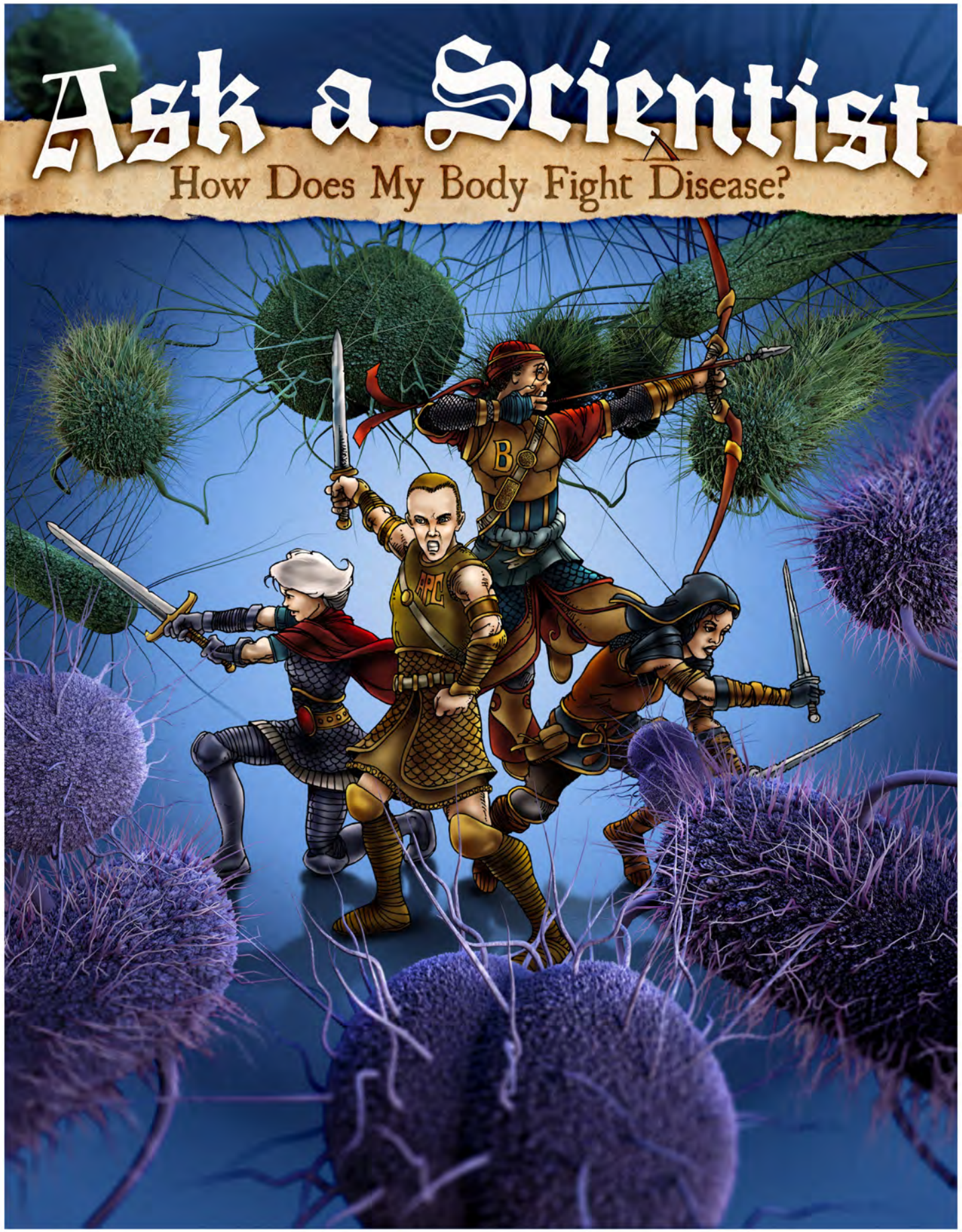
Ask a Scientist

How Does My Body Fight Disease?




In general, your body fights disease by keeping things out of your body that are foreign.
Your primary defense against pathogenic germs are physical barriers like your skin.
You also produce **pathogen**-destroying chemicals, like **lysozyme**, found on parts of your body without skin, including your tears and **mucus membranes**.

A group of **innate immune system** cells will be there to capture and destroy the invading germ.

These cells are always on alert for germs, patrolling your body like soldiers looking for invaders.

These innate cells then communicate to the rest of your body regarding the problem by activating the **inflammatory response**.

The swelling, pain and higher temperature caused by inflammation attracts more cells to the site of infection.

The innate cells also scout out information for another, more specific group of cells called the **adaptive immune system** cells.

The innate immune cells train the **adaptive immune cells** to fight disease in two ways.

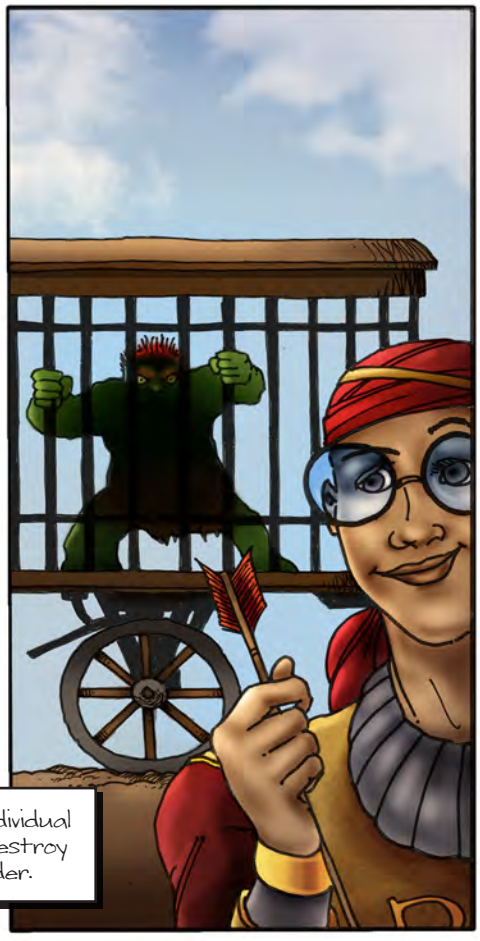
First, they instruct the adaptive immune cells how to respond to the invader by releasing chemicals called **cytokines**.

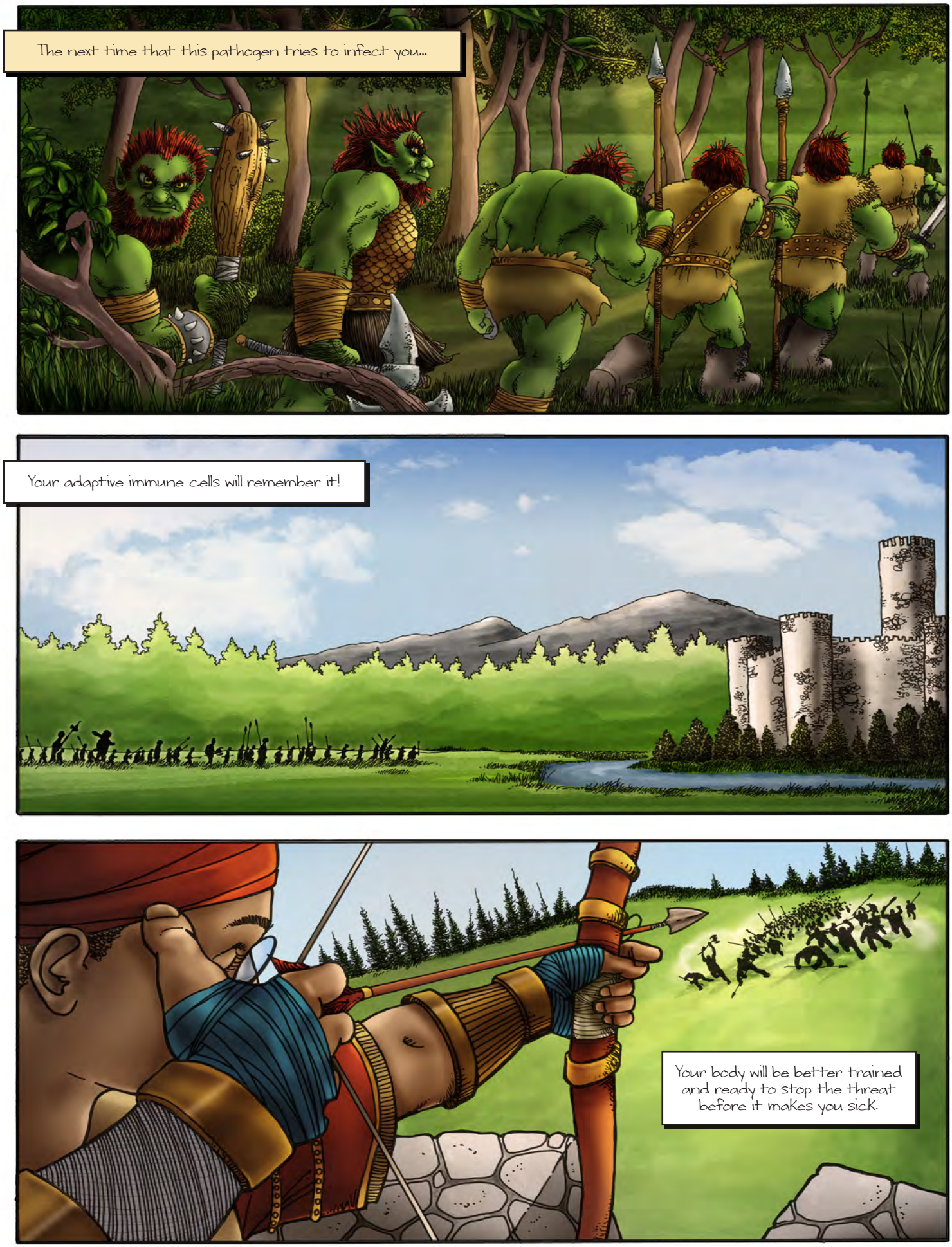
Cytokines are signals recognized by cells, telling them what to do and where to go. Your body responds to threats in different ways depending on the cytokine signal released by your immune cells.

Second, the innate antigen presenting cells capture and break down the invaders into pieces that can be recognized by the adaptive immune system, called **antigens**.

Every invader's antigenic pattern is unique.

Together, cytokines and antigens train individual adaptive immune cells to recognize and destroy specific patterns of each foreign invader.




The next time that this pathogen tries to infect you...
Your adaptive immune cells will remember it!
Your body will be better trained and ready to stop the threat before it makes you sick.


APC
Working together, the innate and the adaptive cells of your immune system have the ability to protect you from nearly anything trying to invade your body.


But this is war. It's not that easy! Some pathogens, including those that cause flu, strep throat, and malaria, can mutate and change the way they look to your immune system over time.


They disguise themselves by changing their surface antigens in a process called **antigenic variation**.

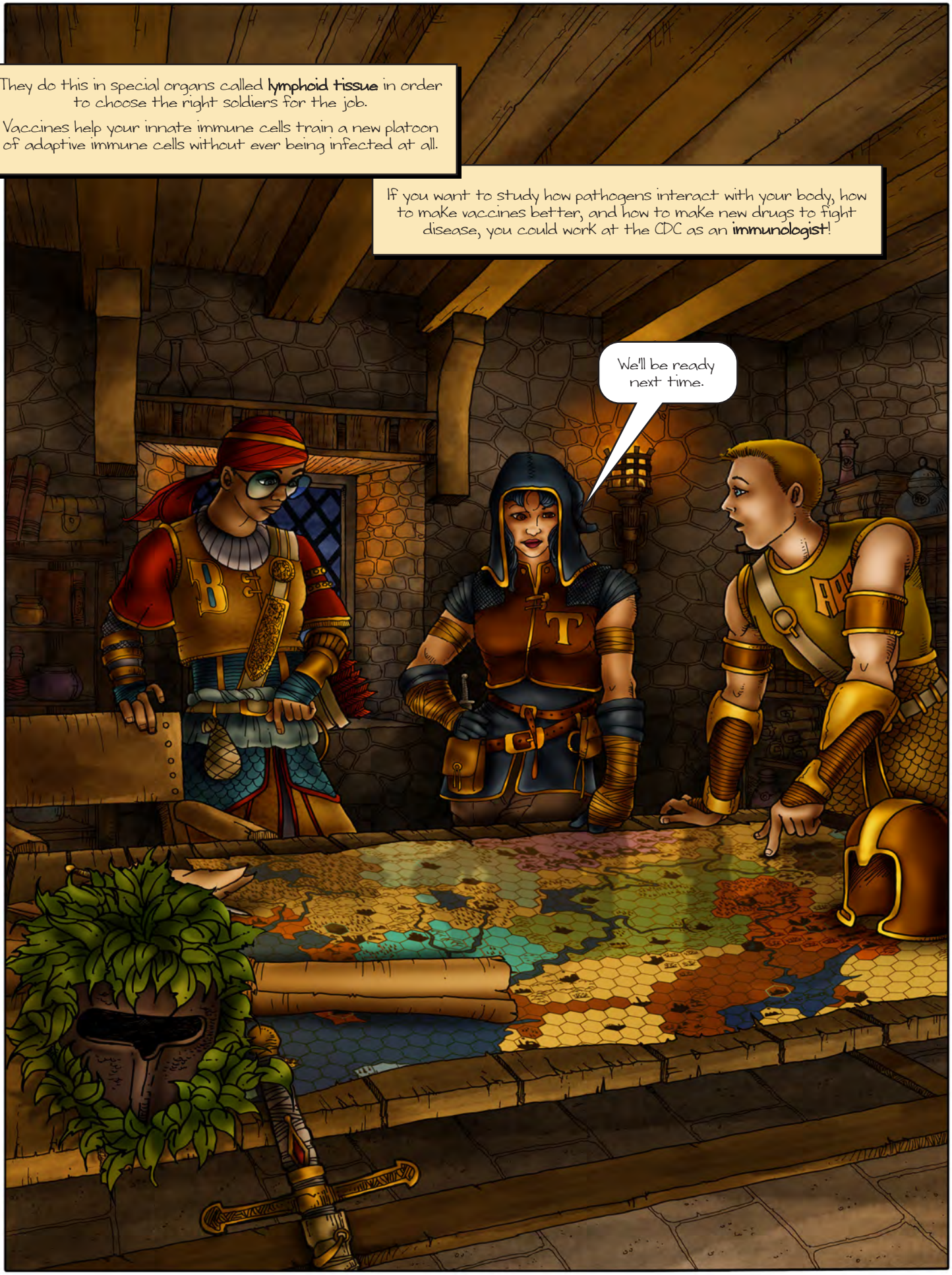

This disguise makes it harder for your immune system to recognize them.


Because it's harder to recognize the mutated germs, your body's immune system has a harder time protecting you from them, even though you've been exposed to them before.
This is why you can get sick from flu and strep throat multiple times.
For these type of germs, just because you've been sick once, doesn't mean you won't get sick again. Every year has the potential to produce new disguised germs that can make you sick.

But there's some good news! You can help your body prepare and defend itself against pathogens and disease by getting your regular vaccinations, including the one for flu.

Vaccines are made up of small, harmless pieces of the pathogen you are trying to protect yourself against.

Antigen Presenting Cells give the antigen from the vaccine to the adaptive immune cells.


They do this in special organs called **lymphoid tissue** in order to choose the right soldiers for the job.
Vaccines help your innate immune cells train a new platoon of adaptive immune cells without ever being infected at all.
If you want to study how pathogens interact with your body, how to make vaccines better, and how to make new drugs to fight disease, you could work at the CDC as an **immunologist**!
We'll be ready next time.

WORD	DEFINITION
adaptive immune system	The immune response that targets specific foreign invaders. It is also responsible for immunological memory, leading to enhanced immune response to subsequent encounters with that foreign antigen.
antibody	A protein secreted by B-cells that identify and neutralize foreign antigens. These proteins can be secreted and circulate in your blood for many years after being exposed to a pathogen or vaccine to protect you from re-infection from that same invader.
antigen	Any of various substances that, when introduced into a living body, causes the production of antibodies.
antigen presenting cells (APC)	Innate immune cells that capture, process and present foreign antigens to activate an adaptive immune response to specifically target that threat.
antigenic variation	The method a germ uses to alter its surface proteins in order to evade a host immune response. This allows pathogens to cause re-infection, as their antigens are no longer recognized by the host's immune system.
B-cell (B)	An adaptive immune cell that monitors for the presence of foreign antigens outside of a person's cells. When activated, they will secrete antibodies to specifically recognize surface antigens on an invading germ or foreign molecule, marking them for destruction by the innate immune system.
cytokines	Any of various molecules secreted by immune cells that carry signals to and have an effect on neighboring cells.
immune system	The bodily system of organs, tissues, cells, and cell products, which protects the body by detecting the presence of, and disabling, disease-causing agents in the body.
immunologist	A scientist who studies how an organism defends itself against pathogens and other foreign invaders to the body.
inflammatory response	The way in which an organism protects itself from harmful stimulation, such as germs, injury or irritants. The function of inflammation is to eliminate the initial cause of cell injury, clear out dead cells and tissues damaged from the original injury, and activate the immune system to initiate tissue repair.
innate immune system	The immune response that provides immediate, but non-specific defense against foreign invaders. It is primarily responsible for initiating the overall immune response and activating the adaptive immune response.
lymphoid tissue	The location for production and maturation of the adaptive immune cells. The lymphatic system is part of the circulatory system, constantly screening an organisms blood for foreign invaders. Major lymphoid organs include the lymph nodes, spleen and thymus.
lysozyme	A molecule made by a person's body that destroys pathogens, found in tears and mucus.
mucous membrane	A lubricating barrier that lines various surfaces or organs, as of the respiratory, digestive, and genitourinary tracts.
mucus	A slimy, slightly sticky material that coats and protects certain parts of the body, such as the inside of the nose and throat.
pathogen	Any organism that causes disease, such as a bacterium, virus, parasite, or fungus.
polymorphonuclear leukocytes (PMN)	Also known as granulocytes, are found in the bloodstream and are usually the first to arrive to an infection or injured site. They amplify the ongoing inflammatory response by releasing more cytokines, eat and destroy invading germs in the affected area.
T-cell (T)	An adaptive immune cell that monitors for the presence of foreign antigens presented to them from inside the organism's cells. When activated, they can direct the ongoing immune response through secreting a variety of cytokines or can directly kill the infected cells.
vaccine	Pieces of germs causing disease that are dead or not active. Vaccines are used to help the immune system protect against the disease.

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This project was a collaboration between the Office of the Associate Director for Communication, the Office of the Associate Director for Laboratory Science and Safety, and the National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health, School Health Branch

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CS238388