Cricket®

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Science and Exploration for Curious Kids

Fighting Germs

Ask®

Science and Exploration for Curious Kids

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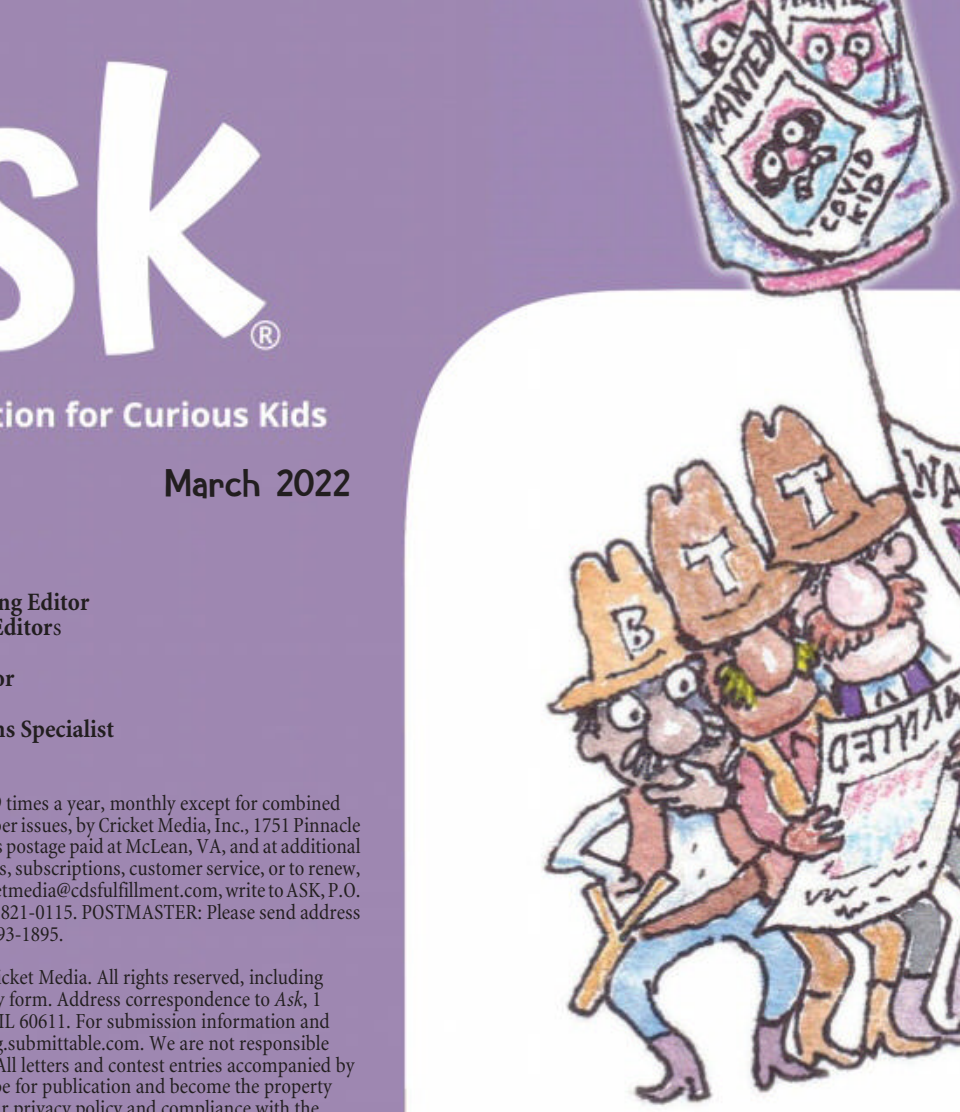

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Suggested for ages 7 to 10.

Features

Nosy News

by Elizabeth Preston

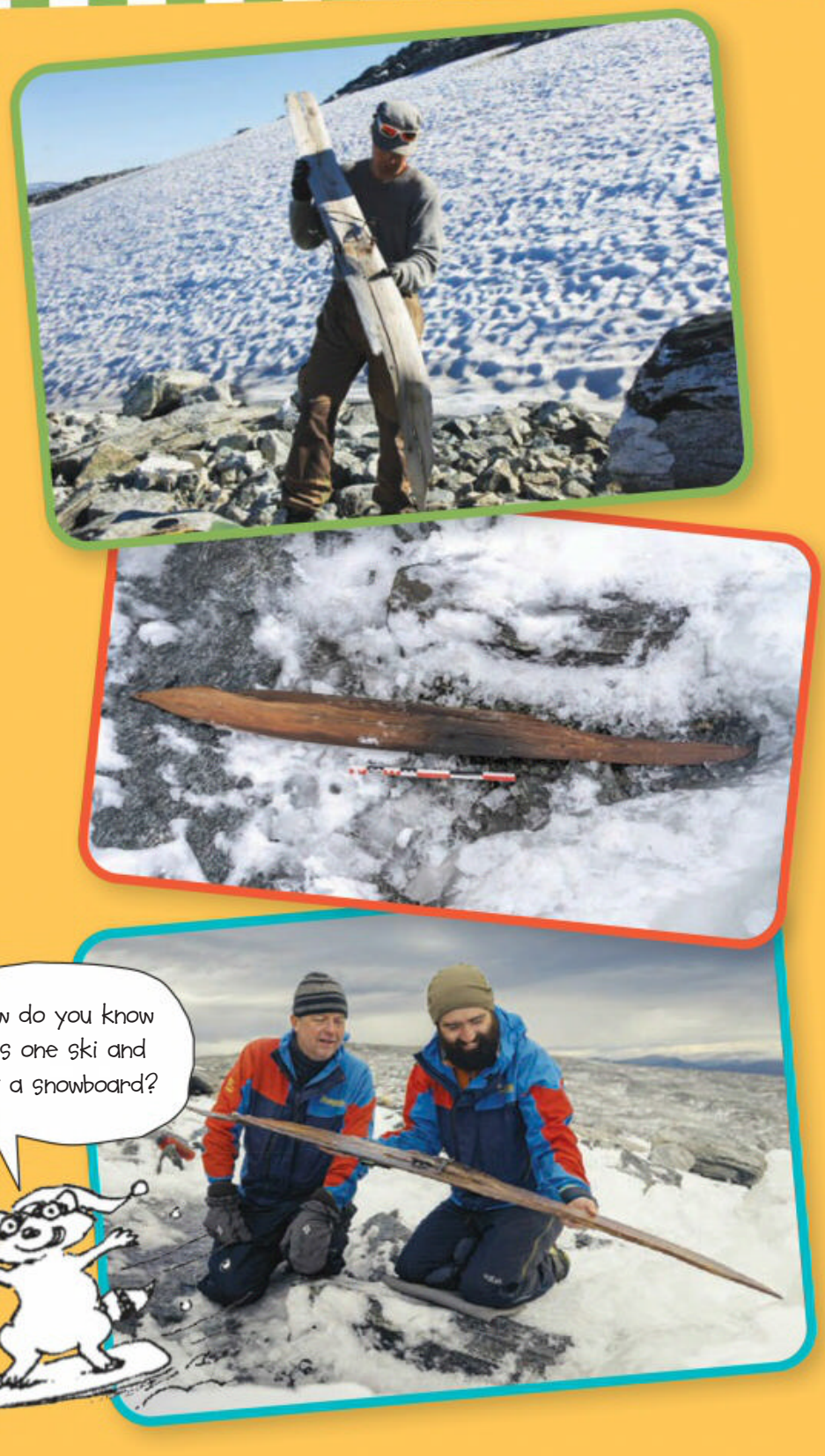
Glacier Lost and Found

High on a mountain in Norway, researchers have found a lost ski.

This normally would not be big news, but this wide wooden ski is 1,300 years old. Preserved in the ice, it still has the leather straps that held it on the wearer's foot. And it's one of a pair. Scientists discovered the first ski back in 2014, as the ice melted due to global warming. Now more ice has melted, revealing the second ski.

No one knows who wore these skis, or why they were left behind on a mountain. But the discovery shows that skis have been around for a long time, in a form very similar to the ones we use today.

Melting glaciers are not a good sign for the climate, but they are revealing many exciting finds for archaeologists.



As glaciers around the world melt, they are revealing artifacts that have been frozen in the snow for hundreds and sometimes thousands of years. This pair of skis was last worn around the year 700 CE, in early Viking times.

GONE FOR GOOD

Ivory-billed woodpeckers were one the largest woodpeckers in the United States. They used their strong white beaks to hammer out nests from trees. But as people cut down their forests, these birds became rare.

The last time someone saw an ivory-bill for sure was in 1944. Then in 2004 some bird-watchers claimed to have spotted one in the swamps of Arkansas. Since then, people have searched and searched for ivory-bills. But there's been no sign. Now the U.S. government has announced that the ivory-billed woodpecker is officially extinct.

One of the last photos of an ivory-billed woodpecker.

Moon Lava

For the first time in more than 40 years, a spacecraft has brought back rocks from the Moon. Engineers in China launched the craft, called Chang'e-5. A robotic drill scooped up rock samples, and a special canister returned them to Earth. Now scientists on Earth have been able to study the lunar rocks.

They found that the rocks are about 2 billion years old. And they are volcanic. That was a surprise. Scientists knew that the Moon had volcanoes in its very ancient past, just after it formed about 4 billion years ago. But they thought things calmed down soon after. These rocks show that volcanoes were erupting on the moon for much longer.

NESTOR'S DOCK

Are you ready for the English test today?

I forgot to read the book!

I'm going to pretend I'm sick so I can stay home.

You did that last week.

I need something worse than a cold or Mom will make me go.

MOM!

I don't feel so good.

200° fever! Is your blood boiling?

I'm covered in spots.

And look!

I'll be in my room resting and playing video games.

by Jeffrey Ebbeler

Wait. I looked up your symptoms.

You have a rare case of Krakenatosis.

I do?

KRAKENOTOSIS

It says you need to soak in a tub of honey and vinegar.

I'm stinky and sticky.

...gargle clam juice...

CLAM

...and eat a pound of raw broccoli.

WAIT!

I made it up. I'm not really sick.

Yes, I knew that the whole time.

Hey Phil, it turns out the test was really quick and easy.

And our teacher made a special test just for you.

Write a 10 page essay! I think I'm going to be sick!

by Mary Jo Hunst
art by Dave Clark

Take Your MEDICINE

Yuck! Bleck! Ptoo-ee! Taking your medicine is never fun. But who wants to stay sick in bed?

Modern medicine. That's what we call it today. And that's probably what the ancient Egyptians called it 3500 years ago. Although their recipes—teas and pastes made from leaves and bark—might seem odd to us, the ways we take medicine have changed surprisingly little.

What Is Medicine?

When you get sick, it's because your body is fighting off germs or because some part isn't working quite right. Medicines are mixtures that help the body get back in balance. What kind of medicine you take depends on what kind of help your body needs.

Plants and fungi make all sorts of useful chemicals that can help human bodies heal. Ancient herbalists tried out many mixtures. Gradually, they learned what worked best for which sicknesses, and how to prepare them so they were most effective.

Most people take medicine for just a short time, until the illness clears up. Some simply help you to feel better while your body heals itself. But sometimes people need to take medicine their whole lives to keep their bodies working properly. For example, people with diabetes need insulin every day to help them process sugar.

So how does medicine get to where it needs to go?

Spread It On

Lotions and salves—often made of honey—were one of the earliest forms of medicine. Honey is a great natural antibiotic to keep wounds clean. Today, we have many more kinds of antibiotics and creams to treat itches, skin rash, and cuts.

Salves bring helpful medicine right to the part that hurts. So do throat lozenges for a sore throat, and ear drops for earache. People with asthma inhale medicine into their lungs to make breathing easier.

Down the Hatch

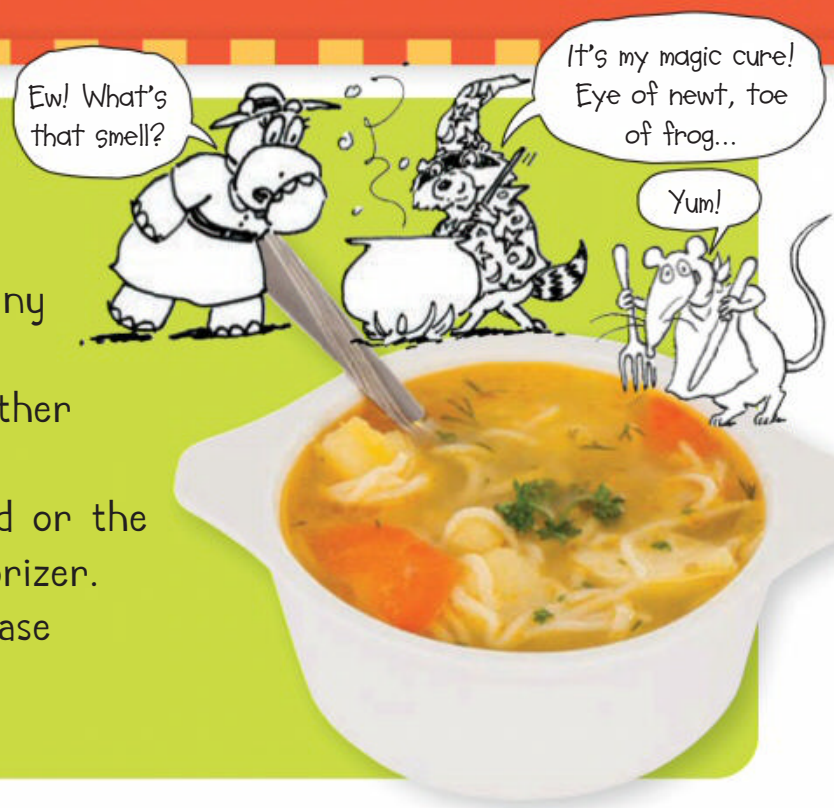
But how do you get medicine to inside parts like the liver, or bring down a fever?

Then, you take a pill. Your stomach digests the pill, and the medicine inside enters your bloodstream. It travels throughout your whole body. It gets to the sick part, but also everywhere else. Usually, the rest of the body just ignores the medicine. Sometimes it might cause side effects, giving you

Medicine for Lunch?

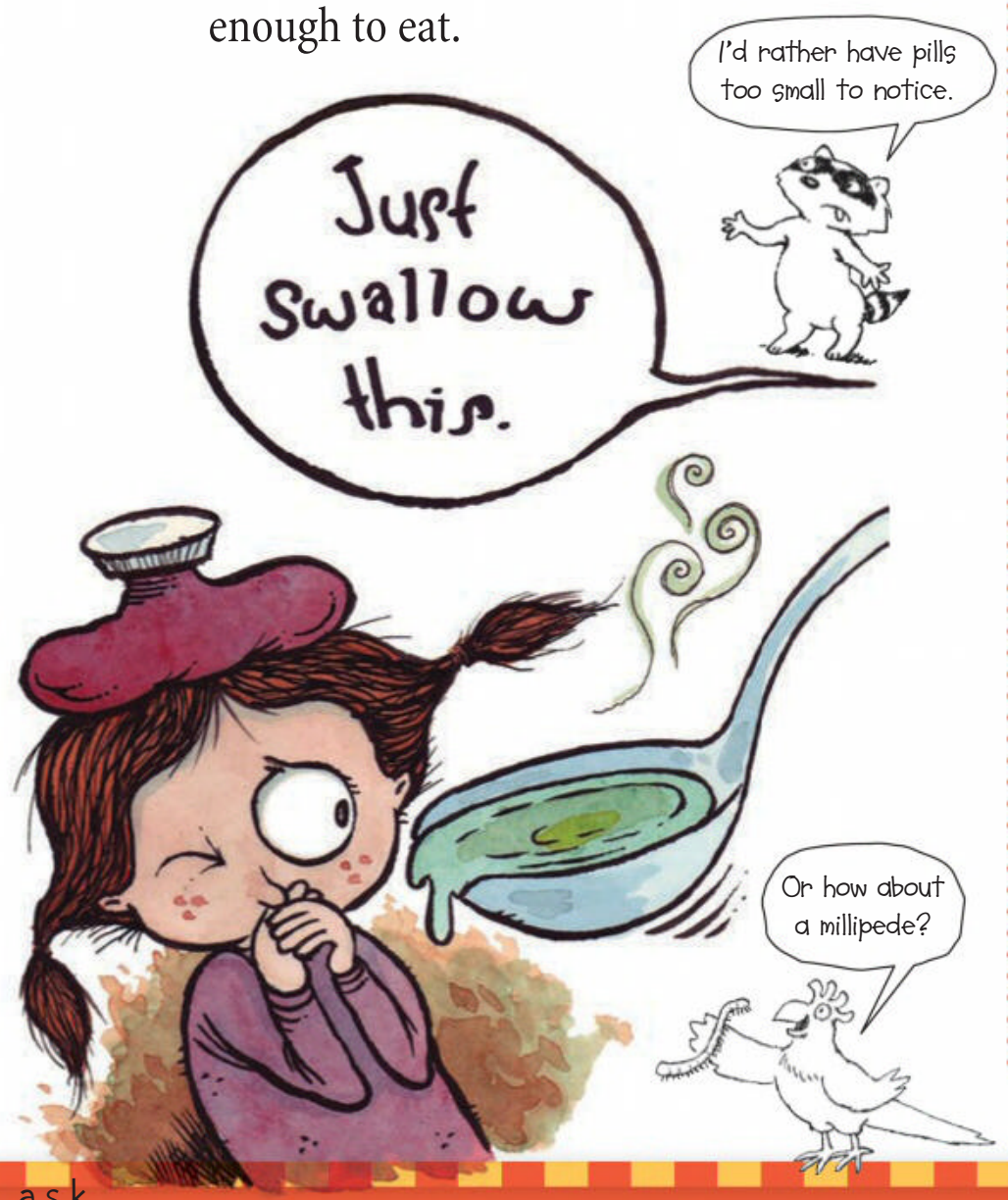
Plants and fungi are the source of many of our best medicines. Scientists have also discovered many healthy compounds in familiar foods. Eating good food can keep people healthy. And vitamins and other nutrients in foods can help sick people recover.

Is chicken soup a medicine? If you have a cold or the flu, a steaming bowl of soup acts like a mini-vaporizer. And chicken soup contains compounds that decrease mucus and stuffiness. So slurp away!



a stomach ache or making you sleepy while it helps other parts to heal.

In a couple of days, your kidneys will clean the medicine from the body (that's their job, to clean the blood of foreign stuff). So you might need to take another dose. The actual amount of medicine in a pill is often tiny. Pill-makers add corn starch or other filler to make the pills big enough to eat.



You may notice that pills come in many shapes—but are never perfectly round. Early pills often *were* round, but people found them very hard to swallow. Eventually, pharmacists figured out that oval or flat shapes went down much easier.

For children and people who don't like pills, many medicines come in liquid form, as a syrup. Medicinal teas and broths are also a very old way of getting medicine.

A Shot in the Arm

Long ago, healers realized that snake venom worked very quickly when fangs pierced the skin. Maybe cures could do the same? They made needles by sharpening the quills of goose feathers or dipping metal pins in medicine. Then these were stuck into the skin, to reach the muscle underneath.

But why stick people at all?

Sometimes, a sick person might not be able to swallow medicine. In an emergency, a shot can get medicine

into the body quickly. But most of the time, injections are necessary because of the medicine itself. Your stomach makes strong acids to dissolve food. These can also destroy some medicines.

Where you get a shot depends on its job. If the medicine needs to work fast, a doctor might inject it directly into the bloodstream. Medicine that needs to act slowly might go into the layer of fat just beneath the skin, where there aren't many blood vessels. But most shots are given in muscles, where the medicine is absorbed at a medium pace.

Shot? Not!

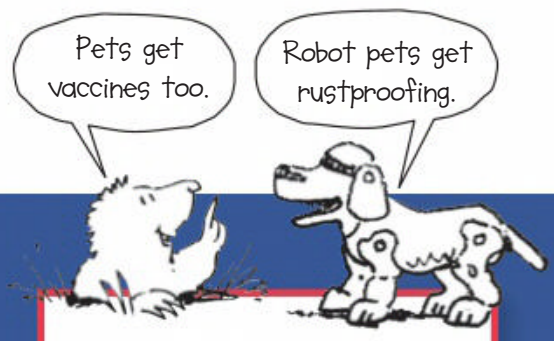
No one likes shots. So doctors are always looking for alternatives. Such as...

Ports Some people with diabetes wear a small machine that gives insulin through a narrow tube just beneath their skin. That way, they don't need several injections every day.

Inhalers Some medicines come in a mist to squirt up your nose. Your nose has lots of blood vessels near the surface, so the medicine gets absorbed quickly. This is also a great way to treat a runny nose right where it's needed.

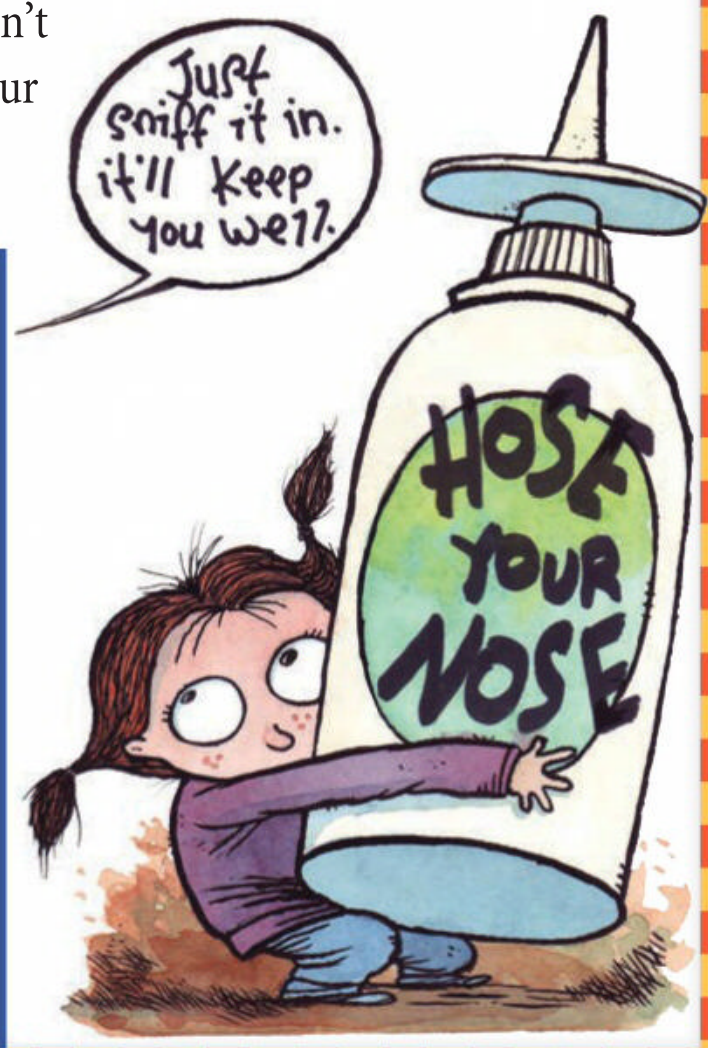
Patches Skin patches stick on like little bandages. They have tiny prickles (too small to feel) that deliver medicine through the skin. Some can be worn for days, releasing medicine slowly all the while.

Whether it comes in a tea, a pill, or a patch, medicine has one job—to help you get better. So, don't be shy to take your medicine!



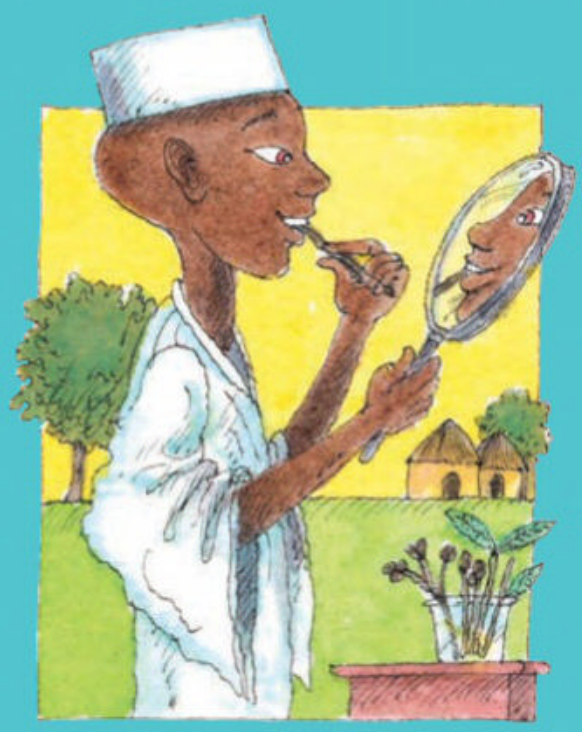
An Ounce of Prevention

Vaccines are medicines that prevent illness caused by viruses. They contain a piece of a germ—too little to cause an infection, but enough for the body's immune system to identify the germ as an invader. Immune cells memorize the germ's features as they clear it from the body. Then, when similar germs invade the body in the future, the immune cells recognize them and pounce.



Weird (that

Powdered earthworms, mouse dung, hare's tooth, dried toads—for years before modern medicine, people used all sorts of unusual remedies in the attempt to cure themselves. But some of the odd cures really worked.



The Toothbrush Tree

Before toothbrushes were invented, many people cleaned their teeth with chewed twigs. In the Sudan, the best tooth twigs came from the *Salvadora persica*, or "toothbrush tree." Recent studies have discovered that the wood of this tree releases a bacteria-fighting liquid that helps prevent infection and tooth decay. It even contains fluoride, which helps keep teeth strong.

A Spoonful of Sugar

Long ago, sugar wasn't used to sweeten cereal—it was put on wounds. Throughout the Ancient World—in Egypt, Rome, and Mexico—healers used pastes made of sugar or honey to treat burns and cuts. Sugar stops germs by drying them out. Honey contains antibiotics that kill some germs. Modern studies have found that wounds treated with a paste of sugar and iodine heal faster than those treated with antiseptic ointments.

Take Two Willow Leaves, and Call Me in the Morning

If that were your doctor's cure for a headache, you'd get a second opinion, right? But ancient Greeks, Egyptians, and Native Americans chewed bark and leaves from the willow tree

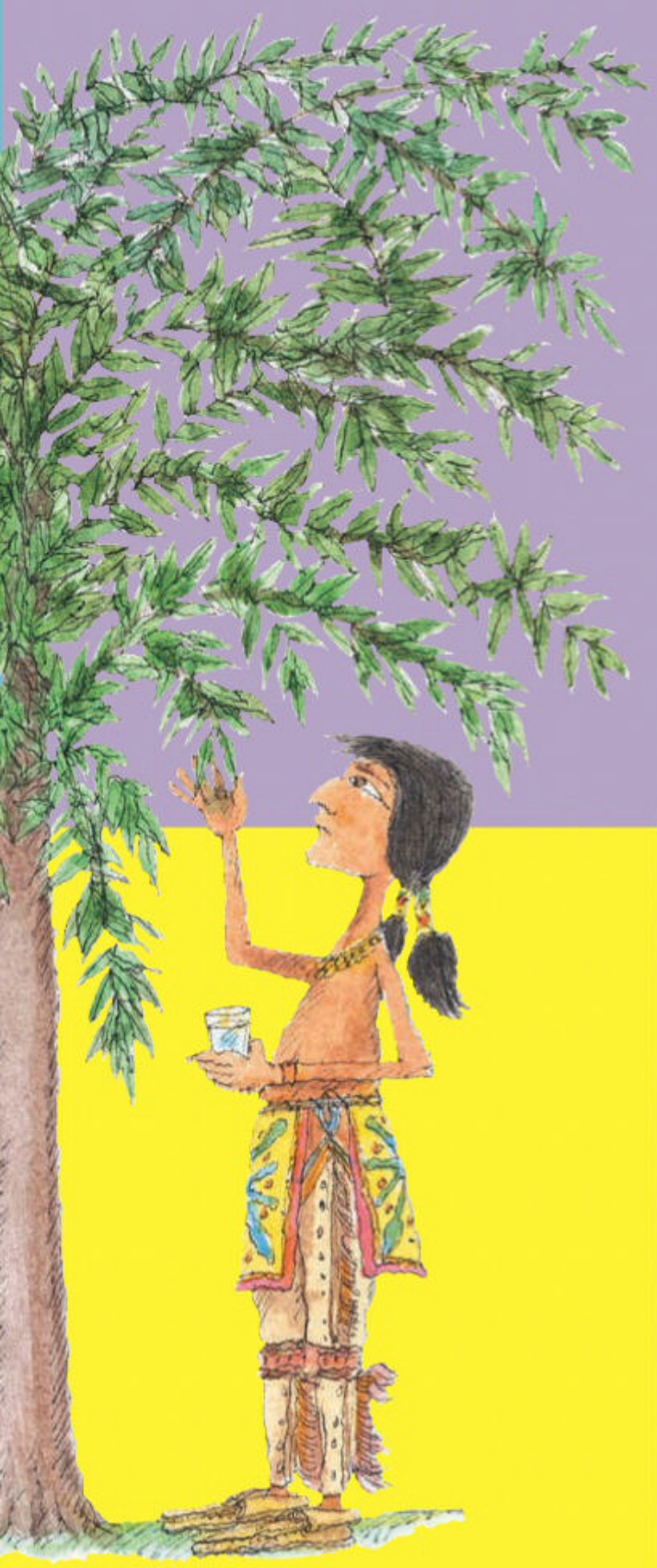
Cures work!)

art by Robert Byrd

Love Those Leeches

Ancient Greeks sometimes tried to cure patients by applying a few leeches to draw off "bad blood." The leeches would feed happily, then fall off, full of the patient's blood. Leeches were a popular cure for almost everything in Europe until the 1700s. "Leech" even became a nickname for "doctor."

Unfortunately, bleeding patients didn't really cure them, and often made things worse. But recently, leeches have found work again. Leech drool contains a chemical called hirudin that stops blood from clotting. When modern surgeons work with tiny blood vessels, they sometimes use hirudin from leeches to keep blood clots from blocking the blood flow.



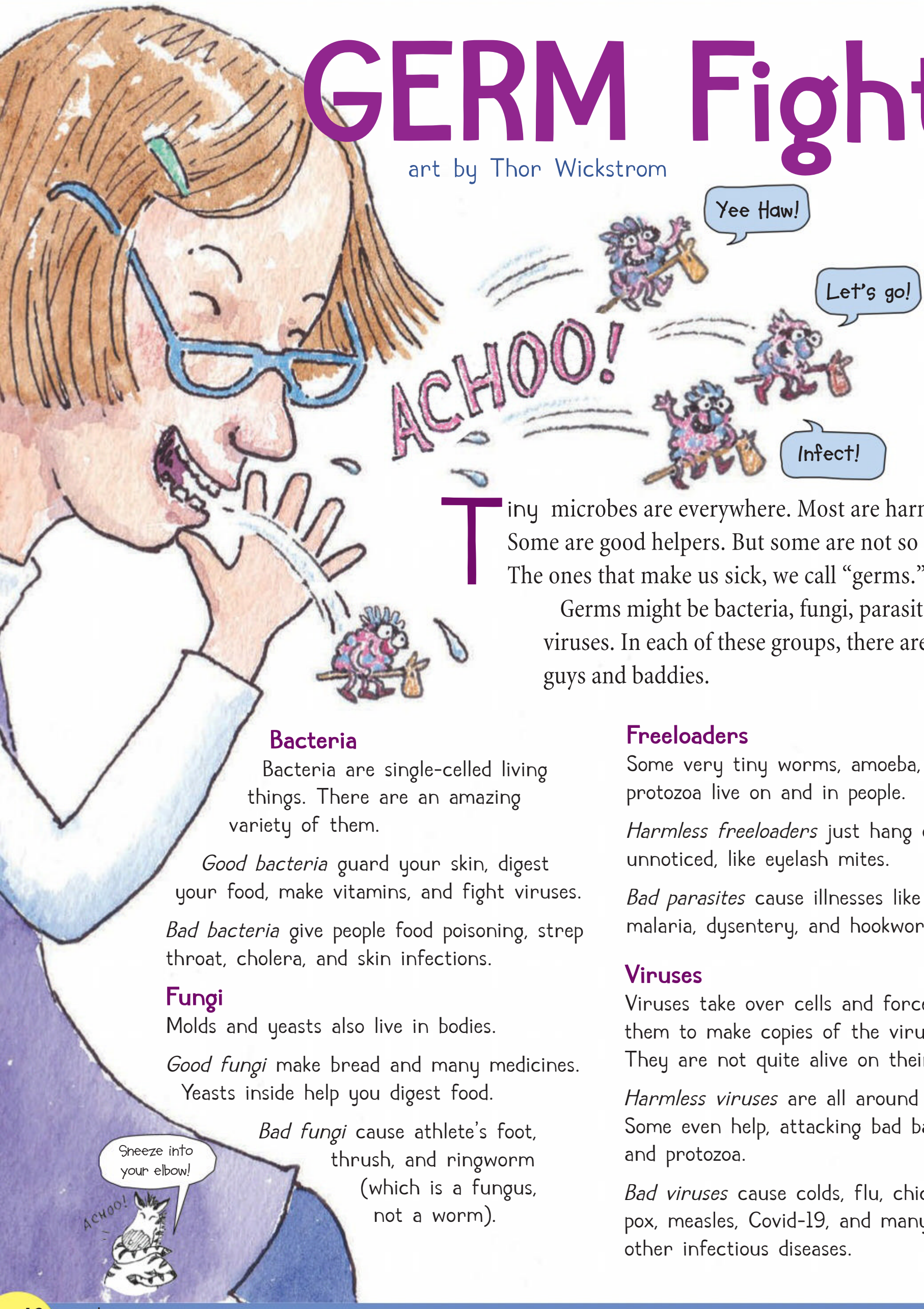
to treat all sorts of aches and pains. Willow trees contain salicylic acid, which is the main ingredient in the modern pain reliever, aspirin.

On Pins and Needles

If you've ever stepped on a needle, you know it hurts. But when one American journalist had emergency surgery in China in 1972, Chinese doctors stuck needles in him to make his pain go away. And it worked! He spread the word. Acupuncture has been practiced in China for more than 2,500 years. The idea is that inserting needles at certain points will block pain signals traveling along nerves under the skin. Scientists are still trying to figure out exactly how it works—and if it really works—but millions of patients swear by it.

GERM Fight!

art by Thor Wickstrom



Tiny microbes are everywhere. Most are harmless. Some are good helpers. But some are not so good. The ones that make us sick, we call "germs."

Germs might be bacteria, fungi, parasites, or viruses. In each of these groups, there are good guys and baddies.

Bacteria

Bacteria are single-celled living things. There are an amazing variety of them.

Good bacteria guard your skin, digest your food, make vitamins, and fight viruses.

Bad bacteria give people food poisoning, strep throat, cholera, and skin infections.

Fungi

Molds and yeasts also live in bodies.

Good fungi make bread and many medicines. Yeasts inside help you digest food.

Bad fungi cause athlete's foot, thrush, and ringworm (which is a fungus, not a worm).

Freeloaders

Some very tiny worms, amoeba, and protozoa live on and in people.

Harmless freeloaders just hang out unnoticed, like eyelash mites.

Bad parasites cause illnesses like malaria, dysentery, and hookworm.

Viruses

Viruses take over cells and force them to make copies of the virus. They are not quite alive on their own.

Harmless viruses are all around us. Some even help, attacking bad bacteria and protozoa.

Bad viruses cause colds, flu, chicken pox, measles, Covid-19, and many other infectious diseases.

Your Body's Defenses

The best way to stay healthy is to keep bad germs out in the first place. Luckily, your body has lots of built-in defenses to help you do that.

Eyelashes, **earwax**, and **nose hair** keep germy stuff from getting inside.

Sneezing is the body's attempt to get rid of germs and other irritants.

Mucus in your nose, mouth, and eyes traps germs on the way in.

Lymph nodes in your neck, armpits, and pelvis make germ-fighting cells.

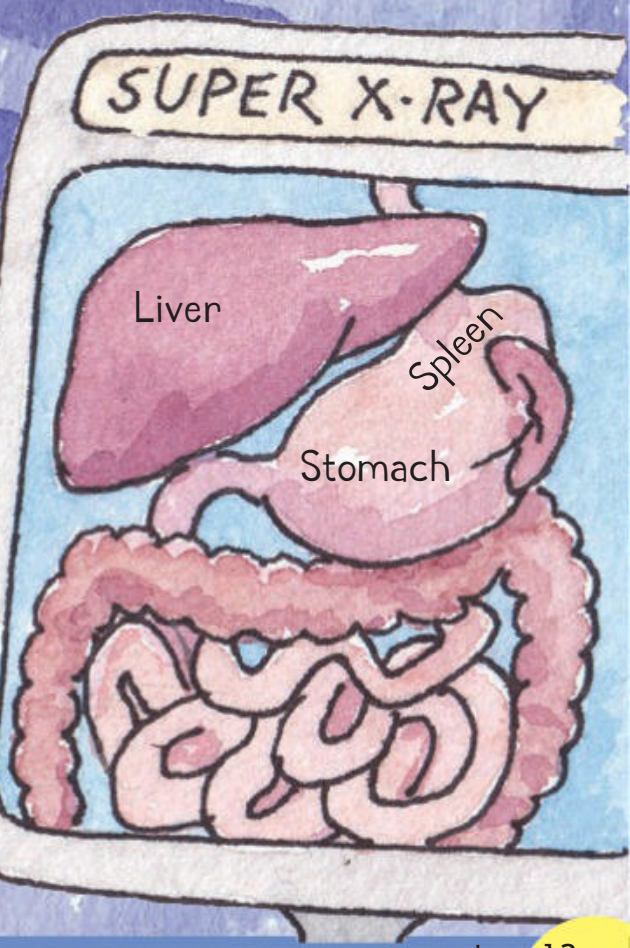
Skin keeps bad germs out. Your own helpful skin microbes destroy them.

When you feel sick, your stuffy nose, sore throat, and fever are signs that your body is fighting germs.

Your nose makes extra mucus to flush germs out. Blood rushes to infected areas (such as your throat or nose) to bring in more germ-fighters. The extra blood makes your nose red and puffy. Fighting germs takes energy, so you'll also feel tired.

Your **spleen** and **liver** clean the blood and alert the body when they spot invading bacteria or viruses.

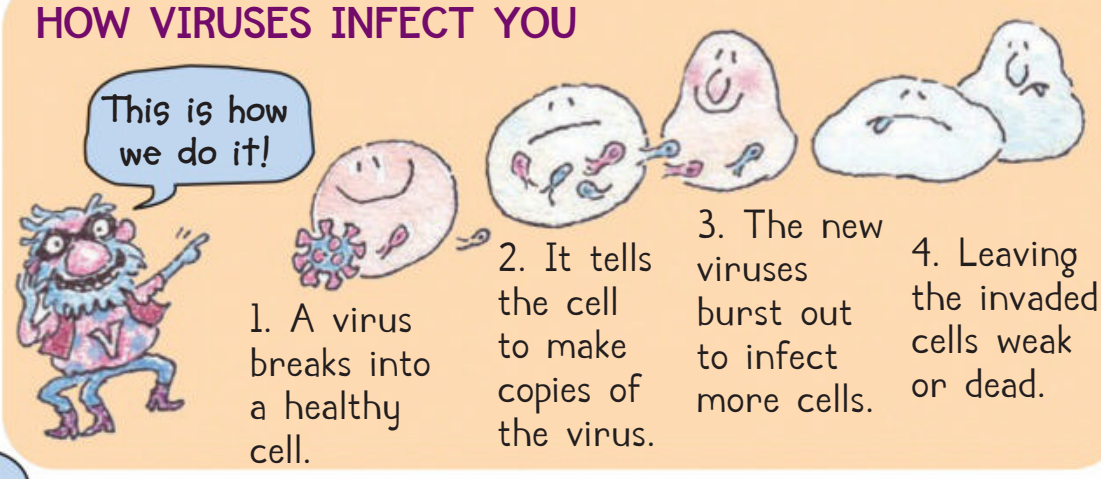
If you swallow germs, your stomach acid will destroy many of them.

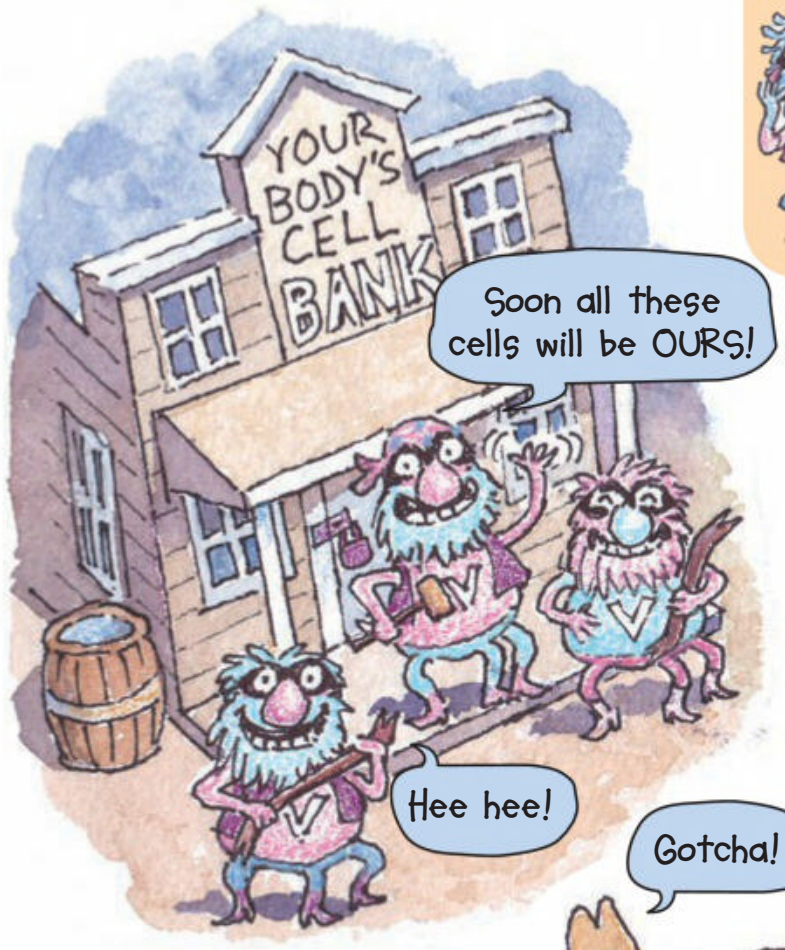


Immune System at Work

Once in a while, despite all your body's great defenses, germs do sneak in.

HOW VIRUSES INFECT YOU



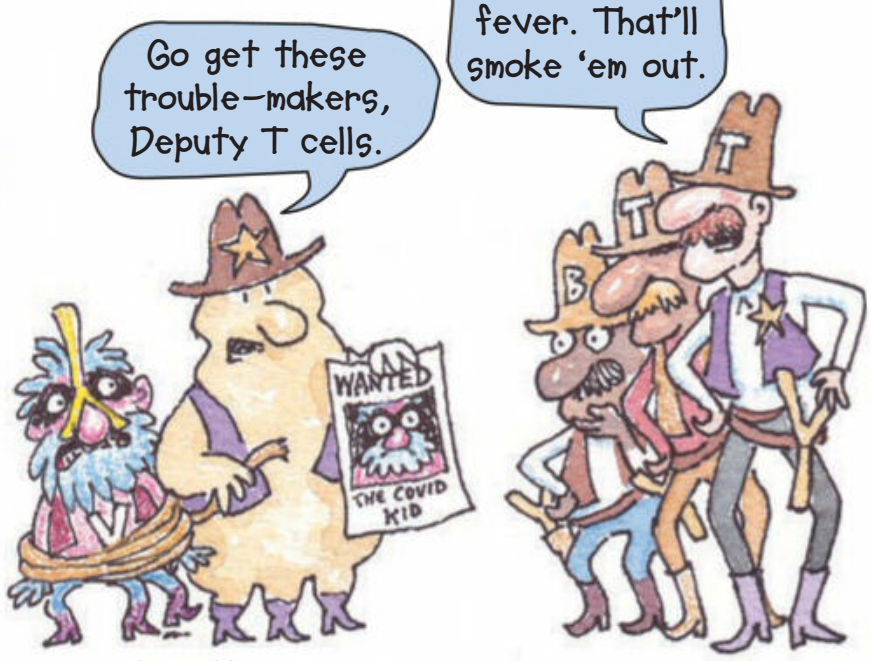


Fighting bad germs is the job of the immune team. White blood cells float through your blood all the time, looking out for invaders.

If a patrol cell spots a strange germ, it releases alarm tokens called cytokines. These call in other immune cells to stop the invader from spreading.

Killer T cells look for marked cells, or any germs they've met before, and kill them.

B cells tag invaders. They also make antibodies, special molecules that block the keys a virus uses to get into cells.



Sheriff macrophage

Big cells called macrophages gobble up the invading germs. The germ-hunting team shares its list of "bad guys" with other immune cells. If they meet a known baddie, they attack.

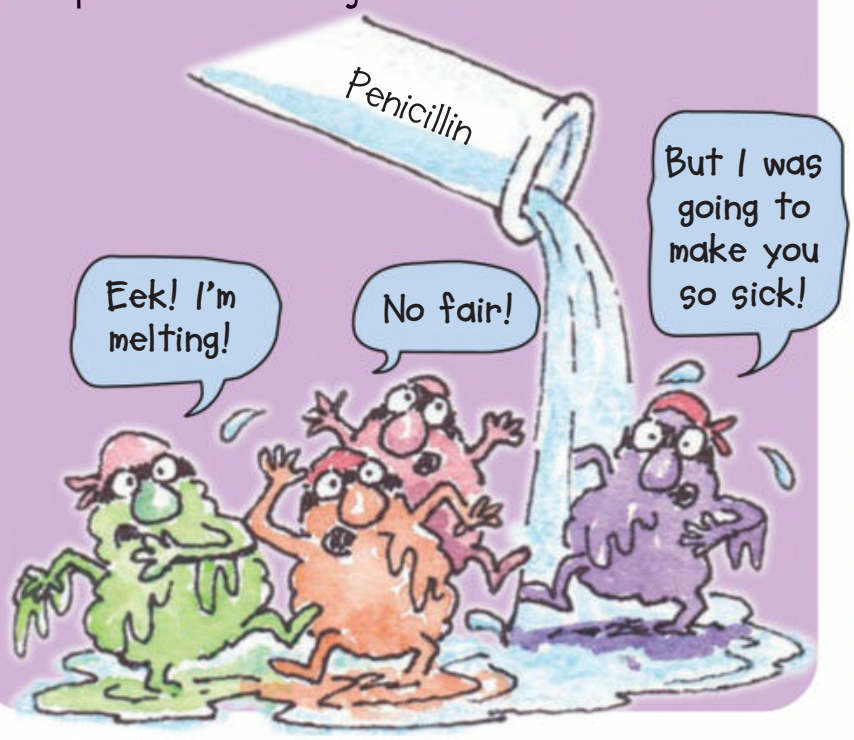
A Little Help

Your immune system is powerful. But sometimes it needs a little help from medicines and vaccines.

To Fight Bacteria: Antibiotics

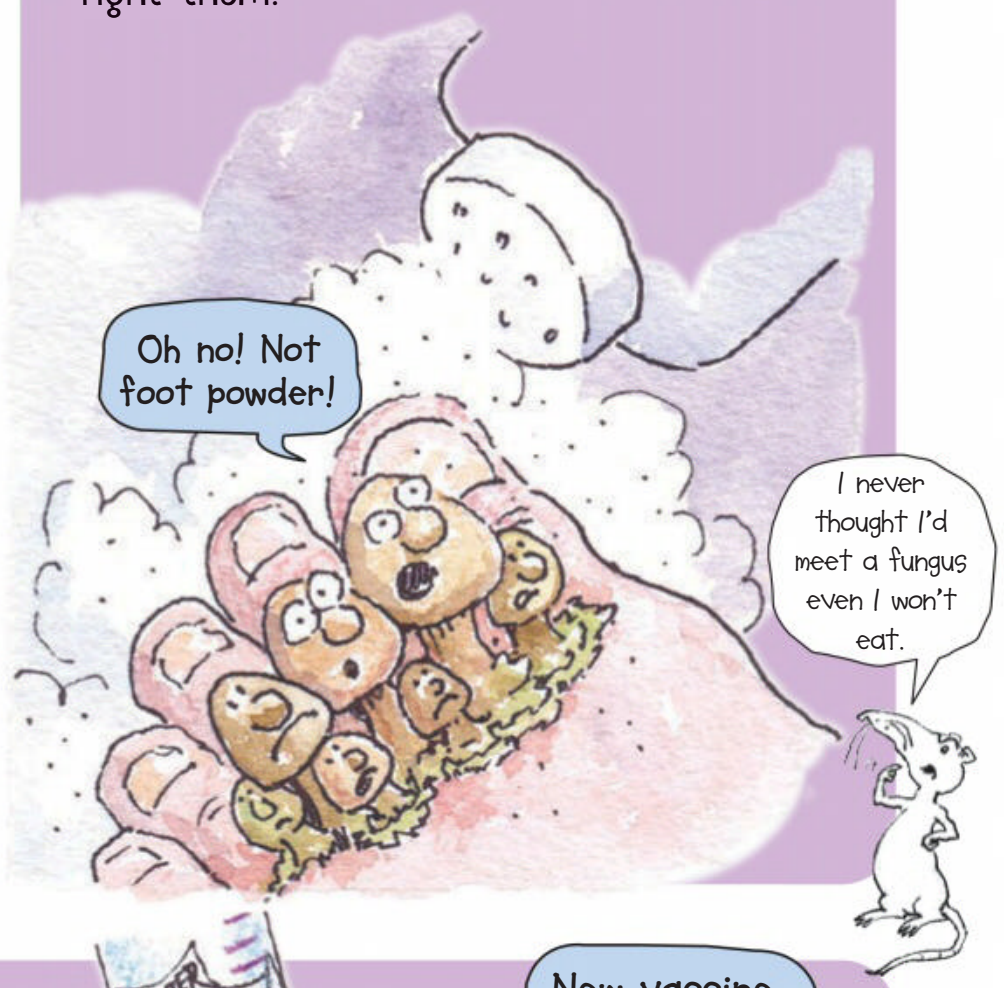
Bacteria cause sickness by multiplying rapidly and making waste that your body doesn't like. Antibiotics are mild poisons that target bacteria. However, they also kill helpful bacteria, so doctors don't like to use them too much.

Many antibiotics are made from fungi, which naturally produce chemicals that keep bacteria away.



To Fight Parasites and Fungi

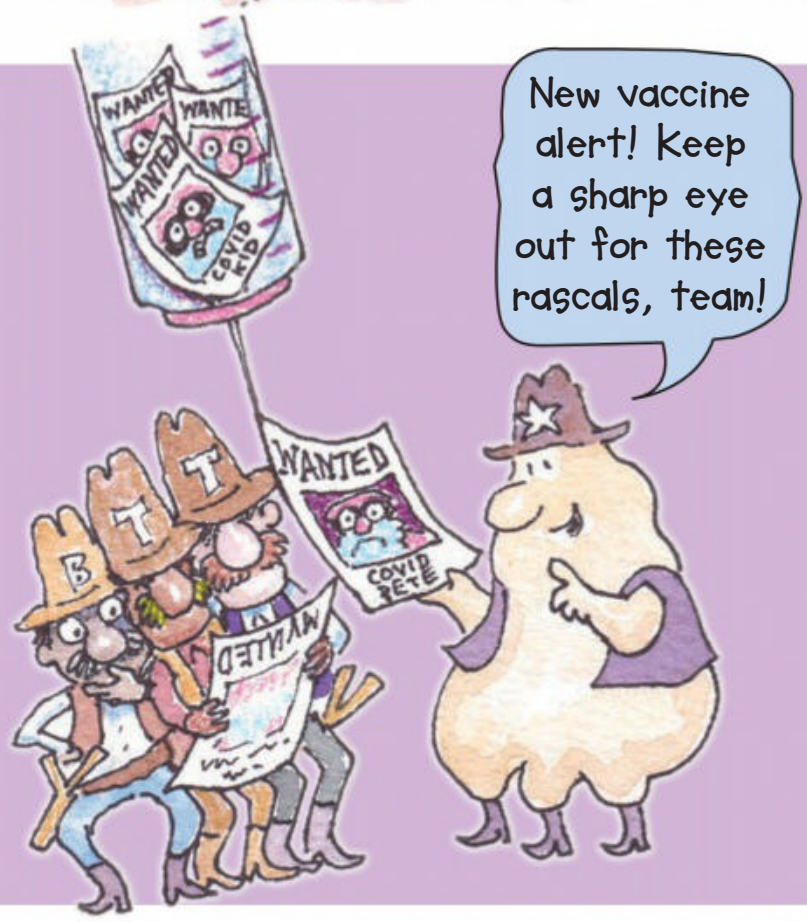
Medicines that fight fungi, worms, and protozoa are designed to poison the invaders (but not you). To get rid of fungi, sometimes you have to dry them out, or get help from bacteria that will fight them.



To Fight Viruses: Vaccines

Viruses take over your own cells and turn them into virus-copying factories. To stop viruses, the best way is to train your own body to spot them and disable infected cells.

Your immune system will do this naturally when it meets a new germ—once it figures out that the invader is there. Vaccines can give your immune cells a head start by showing them the shape of a bad virus before you get infected. That way, the body recognizes and stops the invaders right away, before they get a foothold.



Solving the COVID-19 Puzzle

by Tracy Vonder Brink
art by Seaerra Miller

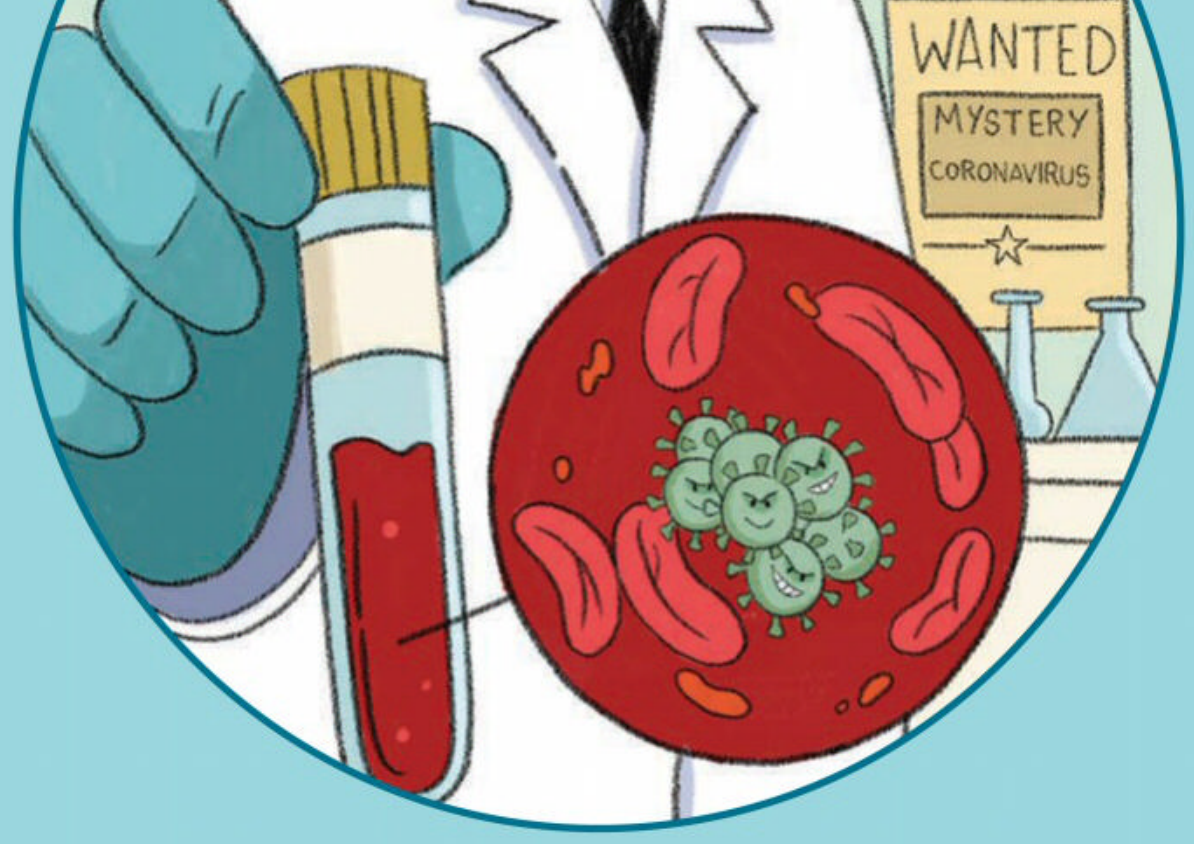
In 2020, did you stay home from school? Cancel vacations? Wear masks? What was that weird year all about? It all starts with a germ...

In January 2020, sickness spread through Wuhan, China. At first, it seemed like a bad flu. Patients came down with a fever, then a raspy cough. But this flu was different. It spread easily. Lungs clogged, and patients found it hard to breathe. If they didn't get extra oxygen, some got worse very suddenly. Many died.

What was this new sickness? At first, doctors thought it might be SARS (Severe Acute Respiratory Distress Syndrome). That virus had caused alarming outbreaks in Asia in past years. Was this the same germ?

What Virus Is That?

Identifying viruses is tricky. They are extremely tiny, much smaller than bacteria. There are trillions of harmless viruses all around us, all the time. So how do you find out which germ is making people sick?

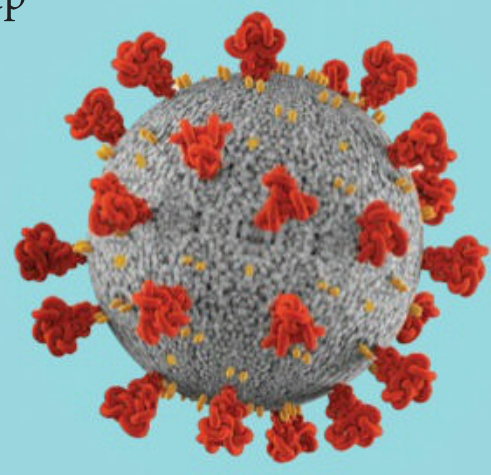


When someone is sick with a virus, their body usually has lots of the bad virus in it. To find the germ, doctors first take a small blood sample from a sick person. They put the blood drop in a spinner called a centrifuge. The light-weight viruses spin out from heavier blood cells and other microbes. Then the viruses go into a machine that finds all the matching ones. If there's a lot of one kind of virus . . . chances are good that's the culprit.

Chinese scientist Yong-Zhen Zhang, an expert in viruses, ran tests on the blood of infected patients in Wuhan. Sure enough, there were a lot of what looked like a coronavirus. Coronaviruses are a common group of viruses. Different types cause everything from regular colds to SARS. They are round and covered with spiky proteins that they use as keys to get into cells.

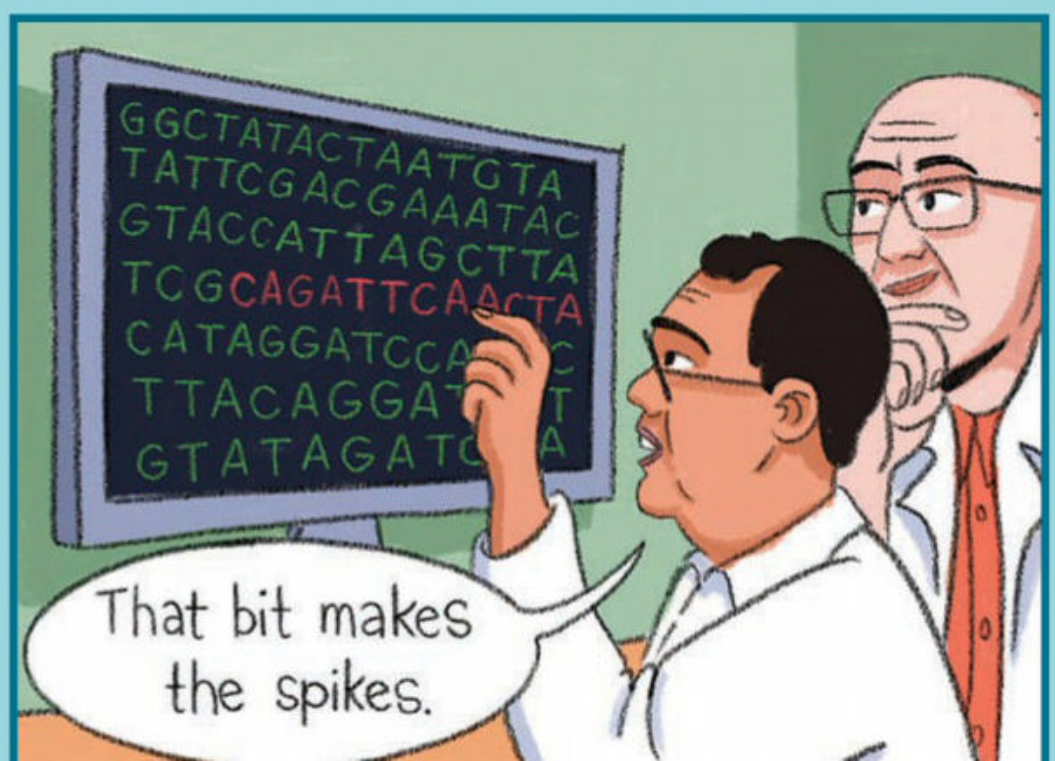
Zhang talked with another expert, Australian scientist Edward Holmes. They agreed that this was a new kind of coronavirus. Later, the new virus was officially named SARS-CoV-2, and the sickness it caused was called COVID-19.

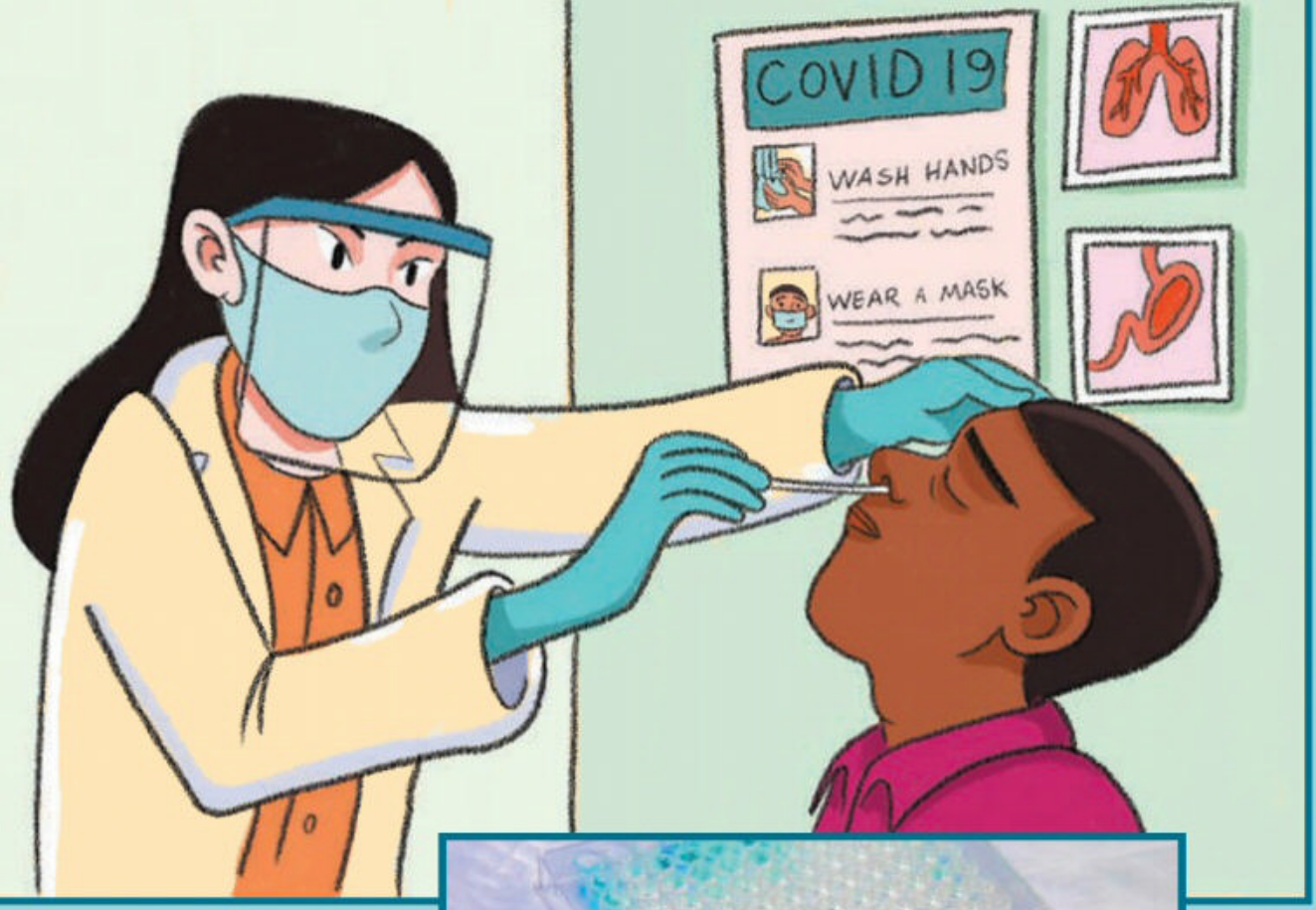
The next task was to decode the virus's genome. This is like a map of the virus. They already knew a lot about coronaviruses, so it didn't take long. They shared the information online, so any scientist anywhere in the world could look at it.



This is a coronavirus. The red bits are its distinctive spike proteins. The body's immune system looks for these to identify and destroy the invading virus.

Teams quickly got to work. Some used the code to develop tests for the Covid virus. Doctors needed to know if a cough was just a cold, or a Covid-19 infection that might get worse fast. The tests also helped health departments track where the virus was spreading. If there were a lot of cases, they could ask people to stay home and wear masks.





A Covid test contains chemicals that turn color if they meet any Covid antibodies. Antibodies show that your immune system is fighting a virus.

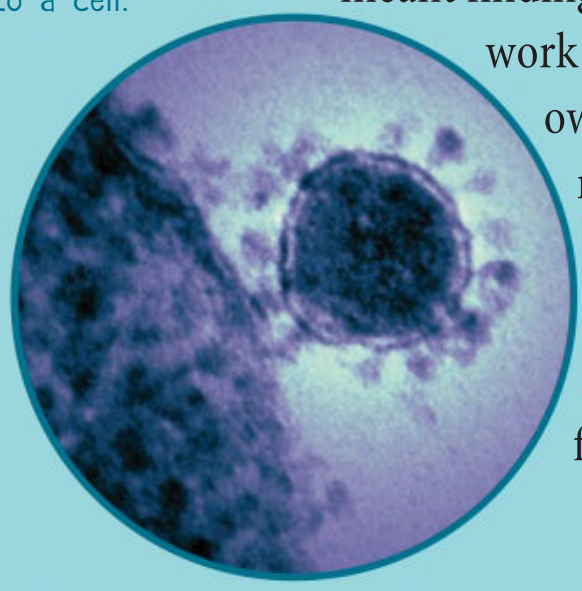
Tests also revealed that some people could carry the virus but not get sick. That was important to know!

Race for a Vaccine

Testing and tracking Covid-19 was important, but stopping the new virus meant finding a vaccine. Vaccines work by teaching the body's own immune system to recognize and fight off a virus.

In most vaccines, a weakened or dead form of a germ is given in a shot. The body's immune cells spot the strange shape of the germ and make antibodies, like little virus handcuffs. The immune cells remember the shapes of the virus and how to make antibodies for it. Then they're all set to fight if the real germ shows up.

This microscope photo shows a coronavirus attaching itself to a cell.



But scientists had been tinkering with a new idea for making vaccines, one that might be much quicker. They had been working on the idea for 10 years, so a lot of the research was already done. And they'd been testing it with coronaviruses.

The idea behind the new vaccines was simple. Immune cells identify viruses based on just one or two distinctive bits—like the shape of the spikes on a coronavirus. So maybe a vaccine didn't need whole dead germs? Maybe just the spikes would work?

They had another clever idea. The new vaccine would ask the body's own cells to make a few fake virus spikes. Cells make stuff all the time, following instructions from a cell message carrier called mRNA (the "m" stands for "messenger"). The vaccine would use mRNA to deliver a few "make spike" instructions. The cell would make a few fake spikes (just a few, not enough to hurt it).

Staying Safe

Meanwhile....

Making a vaccine takes time. While researchers worked on it, health officials had to keep people safe. So they gave the world some hard advice. That advice saved many lives, but also made 2020 a weird year for everyone.

Stay Home

Viruses spread from person to person. So one way to keep everyone safer was to keep people apart. That meant asking people to avoid gatherings, work at home, and stand 6 feet apart when possible.

It was a big decision to ask everyone to stay home. But many community leaders decided that it was worth it to keep more people from getting sick. If too many people needed to go to the hospital all at once, there might not be beds for them all.

Mask Up

They also asked people to wear masks to cover their mouths and noses. Masks stop germy water droplets and sneezes, making it harder for the virus to travel. Washing masks in soap destroys the virus—viruses break apart in soap.

Medical masks trap even more germs. But people wanted to save them for doctors and nurses caring for people sick with Covid, so most people wore cloth masks for everyday.

Wash the Door?

Early in the pandemic, doctors had lots of questions about how the virus spread. For instance, could you catch it by touching surfaces? Some teams set out to answer this question. They wiped samples of virus on metal door handles, wood cabinets, and cardboard boxes at different temperatures and in damp and dry air. They tested the patches after a day and several days to see how many of the viruses were still active. They learned that Covid viruses don't survive long outside the body. So no need to wipe the groceries.

Go Outside

After many tests, researchers found that Covid viruses can spread in tiny water droplets that hang in the air, called aerosols. But the viruses don't like sun and wind. So the main danger was from air inside, where people were not wearing masks. Outside air was much safer. Inside, good air filters could help trap viruses.

Answering all these questions helped communities make rules that would be most helpful to stop the virus spreading.

18+

WHAT IS AVAXHOME?

AVAXHOME-

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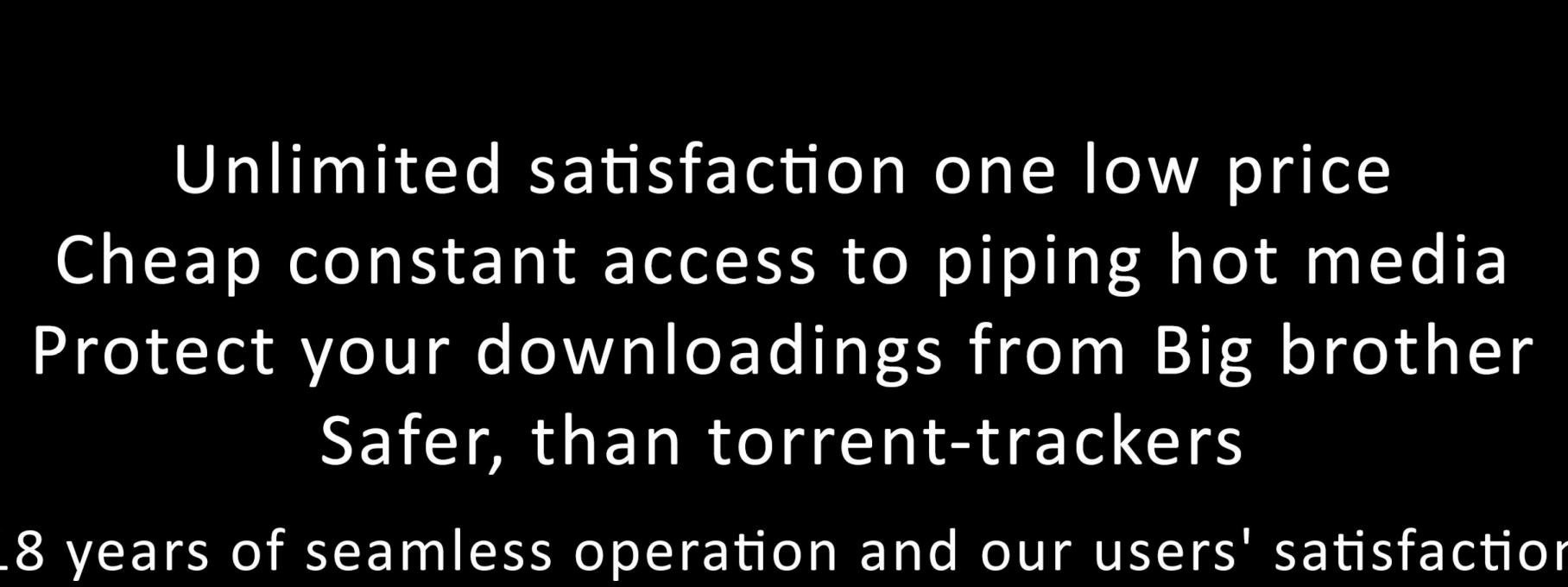

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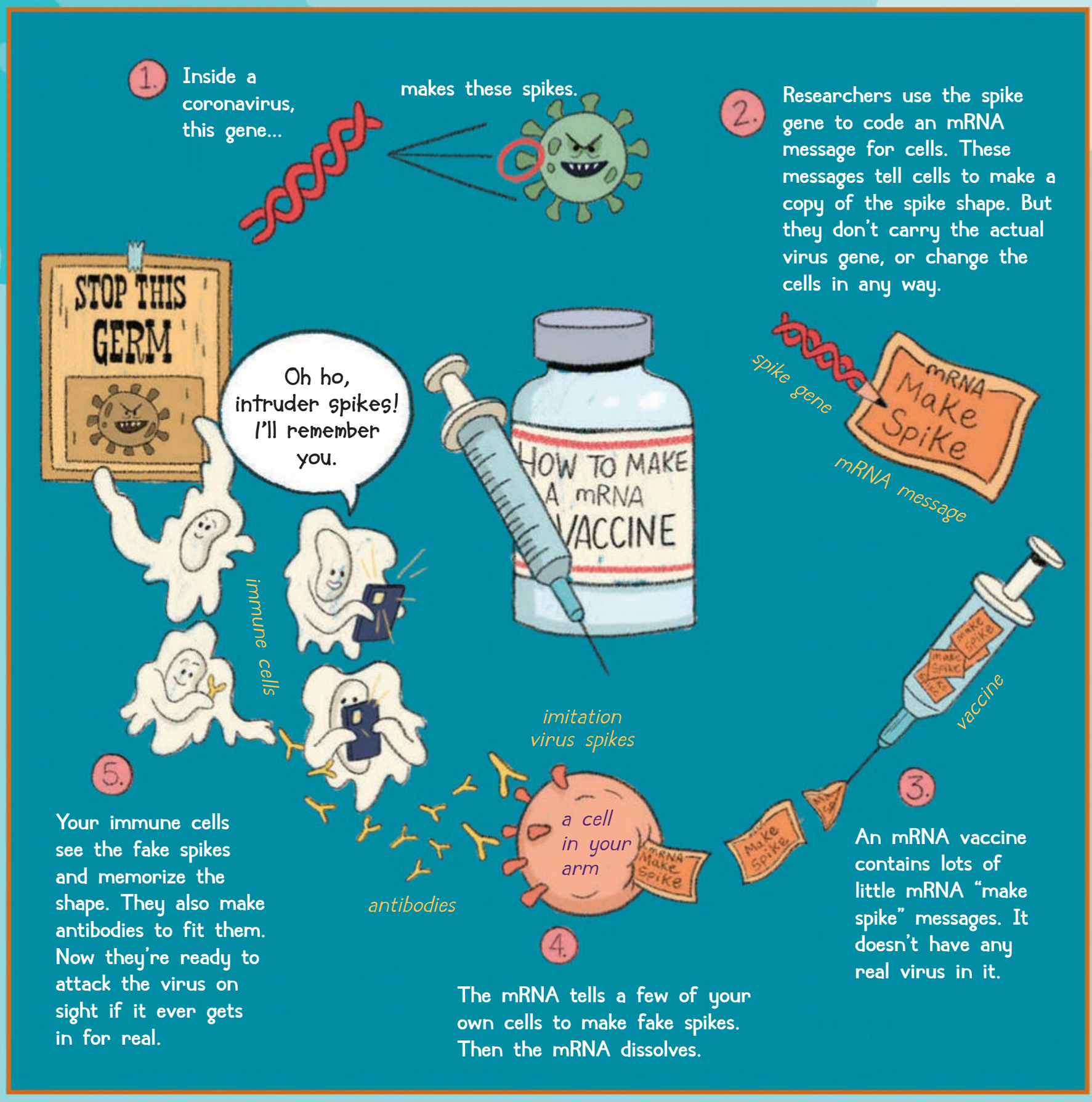


Immune cells would see the spikes and make antibodies that would disable any real Covid viruses if they ever got in.

It was a great idea, but no one had tried to make a real vaccine this way. Maybe now was the time? Teams around the world got to work. Within a couple of months, several mRNA vaccines were ready to test.

Other teams, like Johnson & Johnson, used a harmless virus (instead of mRNA) to deliver the spike code. They had already used this method to make other vaccines, so they were able to make a new one quickly.

Testing, Testing

Before vaccines were given to people, they needed to be tested to make sure they worked and were safe. That took more time!

To test any vaccine, people volunteer to take the shot. Some are given the real vaccine, and some have a placebo, a shot that doesn't have the vaccine in it. The volunteer doesn't know which they get until after the testing is done. Then doctors see how many people in each group get sick. (As they went about their normal lives—researchers did not expose volunteers to Covid viruses just to see if their vaccines worked!) They also looked for any problems or side effects.

For Covid-19, instead of testing the vaccines first in a small group, then in larger groups, the way it's usually done, they ran many trials at the same time. Less than a year after the Covid gene code had been shared online, we had vaccines that worked and that were safe. They either kept people from catching the Covid-19 virus, or if they did catch it, it didn't make them as sick.

Some mRNA vaccines need to be stored in super-cold freezers. This can make it challenging to get them to people in hot places.

While the vaccines were being tested, medical factories were figuring out how to make lots of vaccines quickly, and how to store and transport them safely. Some of the new vaccines needed to be kept very cold in special freezers. So that was another challenge to solve.

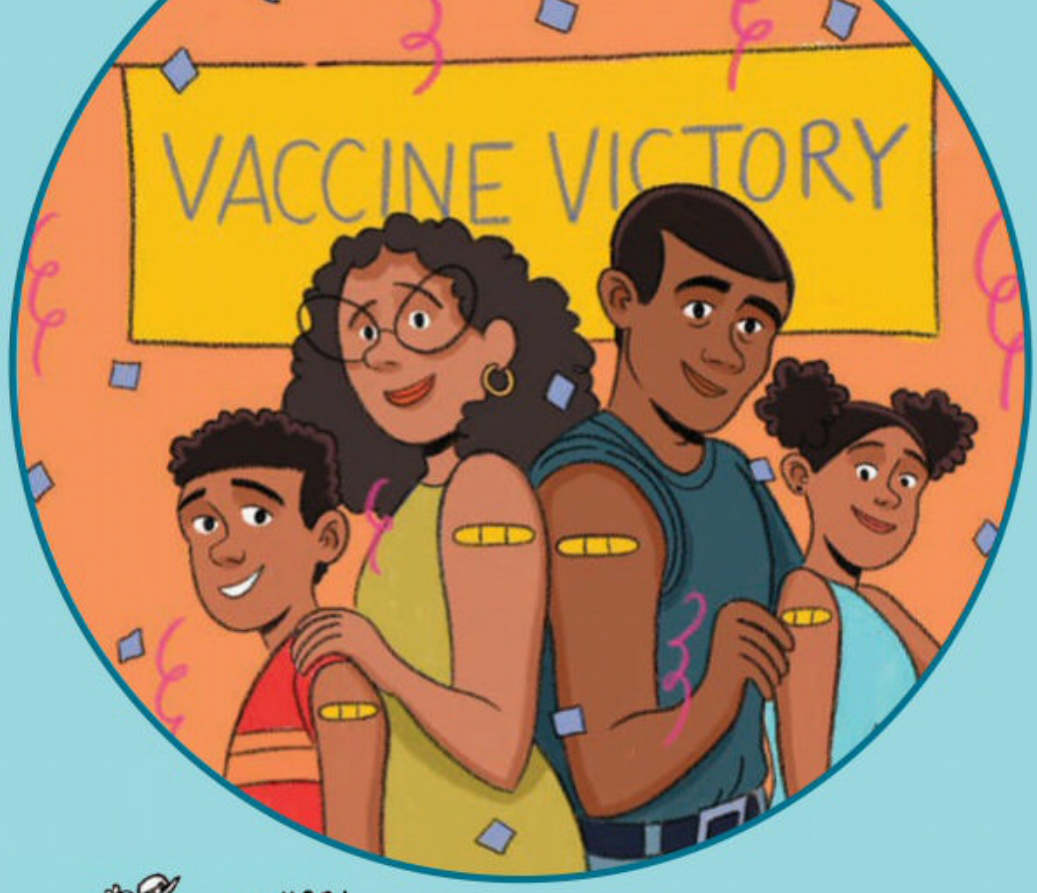
The First Vaccine

In the 1790s, English doctor Edward Jenner was looking for a cure for a terrible disease called smallpox. Back then, no one knew about viruses. But many people had noticed that dairy workers, who milked the cows, almost never got smallpox. They did often catch a mild disease, called cowpox, from the cows. Jenner wondered, could the cowpox somehow be protecting them?

To test his idea, Jenner collected some cowpox pus from a cow. He rubbed a tiny bit into a scratch on the hand of his gardener's 8-year-old son. The boy got a slight fever, but that was all. Then came the real test. Jenner injected the boy with live smallpox germs. The boy did not get sick at all. It worked!

The idea of protecting patients by letting them catch a (hopefully) mild case of a disease had been around since ancient times. It was risky—some patients got very sick. But Jenner had found a new twist. A cousin or de-activated germ could protect just as well, and with less danger. He called this technique "vaccination," from the Latin word for cow, *vacca*.

Today, with the help of Jenner's vaccine and others, smallpox has vanished from the world.



Country singer Dolly Parton donated a million dollars to help develop a Covid vaccine at Vanderbilt University. Inventing vaccines is expensive—it takes many skilled people and high-tech equipment. Dolly was glad to pitch in, and got her shot in March 2021.

Looking Forward

Viruses make more copies of themselves every time they infect a cell. And sometimes, they make copying mistakes. These mistakes can add up to be a new kind of virus, a mutation. Scientists regularly test the viruses in Covid patients to track these changes. They give the variants names from the Greek alphabet: alpha, delta, omicron.

This big robotic machine is processing Covid tests, so humans don't have to get too near the germs.

If the virus changes enough, they might need to make a new vaccine.

Scientists will keep working to keep Covid in check. We've learned a lot about it this past year, and about what we can do to keep ourselves healthy. Eat good food, get enough exercise and sleep, and wash your hands if you've touched something germy. If you do get sick, stay home and take care of yourself. Wearing masks can help slow the spread of many germs—colds and flu as well as Covid-19. And if fewer people get the virus, it will have less chance to mutate.

One thing is certain—germs will always be with us. But if we all work together, we can continue to outsmart them.

We've all had check-ups. But what are doctors looking for when they peer into our ears and thump our knees?

Time for a CHECK-UP

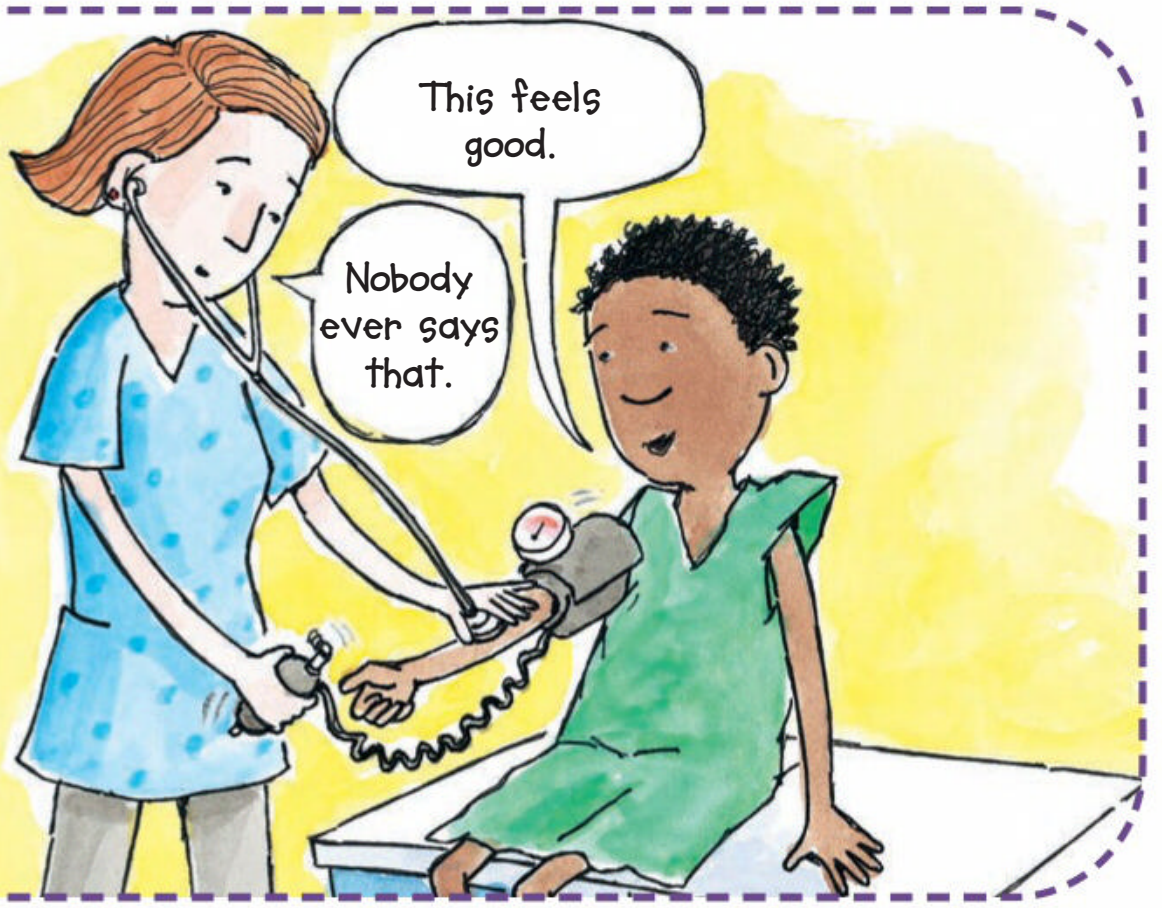
by Maureen Ash art by Mark Hicks

Bobby is getting a yearly check-up. The nurse weighs and measures him to see if he is growing normally.

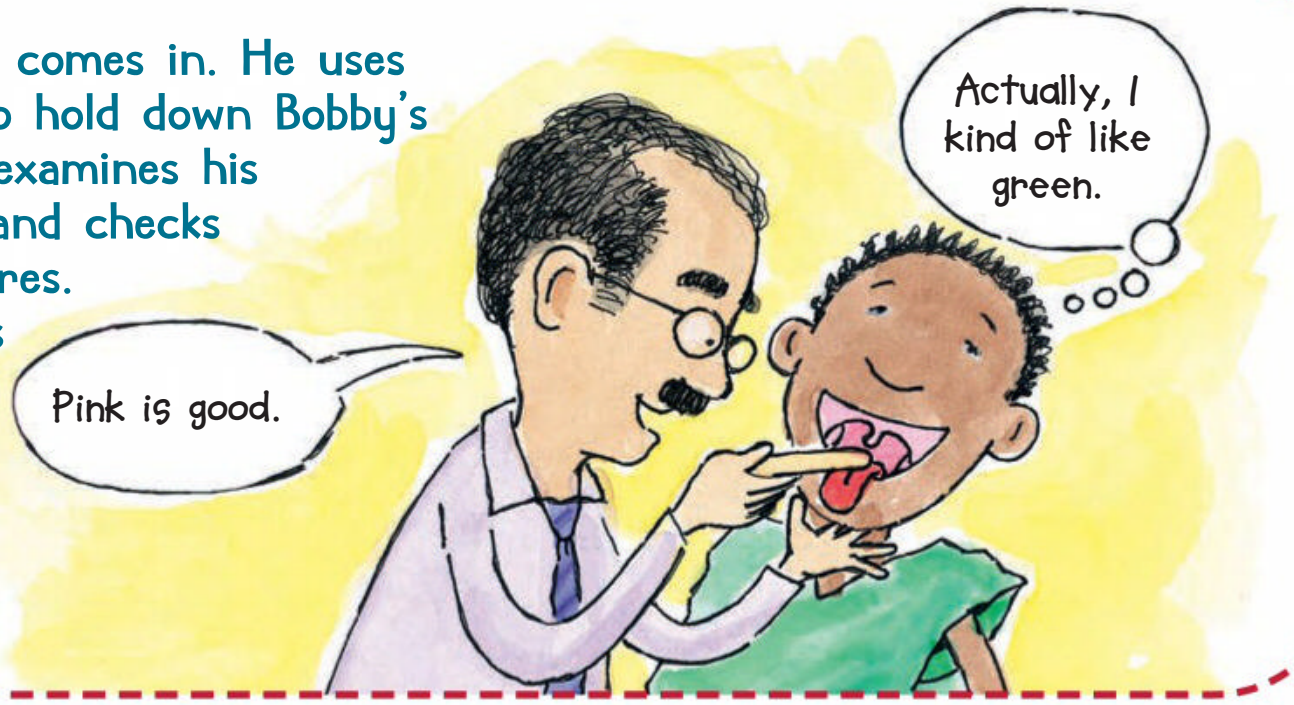
The nurse asks for a urine sample. Chemicals in pee can reveal diseases that might otherwise go unnoticed.

The nurse takes Bobby's temperature with a thermometer. His temperature is normal, so he's not fighting an infection.

She takes his blood pressure with an inflatable arm band called a sphygmomanometer, and counts his pulse. She is checking to see how healthy Bobby's heart is, and how well it is pumping his blood. His blood pressure and heart rate are normal.



Now Dr. Tashjian comes in. He uses a wooden stick to hold down Bobby's tongue while he examines his teeth and gums and checks his mouth for sores. When Bobby says "ah," his tongue moves so the doctor can see if his tonsils are healthy.



Next Dr. Tashjian taps below Bobby's kneecap with a rubber hammer. His leg jumps all by itself. Tapping the tendon below Bobby's knee tests how well his nervous system carries signals to his muscles.

How did you do that?

I didn't do it. Your reflexes did it automatically.

Dr. Tashjian uses an otoscope to look into Bobby's ear. He looks for redness, growths, or swelling.

Can you see my brain?

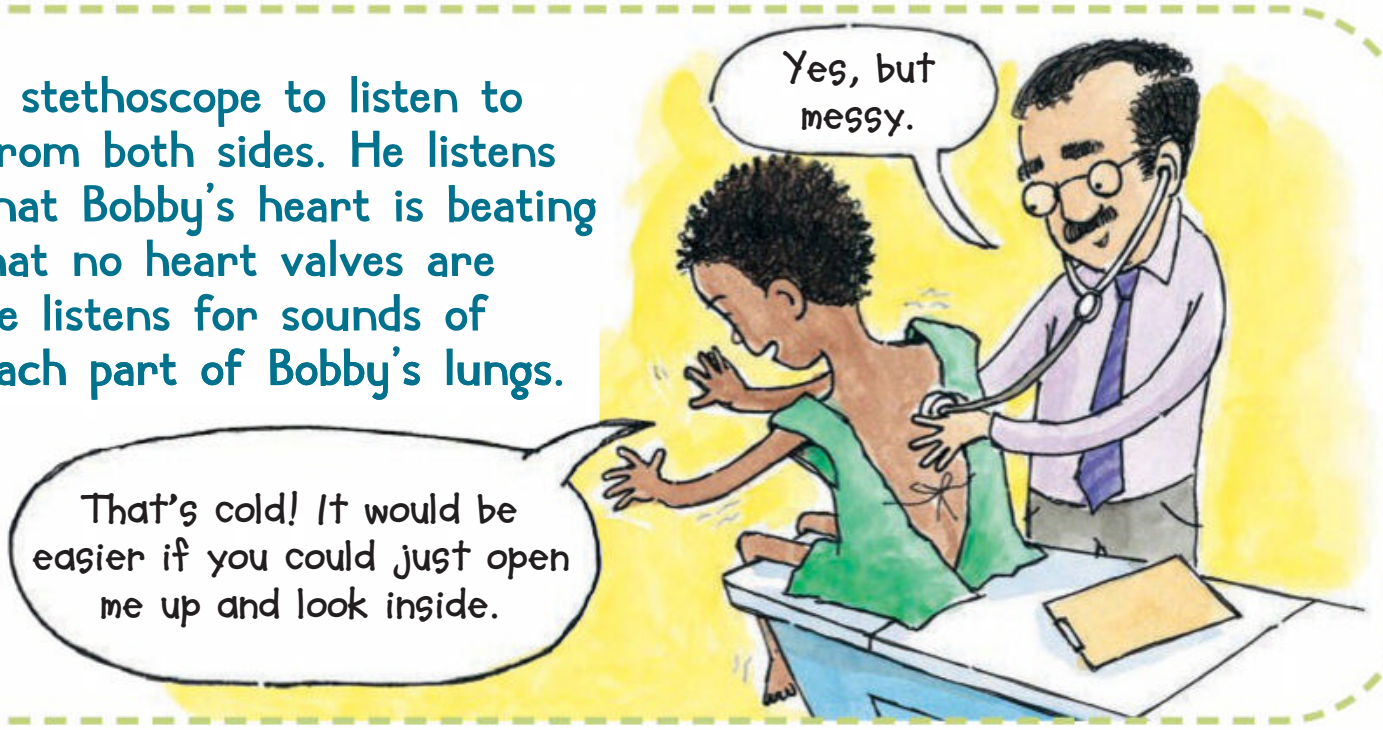
No, but I can see all the way to your middle ear to check your eardrum.

He uses an ophthalmoscope to see inside Bobby's eyes.

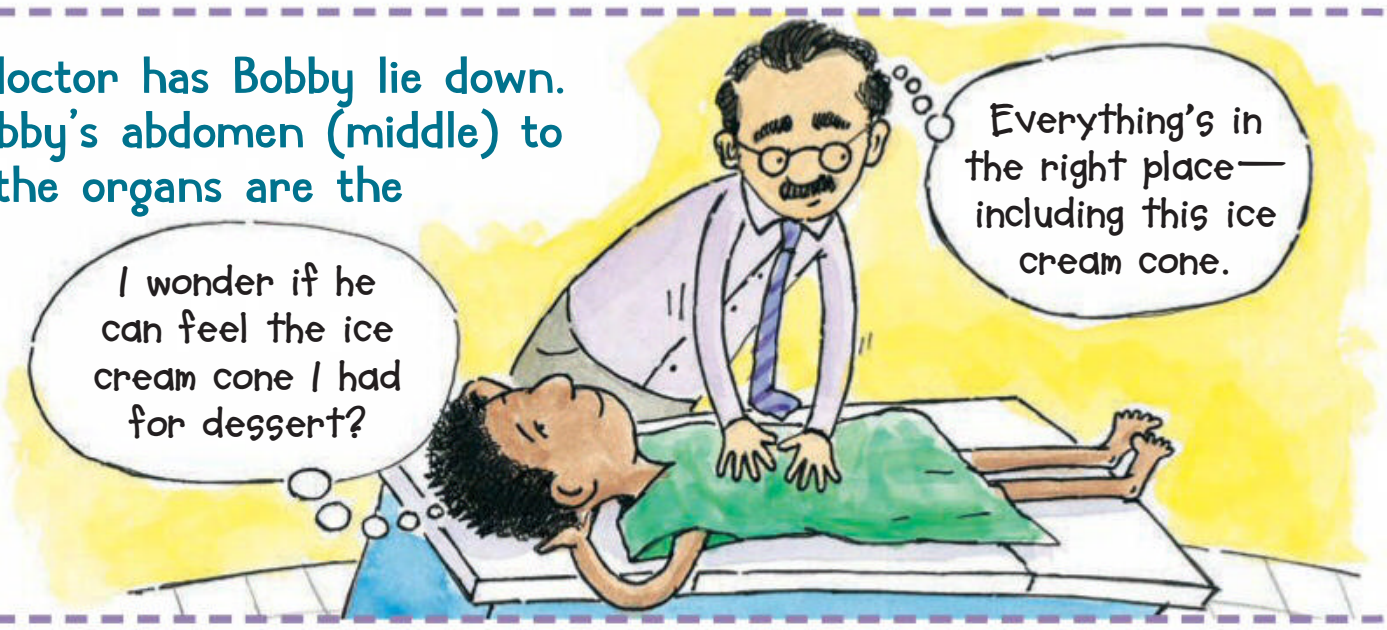
Wow, that's a bright light.

The better to make sure everything's OK inside your eyeball.

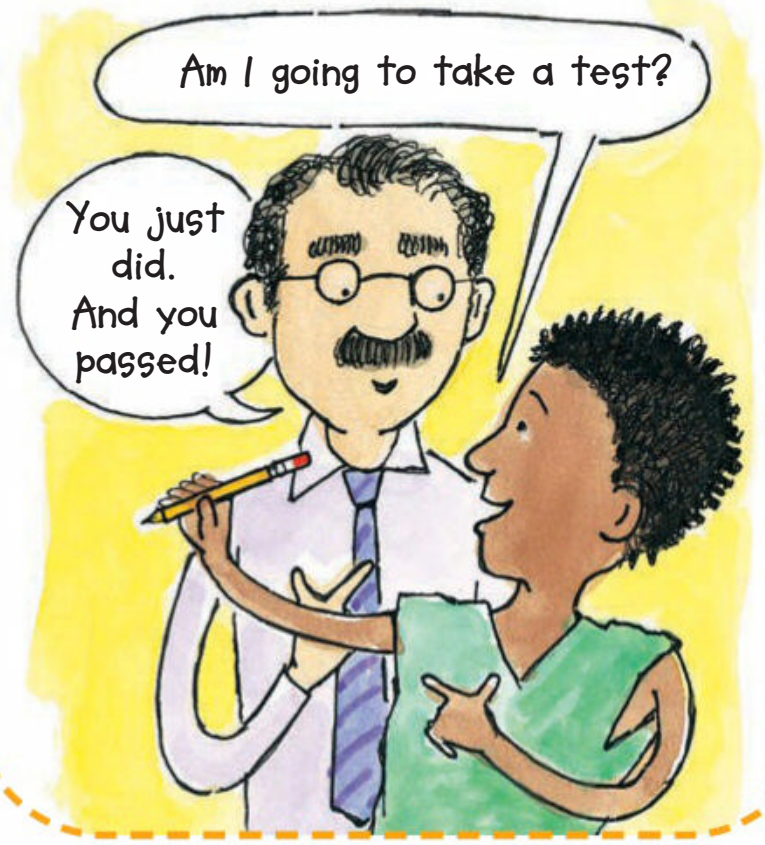
Then he uses a stethoscope to listen to Bobby's chest from both sides. He listens to make sure that Bobby's heart is beating properly and that no heart valves are leaking. Then he listens for sounds of congestion in each part of Bobby's lungs.



Next the doctor has Bobby lie down. He feels Bobby's abdomen (middle) to make sure the organs are the right size. A swollen spleen or liver can mean illness.



Dr. Tashjian asks Bobby to pick up a pencil. He wants to see if Bobby is able to control the movement of the small muscles in his hand.



He asks Bobby to stand on one foot and hop. This is to see if Bobby's large muscles and balance are developing normally.

The doctor pricks Bobby's finger with a lancet to draw a drop of blood. Under the microscope, he'll count Bobby's blood cells to make sure he has a healthy number.

That didn't hurt much after all.

Everyone says that.

Finally Dr. Tashjian checks Bobby's privates to make sure everything looks normal.

You want to check where?

Doctors care for bodies, EVERY part.

GLOVES

Bobby, you're doing great. Everything looks good. Keep on eating healthy foods and exercising. Wash your hands often. Wear a seat belt when you ride in a car. Wear a bike helmet when you ride your bike. Get lots of sleep. Have a yearly check up. Be careful crossing the street. And don't forget to change out of your gown . . .

I'll just let myself out . . .

I want to be a doctor and help people too!

by Faith Hickman-Brynie

Can We Be Too Clean?

Your immune system works hard to protect you from nasty germs that invade your body.

But sometimes, it sounds a false alarm. The result is an allergy.

Too Much of a Good Thing?

Some of your blood cells have a special job. They make antibodies, tiny blockers that disable invading microbes. The body makes five main types of antibodies. One, called IgE, targets parasites, such as roundworms or hookworms.

It's IgE that causes allergy trouble. Sometimes, the immune system mistakes harmless dust or cat fluff for a parasite and starts pumping out IgE. This causes cells in the nose and skin to release a chemical called histamine. Histamine signals the nose and lungs to make more mucus. And, voilà—allergies: runny or stuffy noses, sneezing, and coughing.

Harmless pollen, or an invading worm?

Not Dirty Enough?

So what causes the immune system to over-react? Some experts think that it might actually be that modern life is too clean. They have noticed that children who live on farms tend to have fewer allergies than city kids. The reason may be that they meet more harmless microbes from farm animals. Being around dogs and cats as a baby can also reduce a child's chances of having allergies—not only to animals, but also to ragweed, grass pollen, and dust mites.

Scientists think the harmless microbes that pets carry may help a baby's immune system learn and get strong. Maybe our immune system needs to meet a lot of different germs when it's young, so it learns to tell which are harmful and what isn't.

Not everyone agrees with this idea. The immune system is complex, and it's tricky to study how it all works inside a living person. Research continues. But maybe someday we'll be able to prevent allergies by helping a child's immune system get the right "education."

Ask Ask

WITH SAGE AND BRIAR

TEXT BY ELLEN R. BRAAF
ART BY MARNIE GALLOWAY

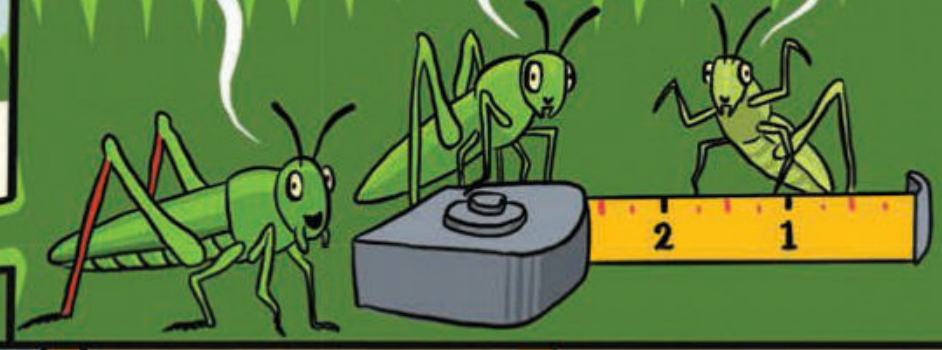
Quinntin wants to know, why can grasshoppers jump farther than humans?

Well...first of all, they can't really. Grasshoppers can leap about one meter (30 to 39 inches) at most. The record human jump is 8.95 meters.

But consider the size of the jumpers!

The record-holding human jumper was 6 feet 2 inches tall.

I'm only about two inches.



You're right. If you measure the distance jumped in body lengths (that is, how many times your own body length can you jump), the best human jumpers can leap five times their body length. But a grasshopper can jump up to 20 times its body length. You are the champs!

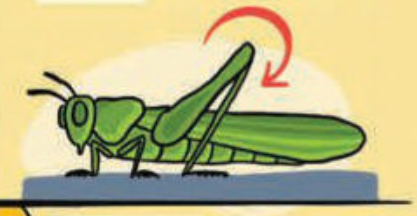
That's like a human leaping over a soccer field in a single bound.

What's their secret?

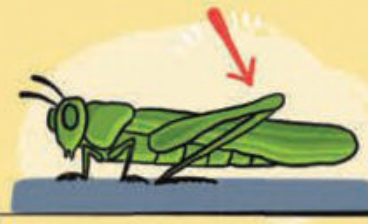
Powerful hind legs that act like catapults.

1 To get ready to jump, a grasshopper pulls in the bottom back leg.

2 Muscles store energy like stretched rubber bands.



3 A strong spring in the knee holds everything until...



4 Release!

5 WHEE!

The knee spring suddenly releases all the stored energy, and I jump!

Ready to take on the hoppers?

I'll need to add a little spring to my step.

ASK US ANYTHING!

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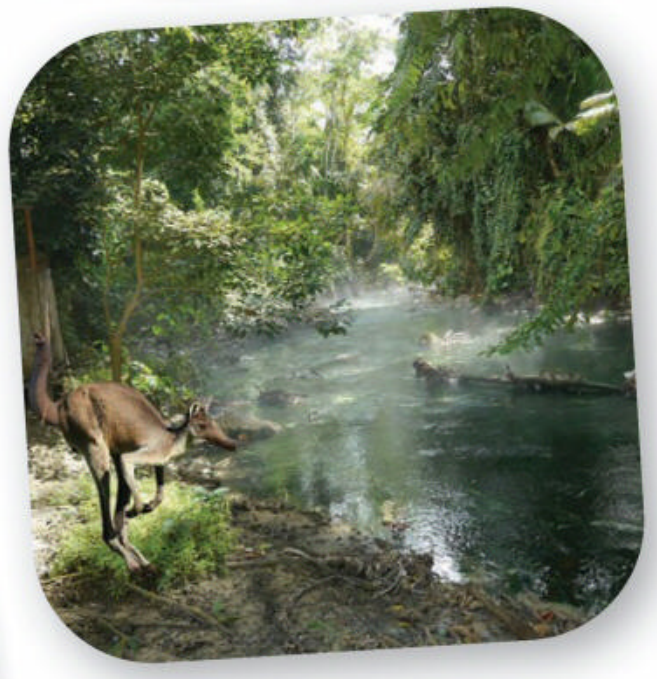
CONTEST and LETTERS

Send your letters to Ask, *1 East Erie Street, Suite 525, PMB4136, Chicago, IL 60611, or have your parent/guardian email us at ask@cricketmedia.com.*

In our October issue we asked you to make us an amusing trick photo. Thanks to all you sneaky shutterbugs for sharing your unlikely creations!



Amazon Rainforest Elephant Aardvark Kangaroo
John Robert C., age 9, Maryland

Levitation
Beau R., age 7, California

Giant Gull that Feasts on People
Mildred N., age 10, Washington

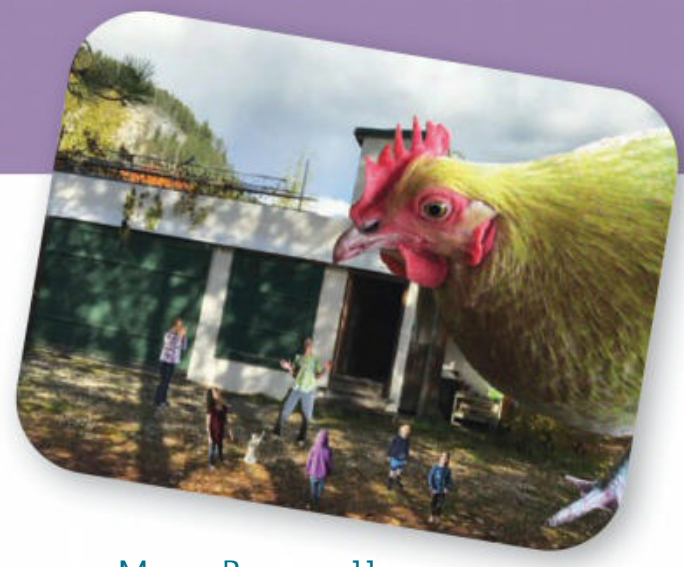
Avery S., age 7

Dear Zia,
I love making beautiful things. I read a book called *The Cupcake Diaries*. Then I really wanted to bake some cupcakes. I found a vanilla recipe, and it was so good that all the cupcakes were gone in 24 hours. Once I made a batch and was so excited that I tried to frost it right when it came out of the oven. But it all dribbled off! Do you like making cupcakes?
Naomi, Washington

Dear Naomi,
Making cupcakes is my favorite thing in the whole world! Though it is hard to wait! Sometimes ours disappear in minutes. But I don't mind because then we have an excuse to make more. Have you ever tried zebra-striped frosting? For two colors you have to wait TWICE as long. So ours came out kind of swirly. They still taste good, though!
Happy baking!
Zia

Liam Y., age 9, Virginia

Contemplation of a Dangerous Bird
Adam L., age 12, California



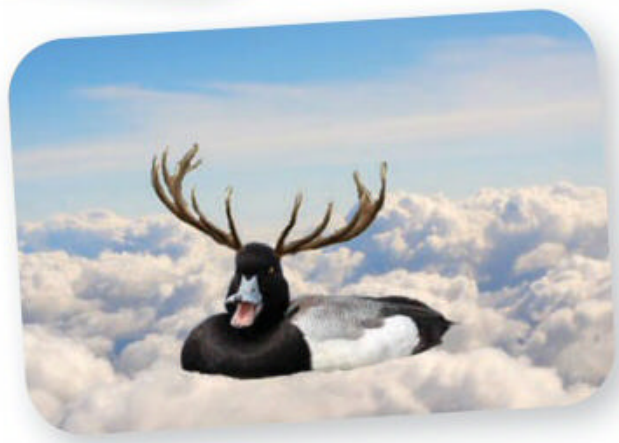
Myra B., age 11

Riley C., age 8, Maryland

Aliens!
Iris K., age 8, New Hampshire

Mushroom Forest
Ian W., age 8, Kentucky

Raymond F., age 7, Illinois



Serena Y., age 9, Massachusetts

Dear Whatson,
What is your favorite book? Mine is Harry Potter. Do you like chess? I do. I love cats! I have a cat whose name is Walt. He is so sweet! Do you like cats?

Your fellow reader,
Violet D., Georgia

Dear Violet,
I am very fond of cats. Alas, cats don't enjoy underground tunnels much, so I mostly visit them at other peoples' houses. My favorite book is...any book I'm just about to start, because then I have the whole book to look forward to.

See you in the pages,
Whatson

Dear Marvin,
I really need a prank that uses water, rubber-bands, and string.

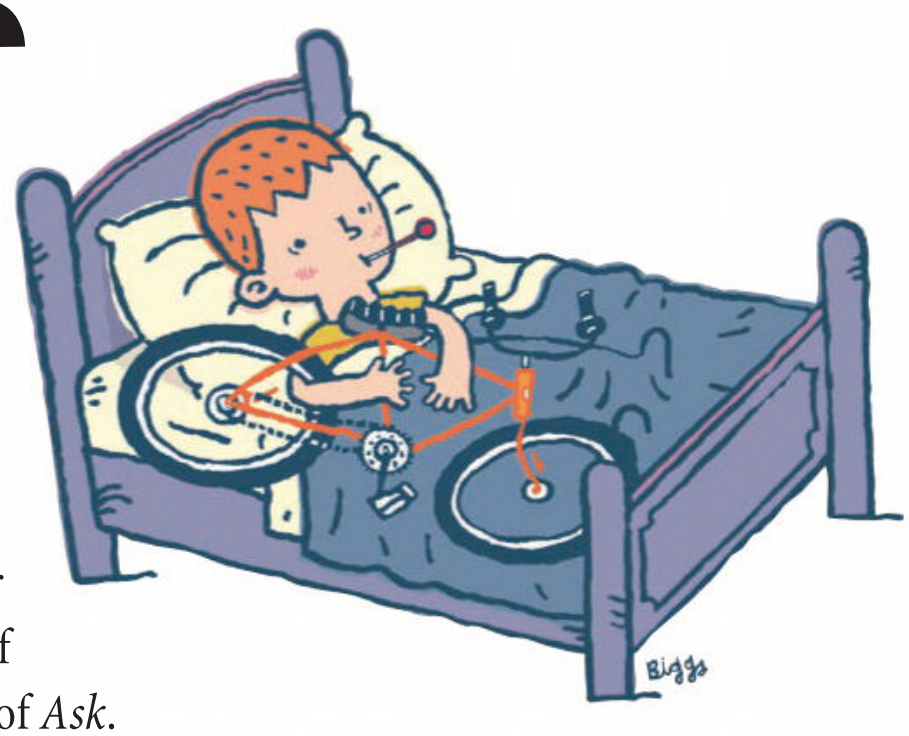
Sincerely,
Hakim, Virginia

Dear Hakim,
Put them in a bag and write on it, "Are you smart enough to solve the puzzle? Clues in bag."

Imaginatively, Marvin

March Contest

All Better

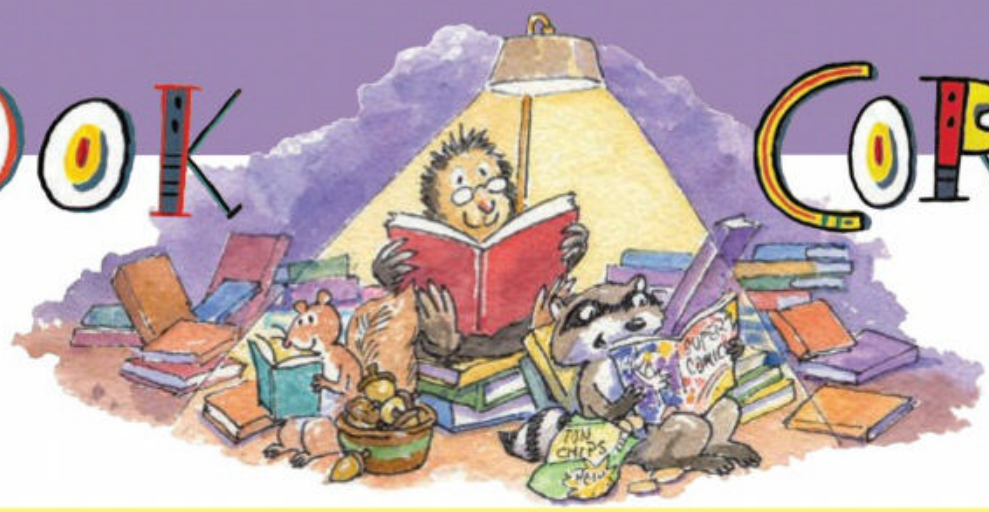


Cough drops and soup can help you feel better when you've got a cold. So can a comfy blanket, a good book, or just the right game to take your mind off sneezes. For this month's contest, draw a picture of something that helps YOU feel better when you're a bit under the weather. We'll share a big helping of the most healing in an upcoming issue of *Ask*.

Contest Rules:

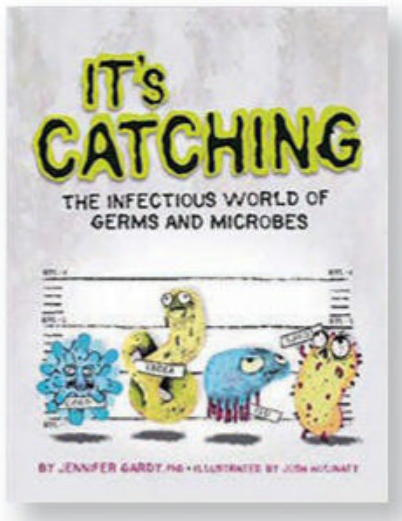
1. Your contest entry must be your very own work. Ideas and words should not be copied.
2. Be sure to include your name, age, and address on your entry.
3. Only one entry per person, please.
4. If you want your work returned, enclose a self-addressed, stamped envelope.
5. Your entry must be signed or emailed by a parent or legal guardian, saying it's your own work and that no one helped you, and that *Ask* has permission to publish it in print and online.
6. For information on the Children's Online Privacy Protection Act, see the Privacy Policy page at cricketmedia.com.
7. Email a photo or scan of artwork to: ask@cricketmedia.com, or mail to: *Ask*, 1 East Erie Street, Suite 525, PMB4136, Chicago, IL 60611
   Entries must be postmarked or emailed by March 31, 2022.
8. We will publish the winning entries in an upcoming issue of *Ask*.

Whatson's BOOK CORNER



It's Catching
by Jennifer Gardy

Colds, flu, ebola, measles...who are all these nasty germs, and where did they come from? And more important, how can we fight them? This fun, informative book covers all the basics—types of germs, historic plagues, and milestones of medical detective work that helped wipe them out. Gripping reading for future doctors, or anyone stuck at home with a cold.

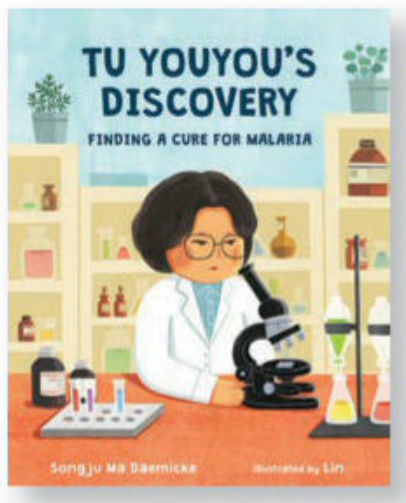


Achoo!
by Trudee Romanek

Why do people sneeze? This simple question kicks off a wide-ranging look at germs, sickness, and germ-fighting through the ages. There are lots of interesting stories along the way, such as the surprising immune systems of manatees. There are also fun experiments you can try yourself—though thankfully, no instructions for brewing up plague.

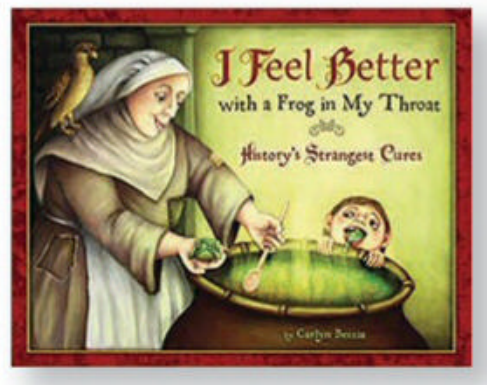
Tu Youyou's Discovery
by Songju Ma Daemicke

Malaria is a sneaky parasite that makes millions of people sick every year. But Tu Youyou swore she would find a cure. She tested hundreds of compounds, including qinghao, a plant used to treat fevers in traditional medicines. After 190 failed tests, it worked! The treatment she discovered, artemisinin, is now widely used to treat malaria. I love a story where stubborn hard work wins!

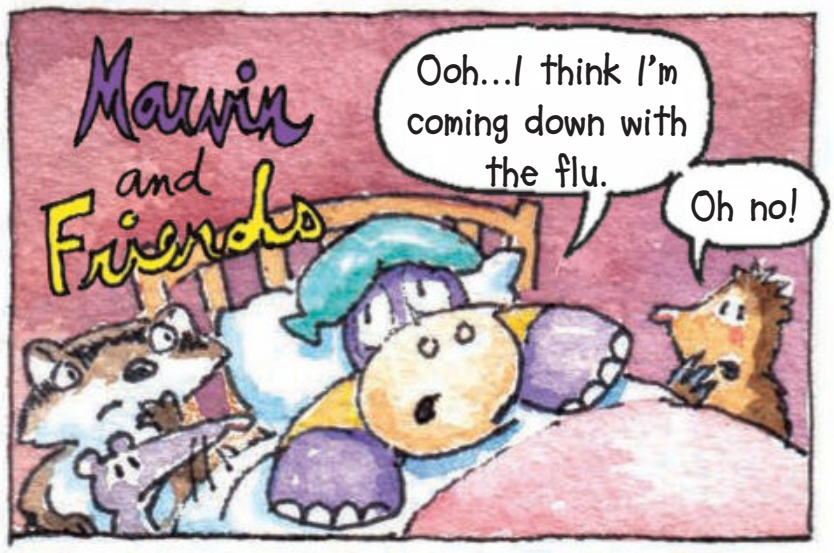


I Feel Better with a Frog in My Throat
by Carlyn Beccia

Back in the Middle Ages, if you had a cough the doctor might recommend frog soup, or maybe a few leeches. Before doctors knew about germs, cures could sometimes be pretty strange. But do any really work? Find out in this fun book! You might be surprised. And it will certainly make you more thankful for cough drops.



text and art by Thor Wickstrom



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