Vaccine Colour-Changing Game

The vaccine game uses colour changes to show whether or not someone has been infected or protected by the vaccine! In this case our infection is a solution of baking soda and the vaccine is lemon juice. The baking powder will be neutralized by the lemon juice, resulting in a color change. This way you can tell if you are infected or not!

Our colour indicator is red cabbage. When boiled, red cabbage gives us a purple coloured indicator that will turn blue with a base (our baking powder) or pink with an acid (our lemon juice).

Preparation

You will need an indicator, a solution of sodium bicarbonate (baking powder), a solution of lemon juice, vials to put them in and droppers to mix the liquids during the game. A whiteboard and some colored markers are also helpful for explaining the results.

Infection solution: approx. 4mg of sodium bicarbonate (baking powder) in 50 ml of water

Vaccine solution: Lemon juice.

Indicator: Take one leaf of red cabbage and put it in a food processor with approx. 2 cups of water. Blend it until the water turns purple. Strain out the left over bits of cabbage and put the liquid in the fridge.

NB the indicator is best used within 2 days and should be kept in the fridge as it will give off a strong smell!

Other components needed:

- Pasteur pipettes or droppers (at least 5 for the children, 1 for the infection liquid, 1 for the vaccine liquid and 1 for the indicator)
- Clear plastic vials, at least 8-10ml ml. You will need at least five for the game.
- White boards with red, black and blue markers.
- A bucket for dumping waste liquid after each result.
- Tissue paper for cleaning up spills!

Learning Objectives

- What is immune memory?
  - When the immune system sees a germ that it remembers, it can kill it quicker, which prevents.
- What is a vaccine?
  - A bit of germ/bacteria that is given so the immune system is given immune memory.
- What is "herd immunity"
  - Even if not everyone is vaccinated, some vaccinated people can stop the spread of the disease.

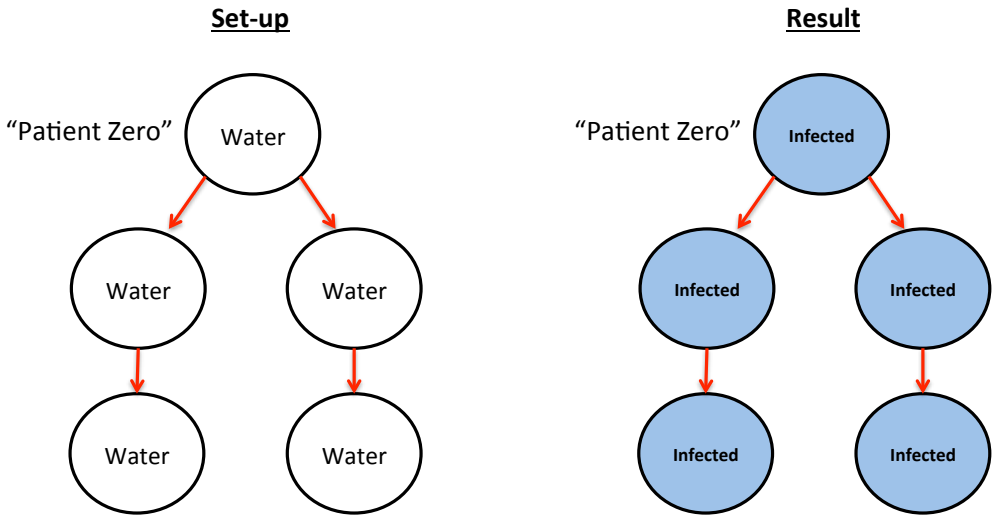
Step 1: Explain the game

Set-up: 1 pre-infected cup, 1 vaccinated cup

- Introduce game, "We are going to show how infection can spread from person to person"
- Show an infected cup of clear liquid (Base) and a non-infected cup of clear liquid (Acid).
- Explain we have an indicator to tell whether it is infected or not. Blue for infection, pink for not infected.
- Add indicator and show the infected and non-infected cup are different colors.

Step 2: Show spread of infection

Set-up: 5 vials of water (~3mL) given to kids. Diagram on white board. Red and blue markers.

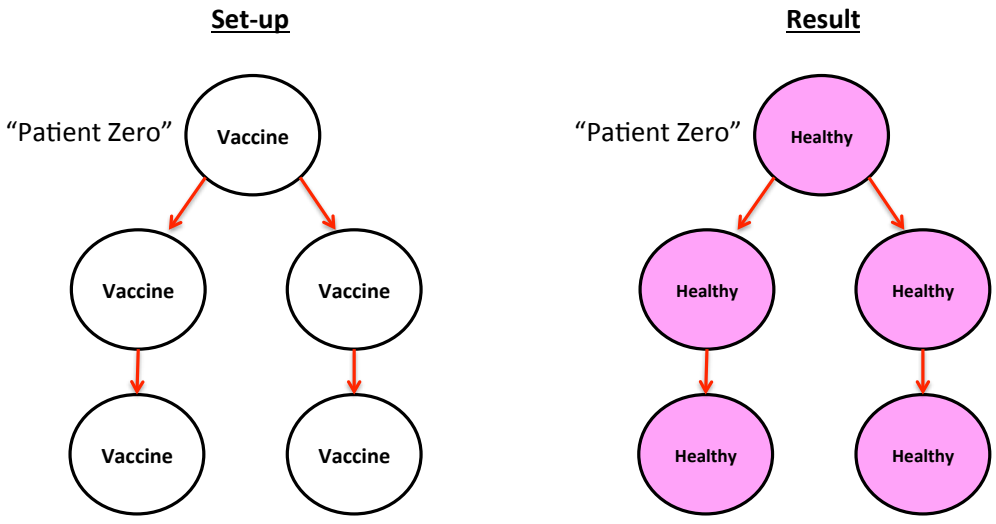


- Ask kids how they think a flu or a cold can spread.
- Explain that a flu can spread by coughing and sneezing. We are replicating this by mixing our vials of water.
- Set up one 2 lines of 2 children with 1 child as the "patient zero" as seen below.
- Give everyone a vial of water.
- Take ~2mL of your Infection solution and add it to the first child in line.
- Liken this mixture to something like sneezing on his friends in school!
- Get the patient zero to take ~2ml (or a Pasteur pipette full) of their vial and add it to the next two children in line, as shown in the diagram below.
- Tell the two children to mix there vials and take ~ 2ml of liquid and pass it back to the next in line.
- Explain to the children that no-one has received a vaccine, and everyone has come in contact with this disease for the first time. Who do they think is infected?
- Add the indicator (ask for a helper) to each vial and give a brief explanation on how it spreads and mark the infections on diagram (above).

This is to show that if encountering a bacteria for the first time, without a vaccine, a disease can spread.

Step 2: Show how a vaccine can stop the spread of infection.

Set-up: 5 vials of water. Diagram on white board. Red and blue markers.



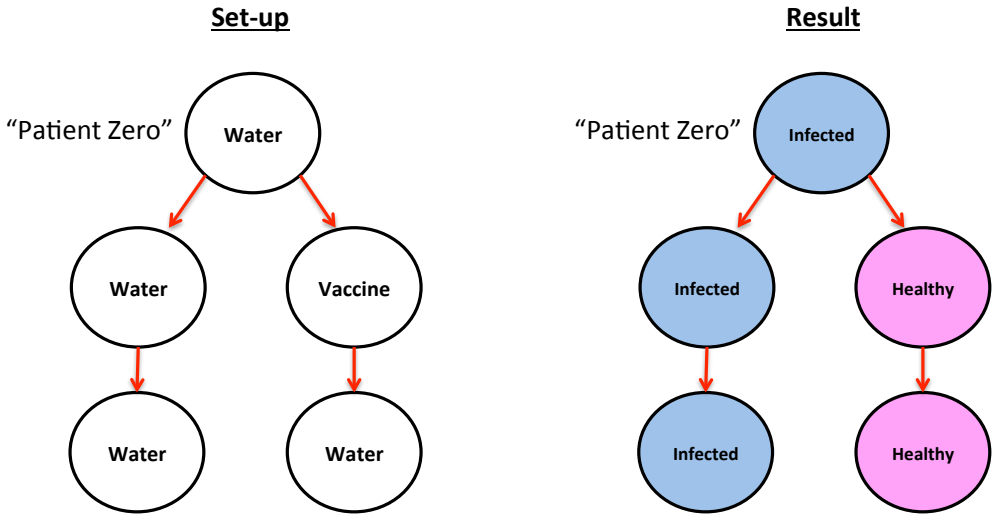
- Explain how a vaccine can stop the spread of infection. By giving immune memory you can stop the bug/bacteria from causing the cold or flu.
- After setting up the lines of children and giving them water. Give each child ~2.5 ml of your "vaccine"

- Take ~2mL of your Infection solution and add it to the **patient zero**.
- Get the patient zero to take ~2ml (or a Pasteur pipette full) of their vial and add it to the next two children in line, as shown in the diagram.
- Tell the two children to mix there vials and take ~ 2ml of liquid and pass it back to the next in line.
- Explain to the children that everyone has received a vaccine. Who do they think is infected?
- Add the indicator to each vial and give a brief explanation on how it spreads and mark the infections on diagram (above).

This is to show that even if someone is encountering a bacterium for the first time, if they have been vaccinated they will be protected.

Step 3: Show how more vaccinated people can stop the spread of infection. Explain herd immunity.

Set-up: 1 pre-infected cup (Base), 2 cups of vaccine (acid) given to first kids in one of the lines. Diagram on white board. Red and blue markers.



- Ask if less children are vaccinated then what would happen? Why would this happen? Do they think everyone would get sick if only a few were vaccinated?
- Set up one 2 lines of 2 children with 1 child as the "patient zero" as seen above.
- Give ~ 2.5ml of vaccine to the one child as shown in the diagram.
- Take ~2mL of your Infection solution and add it to the **patient zero**.
- Get the patient zero to take ~2ml (or a Pasteur pipette full) of their vial and add it to the next two children in line, as shown in the diagram.
- Tell the two children to mix there vials and take ~ 2ml of liquid and pass it back to the next in line.

- Explain to the children that everyone has received a vaccine. Who do they think is infected?
- Add the indicator to each vial and give a brief explanation on herd immunity and mark the infections on diagram (above).

This will show that herd immunity can protect un-vaccinated individuals by curbing the spread of disease.