an operating room?

3.15.8 Placental Separation and the Golden Hours

Mechanism of Placental Separation

After the birth of the baby, the uterus continues to contract and decreases dramatically in size. As the uterine walls come together, the surface area available for placental attachment is reduced, and the placenta shears from the uterine wall. A helpful image from the clinical literature: the relationship of the placenta to the contracting uterus is like a paper label on a balloon that is being deflated. The label cannot accommodate the shrinking surface and peels away. A retroplacental blood clot (hematoma) forms behind the placenta, providing additional force to push it downward.

The placenta exits the uterus in one of two main patterns. In the Schultze mechanism (most common), the placenta separates centrally and slides out fetal-side first, with blood following. In the Duncan mechanism, the placenta separates from the edge, sliding out sideways, with blood trickling throughout the process. Both are normal. The care provider confirms complete placental expulsion by examining the membranes and placenta.

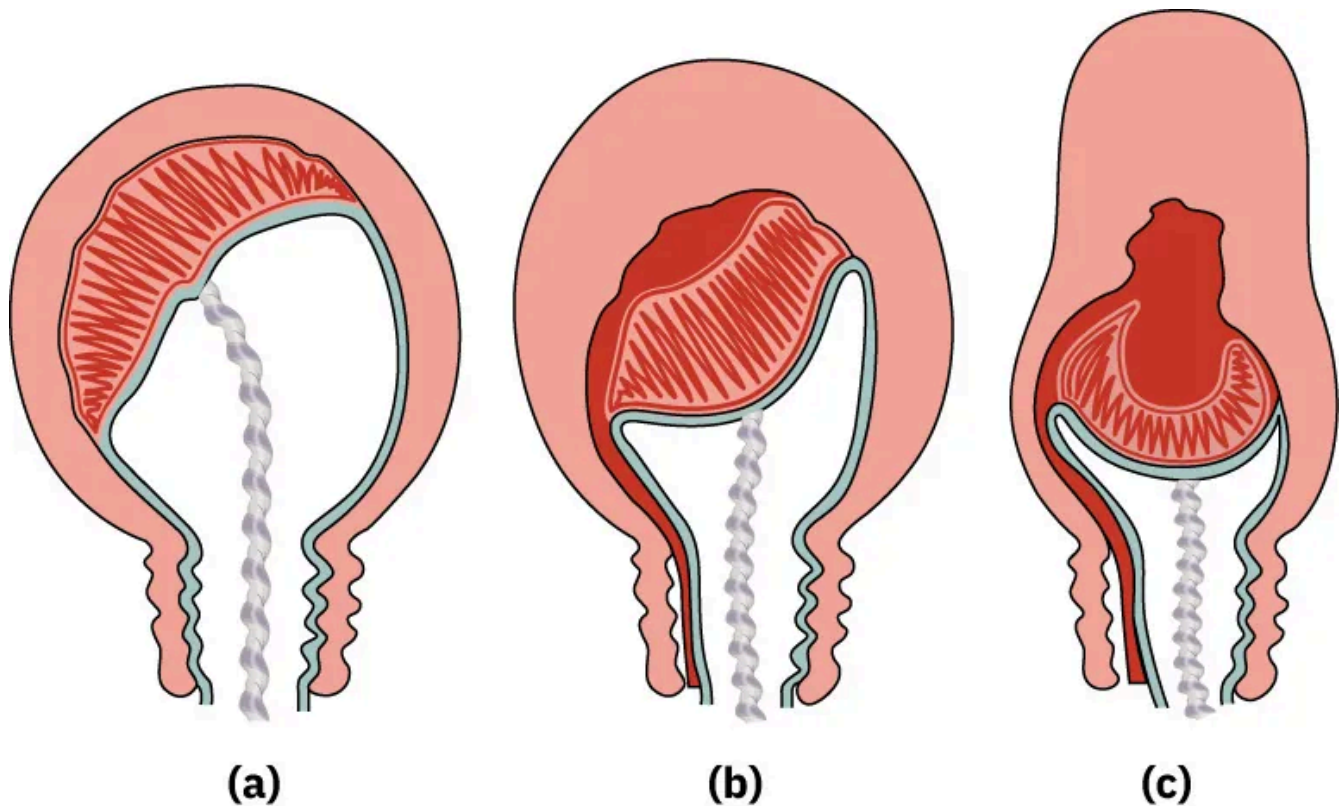


Figure 3.15.13 “[Placental Separation](#)” from [Maternal Newborn Nursing, CC BY 4.0](#).

The Golden Hours

The period from approximately one to two hours following the birth of the placenta is often called the golden hours. This window is physiologically and emotionally significant for the entire family.

For the birthing person: the uterus contracts to control bleeding at the placental site, typically positioning midline between the pubis and umbilicus. Normal blood loss ranges from 250 to 500 mL. Care providers monitor vital signs, uterine tone, and lochia (postpartum vaginal discharge). The birthing person may be thirsty, hungry, shivering with chills from the adrenaline release of birth, and emotionally elated or in shock. Perineal repair, if needed, is typically performed during this period. Skin-to-skin contact with the baby releases more Oxytocin which supports bonding, and recovery.

For the newborn: skin-to-skin contact immediately after birth regulates temperature, supports blood glucose stability, and initiates the hormonal cascade that underpins bonding and breastfeeding or chestfeeding. The newborn's instinctive breast crawl, suckling, and eye contact with the birthing parent are part of this cascade. Oxytocin released during skin-to-skin contact also supports uterine contraction in the postpartum period.

For the doula: the golden hours are a time for quiet presence, practical support (water, food, warm blankets, lighting adjustments), and protecting the environment from unnecessary interruptions. This includes supporting the family's cultural practices around the first feeding, the placenta, the cord cutting, and who is present in the room. The doula does not provide clinical monitoring but does observe and gently note if the birthing person seems pale, excessively tired, or distressed.



The First Two Hours

Birth has just happened. The baby is on the birthing person's chest. The care provider is completing perineal repair. The partner is crying. There are three other people in the room. The birthing person asks you to hold the baby while the repair is being done.

What does your role look like right now? What are you watching for? What are you protecting? What would you do if the birthing person says they feel dizzy and notice you that the pad beneath them is soaked? What does a doula offer in the golden hours that no one else in the room provides?

Note: Intrapartum care, fetal monitoring, complications of labour, pain management options, cesarean birth, and postpartum clinical assessment are explored in depth in HLTH-5035. The content in this section provides the physiological foundation for that clinical training

“[10.3 Labor](#)“, “[10.4 The P’s of Labor](#)” and “[10.7 Complications Associated with Labor](#)” in [Nursing Health Promotion](#) edited by Kimberly Ernstmeyer, MSN, RN, CNE, CHSE, APNP-BC and Elizabeth Christman, DNP, RN, CNE is licensed under a [Creative Commons Attribution 4.0 International License](#), except where otherwise noted.

Appendix: Anatomy & Physiology Exam Review

For additional practice, the OER [*Interactive Activities for Human Anatomy and Physiology*](#) contains exercises to help grow your understanding of human anatomy.

Appendix: Case Studies

The five case studies below are designed to accompany Chapters 2 and 3 of this OER. Each case situates a client at a specific point along the reproductive spectrum, working alongside a different combination of the regulated and community-based providers introduced in [Section 2.5](#). None of these cases has a single “correct” answer. Read for what each client’s body is doing physiologically, for what the people around her, him, or them are doing structurally, and for the doula’s specific scope of practice in that moment — not for a diagnosis or a verdict on any provider’s conduct.

Case Study 1: “The Boarding Home”

Reproductive Spectrum Stage: Pregnancy — Late Third Trimester (36 weeks, 4 days)

Autumn Kwandibens is 27 years old, expecting her second child, and has just landed in Sioux Lookout on a medevac charter from her home community, a fly-in First Nation nearly 500 kilometres north. She is 36 weeks and 4 days pregnant, dated by her last menstrual period and confirmed by an early ultrasound. Under the region’s long-standing Out-for-Confinement policy, she will spend the next several weeks in a medical boarding home, waiting to go into labour alone, away from her partner Marcus, her three-year-old son Kaiden, and the grandmother who was supposed to sit with her through this birth the way she sat through Kaiden’s.

Back home, Autumn’s antenatal care was shared between the community health nurse and an Indigenous midwife who flies in twice a month through the regional Indigenous Midwifery Program. The midwife, Louisa, knows Autumn’s family, knows that her fundal height has consistently measured a week ahead, and knows, without being told, why Autumn goes quiet whenever a hospital form asks about “supports at home.” Three years ago, in the same tertiary hospital Autumn is now waiting to be sent to, a nurse documented “declines pain medication, appears anxious” during Kaiden’s birth in a way that triggered a wellness check from the local Children’s Aid Society two weeks postpartum. Nothing was found. The file was closed. Autumn has not forgotten a detail of it.

Naomi, a doula with a virtual doula-matching program that serves several fly-in communities, has been meeting with Autumn by video call since 28 weeks. She arrived in Sioux Lookout a day after Autumn and is now sitting across from her in the boarding home’s shared kitchen, where Autumn describes tightening across her belly that comes and goes, sometimes with her lower back aching, but nothing regular. “I keep thinking, is this it,” Autumn says, “And then it’s not.” Naomi asks about the pattern, the timing, and whether the sensation stops if Autumn changes position or drinks some water. It does. Naomi explains what she is hearing: this is consistent with Braxton-Hicks contractions, the irregular, non-progressive tightening that becomes more noticeable in the final weeks as the uterus prepares for labour, but that does not, on its own, mean labour has begun. She talks Autumn through what would feel different about true labour — a pattern that intensifies and regularizes rather than fading, that keeps coming whether she rests or moves. She also notices, and gently names, that Autumn’s belly has dropped somewhat since last week’s call: a sign the baby may be settling lower into the pelvis, which in

a first pregnancy often happens weeks ahead of labour but in a second pregnancy can happen much closer to, or even during, labour itself.

What Autumn wants to know most is not about contractions. It is about the team she will meet for the first time when labour starts: an on-call obstetrician she has never spoken to, in a hospital that already holds a file on her from three years ago that she cannot see and does not trust. Naomi cannot change who is on call. What she can do is walk through, piece by piece, what informed consent should look like in the hours ahead: that every recommendation, every intervention, and every question about her history is something Autumn can ask to have explained, slowed down, or declined, regardless of what any old chart says about her.

Discussion Questions

1. How does the concept of informed consent as an ongoing process, rather than a one-time signature, apply to what Naomi is doing with Autumn in this scene? What might that look like once Autumn is admitted to the hospital and labour begins?
2. Using what you know about Braxton-Hicks contractions, lightening, and the hormonal signals that precede labour, explain what Naomi is listening for when she asks Autumn about her symptoms. Why does it matter, physiologically and relationally, that she frames what Autumn is feeling as normal rather than alarming?
3. Autumn's caution toward the hospital is shaped by a specific documented history: the disproportionate use of birth alerts and child welfare surveillance against Indigenous parents, and the practice of pregnancy evacuation itself. How might a doula distinguish between reassuring a client and dismissing a client's well-founded caution?
4. What is within Naomi's scope of practice in this scenario, and what is outside it? Where is the line between preparing Autumn for what to expect and advocating for her once labour begins?

Case Study 2: "Three Hours Each Way"

Reproductive Spectrum Stage: Abortion Care (13 weeks, 4 days)

Trang is 24, in the second year of a nursing program on a study permit, and has told exactly two people that she is pregnant: the nurse practitioner who confirmed it, and Sam, the abortion doula who picked up the phone the first time she called and has not made her repeat her story since. She is 13 weeks and 4 days by her last menstrual period, dated with more uncertainty than most clients Sam supports, because Trang's cycle has always been irregular, and she assumed her missed periods were stress from clinical placements. By the time a home test confirmed what she suspected, the window for medication abortion using mifepristone, approved for use only up to nine weeks of pregnancy, had already closed.

The nearest clinic offering procedural abortion is three hours from the small town where Trang is completing a placement, in a region she chose specifically because it was far from anyone who might

recognize her. Her international student health plan technically covers the procedure, but only as a reimbursement after the fact, which means paying several hundred dollars up front that she cannot easily produce without her family noticing the transaction. She has no vehicle, no one to ask for a ride without disclosing why, and the clinic's intake policy requires a support person to be present to drive her home afterward, given the sedation involved.

Sam has done this before: coordinating a ride-share under her own account, confirming with the clinic that Trang can be met at the door rather than in the waiting room, and checking whether Trang's blood type is known so the clinic can flag whether Rh immune globulin will be needed after the procedure. What Sam cannot do is make the six-hour round trip shorter, or make Trang's absence from her placement site less noticeable, or undo the particular quiet Trang describes about her own decision — a quiet that has less to do with regret than with making a private choice inside a body that, in her family's framework, was never entirely hers to decide about alone.

At the clinic, the physician — a family doctor with additional training in reproductive health — explains what the appointment will involve: misoprostol to begin softening and opening the cervix, then a vacuum aspiration procedure using gentle suction to empty the uterus, performed under local anesthesia with the option of light sedation, typically taking five to ten minutes. She answers Trang's questions plainly, without asking why, and confirms that because the pregnancy has progressed past nine weeks, this procedural approach is the appropriate and standard route, not a sign that anything unusual is happening. Sam sits with Trang in recovery afterward, offers water and a heating pad, and reminds her, when Trang starts to apologize for “making a big deal of a car ride,” that access is only supposed to be this complicated when a system fails to account for someone like her — not because there is anything wrong with the choice she made.

Discussion Questions

1. Using the AAAQ framework (availability, accessibility, acceptability, quality) introduced in [Section 2.5.3](#), identify which dimensions of access were most at risk in Trang's case, and why.
2. Explain, in your own words, why medication abortion was no longer an appropriate option for Trang at 13 weeks and 4 days, and what makes vacuum aspiration the standard procedural approach at this gestational age.
3. Neither Sam nor the physician asks Trang why she is choosing abortion. What is the significance of that choice, professionally and ethically, for each of their roles?
4. Trang's discomfort is described as coming from the sense that her body “was never entirely hers to decide about alone” within her family's framework. How might a doula hold cultural context and bodily autonomy together, without treating either one as more important than the other?

Reproductive Spectrum Stage: Postpartum — Immediate/Early (Day 3, Cesarean birth)

Robin is 32, three days postpartum, and still logging every feed on their phone because the numbers are the only thing that feels controllable right now. Robin and their partner Alex conceived through reciprocal IVF: Alex’s egg, donor sperm, and an embryo transferred into Robin’s uterus — a route the two of them chose deliberately so that Alex, who has never wanted to be pregnant, could still be genetically connected to their child, and Robin, who did want to carry a pregnancy, could do exactly that. A pre-birth parentage order, filed under Ontario’s All Families Are Equal Act, means both of their names are already on the birth certificate without either of them needing to adopt their own baby.

The birth itself did not go as planned. After thirty-one hours of induced labour for a suspected large baby, Robin had a Cesarean birth under the shared care of an obstetrician and a registered midwife who had followed the pregnancy from the second trimester onward. Now, three days out from surgery, Robin’s milk has not “come in” the way the prenatal class described, and every pamphlet the hospital lactation team has handed them uses the word breastfeeding and the word mother — neither of which is wrong exactly, but neither of which is Robin’s word either. Robin has started saying “chestfeeding” quietly to themselves before saying it out loud to a nurse, testing whether it will be repeated back to them or corrected.

Priya, a postpartum doula Robin and Alex hired before the birth, visits on the afternoon of day three. She finds Robin close to tears, convinced something has gone wrong with their supply. Priya asks what Robin is producing, and when Robin says “barely anything, just some yellowish stuff,” Priya is able to offer real reassurance grounded in physiology rather than platitude: what Robin is describing is colostrum, exactly what should be present in these first days, thick and low-volume by design, matched to a newborn’s tiny stomach capacity. She explains that a Cesarean birth, along with the stress of a long induction and surgical blood loss, commonly delays the sharper drop in estrogen and progesterone that triggers full milk production, meaning Robin’s supply may take a day or two longer to shift than the prenatal class described — not that anything has failed. She encourages frequent, effective removal of milk now, by feeding or hand expression, since it is that removal, not time alone, that will build the receptor density supporting supply going forward.

Priya also does something smaller, but Robin notices it: she asks which words Robin wants used for feeding and for their body, writes them on the whiteboard by the bed where the shift-changing nurses will see them, and uses those words consistently herself for the rest of the visit.

Discussion Questions

1. Explain the physiological reason a Cesarean birth, prolonged induction, and blood loss can delay the onset of copious milk production. Why is it inaccurate to describe what Robin is experiencing on day three as a supply problem?

2. What is colostrum, and why does its low volume in the first days reflect a normal, purposeful design rather than a deficiency?
3. Priya's intervention with the whiteboard is a small, practical action. Using the continuum from cultural awareness through cultural safety introduced in [Section 2.8.2](#), where would you place that action, and why does it matter that the standard being met is set by Robin rather than by the hospital's existing materials?
4. Robin and Alex's route to parenthood, reciprocal IVF with a pre-birth parentage order, reflects specific legal and clinical infrastructure that did not exist a generation ago. What does their case suggest about how the right to have children can depend on more than biology alone?

Case Study 4: "Seven Centimetres"

Reproductive Spectrum Stage: Labour and Birth — Active First Stage

Chioma Adeyemi is 34, thirty-nine weeks and two days pregnant, and seven centimetres dilated in the labour and delivery unit of a hospital an hour from the apartment she shares with her husband and their three-year-old daughter. This is the birth she has been preparing for since her daughter's delivery three years ago ended in a Cesarean for "failure to progress" — a diagnosis Chioma has never fully accepted, delivered, as she remembers it, after her repeated reports of pain were met with reassurance that she was "doing fine" and could "wait a little longer" for anything stronger than what she had already been offered. This time, she is attempting a vaginal birth after Cesarean, under the care of an obstetrician whose protocol requires continuous fetal monitoring given her history, alongside a labour and delivery nurse managing her care on the floor.

Chioma is also Rh-negative; she received Rh immune globulin at 28 weeks and will need another dose after this birth if her baby's blood type comes back Rh-positive, to prevent her immune system from forming antibodies that could endanger a future pregnancy. None of that is on anyone's mind right now. What is on Chioma's mind is the pain in her lower back that has been building for the last hour, sharper than what she remembers as normal, even accounting for how much stronger active labour contractions are than the latent ones before them.

Adaeze, her doula, recognizes the pattern: back pain that intensifies between contractions rather than only during them is often consistent with a baby positioned occiput posterior, facing the wrong way for an easy descent, sometimes called back labour. She suggests a hands-and-knees position and continued movement, both associated with helping a posterior baby rotate. But what Adaeze notices more urgently is the gap between how Chioma is describing her pain and how the room is responding to it. Twice now, Chioma has asked when someone can reassess her, and twice the nurse has said "you're doing great" without answering the question. Down the hall, Adaeze can hear a different patient's call bell answered within a minute.

Adaeze knows, because this course has taught her, that the false belief that Black patients feel less pain than white patients is not a relic of history confined to a textbook chapter. It persists, measurably, in

how quickly and how seriously reports of pain are taken in clinical settings today. She also knows something more specific to this room, right now: unmanaged pain and fear trigger the release of epinephrine and norepinephrine, and those stress hormones compete directly with oxytocin, the hormone driving Chioma's contractions. A labouring person who does not feel safe can experience measurably slower physiological progress, which then risks being read by the same system as confirmation that something is wrong with her body, rather than with how she is being supported.

Adaaze does not diagnose or contradict the clinical team. She asks, clearly and on the record, for someone to reassess Chioma's pain within the next few minutes, names the specific request rather than a general complaint, and stays beside Chioma, low and steady, reminding her to breathe through the next contraction.

Discussion Questions

1. Using the Five Ps of labour, identify which factors are potentially at play in Chioma's back pain and slower-than-expected progress. Which of these are within a doula's scope to observe and suggest positioning for, and which require clinical assessment?
2. Trace the physiological pathway from unmanaged pain and fear through to labour progress. How might this mechanism interact with, and potentially reinforce, a provider's pre-existing assumptions about a labouring person?
3. Why does Chioma's Rh-negative status matter clinically, and at what points across this pregnancy and birth would that status have already come into play?
4. Adaaze advocates by making a specific, documented request rather than a general one. Why might specificity matter in this moment, both for Chioma's care and for Adaaze's professional standing in the room?

Case Study 5: "Two Weeks In"

Reproductive Spectrum Stage: Postpartum — Established (Day 14)

Erin MacAllister is 29, fourteen days postpartum, and has been counting down the hours until her public health nurse's home visit since she woke up. She had a baby girl, Fiona, born vaginally at 39 weeks after a pregnancy managed jointly by a high-risk obstetric team and her own long-standing family physician, who took back over Erin's care the day she and Fiona were discharged. Erin has used a manual wheelchair since a car accident at nineteen left her with a T10 spinal cord injury, and she chose to become a parent on her own terms, through donor insemination at a fertility clinic that, unlike two others she contacted first, did not ask her to bring a letter from a physician confirming her "capacity to parent" before agreeing to treat her.

Erin has not said this to anyone outside of one conversation with her doula, but she has spent most of her adult life bracing for someone in a healthcare setting to treat her body as a problem to be managed rather than as a body having a normal experience — and she is aware, in the specific way disabled

people often are, of a history in which the reproductive lives of disabled people in Canada were not treated as fully their own to direct. Fourteen days after Fiona's birth, that history is not what is on the whiteboard. What is on the whiteboard is a question about whether her bleeding is following the expected pattern.

Denise, the public health nurse doing Erin's two-week visit, asks about Erin's lochia: whether it has shifted from the darker red flow of the first several days to the pinkish-brown, lighter discharge expected by this point, a sign that the uterus is contracting down and the placental site is healing on schedule. Erin says yes, that part seems normal. What she is less sure about is a low-grade ache and slight increase in warmth over part of her perineal repair, an area where, because of her injury level, she has reduced sensation and cannot always trust her own body's signals the way someone with intact sensation would. Denise examines the area, finds early signs of localized irritation rather than infection, and explains clearly what to watch for that would indicate the difference, since Erin will be relying more on visual checks and less on pain to catch a problem early.

Erin's doula, Marisol, has been present for feeding support rather than clinical care, helping Erin and Fiona find positions that work with Erin's trunk stability and limited pelvic floor sensation, including a modified side-lying latch that does not require Erin to hold Fiona's full weight against gravity for an extended feed. Marisol also made sure, before Denise's visit, that Erin's apartment door was propped open and the hallway clear — small logistics that determine whether a home visit happens at all.

Discussion Questions

1. Explain what Denise is assessing when she asks about the colour and pattern of Erin's lochia, and why the progression from rubra to serosa over the first two postpartum weeks is a meaningful clinical marker.
2. Erin's reduced pelvic and perineal sensation changes how she and her care team need to monitor for complications like infection. What does this suggest about the limits of relying on pain as the primary signal of a client's physical status, in this case and more broadly?
3. Erin's account of one fertility clinic requiring a letter about her "capacity to parent" reflects a barrier that is not written into any single law but persists in provider discretion. How does this connect to the broader history of reproductive coercion experienced by disabled people, without being identical to that history?
4. What is Marisol's role in this scenario, and how does it differ from Denise's? Identify at least two specific actions in the case that fall clearly within a doula's scope of practice.

Anthropic. (2026). [Claude AI](#) [Large language model].

Prompt

Write five realistic, nuanced case studies that complement the students' learning in the attached OER. Each case study should present a rich, vivid client profile and situate the client at a specific point along the reproductive spectrum (e.g., pregnancy, abortion, labour and birth, or postpartum), clearly indicating the gestational age, postpartum timeline, or stage of care.

Across the five cases, include a diversity of healthcare providers, such as registered midwives, Indigenous

midwives, obstetricians, family physicians, nurses, reproductive health physicians, or other relevant professionals. The doula may be actively providing support at the client's request or may already be working with the client and observing a situation unfold within the healthcare system.

The scenarios should invite critical thinking rather than present obvious answers. They should subtly illuminate the complex realities that shape reproductive experiences, including identity, culture, race, socioeconomic status, disability, immigration status, gender identity, family structure, geography, or other intersecting social determinants of health. Themes of reproductive justice—including bodily autonomy, informed choice, the right to have children, the right not to have children, and the right to parent in safe and healthy environments—should be woven naturally into the narratives rather than stated explicitly.

Each case should also include opportunities for students to apply anatomy and physiology knowledge within the doula's scope of practice. Physiological processes, normal adaptations, potential complications, or healthcare interventions should be incorporated in ways that require students to integrate biological understanding with person-centred, trauma-informed, culturally safe, and evidence-informed doula care.

The case studies should feel authentic and representative of the diverse clients doulas may encounter in practice, encouraging students to synthesize concepts from anatomy and physiology, historical contexts of reproduction, reproductive justice, communication, advocacy, equity, and professional scope of practice.

Video Transcripts

[2.3 Ancient Paths: Anthropology & Ancestral Ways of Being](#)

[Albert Marshall – Reconciliation With The Earth](#)

Okay, first of all, my name is Albert Marshall. I am from Mi'kma'ki, but I do reside in the community here called Eskasoni. Today, we're going to talk about Etuaptmumk.

Two-Eyed-Seeing, as we see it, of course, is that I, as a Mi'kmaw person, I see everything from my Aboriginal lens. And since we now cannot—when since now we have to coexist with my other lens, I'm constantly searching and searching for other perspectives to enhance, or to enhance what I am doing, as to how we can better take care of our, our source of life, which is our natural world.

And, of course, now, when, when we talk about who I seen, we have to be very mindful that any action that we ever take cannot and should not compromise the ecological integrity of the area. Yes, we have to sustain ourselves, but when I invoke my Two-Eyed-Seeing, I have to make sure, I have to become diligent, of ensuring that, that my actions will never compromise the ecological integrity of the area.

So, even now that I can no longer be a hunter and gatherer, and now I, I, I have to enter into a wage economy, my teachers or my ancestors constantly reminds me that no action that I take—or every action that I take—has to be in balance and harmony with our Earth.

And I believe that, uh, if, that if that's part of wonderful idea or philosophy could be employed in a modern context, I don't think we would be in the state of mind, state of being, as we are now. In which I honestly and truly believe that coded to science and technology, we have literally exhausted the carrying capacity of the system. We even exhausted the cleansing capacity of the system.

And the main economic models that we depend upon in the education system is that we're always trying to be enlightened or educated how to become a number one exploiter. But this exploitation, I think, has gone too far, in which now I believe we have reached a point of no return unless now we spend some time together—not regionally, not nationally, but globally—come to some understanding.

In which the journey forward we have to somehow commit ourselves up employing all the, all the, all the lessons that we need to learn from the actions of the past, and take those lessons learned as to how we move forward together, of transforming our actions to be much more harmonious to, to our source of life.

Because it should become obvious to all of us: if our, if our natural world is not healthy, if our environment is not healthy, how can we be healthy? How can we strive? So, I believe from here on end there should be some concerted effort put forth. Yes, we need economic opportunities, but we must always construct our economic to be, to be the arm of destruction, constantly compromising the integrity of the area for the sake of you.

Are we thinking about in the future? In our case, we think about the seven generations. Our, my responsibility here today is to ensure that every action I take will also benefit the future generations. And every action I take, our also has to be—I have to be very, very careful that I do not put any, any, any mark on motherhood that, that will compromise the integrity ever.

Because, again, if she is not healthy, how can we be healthy? If she's not productive, how can we survive?

So, again, I believe it should, should become incumbent in all of us of agreeing that there is a great need for some kind of a transformative change. But the kind of a transformative change that would be required and needed, of course, we all have to come together as one, as one, as one.

All the global people, all people, regional, international, have to come together and say, okay, how do we, how do we construct our economics to be much more, much, much, much more ecologically sustainable? Because, again, I believe if nothing is done soon, just by the gauge of the certain, certain weather patterns we're getting, I'm convinced that I've been told through education that science—science is so wonderful that it could actually transform a human, a world into human creation.

But where is science now to stop all the big fires in BC or all those devastations that happen globally? Science is a wonderful tool, but I think through this economy, I believe we can transform that energy or that tool, not to be, not to further be the arm of destruction, but rather the arm and the arm of healing and mitigation.

Because look at all the areas that have been contaminated. Those that do it, those that, those water, whatever is in there, should be at least mitigated or cleaned up so they can be put back into the environment.

I don't think they're First Nations communities or otherwise. I don't think they got the luxury to, to think, to think now independently, in which, uh, they can't even concern themselves of some kind of a food security, take here in Eskasoni for example. If, for example, if them truck tractor trailers were to stop running for four or five days, what, what are we going to eat? But yet we have so much land here in Nova Scotia, or even here in Cape Breton, that land is vacant.

There's so much cleaning that we can be doing, we could be doing, in which we can generate economic opportunities. But in order for that to happen, I think, you know, people have to agree and see for themselves that we have actually exhausted the carrying capacity of the system.

She can no longer regenerate herself because the rate of extraction, extraction has been ongoing. She can no longer cleanse herself with the rate of chemicals that have been pumped into her.

And if we don't stop soon and, and really take a check and say, how much have we compromised or affected the biodiversity? Because it's true, the biodiversity sustains that, that sustains our natural world.

How much longer can we afford of not, of denying that if this system called biodiversity, it's not, it's not maintained, then what are we, what are, what, what can we expect?

What can we expect, for example, um, all that, all that, all the, all the chemicals are going to be allowed to enter into the atmosphere? Look, look what's happening up in the ice caps. There's some, there's some things that are evolving there.

We're removing things that are so essential for the source of life. For example, um, peat moss. Peat moss produce a lot of carbons. We have cleared our forest, and forest for our lungs. Each tree can, can take in x number of, x number of tons of pounds of carbon dioxide and transform it into an oxygen.

The forests are gone, and now we're targeting the last source of life in which we have, and that's the oceans. When we're now on, we only now have the oceans to depend on for the oxygen that we will need.

So, I, I dare ask: do we have the luxury to continue moving on forward as business as usual? And I do hope that question will ponder, that question will resonate, and with hopes that it will, that will awaken the people to start thinking: what have we done? How much harm have we cost to the very source of life in which we all depend upon?

2.4 From Community to Institution: Colonization, Industrialization and the Medicalization of Birth

All My Babies (1952) — Audio Transcript

Text roll: In many ways, people throughout the United States are working to achieve good medical care for all mothers throughout childbearing. Until that goal can be reached, it is highly important to improve the skills of midwives who carry so much of the responsibility for saving mothers' and babies' lives in rural areas where doctors and trained nurses are scarce.

This film is an educational tool to improve the services of midwives

Distributed by CMC Center for Mass Communication of Columbia University Press

The Georgia Department of Public Health presents

All my Babies. A Midwife's Own Story

Narrator: People like Ida Fleming, who engaged Miss Mary to deliver her third child. People like Adam and Maybell Dudley, newcomers to Dougherty County, who bring their troubles to this midwife. In the county health department are doctors and nurses who help Miss Mary do the job to which she and thousands of other midwives all over the South have dedicated their lives: the birthing of healthy babies.

Woman: All these your babies, Miss Mary?

Mary Coley: Yes, these are all my babies. Delivered about fourteen hundred. Twenty-one come this year.

Ida Fleming: Here's my two. I'm going to send you a real little baby picture of this next one, Miss Mary.

Mary Coley: Why, you do that then, honey.

Mary Coley (narrating): Nothing bothers her now, but I remember four years ago she was so scared. I had to take her to the clinic myself. Back in those days, our clinic was meeting at the old building. Dr. Andrew had been our health officer for, I guess, just about a year.

Little Miss Dixon always tried to help mothers feel easy the first time in the clinic. Of course, I've told them already what they're going to do—how they take each mother's temperature and feel the pulse.

Every time a mother comes to the clinic, they measure her blood pressure. That's another way they can tell if she's keeping in good shape or if she ain't, and what she had better do to get herself well so she can have her baby more easy and normal.

Clinic worker: Heart is doing just fine.

Mary Coley (narrating): The first visit, they draw off a little blood for a test, and in eight months they do the same. That's to see if the mother needs to take the treatments.

Every time the mother comes to the clinic, she brings along a little bottle of her water for a urine test. That's to make sure that her kidneys is working all right.

When our patients begin to check up early, like Ida did, then we midwives ain't so apt to run up against something beyond our handling.

Dr. Newton examines all the mothers the first time they come into the clinic, and again in eight months, and between times if they need him. When they come out, it's time for the doctor. She knows already it wasn't nothing for her to be scared about.

Mary Coley: Yes, honey, but you know the clinic now. Come on over. Let's look at your baby things.

Mary Coley (narrating): Always visit my mothers ahead of time if I possibly can get to it. Yes, I know before I got here that Matt and Ida would have everything fixed up nice.

Health officer: We need to find out why that baby died. The examination showed that his cord got infected, and you all know what that means: something wasn't clean. Maybe the midwife didn't boil her scissors long enough, or it could have been that the dressing she used wasn't sterile, or it might have been that she got in a hurry and didn't wash her hands well.

Now, you midwives in this county have built up a wonderful reputation. You work hard, and I know how difficult it is to keep things clean in some of the homes where you have to go. But your record shows that you can keep clean. And when something like this happens, it's a warning to all of us—to us doctors and nurses, as well as to you midwives. It shows us how very easily we can slip back when we get careless.

Midwife: I've been doing this same thing about eighteen years, but I still know I can slip if I don't keep checking on myself. These young girls who are just starting out, they have an advantage because they're learning the right way to begin. But, you know, folks can change too if they just put their mind to it.

Mary Coley: Well, mister, who is that young'un there now? Now, if you want to talk to me, you have to come on in the house out of this cold wind. Hey, you in that truck too—that's right, come on in too. You people seem to be new around here to me.

Adam Dudley: Yes, ma'am.

Mary Coley: Well, how far are you along with this pregnancy, honey?

Maybell Dudley: About six or seven months, I think.

Mary Coley: What did the doctor say about your case, honey?

Adam Dudley: She ain't seen no doctor.

Mary Coley: Oh, well, before I can take her case, she'll have to see a doctor. She'll have to take a blood test and go through an examination.

Adam Dudley: What's all that for?

Mary Coley: It's for the protection of her and also her baby. How do you know but what she don't need treatments? Maybell, is this your first baby?

Maybell Dudley: No, it ain't.

Mary Coley: Well, let's tell it, honey. How did you get along with all your pregnancies?

Adam Dudley: Our first one come dead. The next one dropped before she got far along with it.

Mary Coley: Well, you've just got to see a doctor. Maybell, I tell you what to do. Come on down to the clinic Friday morning.

Maybell Dudley: It ain't going to hurt me?

Mary Coley: Of course not. It's not going to hurt you. Y'all stop by for me, and I'll go with you.

Adam Dudley: Thank you, Miss Mary. I'll bring her by.

Mary Coley (narrating): Dr. Newton said Maybell ain't been eating right, and it shows up on her. He says every mother ought to have a good examination all over as soon as she thinks she's pregnant. He said Maybell ought to have started getting her checkups months ago. Poor Miss Penny sure got a problem on her hands.

Yes, that was just my day for trouble. Another lady there just begging to be my patient. But I almost knowed she needed the doctor.

Dr. Newton said I was right about that thing, and he showed me the danger signs. The lady's been having sharp headaches all the time. The doctor said being pregnant right by itself is no cause for a healthy Woman to feel all dizzy and dragged out.

The lady's ankles are all swelled up. That's another bad sign. In the clinic, they keep checking on three things: the patient's weight, her blood pressure, and her urine.

This lady's clinic chart shows that she has been putting on too much weight, especially in the last two months. Her blood pressure has been going up likewise, way above what it ought to be.

When they tested her urine, it showed up cloudy, full of albumin, the doctor said, instead of water-clear like a well mother's.

After Dr. Newton got through explaining all of that, then the lady agreed herself it was better to let the doctor wait on her.

By taking a look at all the mothers that come to the clinic, them that have trouble is very few. Now, the nurses always advise with the patients on what to eat and how to take care of themselves.

Miss Penny, she keeps a sharp eye out for the puny patients, like Maybell. And if they eat what she says, they mostly get along okay.

I just didn't know how Maybell was living out there, eleven miles down that hard-up road. Looked like Maybell done forgot what Miss Penny told her to eat.

Maybell Dudley: But, you know, it's hard to eat when you ain't hungry—and by yourself all day long.

Mary Coley (narrating): It's a mess out there. I gave her a box myself to start collecting up her baby things. But it looks like Maybell ain't thinking about nothing such as that. It still is hard to know just what a person got on his mind sometimes.

References

Chapter 2 References

- ABS Canada. (2019, June). [Two-Spirit identity and Indigenous knowledge: Reflections on Indigenous History Month and Pride Month](https://abs-canada.org/canada-two-spirit-indigenous-knowledge-history). <https://abs-canada.org/canada-two-spirit-indigenous-knowledge-history>
- Action Canada for Sexual Health and Rights. (n.d.). [Abortion access tracker](https://www.abortionaccesstracker.ca/) [Interactive map]. <https://www.abortionaccesstracker.ca/>
- [All Families Are Equal Act \(Parentage and Related Registrations Statute Law Amendment\)](https://www.ontario.ca/laws/statute/90c12), S.O. 2016, c. 23. <https://www.ontario.ca/laws/statute/90c12>
- Alloprof. (n.d.). [Urbanization and working conditions \(1850–1896\)](https://www.alloprof.qc.ca/en/students/vl/history/urbanization-and-working-conditions-1850-1896-h1178). <https://www.alloprof.qc.ca/en/students/vl/history/urbanization-and-working-conditions-1850-1896-h1178>
- [An Act Respecting First Nations, Inuit and Métis Children, Youth and Families](https://laws-lois.justice.gc.ca/eng/acts/F-11.73/), S.C. 2019, c. 24. <https://laws-lois.justice.gc.ca/eng/acts/F-11.73/>
- Association of Ontario Midwives. (n.d.). [What is a midwife?](https://www.ontariomidwives.ca/what-midwife). <https://www.ontariomidwives.ca/what-midwife>
- Association of Ontario Midwives. (2019/20). [Bringing birth home: Restoring Indigenous midwifery](https://www.ontariomidwives.ca/bringing-birth-home-restoring-indigenous-midwifery). <https://www.ontariomidwives.ca/bringing-birth-home-restoring-indigenous-midwifery>
- Bartlett, C., Marshall, M., & Marshall, A. (2012). [Two-Eyed Seeing and other lessons learned within a co-learning journey of bringing together Indigenous and mainstream knowledges and their ways of knowing](https://doi.org/10.1007/s13412-012-0086-8). *Journal of Environmental Studies and Sciences*, 2(4), 331–340. <https://doi.org/10.1007/s13412-012-0086-8>
- Bastawros, H. (2023). [Assisted reproductive techniques](https://iastate.pressbooks.pub/humanreproduction/chapter/assisted-reproductive-techniques/). In *Human reproduction: A clinical approach*. Iowa State University Pressbooks. <https://iastate.pressbooks.pub/humanreproduction/chapter/assisted-reproductive-techniques/>
- BCcampus. (2021). [Chapter 20.1: Demography and population](https://opentextbc.ca/introductiontosociology3rdedition/chapter/20-1-demography-and-population/). In *Introduction to sociology* (3rd Canadian ed.). <https://opentextbc.ca/introductiontosociology3rdedition/chapter/20-1-demography-and-population/>
- Behrmann, B. L. (2006). [A reclamation of childbirth](https://pmc.ncbi.nlm.nih.gov/articles/PMC1595162/). *Reproductive Health Matters*, 14(27). <https://pmc.ncbi.nlm.nih.gov/articles/PMC1595162/>
- Belshaw, J. D. (n.d.). [Canadian history: Post-Confederation](https://ecampusontario.pressbooks.pub/histpostconfederation/chapter/3-4-urbanization-and-industry/). eCampusOntario Pressbooks. <https://ecampusontario.pressbooks.pub/histpostconfederation/chapter/3-4-urbanization-and-industry/>
- Black Birth Project. (2024). [About](https://www.theblackbirthproject.ca/). <https://www.theblackbirthproject.ca/>
- Black Breastfeeding Week. (n.d.). [About](https://blackbreastfeedingweek.org/). <https://blackbreastfeedingweek.org/>
- Black History in Two Minutes or So. (n.d.). [The Tuskegee Study](https://www.youtube.com/watch?v=afwK2CVpc9E) [Video]. YouTube. <https://www.youtube.com/watch?v=afwK2CVpc9E>
- Black Mamas Matter Alliance. (n.d.). [Black Maternal Health Week](https://blackmamasmatter.org/). <https://blackmamasmatter.org/>
- Black Midwifery Collective. (n.d.). [History of midwifery](https://blackmidwiferycollective.org/advocacy-birth-justice/history-of-midwifery/). <https://blackmidwiferycollective.org/advocacy-birth-justice/history-of-midwifery/>

- Canadian Association of Schools of Nursing. (2024). [Cultural humility and cultural safety standards for nursing education](https://www.casn.ca/wp-content/uploads/2025/02/CASN_Cultural_Humility_Safety_Standards_2024_EN.pdf). https://www.casn.ca/wp-content/uploads/2025/02/CASN_Cultural_Humility_Safety_Standards_2024_EN.pdf
- Canadian Institutes of Health Research. (2020, October). [Meet the methods series: What and who is Two-Spirit in health research](https://cihr-irsc.gc.ca/e/52214.html). <https://cihr-irsc.gc.ca/e/52214.html>
- Canadian Museum of Human Rights. (2024, March). [What is Two-Spirit? Part one: Origins](https://humanrights.ca/story/what-two-spirit-part-one-origins). <https://humanrights.ca/story/what-two-spirit-part-one-origins>
- Canadian Museum of Health Care. (n.d.). [Ignaz Semmelweis: The saviour of mothers](https://www.museumofhealthcare.ca/blog/ignaz-semmelweis-the-saviour-of-mothers). <https://www.museumofhealthcare.ca/blog/ignaz-semmelweis-the-saviour-of-mothers>
- Canadian Research Institute for the Advancement of Women. (2009). [Everyone belongs: A toolkit for applying intersectionality](https://www.criaw-icref.ca/publications/everyone-belongs-a-toolkit-for-applying-intersectionality/). <https://www.criaw-icref.ca/publications/everyone-belongs-a-toolkit-for-applying-intersectionality/>
- CBC News. (2017). [Abortion rights: Significant moments in Canadian history](https://www.cbc.ca/news/canada/abortion-rights-significant-moments-in-canadian-history-1.787212). CBC/Radio-Canada. <https://www.cbc.ca/news/canada/abortion-rights-significant-moments-in-canadian-history-1.787212>
- CBC News. (2022, May 4). [Why Canada's Roe v. Wade didn't enshrine abortion as a right](https://www.cbc.ca/news/canada/abortion-rights-canada-morgentaler-court-1.6439612). CBC/Radio-Canada. <https://www.cbc.ca/news/canada/abortion-rights-canada-morgentaler-court-1.6439612>
- Centers for Disease Control and Prevention. (n.d.). [Tuskegee Study—Timeline](https://www.cdc.gov/tuskegee/). U.S. Department of Health and Human Services. <https://www.cdc.gov/tuskegee/>
- Costescu, D., & Guilbert, É. (2018). No. 360—Induced abortion: Surgical abortion and second trimester medical methods. *Journal of Obstetrics and Gynaecology Canada*, 40(6), 750–783.
- Cott, N. F. (2000). *Public vows: A history of marriage and the nation*. Harvard University Press.
- Crenshaw, K. (1989). [Demarginalizing the intersection of race and sex: A Black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics](https://chicagounbound.uchicago.edu/uclf/vol1989/iss1/8). *University of Chicago Legal Forum*, 1989(1), 139–167. <https://chicagounbound.uchicago.edu/uclf/vol1989/iss1/8>
- Curtis, E., Jones, R., Tipene-Leach, D., Walker, C., Loring, B., Paine, S.-J., & Reid, P. (2019). [Why cultural safety rather than cultural competency is required to achieve health equity: A literature review and recommended definition](https://doi.org/10.1186/s12939-019-1082-3). *International Journal for Equity in Health*, 18, Article 174. <https://doi.org/10.1186/s12939-019-1082-3>
- Cusick, J. (2022a). [Impact of colonization on Indigenous peoples' culture](https://opentextbc.ca/peersupport/chapter/impact-of-colonization-on-indigenous-peoples-culture/). In *Post-secondary peer support training curriculum*. BCcampus. <https://opentextbc.ca/peersupport/chapter/impact-of-colonization-on-indigenous-peoples-culture/>
- Cusick, J. (2022b). [Overview of all 12 social determinants of health \(SDOH\)](https://opentextbc.ca/peersupport/chapter/overview-of-all-12-social-determinants-of-health-sdoh/). In *Post-secondary peer support training curriculum*. BCcampus. <https://opentextbc.ca/peersupport/chapter/overview-of-all-12-social-determinants-of-health-sdoh/>
- Davis, A. Y. (1983). *Women, race & class*. Vintage Books.
- Dobbs v. Jackson Women's Health Organization*, 597 U.S. 215 (2022).
- DONA International. (n.d.). [History of DONA International](https://www.dona.org/the-dona-advantage/about/history/). <https://www.dona.org/the-dona-advantage/about/history/>

- Du Bois, E. C., & Dumenil, L. (2005). *Through women's eyes: An American history with documents*. Bedford/St. Martin's.
- Dumbaugh, M., Hanneke, R., Kalaitzi, V., Kim, S., Swatscheno, J., Valencia, A., & Peters, K. (2021). [Public health and global societies](https://pubh110.digital.uic.edu/). University of Illinois Chicago. <https://pubh110.digital.uic.edu/>
- EQUIP Health Care. (n.d.). [Trauma- and violence-informed care](https://equiphealthcare.ca/resources/equity-essentials/trauma-and-violence/). <https://equiphealthcare.ca/resources/equity-essentials/trauma-and-violence/>
- Freedom, Inc. (2017). [About us](https://freedom-inc.org/index.php?page=about-us). <https://freedom-inc.org/index.php?page=about-us>
- Government of Canada. (2022). [Trauma and violence-informed approaches to policy and practice](https://www.canada.ca/en/public-health/services/publications/health-risks-safety/trauma-violence-informed-approaches-policy-practice.html). Public Health Agency of Canada. <https://www.canada.ca/en/public-health/services/publications/health-risks-safety/trauma-violence-informed-approaches-policy-practice.html>
- Grayson, N., Quinones, N., & Oseguera, T. (2022). [A model of True CHOICES: Learnings from a comprehensive sexual and reproductive health clinic in Tennessee that provides abortions and opened the city's first birth center](https://doi.org/10.1111/jmwh.13448). *Journal of Midwifery & Women's Health*, 67, 689–695. <https://doi.org/10.1111/jmwh.13448>
- Hayward, R., & Bach, A. (2022). [Returning birthing practices to Indigenous communities](https://vimeo.com/764320888) [Video]. National Collaborating Centre for Indigenous Health. <https://vimeo.com/764320888>
- Health Canada. (2016). [Summary basis of decision: Mifegymiso \(mifepristone and misoprostol\)](https://hpr-rps.hres.ca/reg-content/summary-basis-decision-detailTwo.php?linkID=SBD00239). Government of Canada. <https://hpr-rps.hres.ca/reg-content/summary-basis-decision-detailTwo.php?linkID=SBD00239>
- Health Canada. (2021). [Enhancing equitable access to virtual care in Canada: Principle-based recommendations for equity](https://www.canada.ca/en/health-canada/corporate/transparency/health-agreements/bilateral-agreement-pan-canadian-virtual-care-priorities-covid-19/enhancing-access-principle-based-recommendations-equity.html). Government of Canada. <https://www.canada.ca/en/health-canada/corporate/transparency/health-agreements/bilateral-agreement-pan-canadian-virtual-care-priorities-covid-19/enhancing-access-principle-based-recommendations-equity.html>
- Health Canada. (2024). [Assisted human reproduction](https://www.canada.ca/en/health-canada/services/drugs-health-products/biologics-radiopharmaceuticals-genetic-therapies/legislation-guidelines/assisted-human-reproduction.html). Government of Canada. <https://www.canada.ca/en/health-canada/services/drugs-health-products/biologics-radiopharmaceuticals-genetic-therapies/legislation-guidelines/assisted-human-reproduction.html>
- Hill Collins, P. (2022). *Black feminist thought: Knowledge, consciousness, and the politics of empowerment* (30th anniversary ed.). Routledge.
- Hoffman, K. M., Trawalter, S., Axt, J. R., & Oliver, M. N. (2016). [Racial bias in pain assessment and treatment recommendations, and false beliefs about biological differences between Blacks and Whites](https://www.pnas.org/doi/10.1073/pnas.1516047113). *Proceedings of the National Academy of Sciences*, 113(16), 4296–4301. <https://www.pnas.org/doi/10.1073/pnas.1516047113>
- Holland, B. (2017, August 29). [The “father of modern gynecology” performed shocking experiments on enslaved women](https://www.history.com/news/the-father-of-modern-gynecology-performed-shocking-experiments-on-enslaved-women). HISTORY. <https://www.history.com/news/the-father-of-modern-gynecology-performed-shocking-experiments-on-slaves>
- Hunte, R. S., Klawetter, S., Gill, M., Reed-Holden, D., & Cherry, K. (2025). [Collaborative anti-racist perinatal care: A case study of the Healthy Birth Initiatives–Providence Health System Partnership](https://doi.org/10.3390/genealogy9030068). *Genealogy*, 9(3), Article 68. <https://doi.org/10.3390/genealogy9030068>
- Indigenous Services Canada. (2025). [Transition 2025 Minister Gull-Masty ISC overview: Book 2](https://www.sac-isc.gc.ca/eng/1750344962775/1750344994519). Government of Canada. <https://www.sac-isc.gc.ca/eng/1750344962775/1750344994519>

- Integrative Science, Cape Breton University. (n.d.). [Guiding principles: Etuaptmumk—Two-Eyed Seeing](http://www.integrativescience.ca/Principles/TwoEyedSeeing/).
http://www.integrativescience.ca/Principles/TwoEyedSeeing/
- Johnston, J., & Gulliver, R. (2022). [Advocacy and activism](https://uq.pressbooks.pub/publicinterestcomm/chapter/advocacy-and-activism/). In *Public interest communication*. The University of Queensland. https://uq.pressbooks.pub/publicinterestcomm/chapter/advocacy-and-activism/
- La Leche League International. (n.d.). [Get support](https://www.llli.org/get-support/). https://www.llli.org/get-support/
- La Leche League International Breastfeeding Support Group. (n.d.). [La Leche League International Breastfeeding Support Group](https://www.facebook.com/share/g/1Ai8Hec2FB/) [Facebook group]. Facebook. https://www.facebook.com/share/g/1Ai8Hec2FB/
- Loppie, C., & Wien, F. (2022). [Understanding Indigenous health inequalities through a social determinants model](https://www.nccih.ca/495/Understanding_Indigenous_Health_Inequalities_through_a_Social_Determinants_Model.nccih?id=10373). National Collaborating Centre for Indigenous Health. https://www.nccih.ca/495/Understanding_Indigenous_Health_Inequalities_through_a_Social_Determinants_Model.nccih?id=10373
- Marshall, A. (2020). [Etuaptmumk \(Two-Eyed Seeing\)](https://www.youtube.com/watch?v=7yHOJTgBWVQ) [Video]. YouTube. https://www.youtube.com/watch?v=7yHOJTgBWVQ
- Mohanty, C. T. (1991). Under Western eyes: Feminist scholarship and colonial discourses. In C. T. Mohanty, A. Russo, & L. Torres (Eds.), *Third World women and the politics of feminism* (pp. 51–80). Indiana University Press.
- Montejo, R., Hedegren, A., Shi, X., & Hermansson, J. (2021). [More that childbirth: Doulas and their expanding role](https://www.heraldopenaccess.us/openaccess/more-that-childbirth-doulas-and-their-expanding-role). *Journal of Reproductive Medicine, Gynaecology & Obstetrics*, 6, 086. https://www.heraldopenaccess.us/openaccess/more-that-childbirth-doulas-and-their-expanding-role
- Moraga, C., & Anzaldúa, G. (Eds.). (1981). *This bridge called my back: Writings by radical women of color*. Persephone Press.
- Murdock, M., & Durant, S. (2024). [Settler midwifery: A colonial tool in Canada's reproductive healthcare system](https://pmc.ncbi.nlm.nih.gov/articles/PMC12434214/). *Birth*. https://pmc.ncbi.nlm.nih.gov/articles/PMC12434214/
- National Centre for Indigenous Midwifery. (2019). [Indigenous midwifery in Canada](https://indigenousmidwifery.ca/indigenous-midwifery-in-canada/). https://indigenousmidwifery.ca/indigenous-midwifery-in-canada/
- National Collaborating Centre for Indigenous Health. (2013). [An overview of Aboriginal health in Canada](https://www.nccih.ca/495/An_Overview_of_Aboriginal_Health_in_Canada.nccih?id=101). https://www.nccih.ca/495/An_Overview_of_Aboriginal_Health_in_Canada.nccih?id=101
- National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. (1979). [The Belmont report: Ethical principles and guidelines for the protection of human subjects of research](https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/index.html). U.S. Department of Health, Education, and Welfare. https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/index.html
- National Health Law Program. (2024). [Framing and language in the Doula Medicaid Project](https://healthlaw.org/wp-content/uploads/2024/03/Doula-Terminology-Issue-Brief-FINAL.pdf). https://healthlaw.org/wp-content/uploads/2024/03/Doula-Terminology-Issue-Brief-FINAL.pdf
- National Museum of African American History and Culture. (n.d.). [The historical significance of doulas and midwives](https://nmaahc.si.edu/explore/stories/historical-significance-doulas-and-midwives). Smithsonian Institution. https://nmaahc.si.edu/explore/stories/historical-significance-doulas-and-midwives
- National Research Act, Pub. L. No. 93-348, 88 Stat. 342 (1974).
- Olanlesi-Aliu, A., Alaazi, D., & Salami, B. (2023). [Black health in Canada: Protocol for a scoping review](https://doi.org/10.2196/42212). *JMIR Research Protocols*, 12, e42212. https://doi.org/10.2196/42212

- Ontario Ministry of Children, Community and Social Services. (2020). [Policy directive CW 005-20: Ceasing the practice of birth alerts in Ontario](https://www.ontario.ca/document/child-protection-service-directives-forms-and-guidelines/policy-directive-cw-005-20-ceasing-practice-birth-alerts-ontario). Government of Ontario. <https://www.ontario.ca/document/child-protection-service-directives-forms-and-guidelines/policy-directive-cw-005-20-ceasing-practice-birth-alerts-ontario>
- Paynter, M. (2022). *Abortion to abolition: Reproductive health and justice in Canada*. Fernwood Publishing.
- Paynter, M., Heggie, C., McLeod, A., Castonguay, M., Fuller, M., & Norman, W. V. (2025). [The role of doulas in abortion care in Canada: A qualitative study](https://doi.org/10.1371/journal.pone.0313918). *PLOS ONE*, 20(3), e0313918. <https://doi.org/10.1371/journal.pone.0313918>
- PBS. (2022). [The medicalization of birth](https://www.pbs.org/call-the-midwife/blog/the-medicalization-of-birth). *Call the Midwife* companion blog. <https://www.pbs.org/call-the-midwife/blog/the-medicalization-of-birth>
- Pezaro, S., Pendleton, J., van der Waal, R., LaChance Adams, S., Santos, M. J. D. S., Bainbridge, A., Isthia, K., Maeder, Z., Gilmore, J., Webster, J., Lai-Boyd, B., Brennan, A. M., & Newnham, E. (2024). [Gender-inclusive language in midwifery and perinatal services: A guide and argument for justice](https://doi.org/10.1111/birt.12844). *Birth*, 52(3), 435–447. <https://doi.org/10.1111/birt.12844>
- Physio-pedia. (n.d.). [Availability, accessibility, acceptability and quality framework](https://www.physio-pedia.com/Availability,_Accessibility,_Acceptability_and_Quality_Framework). https://www.physio-pedia.com/Availability,_Accessibility,_Acceptability_and_Quality_Framework
- Public Health Agency of Canada. (n.d.). [Social determinants of health and health inequalities](https://www.canada.ca/en/public-health/services/health-promotion/population-health/what-determines-health.html). Government of Canada. <https://www.canada.ca/en/public-health/services/health-promotion/population-health/what-determines-health.html>
- [R. v. Morgentaler](https://www.canlii.org/en/ca/scc/doc/1988/1988canlii90/1988canlii90.html), [1988] 1 S.C.R. 30. <https://www.canlii.org/en/ca/scc/doc/1988/1988canlii90/1988canlii90.html>
- Roberts, D. (2022). *Torn apart: How the child welfare system destroys Black families—and how abolition can build a safer world*. Basic Books.
- Roe v. Wade*, 410 U.S. 113 (1973).
- Roome, P. (2019, January 14). [25 years on: What midwifery in Canada has achieved and what it still needs](https://theconversation.com/25-years-on-what-midwifery-in-canada-has-achieved-and-what-it-still-needs-120210). The Conversation. <https://theconversation.com/25-years-on-what-midwifery-in-canada-has-achieved-and-what-it-still-needs-120210>
- Sapkota, D., Dennison, S., Allen, J., Gamble, J., Williams, C., Malope-Rwodzi, N., Baar, L., Ransley, J., & McGee, T. R. (2022). [Navigating pregnancy and early motherhood in prison: A thematic analysis of mothers' experiences](https://doi.org/10.1186/s40352-022-00196-4). *Health & Justice*, 10(1), Article 32. <https://doi.org/10.1186/s40352-022-00196-4>
- Savage, D. W., Garg, A., Choudhury, S., Strasser, R., Ohle, R., & Mago, V. (2025). [Characterizing the services provided by family physicians in Ontario, Canada: A retrospective study using administrative billing data](https://doi.org/10.1371/journal.pone.0316554). *PLOS ONE*, 20(1), e0316554. <https://doi.org/10.1371/journal.pone.0316554>
- Schummers, L., Law, M. R., McGrail, K., Darling, E. K., Zusman, E. Z., Dunn, S., Kaczorowski, J., Gayowsky, A., Gozdyra, P., & Norman, W. V. (2025). [Changes in local access to mifepristone dispensed by community pharmacies for medication abortion in Ontario: A population-based repeated cross-sectional study](https://doi.org/10.1503/cmaj.241505). *CMAJ*, 197(13), E345–E354. <https://doi.org/10.1503/cmaj.241505>
- SisterSong Women of Color Reproductive Justice Collective. (n.d.). [Reproductive justice](https://www.sistersong.net/reproductive-justice). <https://www.sistersong.net/reproductive-justice>

- SOC 111: Introduction to Sociology. (n.d.). [Chapter 12: Gender, sex, and sexuality](#). SaskOER.
<https://www.saskoer.ca/soc111/chapter/chapter-12-gender-sex-and-sexuality/>
- Sosa, R., Kennell, J., Klaus, M., Robertson, S., & Urrutia, J. (1980). [The effect of a supportive companion on perinatal problems, length of labor, and mother-infant interaction](#). *New England Journal of Medicine*, 303(11), 597–600. <https://doi.org/10.1056/NEJM198009043031001>
- Standing Senate Committee on Human Rights. (2022). [The scars that we carry: Forced and coerced sterilization of persons in Canada—Part II](#). Senate of Canada. <https://sencanada.ca/en/info-page/parl-44-1/ridr-the-scars-that-we-carry-forced-and-coerced-sterilization-of-persons-in-canada-part-ii/>
- Statistics Canada. (2022a). [Canada's diversity: Highlights from the 2021 Census](#). Government of Canada. <https://www12.statcan.gc.ca/census-recensement/2021/ref/98-200-X/98-200-X2021001-eng.cfm>
- Statistics Canada. (2022b). [Religion: Highlights from the 2021 Census](#). Government of Canada. <https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-x/2021009/98-200-X2021009-eng.cfm>
- Statistics Canada. (2023). [Gender diversity and sexual orientation: 2021 Census](#). Government of Canada. <https://www150.statcan.gc.ca/n1/daily-quotidien/230615/dq230615a-eng.htm>
- Statistics Canada. (2026). [Population projections for Canada \(2025 to 2075\), provinces and territories \(2025 to 2050\)](#) (Catalogue No. 17-20-0003). Government of Canada. <https://www150.statcan.gc.ca/n1/pub/17-20-0003/172000032026001-eng.htm>
- Steckley, J., & Letts, G. (n.d.). [Chapter 19: Health and medicine](#). In *Introduction to sociology* (1st Canadian ed.). BCCampus/eCampusOntario. <https://opentextbc.ca/introductiontosociology/chapter/chapter19-health-and-medicine/>
- Stoney, G. C. (Director). (1952). [All my babies: A midwife's own story](#) [Film]. Georgia Department of Public Health. <https://archive.org/details/all-my-babies-1952>
- Tam, M. W. (2021). [Queering reproductive access: Reproductive justice in assisted reproductive technologies](#). *Reproductive Health*, 18(1), Article 164. <https://doi.org/10.1186/s12978-021-01214-8>
- Taylor, K.-Y. (Ed.). (2017). *How we get free: Black feminism and the Combahee River Collective*. Haymarket Books.
- The Canadian Encyclopedia. (2019). [Sterilization of Indigenous women in Canada](#). Historica Canada. <https://thecanadianencyclopedia.ca/en/article/sterilization-of-indigenous-women-in-canada>
- The Canadian Encyclopedia. (2024). [Two-Spirit](#). Historica Canada. <https://www.thecanadianencyclopedia.ca/en/article/two-spirit>
- Thompson, B. (2002). Multiracial feminism: Recasting the chronology of second wave feminism. *Feminist Studies*, 28(2), 337–360.
- Viens, A. M. (2018). [Separating birth from community: Colonialism and historical institutionalism in Indigenous pregnancy evacuation policies](#). *Health Reform Observer*, 6(1). <https://mulpress.mcmaster.ca/hro-ors/article/view/5101>
- Wells, I. B. (1893). [Lynch law in all its phases](#). *Our Day: A Record and Review of Current Reform*, 11, 333–347. <https://voicesofdemocracy.umd.edu/wells-lynch-law-textual-authentication/>

- Whitehead, C., Harjee, R., & Tallon, N. (2024, June). [BC to fund in vitro fertilization: For whom and how?](https://bcmj.org/articles/bc-fund-vitro-fertilization-whom-and-how). *British Columbia Medical Journal*, 66(5), 150–153. <https://bcmj.org/articles/bc-fund-vitro-fertilization-whom-and-how>
- World Economic Forum. (2018, October 25). [Can inequality be blamed on the agricultural revolution?](https://www.weforum.org/stories/2018/10/how-the-agricultural-revolution-made-us-inequal/) <https://www.weforum.org/stories/2018/10/how-the-agricultural-revolution-made-us-inequal/>

Chapter 3 References

- Beetham, K. S., Giles, C., Noetel, M., Clifton, V., Jones, J. C., & Naughton, G. (2019). [The effects of vigorous intensity exercise in the third trimester of pregnancy: A systematic review and meta-analysis](https://doi.org/10.1186/s12884-019-2441-1). *BMC Pregnancy and Childbirth*, 19, 281. <https://doi.org/10.1186/s12884-019-2441-1>
- Betts, J. G., Young, K. A., Wise, J. A., Johnson, E., Poe, B., Kruse, D. H., Korol, O., Johnson, J. E., Womble, M., & DeSaix, P. (2022). [Anatomy and physiology 2e](https://openstax.org/books/anatomy-and-physiology-2e/pages/28-6-lactation). OpenStax. <https://openstax.org/books/anatomy-and-physiology-2e/pages/28-6-lactation>
- Coad, J., & Dunstall, M. (2011). *Anatomy and physiology for midwives* (3rd ed.). Elsevier Churchill Livingstone.
- Corporis. (2018, August 29). [The easiest way to remember directional terms—Anatomy basics](https://www.youtube.com/watch?v=gxxy7AP_eGQ&ab_channel=Corporis) [Video]. YouTube. https://www.youtube.com/watch?v=gxxy7AP_eGQ&ab_channel=Corporis
- Corporis. (2020, August 6). [Intro to histology: The four tissue types | Corporis](https://www.youtube.com/watch?v=S59JwFCjNhc) [Video]. YouTube. <https://www.youtube.com/watch?v=S59JwFCjNhc>
- Duong, H. T., Hashmi, S. S., Ramadhani, T., Canfield, M. A., Scheuerle, A., Waller, D. K., & National Birth Defects Prevention Study. (2011). [Maternal use of hot tub and major structural birth defects](https://doi.org/10.1002/bdra.20831). *Birth Defects Research Part A: Clinical and Molecular Teratology*, 91(9), 836–841. <https://doi.org/10.1002/bdra.20831>
- Fanshawe College. (2025). *HLTH 1231: Anatomy and physiology—Lecture 9: Lactation and the mammary glands* [Course slides]. Fanshawe College School of Nursing, Doula Studies Program.
- Greene, S. (2022). [Wading through the weeds: A public health response to supporting pregnant and breast/chestfeeding people who consume cannabis](https://www.wadingthroughtheweeds.com/s/Wading-Through-the-Weeds_2022.pdf) [Report]. https://www.wadingthroughtheweeds.com/s/Wading-Through-the-Weeds_2022.pdf
- Greene, S. (2025). [Wading through the weeds: A harm reduction toolkit for supporting parents and lactating individuals who consume cannabis](https://www.wadingthroughtheweeds.com/s/Wading_Through_The_Weeds_Toolkit_250514_6mb.pdf) [Toolkit]. https://www.wadingthroughtheweeds.com/s/Wading_Through_The_Weeds_Toolkit_250514_6mb.pdf
- Health Canada. (2009). [Fetal alcohol spectrum disorder](https://www.canada.ca/en/health-canada/services/substance-use/alcohol/fetal-alcohol-spectrum-disorder.html). Government of Canada. <https://www.canada.ca/en/health-canada/services/substance-use/alcohol/fetal-alcohol-spectrum-disorder.html>
- Herlihy, B. (2018). *The human body in health and illness* (6th ed.). Elsevier.
- InterACT Advocates for Intersex Youth. (n.d.). [About intersex](https://interactadvocates.org/). <https://interactadvocates.org/>
- Kabi. (2012, April 20). [Homeostasis positive feedback control of labor pregnancy](https://www.youtube.com/watch?v=heW0EkjutHc&ab_channel=Kabi) [Video]. YouTube. https://www.youtube.com/watch?v=heW0EkjutHc&ab_channel=Kabi
- Marieb, E. (2015). *Essentials of human anatomy & physiology* (11th ed.). Pearson Education.
- Marieb, E. N., & Keller, S. M. (2022). *Essentials of human anatomy & physiology* (12th ed.). Pearson.

- Mendelson, C. R., Montalbano, A. P., & Gao, L. (2017). [Fetal-to-maternal signaling in the timing of birth](https://doi.org/10.1016/j.jsbmb.2016.09.006). *Journal of Steroid Biochemistry and Molecular Biology*, 170, 19–27. <https://doi.org/10.1016/j.jsbmb.2016.09.006>
- Morgan, S., Koren, G., & Bozzo, P. (2013). [Is caffeine consumption safe during pregnancy?](https://www.cfp.ca/content/59/4/361) *Canadian Family Physician*, 59(4), 361–362. <https://www.cfp.ca/content/59/4/361>
- National Geographic. (2017, December 1). [Human body 101](https://www.youtube.com/watch?v=Ae4MadKPJC0&t=108s) [Video]. YouTube. <https://www.youtube.com/watch?v=Ae4MadKPJC0&t=108s>
- Riordan, J., & Wambach, K. (2010). *Breastfeeding and human lactation* (4th ed.). Jones & Bartlett Publishers.
- Solomon, J. (2025a). *Week 10: Physiological adaptations to pregnancy* [Course slides]. HLTH 1231: Anatomy and Physiology, Fanshawe College.
- Solomon, J. (2025b). *Week 13: Genetics, embryology, and diversity* [Course slides]. HLTH 1231: Anatomy and Physiology, Fanshawe College.
- Solomon, J. (2025c). *Week 14: Labour and birth* [Course slides]. HLTH 1231: Anatomy and Physiology, Fanshawe College.
- Sorrentino, S. A., Remmert, L., & Wilk, M. J. (2018). *Mosby's Canadian textbook for the support worker* (4th ed.). Elsevier.
- TED-Ed. (2020, October 1). [The surprising effects of pregnancy](https://www.youtube.com/watch?v=F_ssj7-8rYg) [Video]. YouTube. https://www.youtube.com/watch?v=F_ssj7-8rYg
- United Nations Human Rights Office. (2015). [Intersex](https://unfe.org/system/unfe-65-Intersex_Factsheet_ENGLISH.pdf) [Fact sheet]. https://unfe.org/system/unfe-65-Intersex_Factsheet_ENGLISH.pdf
- WisTech Open. (2025a). [10.3 Labor](https://wtcs.pressbooks.pub/healthpromo/chapter/10-3-labor/). In *Health promotion*. Open Resources for Nursing (Open RN). <https://wtcs.pressbooks.pub/healthpromo/chapter/10-3-labor/>
- WisTech Open. (2025b). [10.4 The P's of labor](https://wtcs.pressbooks.pub/healthpromo/chapter/10-4-the-ps-of-labor/). In *Health promotion*. Open Resources for Nursing (Open RN). <https://wtcs.pressbooks.pub/healthpromo/chapter/10-4-the-ps-of-labor/>
- WisTech Open. (2025c). [10.7 Complications associated with labor](https://wtcs.pressbooks.pub/healthpromo/chapter/10-7-complications-associated-with-labor/). In *Health promotion*. Open Resources for Nursing (Open RN). <https://wtcs.pressbooks.pub/healthpromo/chapter/10-7-complications-associated-with-labor/>

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1.0		First Publication	N/A