Children's Vaccine EDUCATION PROJECT

NATIONAL NURSE-LED CARE CONSORTIUM a PHMC affiliate

How Vaccines Work

Activity Guide

Learning objectives:

- Vaccines teach your body to recognize a virus and fight back.
- Vaccines can't give you the disease.

Materials:

Picture of coronavirus

Virus model:

- Plastic wiffle ball
- 8-10 blue foam darts
- Long blue/white shoelace

Vaccine model:

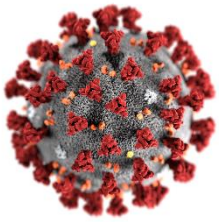
- Small plastic zipper bag
- Short blue shoelace
- 1 blue foam dart

Advance preparation: Ensure all materials are accessible.

What to do:

Part 1 – Building a Virus

1. Ask students what they know or have heard about viruses:
   - *Have you heard the word "virus" before?*
   - *What is a virus? What does it do?*
   - *Have you ever seen a virus? Why not?*
2. Accept student answers and summarize key points: **Viruses are germs that are too tiny to see. They can get inside a person through the nose or mouth, where they start to make lots of copies of themselves. This makes the person sick.**



3. Show students the picture of the coronavirus – the kind of virus that causes COVID-19. Explain that scientists used special, powerful microscopes to take a picture of the virus. The different colors were added to the picture to help us see the different parts of the virus.
   - *What do you notice about the virus?*
   - *What different parts can you see?*
4. Invite students to help you build a model of the virus. Show them the model materials (ball, foam darts, and shoelace) and invite them to compare with the coronavirus picture to think about which parts of the virus each material could represent. Briefly explain what each part of the model represents as you assemble the body and spikes. You could involve students by asking one person to hold the ball and others to push the foam darts into the holes.
   - *Ball: The virus's body is like a round shell*
   - *Foam darts: The outside of the body is covered with spikes*

5. Show students the long shoelace. Explain that the last piece of the virus is the instructions for building the virus. Different sections of the shoelace represent instructions for building different pieces of the virus.
   - *Which part of the instructions do you think are for building the spikes?*
   - *Where on our virus model do you think the instructions go?*
6. If needed, use the coronavirus picture to help students think about where the instructions go. (*If we can't see it on the outside, where else could it be?*) Then insert the shoelace into the ball through one of the open holes (or invite a student to help).

7. Using the model, ask students to think about how the virus works:
    - *When you breathe in the virus, which part do you think sticks to the inside of your nose or mouth first?*
    - *Which part does the virus need to make more copies of itself?*

Part 2 – Building a Vaccine

8. Explain that one way we can fight viruses that make people sick is with a vaccine.
    - *Have you seen or heard about vaccines before? What do you know about them?*
9. Explain that **a vaccine is a medicine that teaches your body what the coronavirus looks like**. If you catch the virus later, your body can recognize it and attack it right away, before it can make too many copies of itself. Imagine showing someone a picture of your friend so they can find them on the playground later.
10. Ask students to help you make a model vaccine for your virus.
    - *What part of the virus do you think is the easiest for your body to recognize?*
    - *Where do we have instructions for how to make that spike?*
11. Explain that scientists can make just the spike section of the instructions in the lab. Show students the short blue shoelace representing the genetic instructions for the spike.
12. (Optional – may skip this step for younger students.) Tell students that the instructions are fragile, so they need some packaging to protect them until they get to the right part of your body. Scientists package the instructions in tiny bubbles of fat, but we're going to use a plastic bag. Demonstrate by placing the shoelace into the bag and sealing it up (or invite a student to help you).

13. Now the vaccine is ready to go into your body. How does it get there? Ask students to represent the injection by giving themselves a gentle poke in the shoulder.
14. Explain that inside your body, the fat bubble packaging breaks apart. Demonstrate by removing the shoelace from the plastic bag.
    - *What is inside your body now?*
    - *What can your body build with these instructions?*
15. Hold up the single foam dart and the whole virus model. Ask the group to vote on which one the body can build. If needed, you could pull the long shoelace out of the virus model to compare with the short one.
16. Ask students to think about what this means for the virus in our bodies:
    - *Can the vaccine make us sick the way the virus does? Why not?*
    - *Now our bodies know what this spike looks like. What do you think will happen when a virus with this kind of spike gets inside our bodies?*
17. Discuss student answers and close by summarizing key points:
    - The spike protein is enough to prepare your body to recognize and attack the virus in the future, so you're less likely to get seriously sick.
    - The vaccine doesn't have enough information to build the whole virus, so you can't get COVID-19 from the vaccine.

<u>Maintenance:</u>
To help the foam darts keep their shape, pull them out of the wiffle ball for storage after each use.

What's going on:

Coronaviruses are a family of viruses—including both the common cold and SARS-CoV-2, the virus that causes COVID-19. These viruses are typically encoded by genetic instructions in a single strand of RNA. The RNA is packaged in a capsule with spiky proteins on the surface, which help the virus infect its host cell. Like fitting a key into a lock, the virus uses the spike protein to attach to a human protein called the ACE2 receptor that is common in the airways and other body tissues. Once attached, the virus is able infect the host cell and make more copies of itself.

When your body encounters a germ like the SARS-CoV-2 virus, a healthy immune system revs up to attack and destroy it. However, sometimes the immune system can't get the infection under control fast enough, or it overreacts and starts to attack the body itself. These reactions cause severe cases of COVID-19 that can lead to hospitalization or death.

A vaccine is a neutralized version of a germ that can trigger a "training" immune response, significantly reducing the likelihood of severe disease in the future. Both the Pfizer and Moderna vaccines rely on messenger RNA (mRNA) vaccine technology, delivering the RNA instructions for the spike protein packaged in a lipid nanoparticle. The body builds the spike protein from those instructions and generates an immune response before breaking down the vaccine components and flushing them out. Evidence shows that, compared to natural infection with SARS-CoV-2, full vaccination typically leads to a more consistent and initially stronger immune response.

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