mystery science

Grades K-5
Mini-Lesson: “How do vaccines work?”

VIDEO TRANSCRIPT

VIDEO 1

[Video Call]

- Hi, Doug!

- Hi, Raj!

- I have a question for you. How do vaccines work?

- Ooh, that's a great question and so important.

There are lots of different reasons people get sick. There are many different kinds of sicknesses or diseases. Diseases that are caused by germs can be stopped in different ways. For example, strep throat is caused by germs. If you've ever had strep throat, you were probably given a medicine called an antibiotic. That's one that harms the microscopic germs causing your strep throat, but that doesn't harm you. Antibiotics are medicines you take because you're sick. In other words, the germs have already entered your body and are making you not feel well. Vaccines are a totally different kind of medicine to fight against germs. The big difference between an antibiotic and a vaccine is this. A vaccine is something you take before you ever get sick in the first place. You get a vaccine while you're healthy, not sick. In other words, a vaccine is a type of medicine that stops germs from making you sick to begin with. Now, you might be

wondering, how can a medicine keep you from getting sick in the first place? Before I say anything more, what do you think?

VIDEO 2

Well to understand this, it's helpful to know the story of how vaccines were even invented in the first place. For thousands of years, a disease called smallpox was one of the most terrible. When someone caught it it gave them sores all over their bodies and a really high fever. And it was often deadly. Doctors tried many different ways to stop it, but none of these worked. Then some people discovered something really interesting. People who worked with cows like farmers and their helpers, weren't getting smallpox at all. It's like they had some secret power against smallpox. When scientists started to look into this, they found out that people who worked on farms did get sick with something else, a different sickness. One they were catching from cows that they milked every day—a disease called cowpox. Cowpox had some similarities with smallpox but also some important differences. Cowpox gave you sores like smallpox, but just a few on your hand. It also gave you a fever just like smallpox did but only a slight fever and most important of all, cowpox was almost never a deadly disease, the way smallpox was. Catching cowpox was somehow helping these farm workers' bodies fight off the much deadlier smallpox. Now, at the time, all of this was being discovered. Scientists didn't even have microscopes powerful enough to see the germs that cause cowpox and smallpox. But, they realized that whatever was causing cowpox was like a weaker version of what was causing smallpox. So doctors tried giving small doses of cowpox to people who weren't sick. They wanted to find out if having cowpox would stop people from ever getting smallpox. And it worked. People who were given a dose of cowpox never got sick with smallpox. Giving people

small doses of cowpox, was the first type of vaccine. And in fact, even the word vaccine, has something to do with this incredible story. It comes from the word Vacca, the Latin word for cow. The cowpox-smallpox vaccine was amazing. The number of people getting sick with smallpox started to go way down. In fact, it worked so well, that the smallpox disease eventually disappeared from the world entirely. Now, no one gets smallpox anymore. All thanks to the vaccine. Now that we have more powerful microscopes, we've discovered that there are so many different kinds of germs. We've also learned more about what happens when germs get inside a person's body. Each of our bodies contains tiny disease-fighting blobs called immune cells. When a certain kind of germ attacks your body for the first time, your immune cells have to learn how to fight that kind of germ. It's as if they have to figure out the secret moves that work against that germ. For example, when someone gets sick with cowpox, their immune cells learn to fight the cowpox germ. They learn the secret moves that fight cowpox. Then if smallpox comes along, the immune cells are ready. Since smallpox is a lot like cowpox, the immune cells can use the secret moves they already learned and fight off those germs before the person gets sick. Not every germ has a weaker version like the smallpox-cowpox story. So how can we get vaccines that fight against all those germs? If there isn't a weaker version of a germ, scientists have to figure out how to make a weaker version of the germ. The new coronavirus vaccine is a great example of how scientists try new ways to make vaccines. Rather than using the whole Coronavirus germ, scientists are able to create a small piece of the coronavirus germ and use that in the vaccine. Injecting people with that small part of the germ is enough to teach someone's body's immune cells, how to fight against the germ without making them sick. So that way, if the Coronavirus shows up, the immune cells are ready to fight it off. Thanks to the incredibly hard work of a lot of scientists, who stayed curious and didn't give up. We now have a vaccine for the Coronavirus. And once enough people are vaccinated, this pandemic can finally

come to an end and that's something worth celebrating. That's all for this week's question.

Thanks, Raj, for asking it!