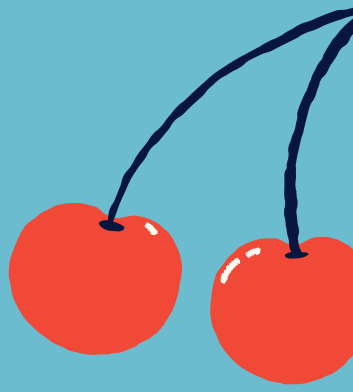
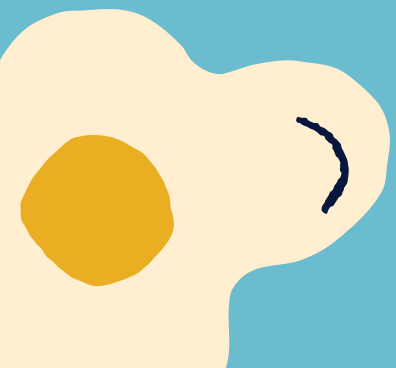
It Takes Guts

HOW YOUR BODY TURNS FOOD INTO FUEL

(AND POOP)



A Companion Guide for Teachers and Parents



TITLE:

It Takes Guts: How Your Body Turns Food Into Fuel (and Poop)

AUTHOR: Dr. Jennifer Gardy

ILLUSTRATOR: Belle Wuthrich

GENRE: Nonfiction

THEMES: Physical and mental health, nutrition, biology, STEM, body systems (digestive, immune), humor

SUITABLE FOR: Ages 8–12, Grades 3–7

GUIDED READING LEVEL: S

LEXILE LEVEL: 1160L

COMMON CORE STANDARDS:

RI.5.1, 2, 3, 4, 5, 6, 7, 8, 9

W.5.1.1a, 1b, 1c, 1d, 2, 2a, 2b, 2c, 2d, 2e, 4, 5, 6, 7, 8, 9b

SL.5.1, 1a, 1b, 1c, 1d, 2, 3, 4, 5, 6

L.5.1, 2, 2a, 2b, 2c, 2d, 2e, 3, 3a, 4, 4a, 4b, 4c, 5b, 5c, 6

Summary

It Takes Guts explores the amazing things that happen in your digestive system, including:

- The surprising role that food and digestion play in your mood and immune system.
- The tools your body uses to break down food, including acids, which do their job without burning a hole in your stomach.
- The truth about bacteria, both the bad and the billions of "helpful bacteria" that belong in your gut.

Chapters follow the journey taken by your food and drink, from mouth to esophagus to stomach, to small intestine to colon to rectum. Along they way, Dr. Jennifer Gardy mixes facts and humor to explain the science behind barfs, burps, farts, poop, enzymes, and your microbiome. Sidebars, fast facts, and playful illustrations by Belle Wuthrich also contribute to making *It Takes Guts* both educational and entertaining.

Educational Connections

Common Core State Standards:

Reading Standards for Informational Text

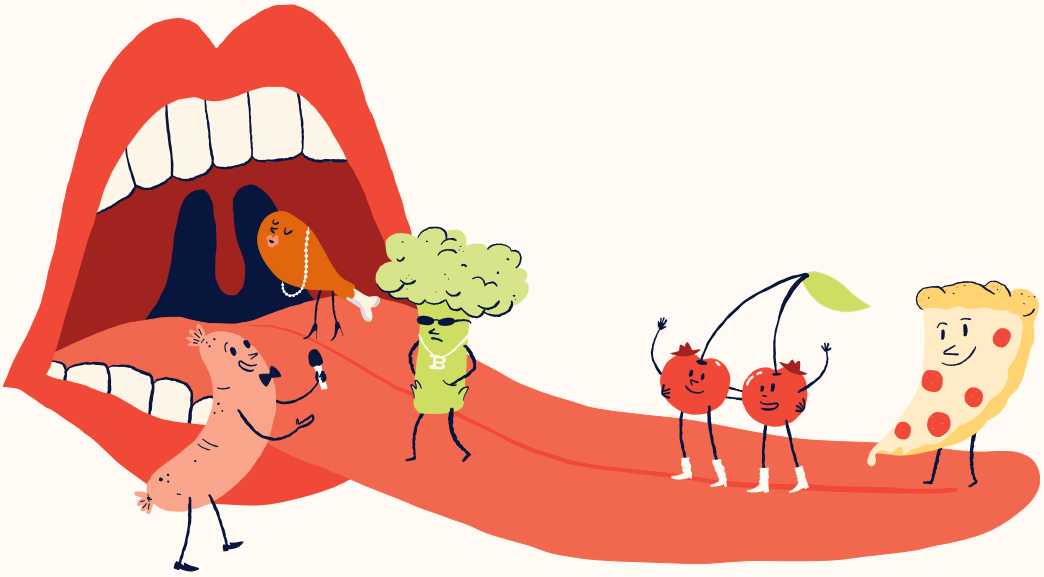
Skills and Competencies:

Making connections; using nonfiction text features; summarizing; predicting; following procedural steps; observing; recording information in a table; applying strategies; inferring; evaluating information; drawing conclusions; learning about personal health and self-care; identifying and describing cause and effect.

Before Reading

Reflect on the Topic

1. Look at the cover of the book and flip through the pages. Is this a fiction or a nonfiction book? How do you know?
2. What do you already know about digestion? Label the diagram on page 18 of this guide with everything you already know about how digestion works and the parts of the body used in digestion.
3. Write a list of questions you have about digestion. What are you hoping to learn from the book? You can use a mind map like the one on page 19 of this guide to keep track of your questions.
4. Reflect on the following questions individually or with a reading partner:
   - How might it be useful to understand digestion?
   - Why might topics like poop, farts, and barf be considered rude to discuss? Why might they be helpful to discuss?



Practice Using Text Features

Nonfiction books have special text features that can help you find the information you need. You don't always have to read a nonfiction book from start to finish. Although—reading *It Takes Guts* from start to finish is a great idea, because then you'll get to experience the whole journey of food all the way through your body!

Find the following text features in the book and consider how they can help you as you read:

TABLE OF CONTENTS

What information does the table of contents include? How might it be useful if you weren't going to read the whole book? Or if you were only looking for specific information?

GLOSSARY

While you're reading, you'll notice some words are **bold**. That means they are included in the glossary. Find the glossary on pages 134–137. How will it come in handy as you read?

INDEX

Read page 138 to learn about how useful the index can be!

DIAGRAMS

This book is about things going on mostly inside your body. Take a look at the diagram on page 8. Why might the author have included this diagram so early on in the book?

Other diagrams in the book can be found on the following pages: 21, 42, 43, 72, 74–75, 85, 122, and 129. What's the difference between an illustration and a diagram? What can you learn just by looking at the diagrams?

HEADINGS

Many headings are used throughout the book. Why would the author use so many headings?

SIDEBARS

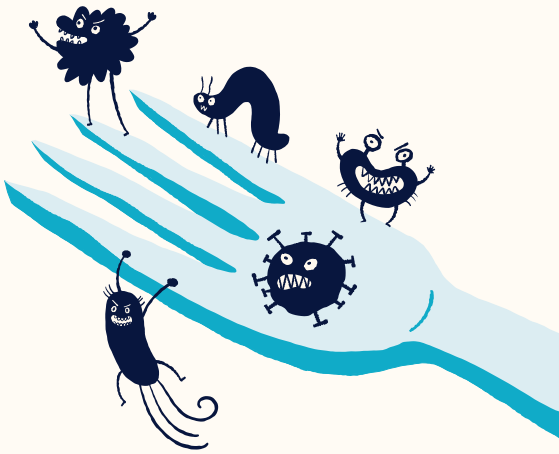
In this book, sidebars are written inside a blue frame. Find the sidebars on pages 16, 18, 23, 28, 35, 53, 62, 64, 78–79, 80–81, 87, 101, 107, 113, 118–119, 124–125, and 130. What kind of information is included in the sidebars? What might the purpose of a sidebar be?

FAST FACTS

At the end of each chapter, the author includes a list of fast facts, on pages 29, 39, 55, 67, 91, 109, and 131. When might you use these fast facts? Why would the author include these?

LISTS

This book includes some numbered and some bulleted lists, on pages 15, 35, 48, 62, 70–71, 87, 94, 101, and 105–106. Why might nonfiction books be more likely to include lists? How will the lists in this book be useful as you read?



During Reading

Learn While You Read

1. As you read, keep a second copy of page 18 of this guide beside you. Add labels and summary notes to the diagram as you learn new facts about the digestive system. Be sure to include the following in your diagram:

appendix	(colon)	small intestine
duodenum	liver	soft palate
epiglottis	masseter	sphincters (hint: there are six!)
esophagus	pancreas	stomach
gallbladder	papillae	taste buds
ileum	pharynx	trachea
jejunum	rectum	villi
large intestine	salivary glands	

2. This book includes information about the development of your digestive system from when you were an embryo. Use the timeline on page 20 of this guide to record facts about development as you come across them while you read (hint: pay close attention to the information on pages 9, 10, 66, 71, 81, 98–100, and 116).

After Reading

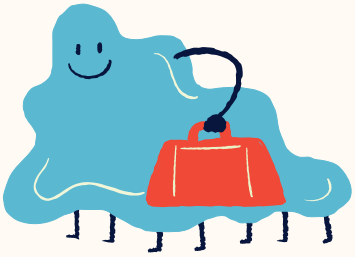
Summarize What You Learned

1. Which types of food does each enzyme help digest?

ENZYME	FOOD TYPE
Amylase	
Lactase	
Lipase	

1. Which types of food does each enzyme help digest?

HORMONE	EFFECT
Adrenaline	
Gastrin	
Ghrelin	
Glucagon	
Insulin	



3. What does each type of tooth do?

TOOTH TYPE	PURPOSE
Incisor	
Canine	
Premolar	
Molar	

4. What causes each of these things?

CAUSE	EFFECT
	Burp
	Fart
	Barf
	Hiccup
	Heartburn
	Aspiration (food going down the “wrong tube”)
	Choking

Keep a Poop Journal

Have you ever looked in the toilet after you pooped? Did you wonder what made your poop that color or that size? Have you ever wondered why some days you fart a lot and other days not as much?

One of the best ways to understand how your body works is to keep track of it! In the book, you learned about how food travels through your digestive system. Now you can use what you learned to understand your body better.

Choose a week to track your eating and pooping. Keep your poop journal in a place where you'll remember to write in it each day. You could write in it each time you eat or poop, or you could write everything down at the end of the day—if you know you can remember it all!

Write down everything you eat or drink each day. The more detailed you can be, the more you will understand the effects those foods have on your body.

Use the diagram on page 122 in the book to identify which type of poop you had. Also record the time of day, size, and color in your journal.

In the "Observations" column, write down anything you notice that might have affected your poop. For example, did you notice your poop was an unexpected color? Could it be the beet salad you ate or maybe the blue fizzy drink you had after school yesterday? Or did you notice that you farted a lot one day or your farts were especially smelly? What did you eat that might have caused that? (See page 118 in the book for a list of the best fart-producing foods!)

DAY OF THE WEEK	WHAT I ATE	WHAT I DRANK		OBSERVATIONS
	BREAKFAST		TIME:	
	LUNCH		TYPE:	
			SIZE:	
	DINNER		COLOR:	
	SNACKS			

Make Your Own Probiotics!

Probiotics are the good bacteria that help your body digest food. You can buy probiotic pills or foods that have probiotics in them. You can also grow your own probiotics at home! Humans have been making probiotics for thousands of years—long before they understood bacteria or had a name for them.

Yogurt is one of the most common probiotics eaten by people in North America—and it's not very difficult to make.

INGREDIENTS

4 cups (946 mL) whole milk
¼ cup (60 mL) plain yogurt with live probiotics

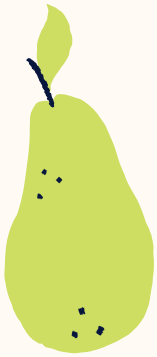
EQUIPMENT

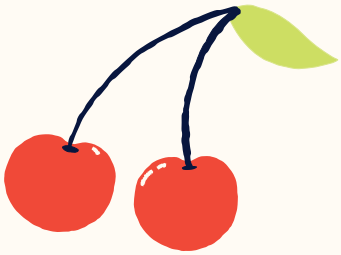
Large pot
Stove
Kitchen thermometer
Whisk
Glass jars with lids (enough to fit 4 ¼ cups [1,020 mL] of liquid)
Oven

DIRECTIONS

1. Pour the milk into the pot.
2. Put the pot on the stove at medium heat.
3. Turn the oven on low (170°F [77°C]) for about ten minutes while the milk is heating up. Turn the oven off and leave the door closed to keep the heat in until you are ready to use it.

4. Every few minutes, stir the milk and check the temperature with the thermometer.
5. Once the milk has reached 180°F (82°C), take the pot off the stove and let it cool.
6. Continue to stir and check the temperature of the milk regularly until the milk reaches 110°F (43°C).
7. While you wait, clean the jars and lids very well with soap and water. You don't want any unfriendly bacteria or mold getting into your yogurt.
8. Once the milk is at 110°F, gently stir in the plain yogurt with the whisk.
9. Pour the milk mixture into the jars and put on the lids.
10. Put the jars in the oven, and turn the oven light on to keep the oven warm. Leave the jars in the oven for six to twelve hours until thickened
11. Check to see if the yogurt is ready: remove the lid from one of the jars and gently tilt the jar back and forth. If the yogurt is ready, you will see that the milk has thickened and separated (the white part will look solid and there will be a clear liquid on top).
12. Once the yogurt is finished, put it in the fridge to cool.
13. Add granola, fruit, honey, or any other treat you'd like to use to flavor the yogurt.
14. Eat and enjoy!



TIPS FOR SUCCESS

- Read the label before you buy the yogurt—make sure it doesn't have any flavorings or sugar added, and that the ingredient list includes "active bacterial cultures." It may even tell you which kinds of bacteria have been added!
- You can use skim or partially skimmed milk, but whole milk makes for the most deliciously creamy yogurt!
- A "skin" may form on top of the milk while it's heating and cooling. If that happens, just stir it back into the milk. Stirring more regularly will prevent the skin from forming.
- If you want to make thicker yogurt, keep the milk between 170°F and 180°F (77°C and 82°C) for an extra thirty minutes. You can do this by leaving the pot on the stove on low heat and checking the temperature regularly to make sure it isn't too hot or too cold.
- To safely pour the hot milk into the jars, use a small container with a spout (e.g., a liquid measuring cup). Dip the measuring cup into the pot to fill it with milk, and then gently pour it into the jars.
- Bacteria need a consistently warm environment to grow successfully.

Continue to Explore the Wonderful World of Digestion

» Track and record your eating and pooping for another week, this time applying your observations to see if they're correct—for example, if you noticed you farted a lot one day and made a prediction about which food might have caused it. Eat that food again and see if the same thing happens again.

» Start using a poop stool and see how it affects your daily poop!

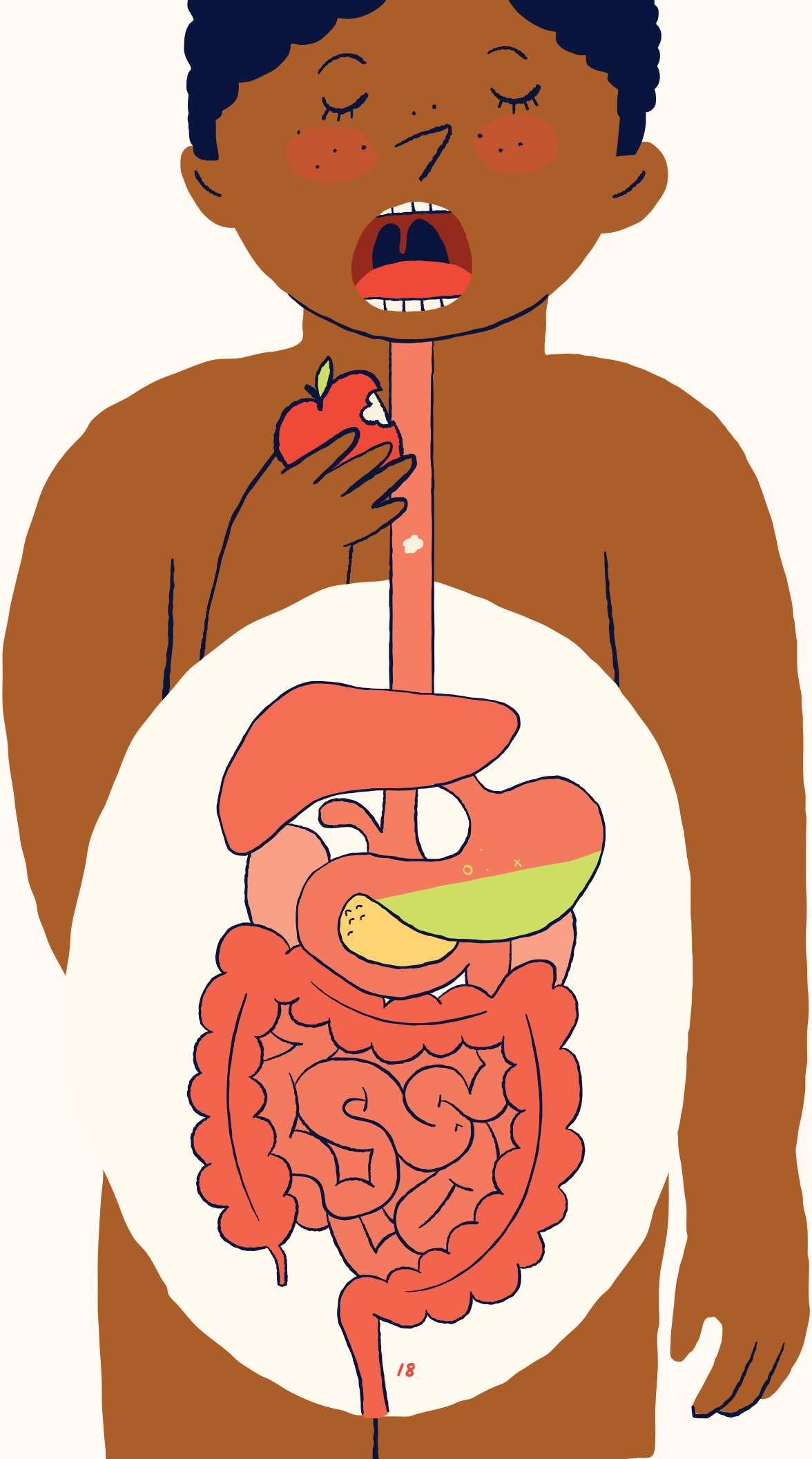
» Research a scientist who made a significant contribution to our understanding of digestion. You could find out more about one of the scientists mentioned in the book or find a different scientist (or flatologist!) to learn more about. Here are the scientists mentioned in the book:

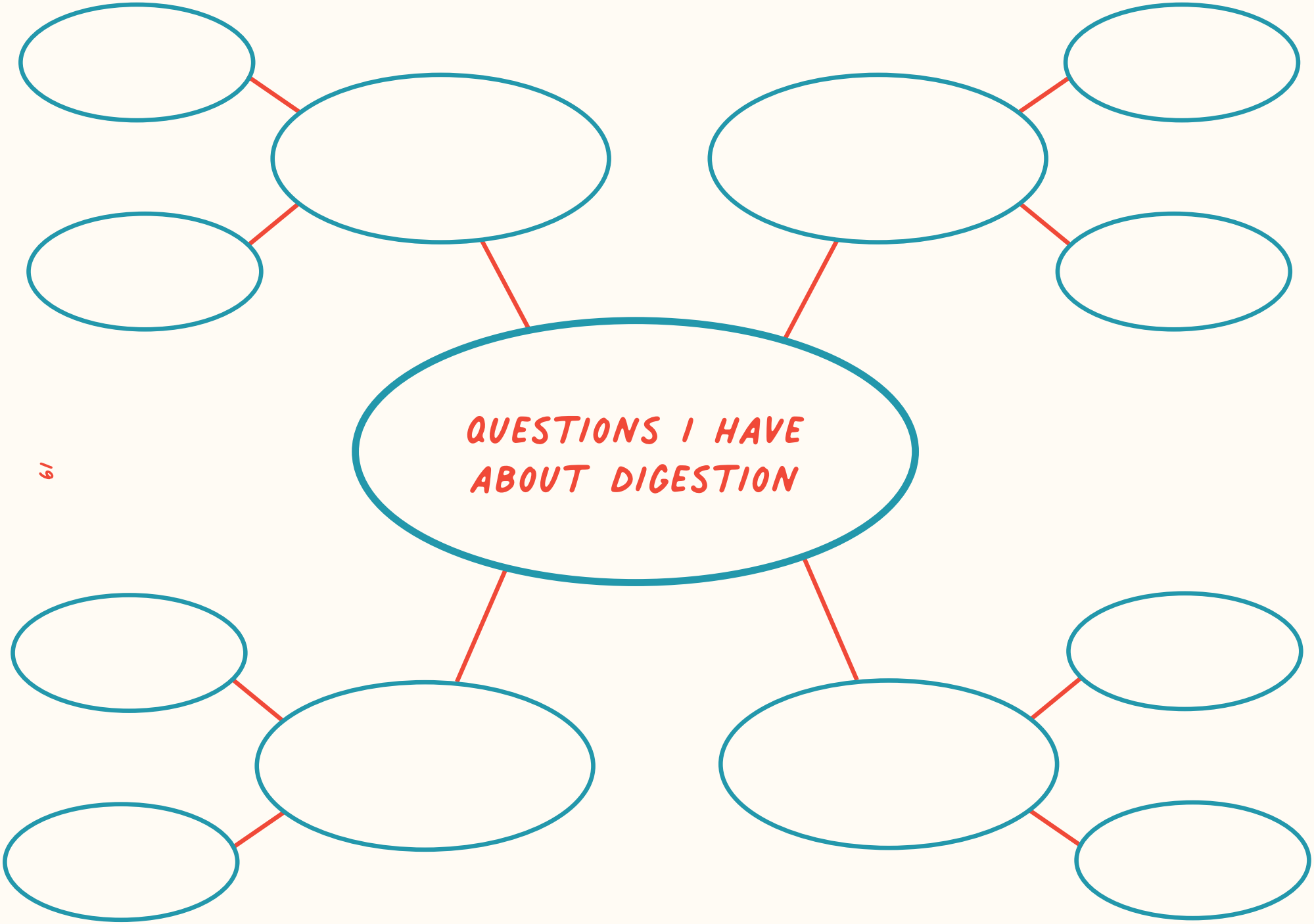
Ruggero Oddi
Adolf Kussmaul
William Beaumont
Antonie van Leeuwenhoek

» Research to learn more about one of the digestion-related innovations discussed in the book:

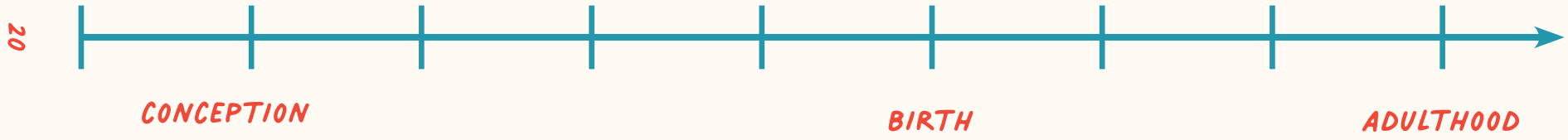
plumbing
flush toilets
poop transplants
biogas from poop
the Omni Processor
space toilets
pooping in a space suit

- Design a scientific experiment to test out different mouthwashes. Include what materials you would need and the procedure you would follow to get accurate results. Which mouthwash does the best job fixing halitosis?
- Follow the instructions on page 23 of the book to see if you might be a supertaster!
- Go outside on a rainy day and watch an earthworm moving (or search online for a video of an earthworm moving), so you can see what peristalsis looks like. Now imagine your intestines doing that after you eat a meal!
- Create a timeline showing the journey of your food from the time it enters your mouth to the time it exits at the other end.
- See what happens when you try to mix oil and water together as described on page 85 of the book. Research emulsifiers and see if you can make the oil and water mix in the same way your bile acids mix fats and water in your digestive tract. Go even further and design a scientific experiment to test out the effectiveness of different emulsifiers.
- Research unique animal poops like wombat poop and sloth poop. What other animals have strange poops? Why might their poop be like that? Consider their habitat and need for survival.




QUESTIONS I HAVE
ABOUT DIGESTION

DEVELOPMENT OF THE DIGESTIVE SYSTEM



DEVELOPMENT OF THE DIGESTIVE SYSTEM – KEY