Viruses & Your Immune System

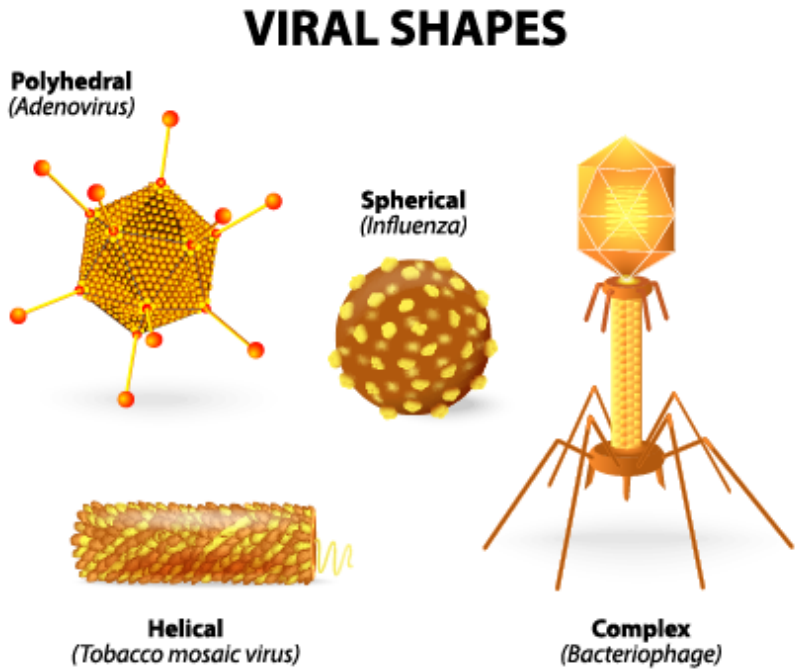
What do you know? (Write in your journal)

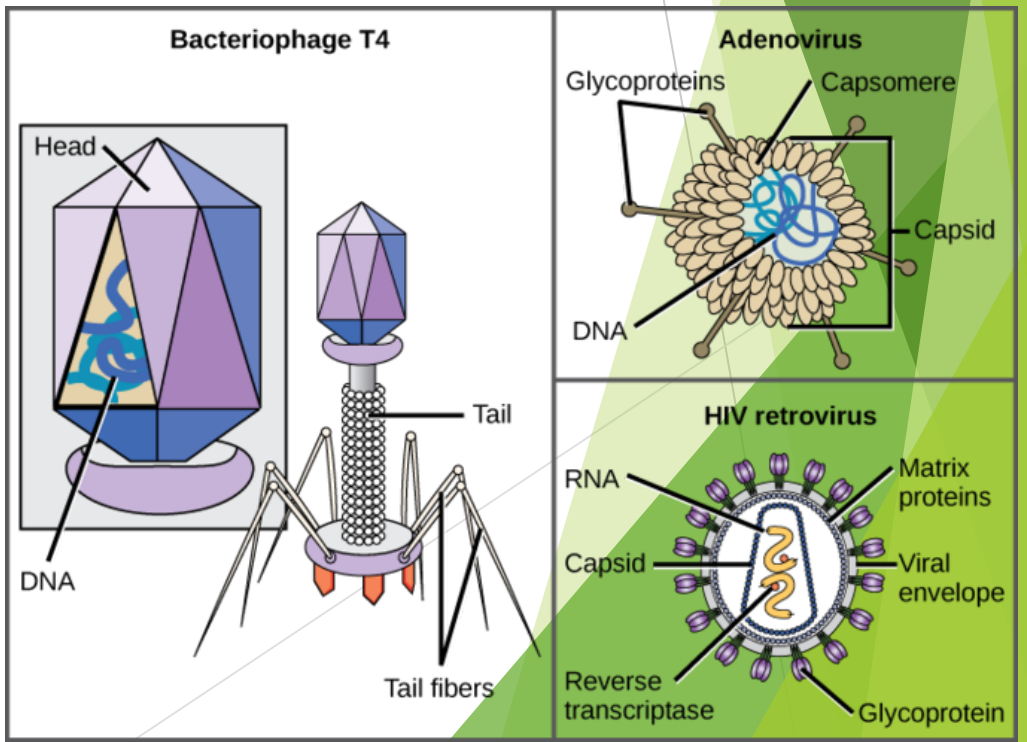
- How did the video make you feel?
- What do you know about viruses and diseases?
- How do they look?
- How do they Spread?
- How does our body fight them?

What are Viruses?

Alive or Not?

- ✓ Respond to Environment
- ✓ Need Energy
- ✓ Grow
- ✓ Reproduce
- ✓ Gets rid of waste



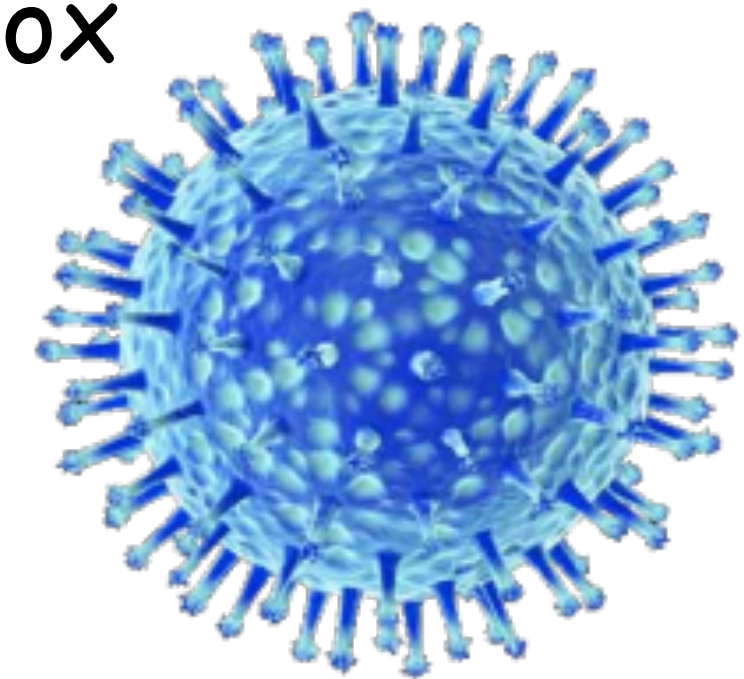


What do they do in our bodies?

What are some different types of viruses?

- Cold Virus
- Small Pox
- Chicken Pox
- Ebola
- Flu

What are viruses you know of?



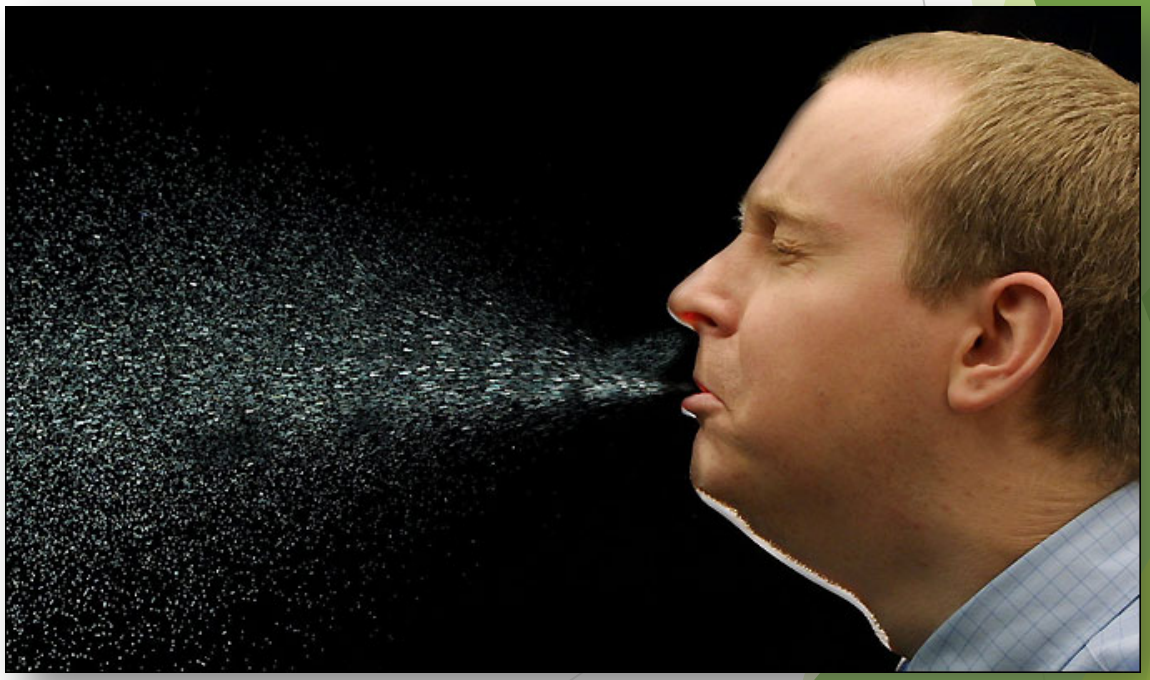
How do pathogens spread?

Come up with your own ideas

How do pathogens spread?

Direct contact: Hand shaking or sharing body fluid

Indirect contact: coughing or sneezing



How do pathogens spread?

Ingestion: Eating food or drinking water that is contaminated with pathogens

Animal bites: What is in animal's mouth would go directly into you

Homework

Take notes on your virus and find out at least 8 facts about your virus. Please write down your sources and how you used your source

Ex.
https://www.aids.gov - Basic understanding and information
http://www.avert.org/origin-hiv-aids.htm - History

Possible things to look for:

- What is your virus?
- What does it looks like?
- How it spreads
- What are some symptoms?
- Where did the virus originate?
- What are some treatments?

Check in will be done tomorrow on your progress!

Links to get you started
http://www.cdc.gov/DiseasesConditions/az/a.html
http://www.phac-aspc.gc.ca/id-mi/index-eng.php

Check-in! (3min each)

Share with your partner your findings

ANSWER on your own:

What can you do to improve your project?

What else would you like to research?

What will I finish tonight?

We Fight Using Our Immune System

The immune system protects your body against invasive pathogens (bacteria, virus, parasites, etc)

Pathogens are organisms OR substances that cause disease

Antigens are the outer surface molecules of each pathogens. They triggers your immune system to go on red alert

First line of defense

This is our body trying to stop the pathogen from getting inside our body in the first place

First line of defense

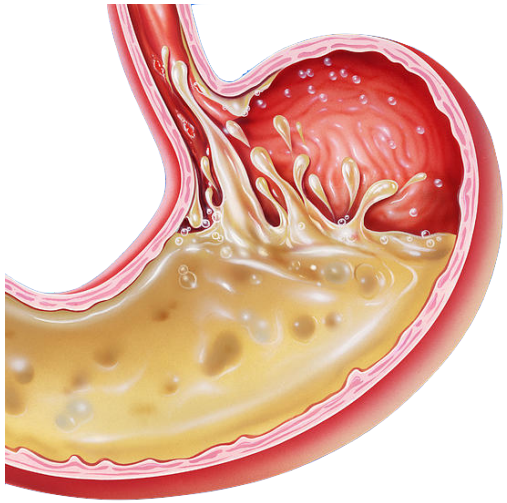
Sweat and oil on our body keep our skin slightly acidic. This prevents the bacteria from growing on our skin.

Sweat also produces molecules called lysozymes that kill bacteria

First line of defense

Your saliva also has lysozyme too.
If bacteria escape the saliva and enter the body, our stomach acid is waiting for them

Hair and mucus in our nasal cavity also trap bacteria, so they can't go inside



Second line of defense

Second line of defense activates after pathogens got inside our body.

There are two types of second line of defense

- Innate immune response
- Acquired immune response

Innate immune response

Innate immune response is quick and general (non-specific) response carried out by white blood cells called phagocytes

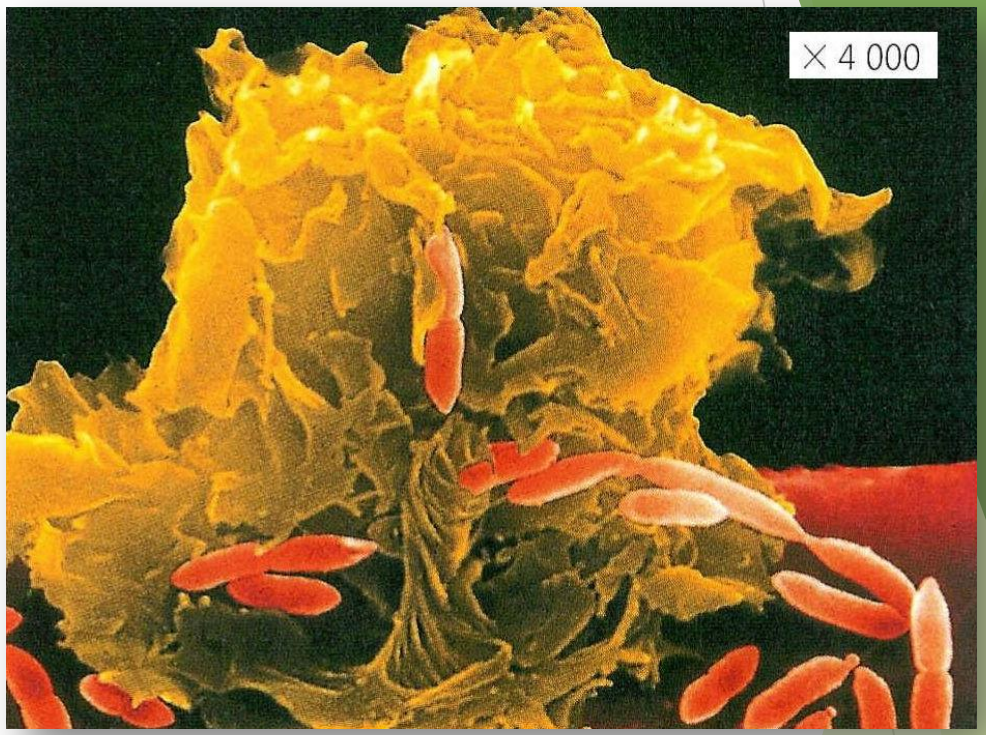
What is a phagocyte?

First, the blood containing millions of white blood cells is sent to the site of the infection.

This causes swelling, fever, and inflammation

Innate immune response

The phagocytes
will swallow and destroy
the pathogens.



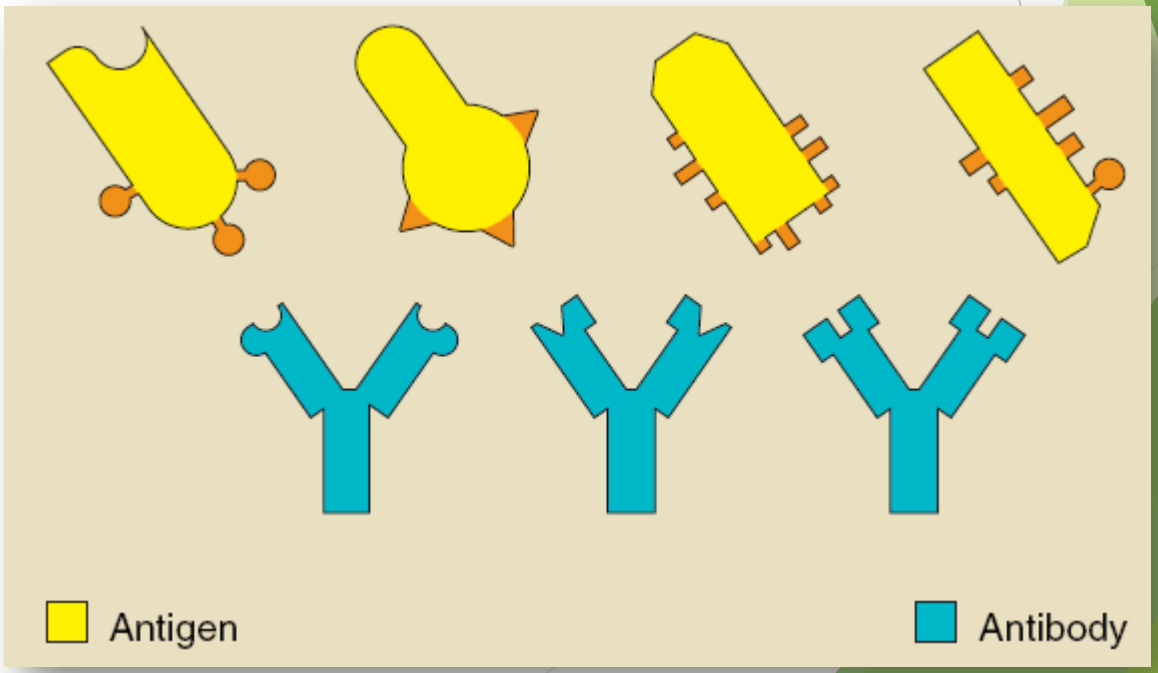
Innate immune response is
not perfect.

What do you think can make it harder to catch the pathogens?

Acquired immune response

Acquired immune response is a more specific response

Special type of white blood cells called “B cells” study the antigen of the pathogen. Then, they try to come up with the antibody that fits the antigen perfectly.

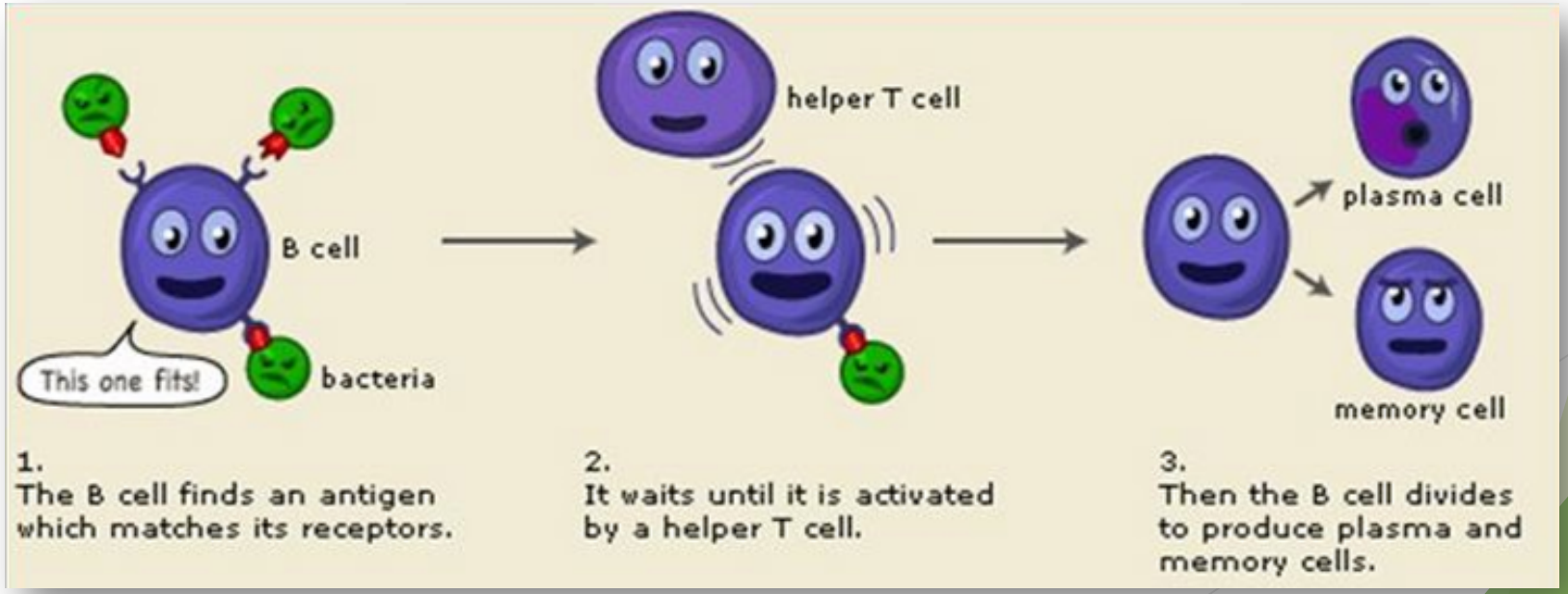


Acquired immune response

Once the B cells figured out the right antibody, they wait.

They need helper T cells to activate them.

Once activated, the B cells split into 2 different kinds of cells: plasma cells and memory cells.



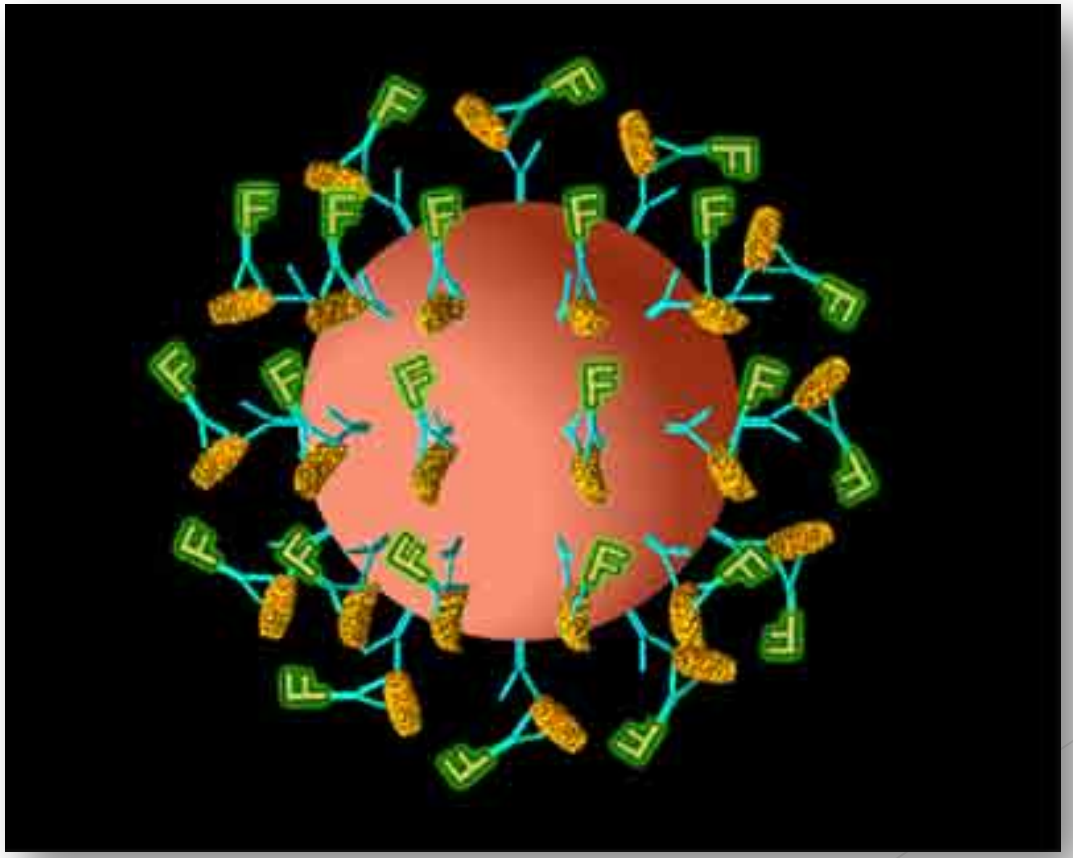
Acquired immune response

Plasma cells are in charge of making antibodies. They produce billions of antibodies and flood the bloodstream with them.

Antibodies will travel the bloodstream and attach onto their target antigens (of the pathogens)

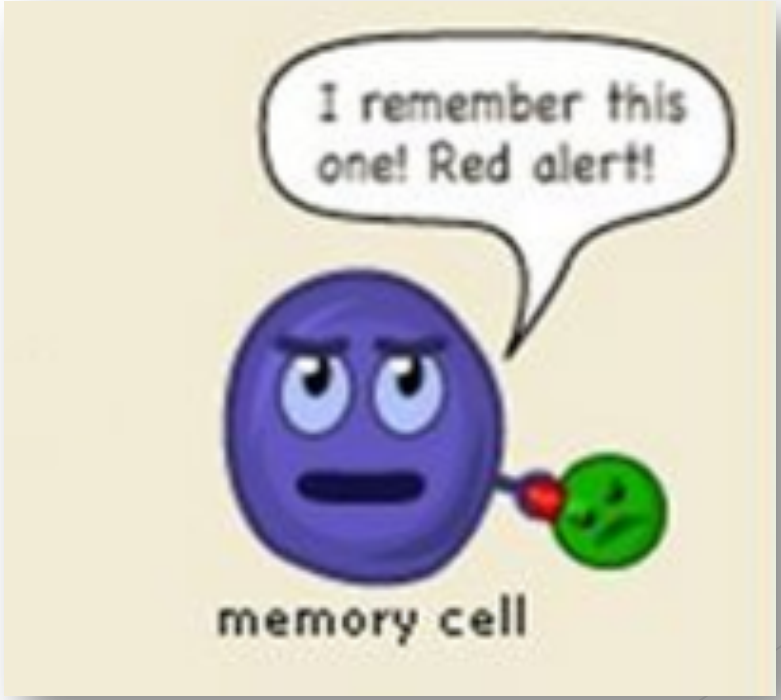
Acquired immune response

Once the target pathogen is covered with antibodies,
it becomes much easier for the phagocytes to swallow them.



Acquired immune response

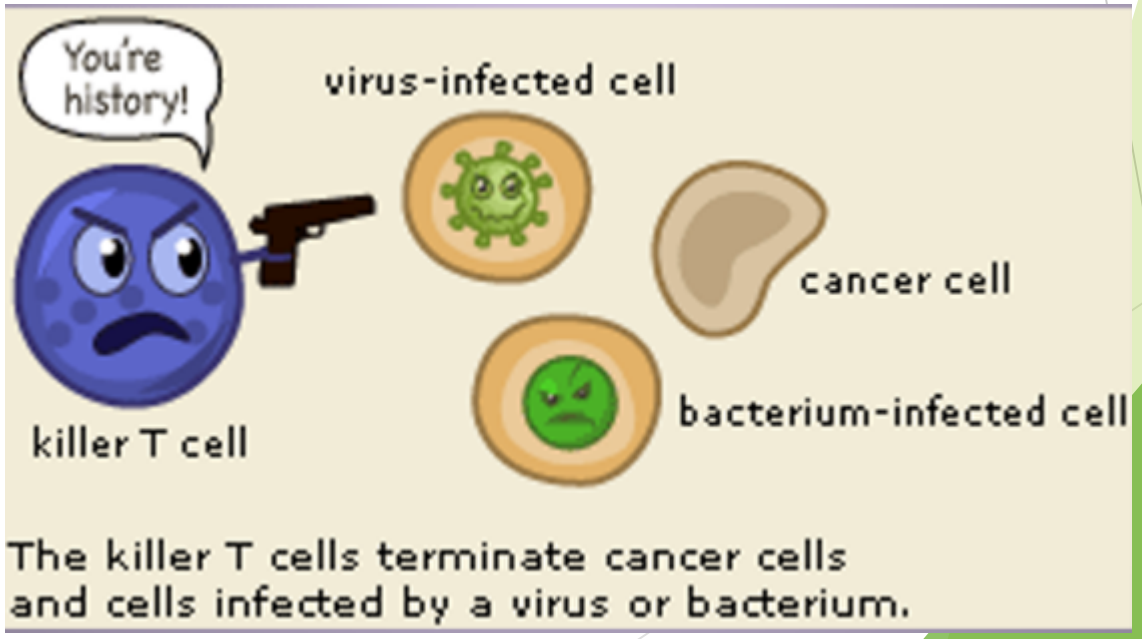
Memory cells are in charge of remembering the intruder. Therefore, next time you are infected with the same pathogen, B cells do not have to spend time designing an antibody.



Acquired immune response

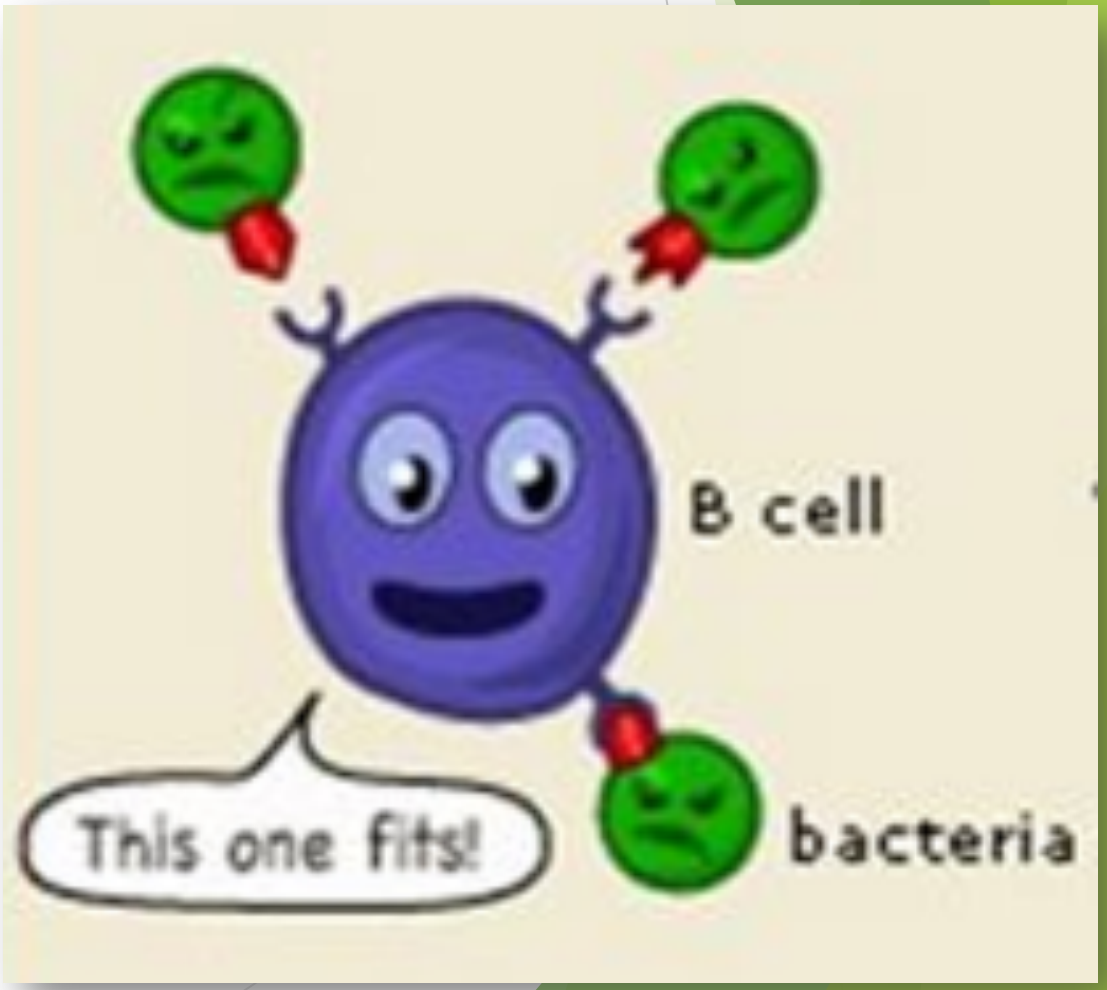
What about our own cells that have already been infected? (e.g. turned into virus filled cells due to the viral DNA).

We have a special type of white blood cell called killer T cells to kill our own infected cells.



Our immune system has a small problem

Do you remember that B cells needed time to design an antibody?



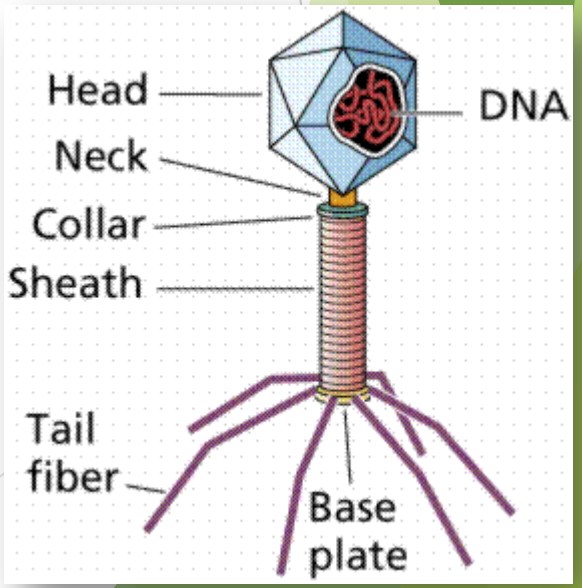
What if the pathogen manages to kill you before the B cell can come up with an antibody?

How can you buy your immune system more time?

Vaccine

We said that virus is made of protective protein coat with DNA inside.

What if that DNA was removed, and we put a lot of “blank” virus into our body?



Vaccinations

Vaccines are weakened or dead pathogens given to people.

In your phagocyte's point of view, it doesn't care whether The empty shell is dangerous or not.

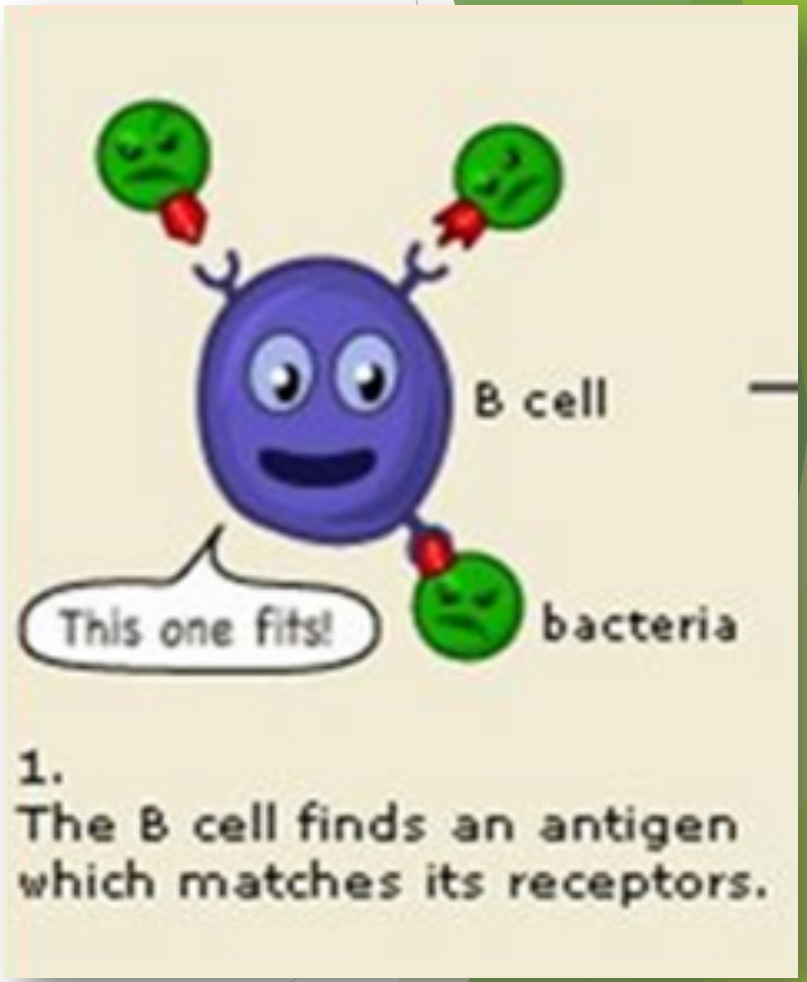
All it knows is that it "feels" different from your own cells when it touches them!

Vaccinations

Therefore, your immune system (B cells specifically) will start developing antibodies against these empty shells as if they were real viruses.

Which Cells Produce the Antibodies?

You will also make memory cells in the process!

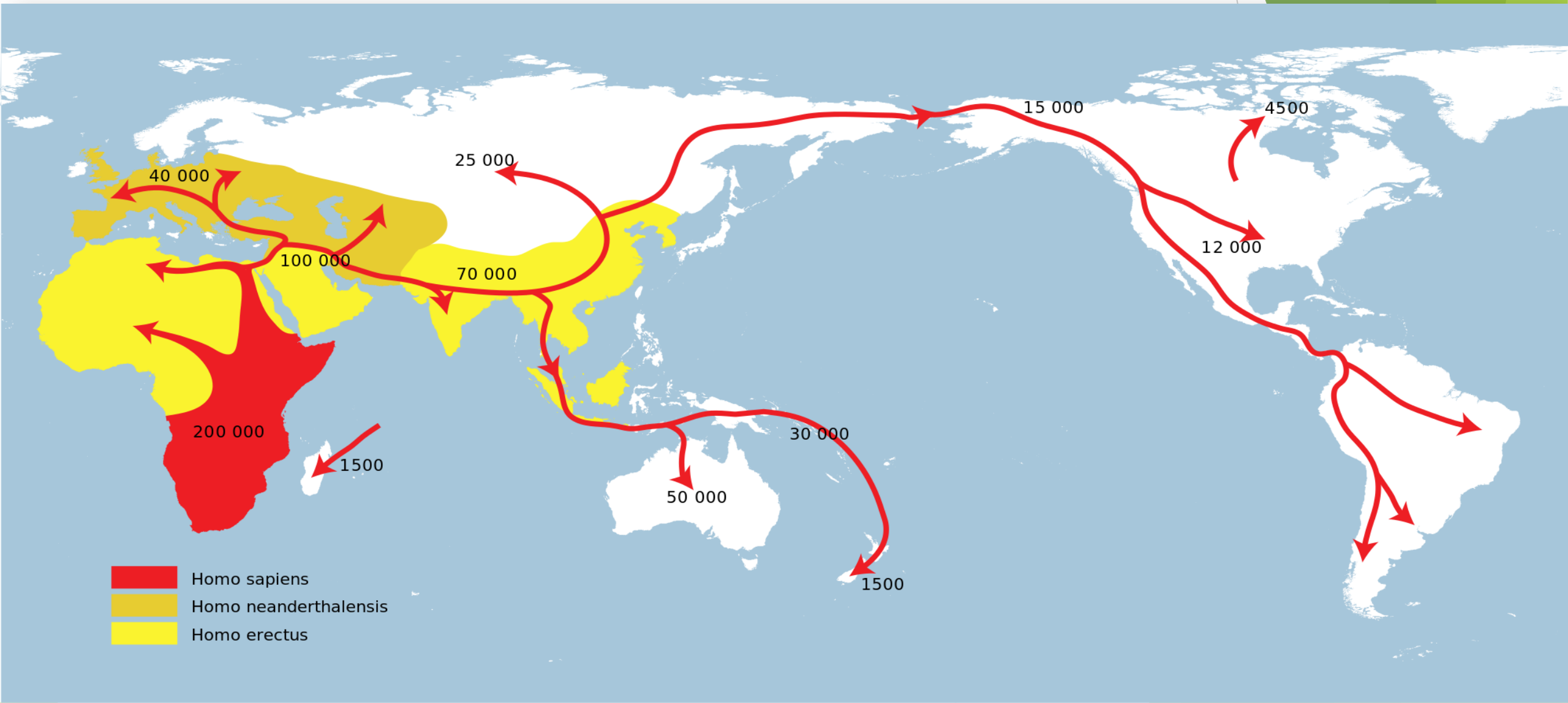


Vaccinations

When the REAL virus enters your body later, it is basically round two for your body.

Vaccinations

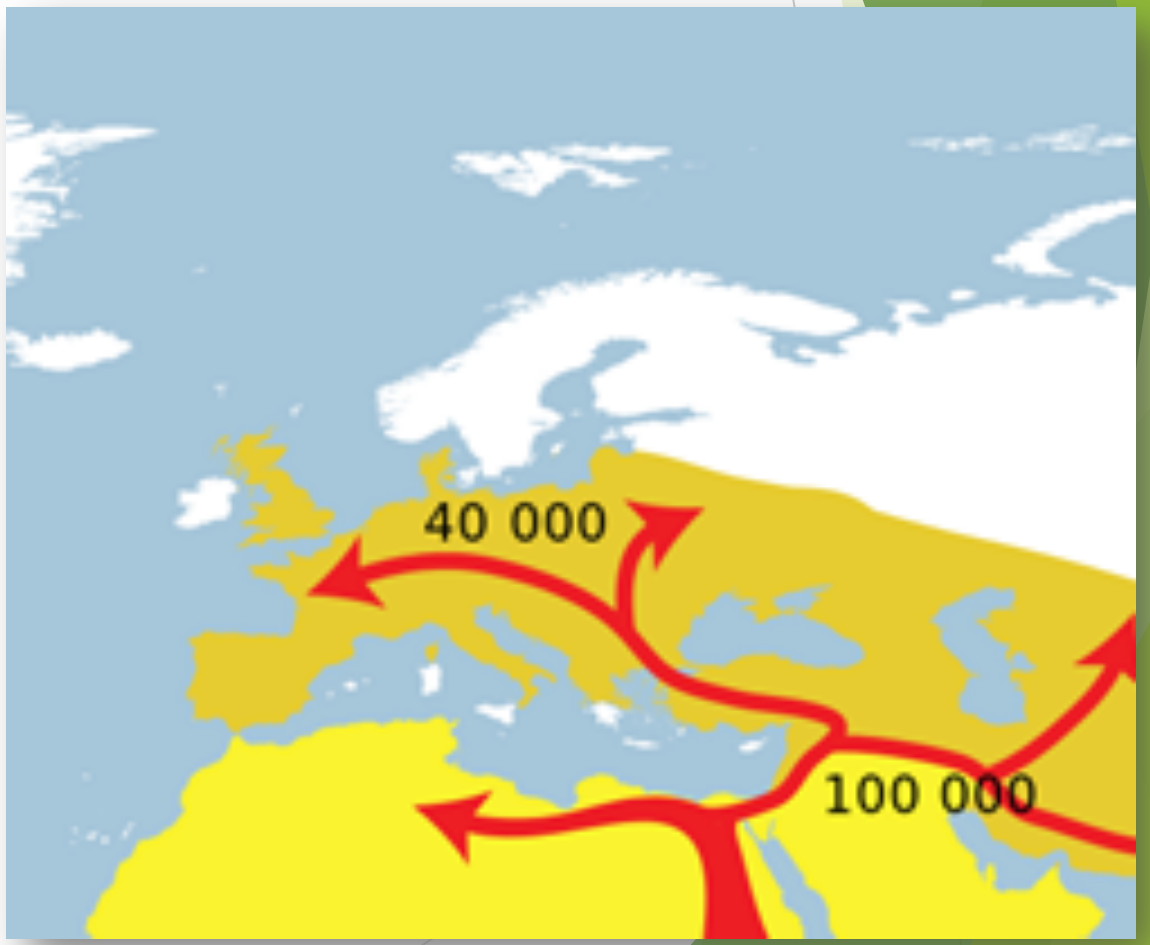
Now, consider this.



Vaccinations

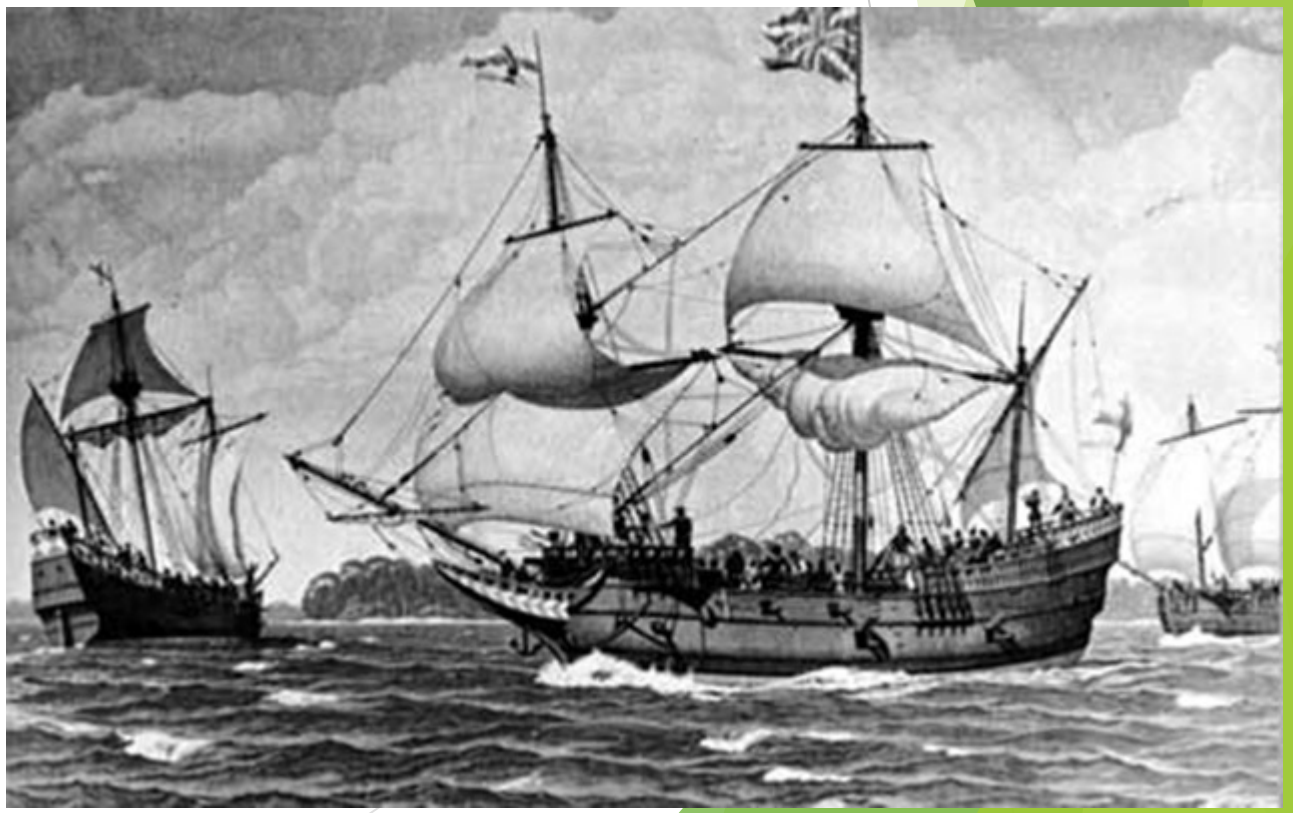
Population in Europe lived with European disease for thousands of years.

Europeans were exposed to European disease for a long time, and their body got used to fighting against these disease.



Vaccinations

What do you think will happen when Europeans first came to America? What if some of them were ill and brought disease with them?



Vaccinations

The Aboriginal people in Canada were never exposed to European disease before.

This means that their immune system was not ready for fighting against European disease.

If so, what do you think happened in Canada when the European disease first broke out?