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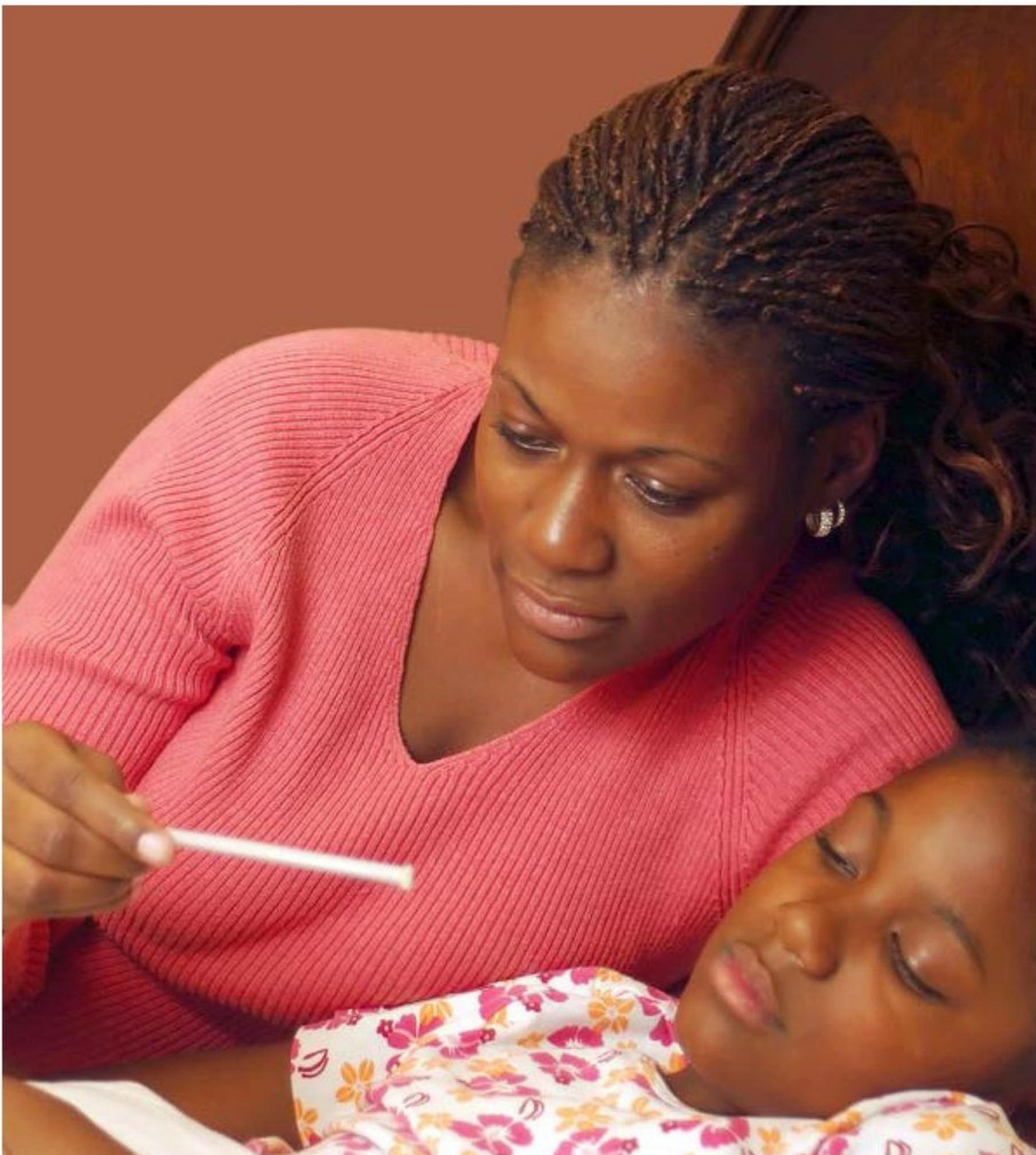
# InFLUenza

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Written by Ned Jensen

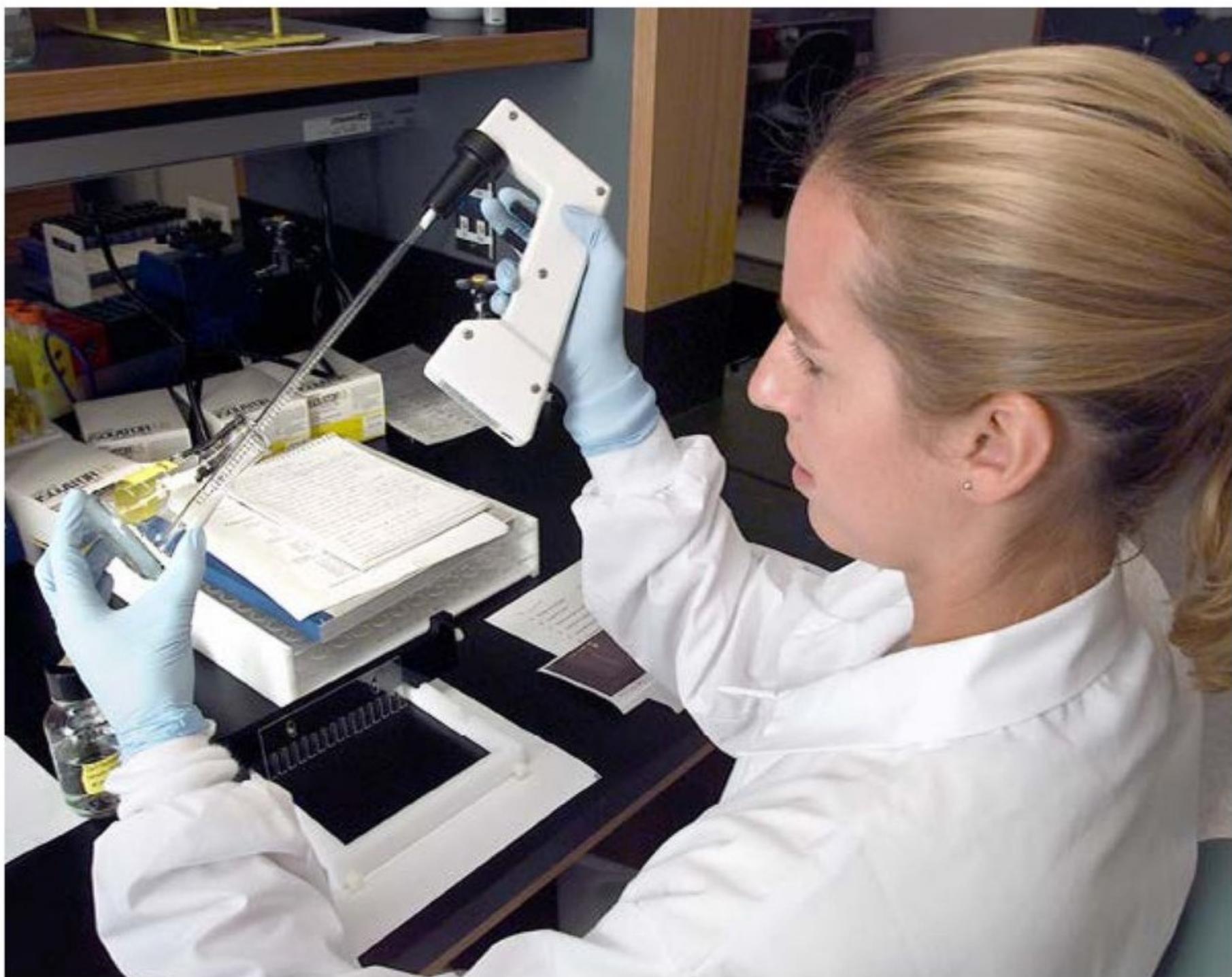
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## Introduction

Have you ever shivered with chills or burned up with a fever? Have you ever had a sore throat, a stuffy nose, a pounding headache, and muscle aches? Have you ever felt really **fatigued** even though you've just woken up in the morning? If you feel symptoms such as these, flu **germs** may have invaded your body.

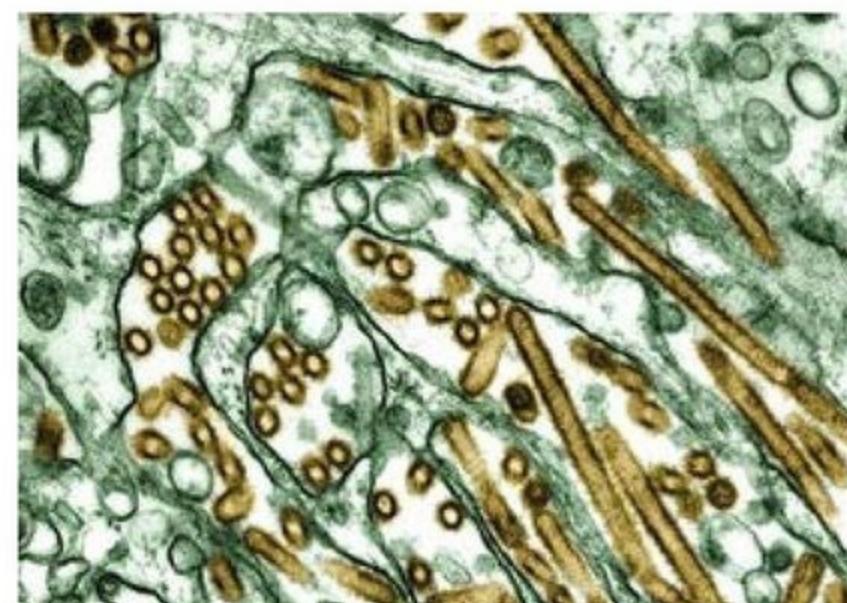
By learning about the flu—what it is, what causes it, what its symptoms are, and how to treat it—you can fight back against this illness and stay healthy.



A water bottle and a blanket can help when you have the flu.

## What Is the Flu?

The flu is also called *influenza* (in-floo-EN-zah). It's caused by a **virus** that has the ability to quickly spread between people. A virus is a tiny **microorganism**—a microbe, or germ—that is invisible to the naked eye. A virus is composed of a little bit of **genetic material** surrounded by a hard **protein** shell that protects it. Viruses are **submicroscopic**—so small that scientists must use extremely powerful microscopes to see them. Even when viewed through a microscope, a virus can only be seen after its image has been magnified to one thousand times its original size. In fact, viruses are so small that hundreds of thousands of them can live on the head of a pin.

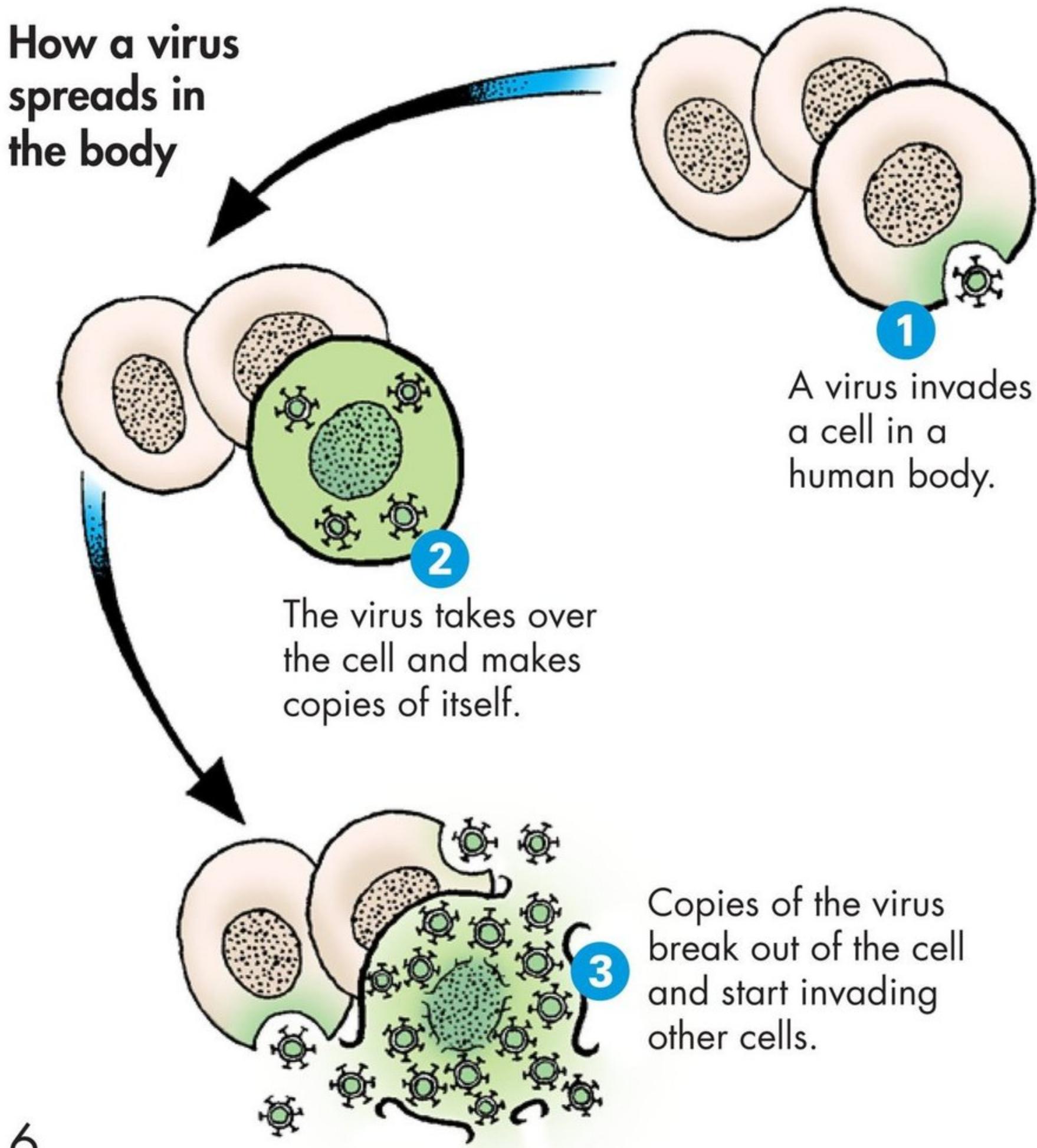


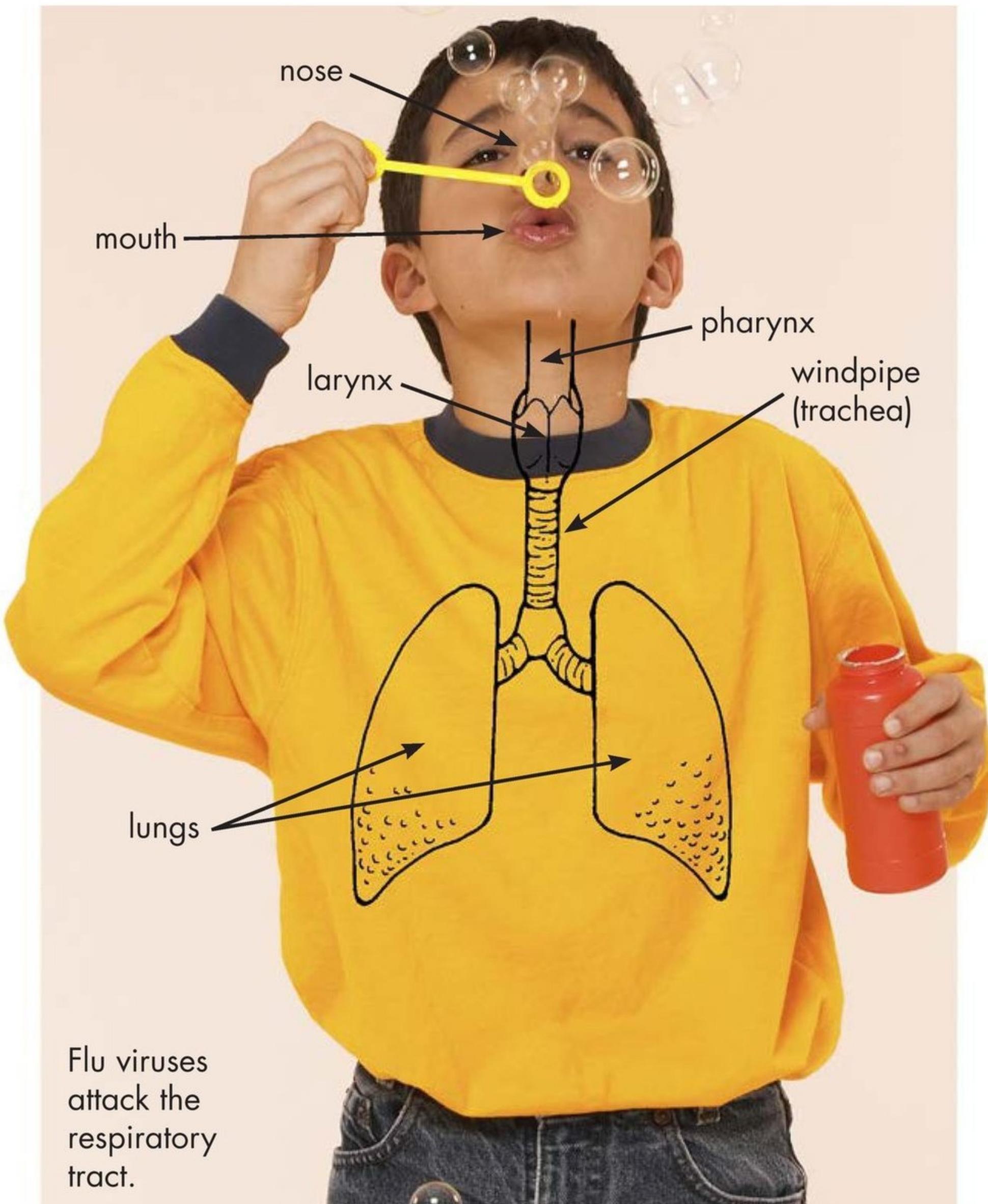
Avian influenza virus

Viruses are everywhere. Some won't bother you at all, but some can be dangerous, even deadly, to people and other animals. And during flu season, which lasts from October through May in the northern hemisphere, viruses are widespread. Like many other organisms, viruses need a particular type of home in order to survive and reproduce. Unfortunately for humans and other animals, that home is inside us!

## Viruses act as **intracellular parasites**.

Although they can live on their own for a period of time—sometimes for years—eventually they must find organisms to serve as **hosts** and get inside their cells in order to reproduce. Once a virus infects a human being, it uses its hard protein shell to make a hole in a cell, which it then invades. Once inside the host cell, the virus inserts its own genetic information into the cell and begins to rapidly make copies of itself. One to four days after infection, the host may begin to experience symptoms and feel sick.





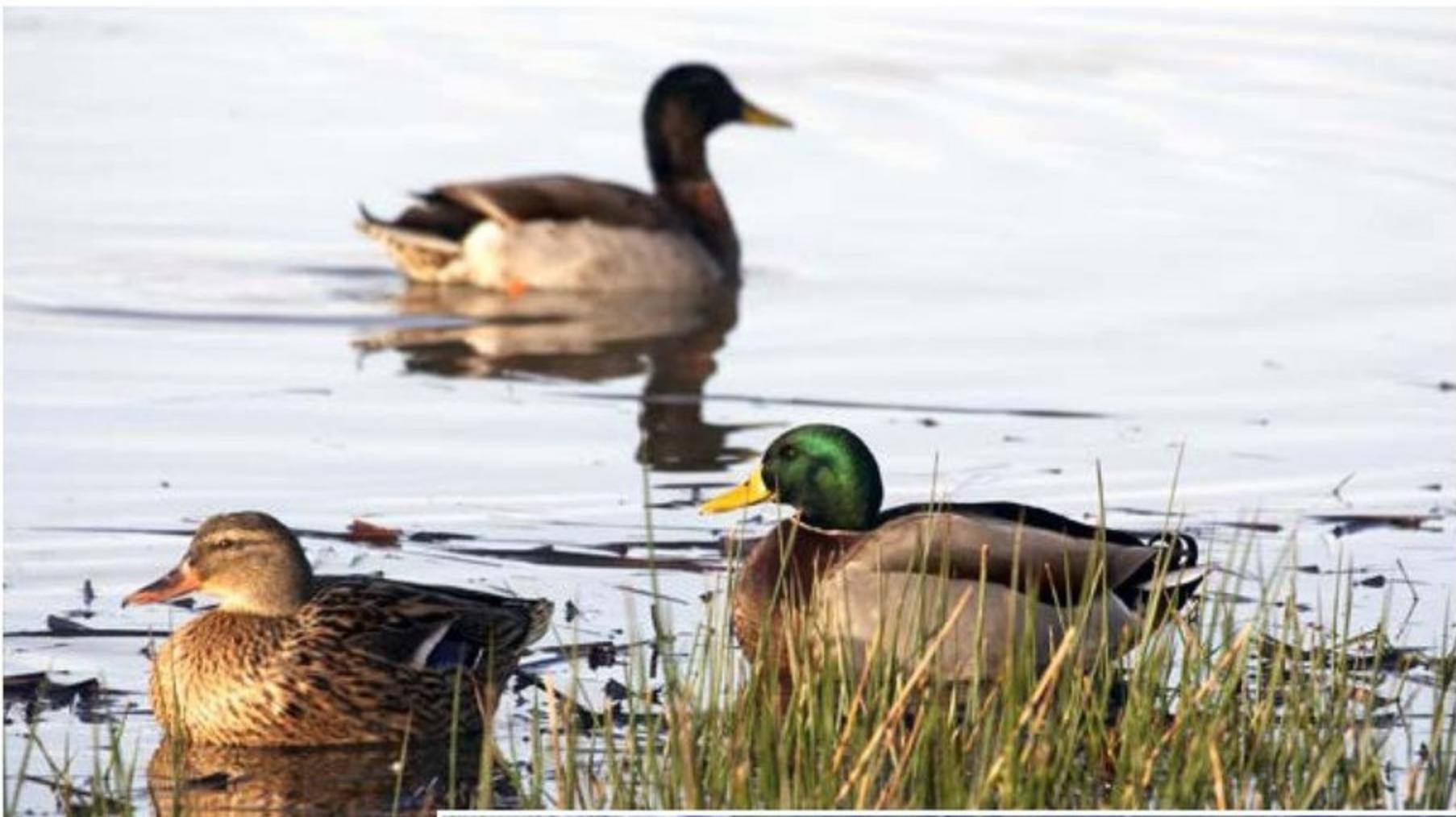
There are many kinds of flu, and each is caused by a specific virus. But even though there are different types of flu, their symptoms are very similar. Flu is an infection of the **respiratory tract** that usually causes you to feel achy, feverish, **congested**, fatigued, and sick to your stomach.

Influenza has three basic types: Influenza A, Influenza B, and Influenza C. Influenza A can cause serious illness in humans and other animals and is usually responsible for large outbreaks. Influenza B is milder, causes smaller outbreaks, and affects only humans (mostly children). Influenza C usually causes only mild illness in humans.



All types of influenza can be passed from an infected person to a healthy person through the air or through

contact with objects such as eating and drinking utensils. The influenza virus is often transmitted in saliva from an infected person's mouth and on droplets of mucus sneezed or coughed into the air. For this reason, it is always important to cover your mouth and nose when you cough or sneeze. It's also important to wash your hands after going to the bathroom and before eating or preparing food. If you are infected, the very best thing you can do is to stay home and away from other people so you don't spread your germs.

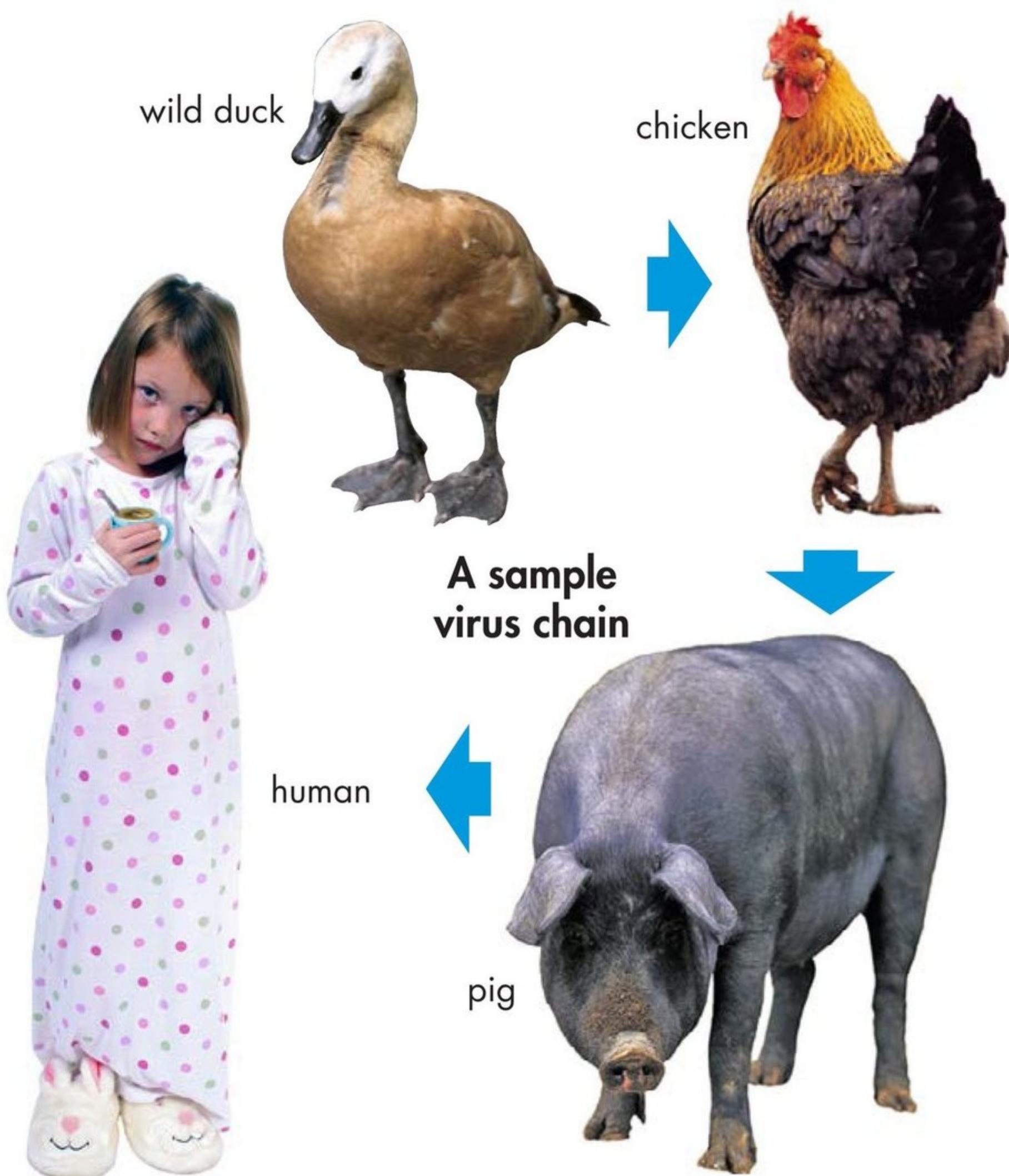


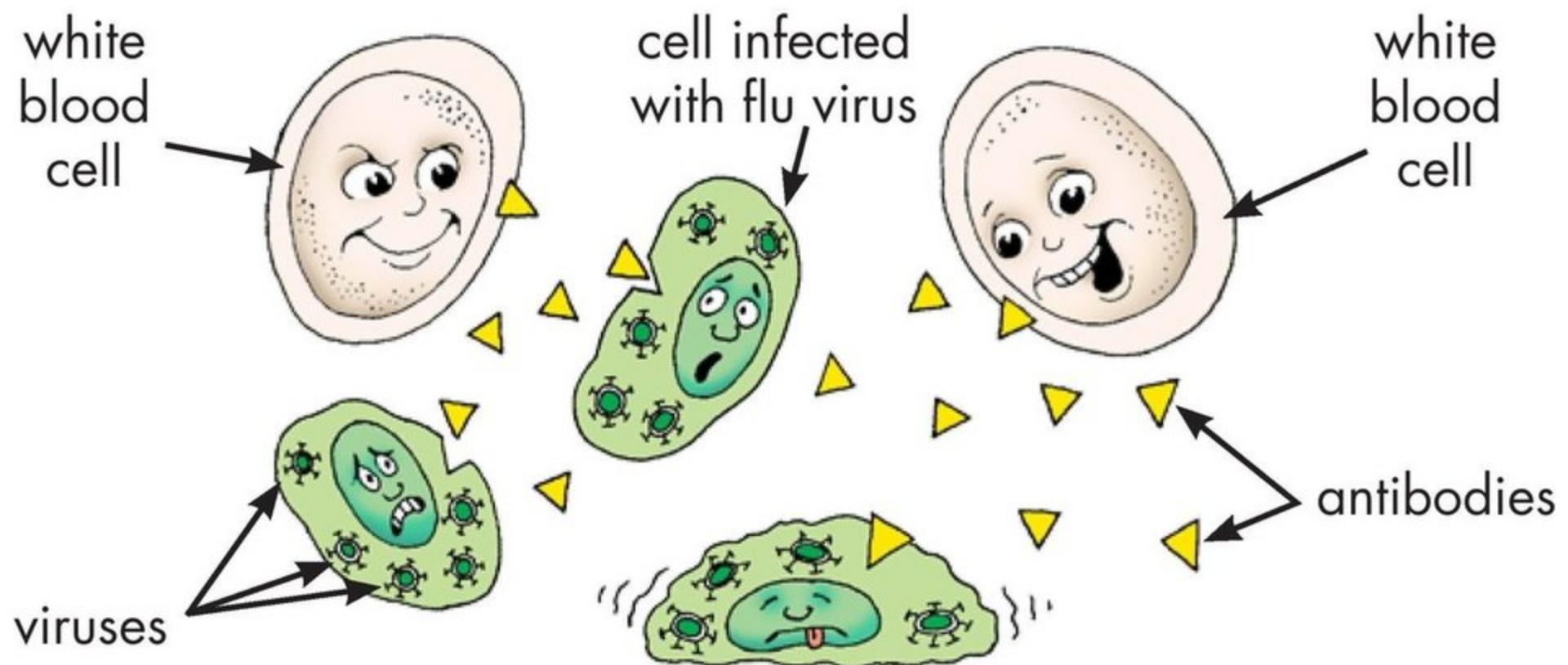
Wild birds (above) often pass viruses to farm chickens (right), which come into more contact with people.

## Changing Viruses

Viruses are capable of changing, or **mutating**. Flu viruses are among the most changeable of all viruses. Each type of virus that mutates from another virus is called a **strain** of that virus. Many influenza viruses start in wild animals, most often in birds. These viruses can easily mutate into strains that infect ducks and chickens on farms. Once a virus has infected birds on farms, it can further mutate into strains that can infect animals such as pigs, and even humans.

Since chickens, pigs, and humans come in close contact on farms, the spreading and mixing of viruses can be deadly. The chain of animals infected as the infection moves from wild animals to humans varies from virus to virus. A single virus chain may include animals as different as dogs and whales. Sometimes a virus takes a shortcut in the chain, such as the avian virus of 1997, which jumped directly from birds to humans.



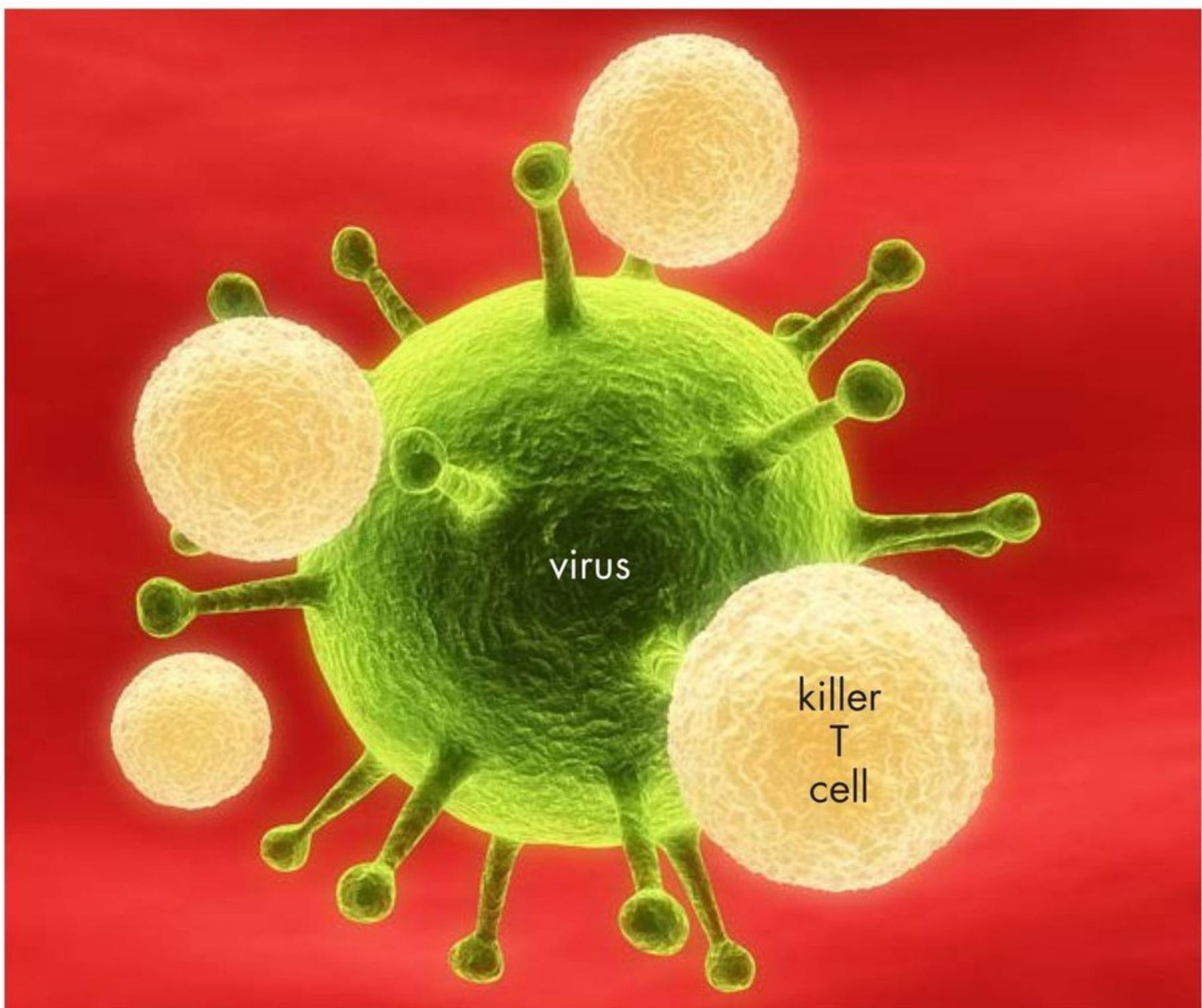


## The Body Fights Back

The human body has ways of fighting back against the invasion of flu viruses. The immune system protects against the invasion of harmful microbes by producing chemicals called **antibodies**, which travel in the blood and patrol the body in search of invaders. Antibodies are programmed to destroy a specific type of microbe. When they find an **invasive** microbe, antibodies attack and destroy any cells that contain the virus.

Because viruses have the ability to mutate, influenza can be a terrible enemy. Even if your body successfully fights the virus, the virus can change into a different strain from which your body has no protection, or **immunity**. Then your body has to start all over again, learning how to fight the new strain at the cellular level. Scientists always worry that the next new strain will be even more deadly than previous ones.

Your body produces white blood cells to protect you against infectious diseases. Your body can detect invading microbes in your bloodstream because these diseases carry **antigens** in their proteins. Special cells in your immune system, such as T helper cells, can sense antigens in small portions of viruses poking out of your cells. When your body finds an antigen, it has many different ways to attack. The T helper cells produce more antibodies. T helper cells also call in cells called **phagocytes** (FAY-goh-sites), which eat microbes. Or, they call killer T cells, which can destroy cells that are infected with a virus.



Artist's image of killer T cells attacking a virus

One of the best things about the immune system is that it will always remember a microbe it has fought before. It will always know just how to fight it again in the future. You may even develop an immunity to a particular microbe; your body can learn to fight so well that your immune system can completely destroy a virus before you feel sick at all.

These are just some of the amazing ways your body defends itself against invaders. Depending on the kind of microbe it finds, your body produces many different kinds of cells. Most of the time, your body knows exactly how to fight an invading microbe. However, if the immune system of a human body invaded by a virus is weak, viruses can get a stronghold and begin reproducing faster than the immune system is able to destroy them. When this happens, the body comes down with flu symptoms that quickly get worse without medical care.



Scientists study ways to help your body fight the flu.

## Preventing the Virus from Taking Over

You can take some commonsense actions to prevent a flu virus from entering your body. Two of the best ways to stay healthy are by getting plenty of rest and eating well. Avoid contact with objects used by infected people for eating and drinking. Wash your hands frequently and keep your fingers out of your mouth. These precautions are important because an infected person can be **contagious** before showing any symptoms. The person may not know that he or she has been exposed and is about to get sick. Avoiding people who have flu symptoms, such as sneezing and coughing, will also help protect you from the virus.



Washing your hands often will help keep you from getting the flu.

However, even the most cautious people can become infected. Fortunately, medical scientists have found a way to keep the flu virus from taking over your body. They have developed **vaccines**. Vaccines are weakened or dead flu viruses that are injected into a person's body before the person gets sick. These weakened viruses cause the body to produce antibodies that attack and destroy the weakened or dead germs. Once the body has "rallied the troops" and produced antibodies to destroy the viruses injected into the body, it is on alert and prepared to attack stronger viruses that may invade during flu season.

Each strain of a virus requires a different vaccine. Some flu vaccines contain several strains. When these strains are injected into the body, each one causes the body to produce a particular antibody to destroy it. Exposing the immune system to multiple strains prepares the body to defend against many forms of viruses that doctors think might be present during a particular flu season.

## Do You Know?

British physician Edward Jenner developed the first vaccine in 1796 when he injected patients with cowpox virus to protect them from the similar but much more dangerous smallpox virus.



Vaccines for most viral strains have an eighty-percent prevention rate, which means that eighty percent of the time, you'll be immune and won't get sick from a strain you have been vaccinated against. That's pretty high, but it's not perfect, so you might still get the flu even if you've received a vaccine. But if you've had the vaccine, your symptoms will be milder—you won't ache so much, and you won't feel so hot. However, if you become infected with a strain that is different from those in your flu shot, you can still get sick. Scientists must be good detectives to predict which strains to put into the shot each year.

Not everyone has the same risk of catching the flu, and some people get more seriously ill than others. People who are very young or very old, or who already have health conditions such as diabetes and heart disease, are at greater risk of catching the flu than others.

## Treating the Flu

Preventing the flu is not always possible. However, once viruses infect your body, you still can do several things to fight back. Pharmacies offer many over-the-counter medicines that can help relieve the symptoms of the flu. These medicines can eliminate the achy feeling in your head and muscles. They can also help reduce a fever.

Drinking plenty of fluids, such as water or fruit juices, can also help. You should get plenty of rest so your body can better fight the viruses that have invaded your cells. Think about all the work your immune system has to do when it's fighting an infection. It's no wonder you feel pain and exhaustion—there's a war going on inside your bloodstream! Give your body plenty of water and rest so it can do its job.

Most people recover from the flu without receiving any special medical treatment. For very serious cases of the flu, however, doctors do have some medicines that they can use. Although **antibiotic** drugs have no effect on viruses, some antiviral drugs do target flu viruses. However, antiviral drugs and medicines that work well against one strain of virus might be useless against another strain. Viruses can also develop resistance and even immunity to drugs over time.



A doctor gives children shots of vaccine in 1941.

## History of the Flu

Throughout history, there have been many outbreaks of influenza. Some of them have been mild and not very widespread. Other outbreaks have been severe, spreading throughout the world and killing millions of people. Once a flu virus develops and infects a few people, it can spread rapidly to become an **epidemic**. Scientists have evidence suggesting that flu epidemics date back hundreds and possibly even thousands of years. Each epidemic has killed thousands of people or more.

The history of any influenza outbreak begins with a single person. On March 11, 1918, a young man in the U.S. Army reported to a hospital with a fever, sore throat, and a headache. Shortly after, many other soldiers at his base developed the same symptoms. In one week, the Army hospital was treating more than five hundred sick soldiers. By the end of spring, forty-eight of those people had died. At first, no one knew why, not even the doctors and scientists. Doctors later learned that the illness was caused by a particular strain of the influenza virus.

In total, this strain of influenza, known as the Spanish flu, killed more than 600,000 Americans and 25 to 40 million people worldwide. When an outbreak reaches this size, it is known as a **pandemic**—a disease that spreads rapidly around the world.



1918 Spanish flu patients

But the pandemic of 1918 was not the only major influenza outbreak in history. The Asian flu, which appeared in 1957, caused about 70,000 deaths in the United States. It got its name because it first appeared in China before coming to the United States in June 1957. Another strain of flu, the Hong Kong flu, was first detected in Hong Kong, China. In 1968, this virus caused another pandemic, resulting in 34,000 deaths in just the United States—as many people as live in a small city. And in 2009, the H1N1 swine flu became the first pandemic in 41 years, infecting people in over 70 countries.



This map shows an example of how pandemics, such as the Asian flu of 1957–1958, might spread from one area to many others.

Other outbreaks have caused widespread concern without developing into actual pandemics. These include the Russian flu in 1977 and the avian flu in 1997 and 1999. Both of these strains of flu began in regions of China and spread to other countries. Doctors are always on the lookout for the next major outbreak. They believe that if they can detect outbreaks quickly enough, they can keep them from becoming worldwide pandemics.



Masks that fit around the nose and mouth are sometimes worn to help prevent the spread of viruses. However, the masks do not work all the time.

## Conclusion

Influenza has been around for hundreds of years. Because flu viruses can change and develop into new strains, influenza may never be wiped out. When you have the flu, the most important thing you want to do is take care of yourself and prevent others from getting it. You'll want to drink as much water as a camel drinks and sleep like a bear. Get a vaccine if one is available. Most importantly, remember to attack back! Good food and rest allow the healthy cells in your body a chance to win the battle.



## Glossary

|                                       |  |
|---------------------------------------|--|
| <b>antibiotic</b> ( <i>adj.</i> )     | relating to a medicine that fights infections in the body from certain types of microbes (p. 17) |
| <b>antibodies</b> ( <i>n.</i> )       | chemicals produced by the body that attack invading germs (p. 11)                                |
| <b>antigens</b> ( <i>n.</i> )         | substances that trigger immune responses in the body (p. 12)                                     |
| <b>congested</b> ( <i>adj.</i> )      | filled up or blocked (as with mucus in the nose and throat) (p. 7)                               |
| <b>contagious</b> ( <i>adj.</i> )     | able to spread from one organism to another (p. 14)  |
| <b>epidemic</b> ( <i>n.</i> )         | an outbreak of disease that spreads rapidly through a group of living things (p. 18)             |
| <b>fatigued</b> ( <i>adj.</i> )       | tired or weary from mental or physical labor (p. 4)  |
| <b>genetic material</b> ( <i>n.</i> ) | the part of a cell that carries the basic information about an organism's characteristics (p. 5) |
| <b>germs</b> ( <i>n.</i> )            | microorganisms that often cause disease and sickness (p. 4)                                      |
| <b>hosts</b> ( <i>n.</i> )            | organisms in or on which other organisms live (p. 6)   |
| <b>immunity</b> ( <i>n.</i> )         | the ability of a body to resist infection (p. 11)  |
| <b>intracellular</b> ( <i>adj.</i> )  | existing within cells (p. 6)   |
| <b>invasive</b> ( <i>adj.</i> )       | relating to moving into a new area or body with harmful or disruptive effects (p. 11)            |

|  |   |
|--|---|
| <b>microorganism</b> ( <i>n.</i> )     | an organism of microscopic size, such as a virus or single bacterial cell (p. 5)  |
| <b>mutating</b> ( <i>v.</i> )          | changing into a different form (p. 9)   |
| <b>pandemic</b> ( <i>n.</i> )          | the rapid, worldwide spread of a disease (p. 19)  |
| <b>parasites</b> ( <i>n.</i> )         | organisms that live inside of and take nourishment from other organisms (p. 6)  |
| <b>phagocytes</b> ( <i>n.</i> )        | cells that eat invading microbes in the body (p. 12)  |
| <b>protein</b> ( <i>n.</i> )           | an essential nutrient found in the cells of all living things (p. 5)  |
| <b>respiratory tract</b> ( <i>n.</i> ) | the passages in the nose, mouth, throat, and lungs through which air travels during breathing (p. 7)                              |
| <b>strain</b> ( <i>n.</i> )            | a group of microbes of the same type (p. 9)   |
| <b>submicroscopic</b> ( <i>adj.</i> )  | too small to be seen with an ordinary microscope (p. 5)   |
| <b>vaccines</b> ( <i>n.</i> )          | medicines made of weak or dead viral strains that teach the body to fight stronger viruses of the same type (p. 15)               |
| <b>virus</b> ( <i>n.</i> )             | a microorganism that enters the body, gets into cells, rapidly reproduces, and causes illness; a disease caused by a virus (p. 5) |

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