

The top of the cover features a variety of colorful, stylized microorganisms. These include green and orange spherical viruses with spikes, pink and blue rod-shaped bacteria, and a green, worm-like microbe. The background is a solid blue color.

MICROBE MYSTERIES

A JOURNEY THROUGH A TINY WORLD



BY KEILIN GORMAN AND LAUREN MARK

WITH DR. NAOWARAT CHEEPHAM (ANN)

Microbe Mysteries: A Journey Through a Tiny World

**Written by Keilin Gorman
and Lauren Mark**

Illustrated by Lauren Mark

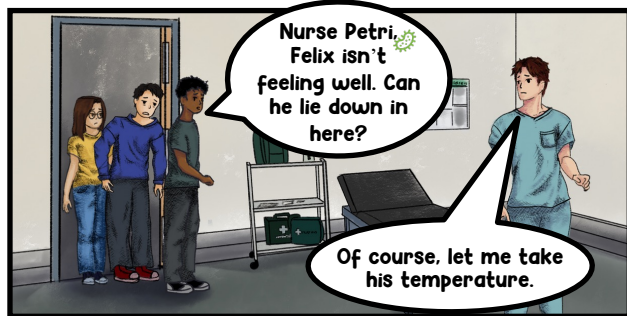
In collaboration with Dr. Naowarat Cheeptham (Ann)

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Whenever you see this
icon,  you can look at
the end of the book to
learn more in our *Word
Explorer*.



One day, Lily, Max, and Felix were getting ready for a presentation...





His temperature is 39.8°C . He definitely has a fever. 



What's wrong with him?

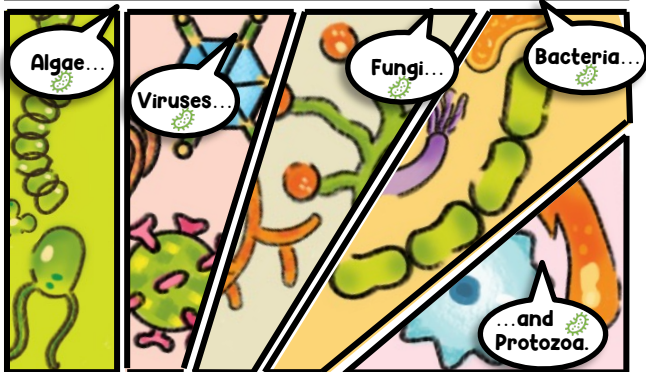
I'm not sure, it might be a *bad* microbe... For now, let's let him rest.

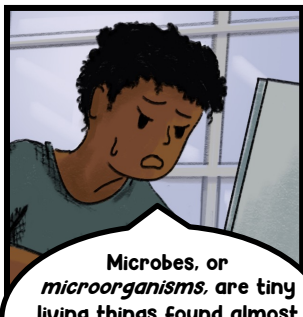


Max, are you thinking what I'm thinking?



It's up to us to figure out what's wrong with him, Lily!





Microbes, or *microorganisms*, are tiny living things found almost everywhere... Soooo, where should we start?



Max...I have an idea. Let's travel the world to learn about microbes!



Let's go save Felix!

After a short flight...

Lily, what are we doing in Japan?

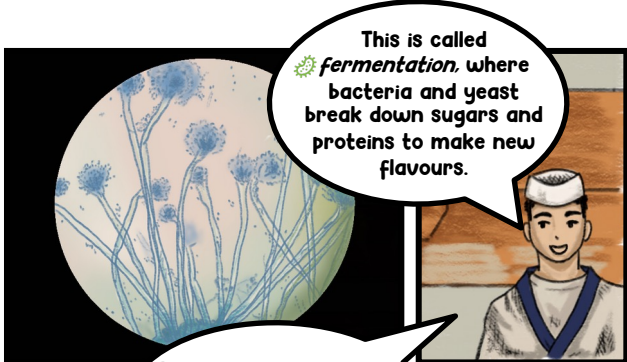
I think the chef might be able to teach us why microbes are important in cooking.

Here you two, have a taste of this miso soup.

Mmm! How do you make this taste so good?

I can't take all the credit, microbes are the little chefs behind soy sauce and miso! If only we had some way of seeing them in action...

We have a pocket microscope that can help!



Max and Lily then decided to see what they could find out about microbes in India.

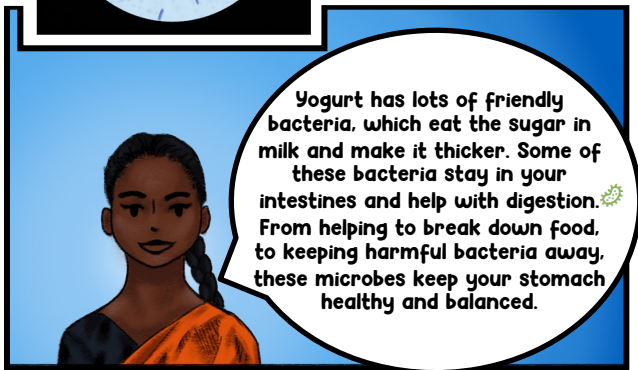
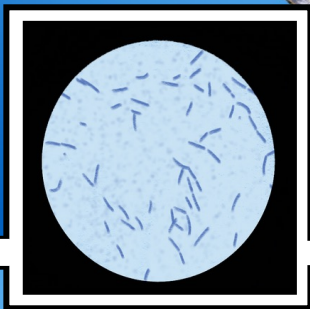
Now it's time for a sweet treat. I wonder what *Dahi* is?

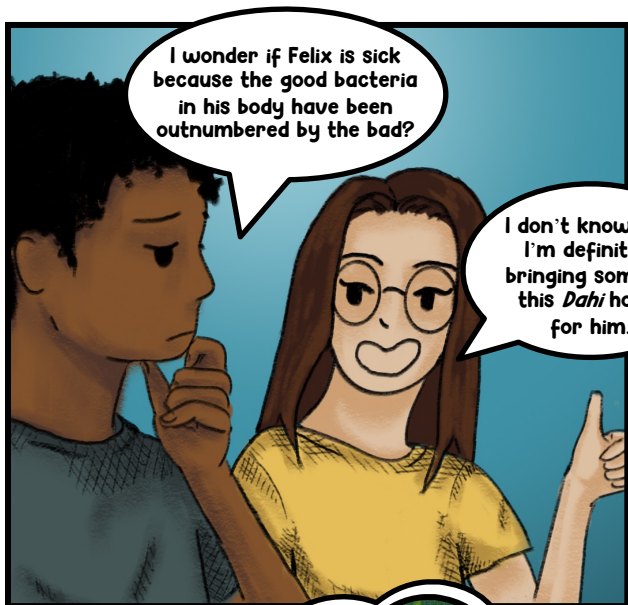
Would you like to try some? It's like yogurt, so it has both a sour taste and is good for digestion!

Thanks!



YUM! I wonder if they use microbes to make *Dahi* too?





Deep in the jungle...



What are we doing in the Amazon Rainforest?

We've learned about microbes and food, but I was wondering where else they might be.

Microbes? You've come to the right place if you're looking for bacteria. There are loads of them in the dirt beneath our feet.



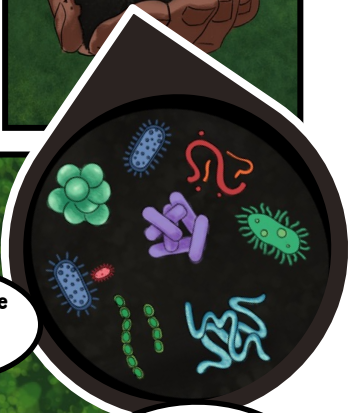
What are they doing down there?



Microbes break down dead plants and animals helping keep the soil healthy.

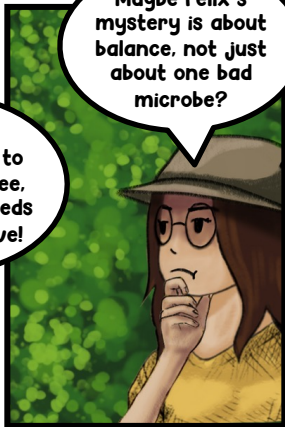


They're like nature's janitors.

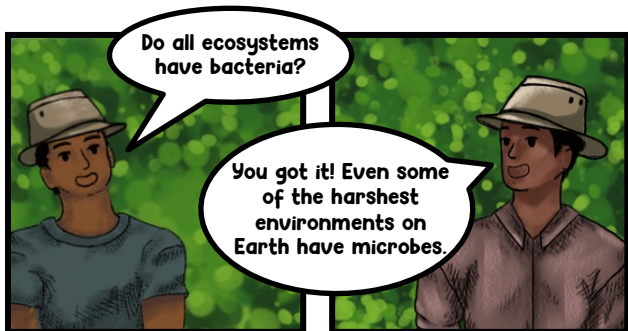


Yes! They help maintain balance of the rainforest and make the whole ecosystem run smoothly.

From the smallest bug to the tallest tree, everything needs them to thrive!



Maybe Felix's mystery is about balance, not just about one bad microbe?



They visited some *very* extreme environments.

I can't believe bacteria can live in lava!

Well, bacteria actually live in the steam vents around volcanoes.

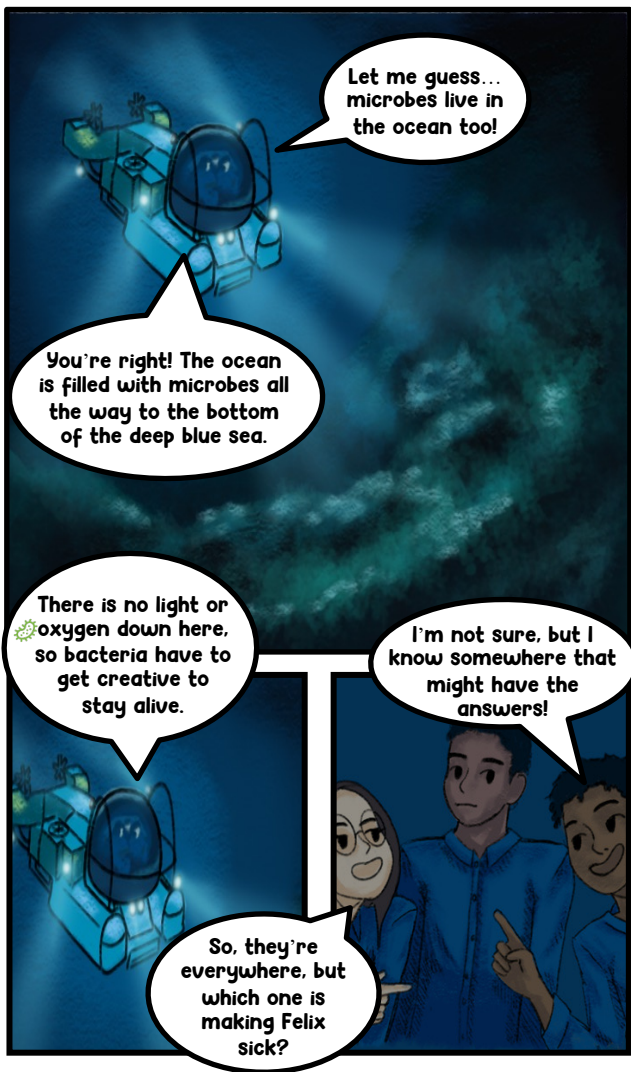
They can survive temperatures above 100°C , which is hotter than boiling water!

I guess even microbes like hanging out in hot tubs.

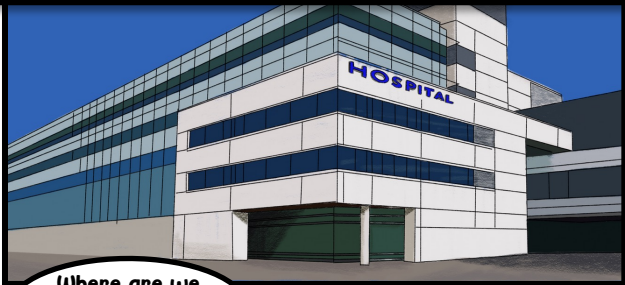
Brr, I liked it better at the volcano.

You might like the warm, but some bacteria love the cold too!

Some microbes can live in the ice of glaciers.



Back in Canada, Max and Lily made their way to their local hospital.

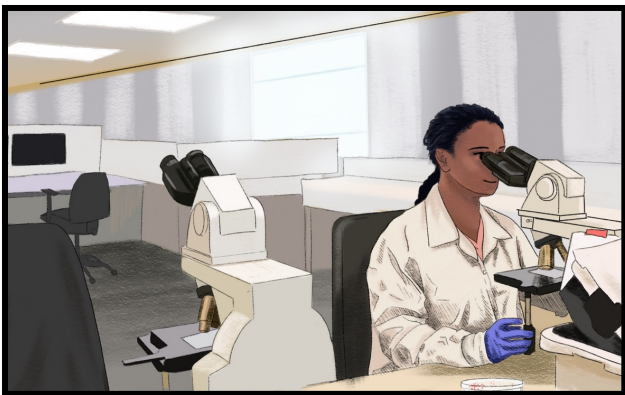


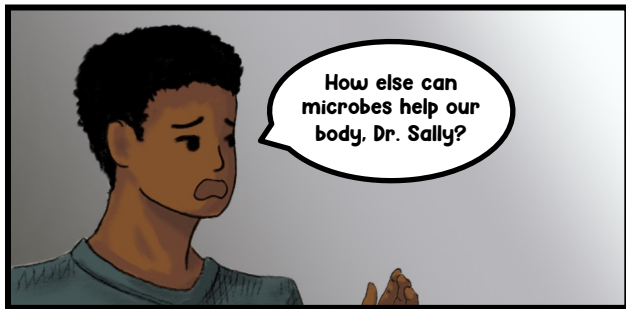
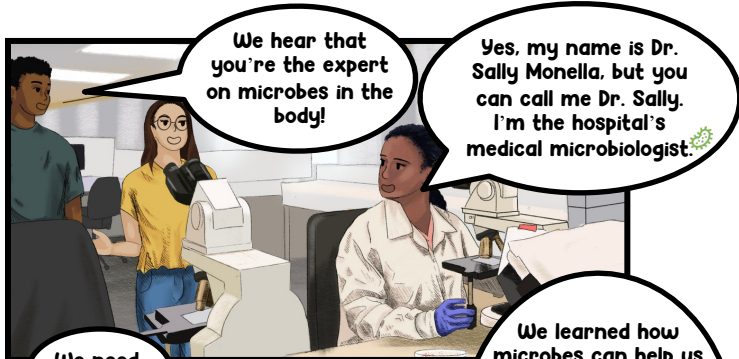
Where are we going? Why are we at the hospital?

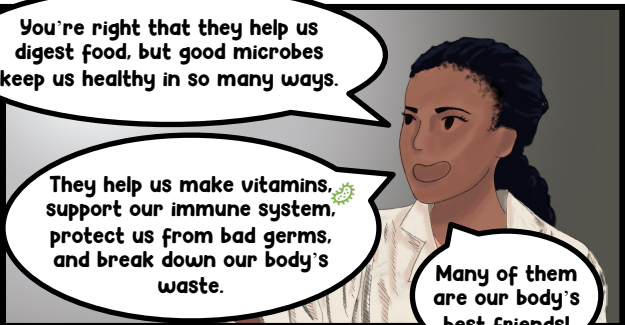


Don't worry, we're almost there.

DEPARTMENT
OF
MEDICAL
MICROBIOLOGY







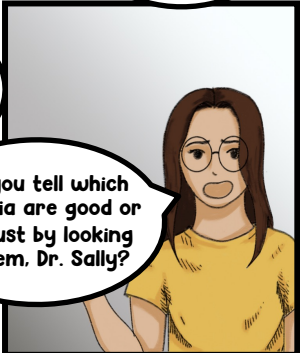
You're right that they help us digest food, but good microbes keep us healthy in so many ways.

They help us make vitamins, support our immune system, protect us from bad germs, and break down our body's waste.

Many of them are our body's best friends!



Wow! I didn't know bacteria stop us from *getting* sick too!



Can you tell which bacteria are good or bad just by looking at them, Dr. Sally?



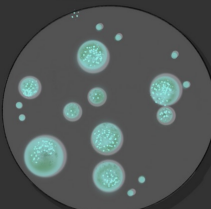
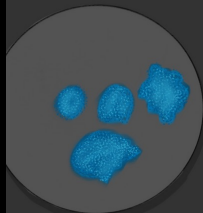
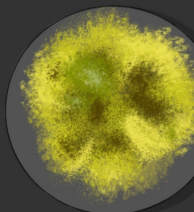
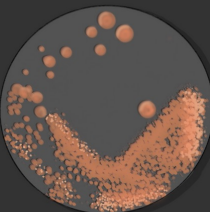
Not all the time, but there are some clues that help microbiologists tell them apart.

When we grow bacteria in the lab on Petri dishes, they can have different *macroscopic morphologies*, or things we can see with our own eyes, like...

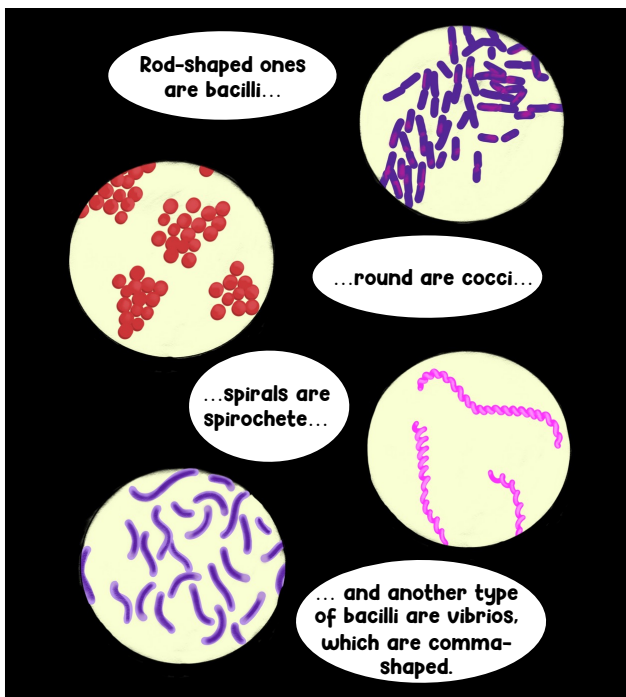
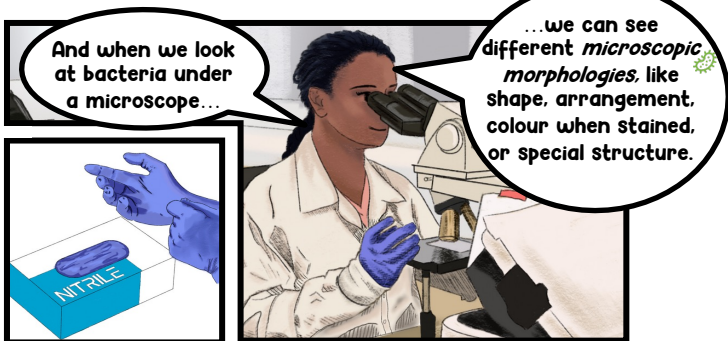


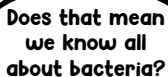
...colour...

...shape...



...texture,
and even
smell.

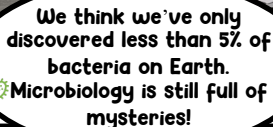




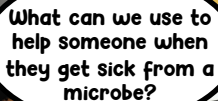
Does that mean we know all about bacteria?



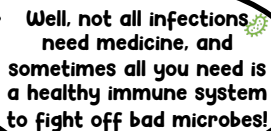
Actually, no!



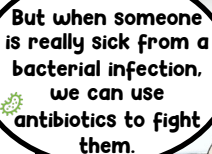
We think we've only discovered less than 5% of bacteria on Earth. Microbiology is still full of mysteries!



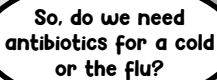
What can we use to help someone when they get sick from a microbe?



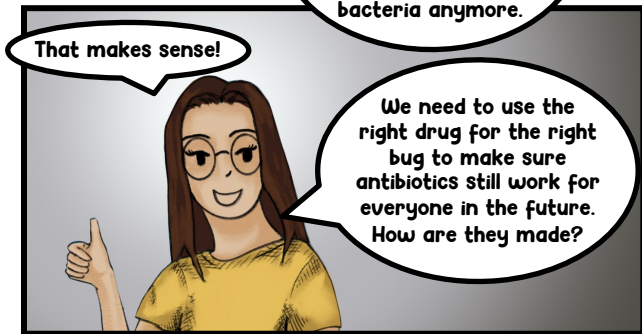
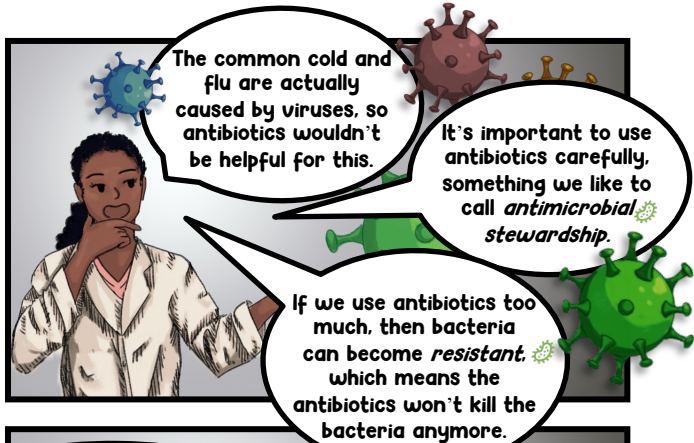
Well, not all infections need medicine, and sometimes all you need is a healthy immune system to fight off bad microbes!



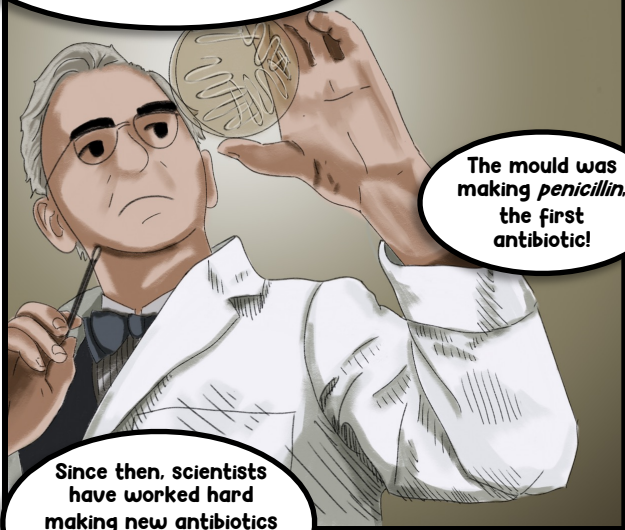
But when someone is really sick from a bacterial infection, we can use antibiotics to fight them.



So, do we need antibiotics for a cold or the flu?

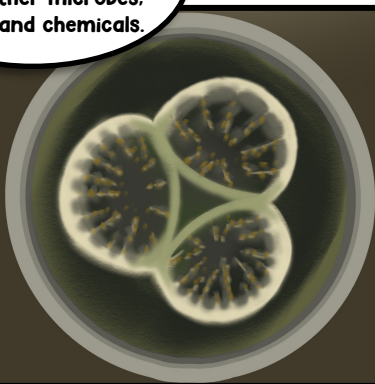


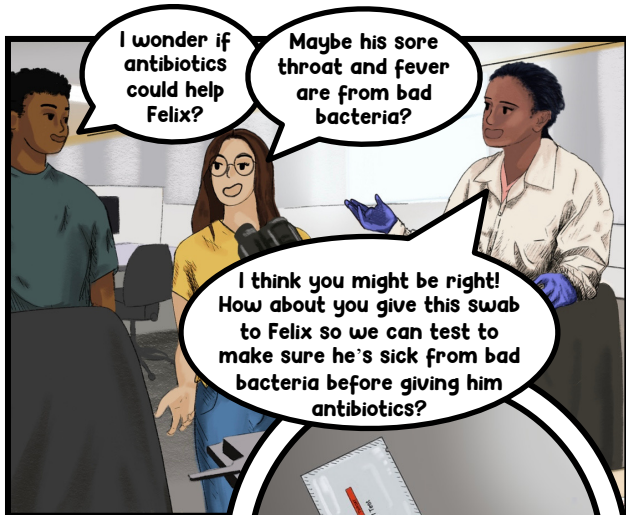
One day, he noticed some mould growing alongside his bacteria, but around the mould, the bacteria were dead!



The mould was making *penicillin*, the first antibiotic! 

Since then, scientists have worked hard making new antibiotics from other microbes, plants, and chemicals.





You can tell him all about what you learned on your adventure!



Lily and Max rushed back to school to tell Felix everything and give him the test Dr. Sally gave them.

Felix! You'll never guess what we discovered about microbes!

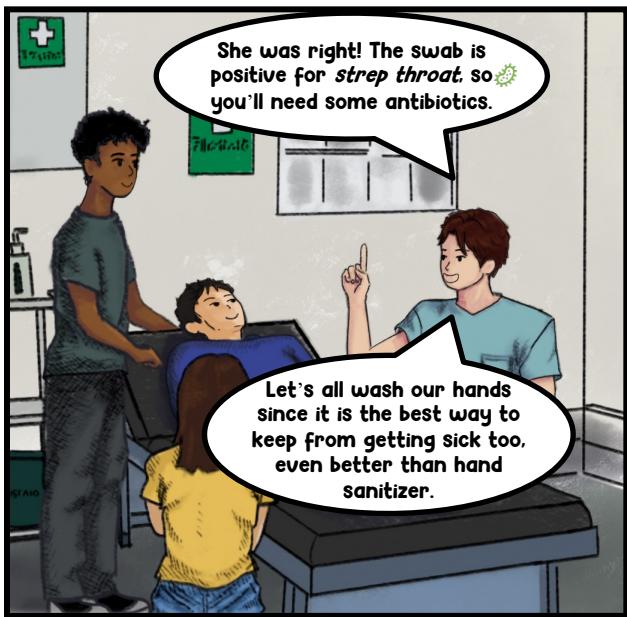
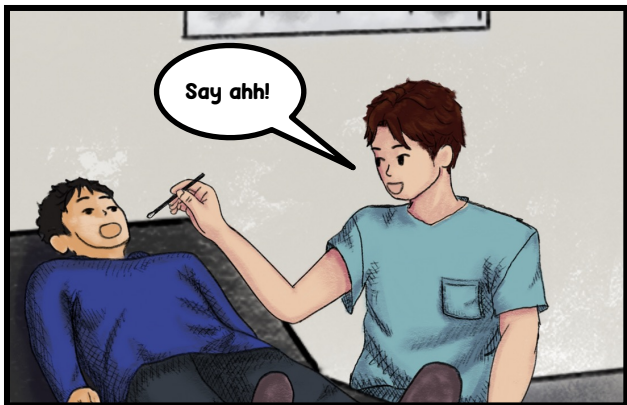
We learned about using them to make food, how they help the environment, all the exciting places they can live...

... and best of all, how important they are in keeping us healthy.

That all sounds really cool, but do you have any idea why I'm sick?

Yep, how could we forget! We met a medical microbiologist who thinks you might have a bacterial infection in your throat.

Here is a swab that can test for it.



A few days later...

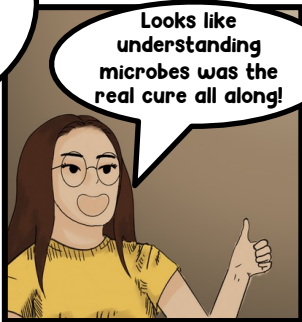


I'm feeling much better after seeing a doctor and getting some antibiotics, thank you for your help!

No problem! I know you've had a bad bug, but I'm so glad we learned about how good microbes can be. I even brought miso soup for lunch!



Looks like understanding microbes was the real cure all along!



THE END

WORD EXPLORER

Alexander Fleming	Alexander Fleming was a scientist who discovered penicillin in 1928 by accident after noticing that mould killed bacteria on a Petri dish. His discovery has saved millions of lives.
Algae	Algae are plant-like microbes that usually live in water. They make oxygen and are an important food source for many animals. <i>Fun fact: Much of the oxygen we breathe comes from algae in the ocean.</i>
Antibiotics	Antibiotics are medicine that helps kill bacteria or stop them from growing when they make you sick. Antibiotics do NOT work on viruses.
Antibiotic resistance	Antibiotic resistance happens when bacteria change and stop responding to antibiotics. This makes infections harder to treat and is a growing problem around the world.
Antimicrobial stewardship	Antimicrobial stewardship means using medicines like antibiotics carefully, so they keep working in the future. It helps prevent antibiotic resistance.
Bacteria	Bacteria are tiny, single-celled living things found almost everywhere like in soil, water, food, and inside your body. Some bacteria are helpful, and some can cause sickness.
Ecosystem	An ecosystem is a community of living things and their environment working together. Microbes are essential to all ecosystems. <i>Fun fact: A forest, a pond, and even your skin are ecosystems.</i>

Fermentation	Fermentation is a process where microbes change sugar into other substances like gas, acid, or alcohol. It is used to make foods like yogurt, bread, cheese, and kombucha.
Fever	A fever is when your body temperature rises above normal because your immune system is fighting an infection.
Fungi	Fungi are living things that include moulds, yeasts, and mushrooms. Some break down dead material in ecosystems, some help us make food, and some cause sickness.
Human digestion	Human digestion is how your body breaks down food so it can absorb nutrients. This happens in your stomach and intestines. <i>Fun fact: your small intestine is about 6 meters long when stretched out.</i>
Human immune system	The human immune system is your body's defence system. It is made up of special parts of your body that help us from getting sick. Everybody's immune system responds to bacteria differently because our bodies are different.
Infection	An infection happens when a bad microbe grows and multiplies in your body, sometimes causing you to get sick.
Macroscopic morphologies	Macroscopic morphologies are the appearance of bacterial colonies that you can see on a Petri dish. Each colony or spot is made up of millions of bacteria that all come from one original bacterial cell.
Medical microbiologist	A medical microbiologist is a doctor who studies microbes that cause disease and helps diagnose infections and choose treatments.

Microbiology	Microbiology is the study of tiny living things (microbes) and how they affect our world.
Microscope	A microscope is a tool that magnifies tiny objects so we can see things like microbes.
Microscopic morphologies	Microscopic morphologies are the appearance of individual bacteria that you can see under a microscope after staining.
Oxygen	Oxygen is a gas that some living things need to breathe and survive.
Penicillin	Penicillin is the first antibiotic ever discovered. It comes from a mould and is still used to treat many bacterial infections today.
Petri dish	A Petri dish is a small, round dish used by scientists to grow microbes like bacteria or fungi in a lab. It contains <i>media</i> , which has nutrients to feed the microbes, and <i>agar</i> , a jelly-like substance made from seaweed that gives them a surface to grow on. <i>Fun fact: It was invented in the late 1800's by a German scientist named Julius Richard Petri.</i>
Protozoa	Protozoa are single-celled microbes that often live in water or soil. Some protozoa are harmless, while others can cause sickness in humans and animals.
<i>Salmonella</i>	<i>Salmonella</i> is a type of bacteria that can cause food poisoning. It is often linked to raw or undercooked eggs, chicken, or contaminated food.

Strep throat	Strep throat is an infection caused by <i>Streptococcus</i> bacteria. It causes a sore throat, fever, and swollen glands and is treated with antibiotics.
The 5 types of microbes	The 5 types of microbes are bacteria, viruses, algae, fungi, and protozoa.
Virus	A virus is a very small microbe that needs a living cell to survive and multiply. Unlike bacteria, viruses are not alive on their own. Examples include the flu and COVID-19.
Vitamins	Vitamins are nutrients your body needs to grow, stay healthy, and fight illness. We can get vitamins from food, sunlight, and microbes.

OUR TEAM

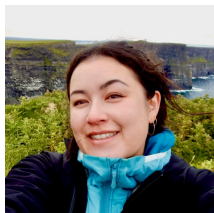


NAOWARAT CHEEPTHAM (ANN)

Professor (Cave Microbiology, Thompson Rivers University, Kamloops, BC, Canada) and 3M National Teaching Fellow (2022)

Project Mastermind

As an Earthling, a mom, and a microbiologist/educator, one of Ann's life missions is to debunk the bad press microorganisms unfairly and undeservingly get. To do so, she continues to volunteer to visit local schools near and far to make sure kids know how fun science (microbiology) can be. She spearheads this graphic novel project to reach a wider and younger audience and bring awareness to a broader audience. Ann can be reached at ncheeptham@tru.ca



LAUREN MARK

Teacher

B.Ed., Thompson Rivers University

Author and Illustrator

Lauren is a high school science educator with a background in biomedical engineering who brings curiosity, creativity, and enthusiasm into the classroom. By blending scientific inquiry with artistic expression, Lauren strives to make science approachable, engaging, and meaningful by encouraging students to ask questions, think critically, and develop a lifelong love of learning.



KEILIN GORMAN

Pediatrics Resident

M.D., University of British Columbia

Author

Keilin is a graduate from UBC medical school and is completing his residency in pediatrics. He is passionate about humanizing medical and science education by grounding research and clinical knowledge in human connection. He strives to create meaningful relationships with the children and families he works with through collaboration, curiosity, and compassion.

Thank you for reading! We hope this book cleared up common misconceptions about microbiology and inspired a deeper curiosity about the microscopic world shaping our everyday lives. Microorganisms are vital components of interconnected systems linking human health, animal health, and our shared environment.

To continue exploring this bigger picture, we encourage you to look at the World Health Organization's One Health framework:

<https://www.who.int/health-topics/one-health>

One Health recognizes that major global challenges like infectious diseases, antibiotic resistance, and food safety cannot be solved in isolation. By collaborating across disciplines, scientists and health professionals work to prevent problems at their source and build healthier systems for everyone.

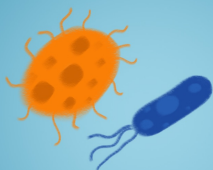
To make these essential concepts accessible to an even wider audience, we are continuously expanding our website with multilingual translations of our graphic novel. You can follow our ongoing translation efforts and access new language editions here:

<https://microbemysteries.trubox.ca/>

Stay curious,

Keilin, Lauren, and Dr. Cheeptham





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