

SCIENCE WORLD

1455 Quebec Street
Vancouver, BC
Canada V6A 3Z7
scienceworld.ca

VOCABULARY LIST:

Pathogen: Any organism that causes some sort of disease in our body. SARS-CoV-2 (the virus that causes the disease called COVID-19)

Antigen: A molecule on the surface of a pathogen that gets the immune system to respond. The antigen from the pathogen will be seen as foreign (not made within our own body).

Antibody: A protein that helps fight off the pathogen.

Immune System: Our body's natural defense against pathogens.

B cells: Cells that are a part of our immune system. They activate an immune response to a pathogen, when the antibodies on their surface match the pathogen's antigens.

Learn how one part of your immune system works to fight invaders. You will make playdough antibodies and antigens and then create a model to explore how an antibody matches to a particular antigen, triggering an immune response (fights the infection).

BACKGROUND SCIENCE:

When a pathogen like the virus SARS-CoV-2 (the virus that causes the disease called COVID-19) enters your body, your B cells try to figure out whether it's part of you, or foreign. When your B cells recognize a pathogen, they trigger an immune response by activating other cells to get rid of the pathogen. But B cells are very picky. Proteins on the surface of B cells must match the antigens on the pathogen in order to start the process! These proteins are one kind of antibody.

Fortunately, after an immune response to a pathogen, some of your B cells change to create more antibodies to match that pathogen. The next time the same pathogen arrives, your body has plenty of antibodies ready to quickly activate a response.

In this activity, you'll use playdough to create "antibodies" for "antigens" (small objects), and then try to match the antibodies to the antigens.

FUN FACT:

A B cell can only bind to one kind of antigen! Your body needs to make billions of different antibodies to respond to all the pathogens it might encounter.

MATERIALS:

- Mixing bowl and large spoon
- 2 cups flour
- 1/2 cup salt
- 3/4 cups hot water (microwave or kettle) in a jug or cup
- Cling film
- Food colouring – optional
- 10 different shaped objects to make an imprint of (i.e., rocks, Lego, etc.). These represent antigens.

WHAT TO DO:**Step 1: Make the playdough**

- Gather flour, salt, and jug/cup of hot water
- Using your spoon, mix the flour and salt together in a bowl
- Slowly add water to the dry mix, a little at a time, until it starts to stick together in a ball
- Add some extra flour and use your hands to knead into dough*
- Cover dough in cling film to keep soft.

Tip: *If too sticky, add more flour. If too dry and flaky, add a little more water*

Step 2: Create a set of Antibodies

- Optional: Add 1-2 drops of food colouring to your ball of dough and knead to mix in the colour
- Divide the playdough into golf-ball sized balls
- Flatten each of these to make a disc
- Press an object into the disc (about half-way) to make an impression, then remove the object. The object represents the antigen, and your impression represents the antibody.
- Repeat the above step until you have a set of disks with a variety of impressions
- Let disks dry until top is hard, then flip to dry the other side (can take a few days)

Step 3: Create your Immune System Model

- Spread all the disks and objects across a table. Turn them upside down so you can't see the impressions.
- Pick an antigen (object) and quickly try to match to an antibody by flipping the antibodies.



WONDERINGS:

1. How fast did you find a match? Would it be easier to find a match if there were more copies of the same antibody?
2. Why do you think it so important that our immune cells are able to tell the difference between pathogens and the cells of our own bodies?

CREDIT

Based on an activity from the Regenerative Medicine Partnership for Education – Duquesne University:

<http://www.sepa.duq.edu/data/EducationImgDocs/Immunology%20Module%20Teacher.pdf>