

Human physiology

The Immune response and Vaccines 11.1



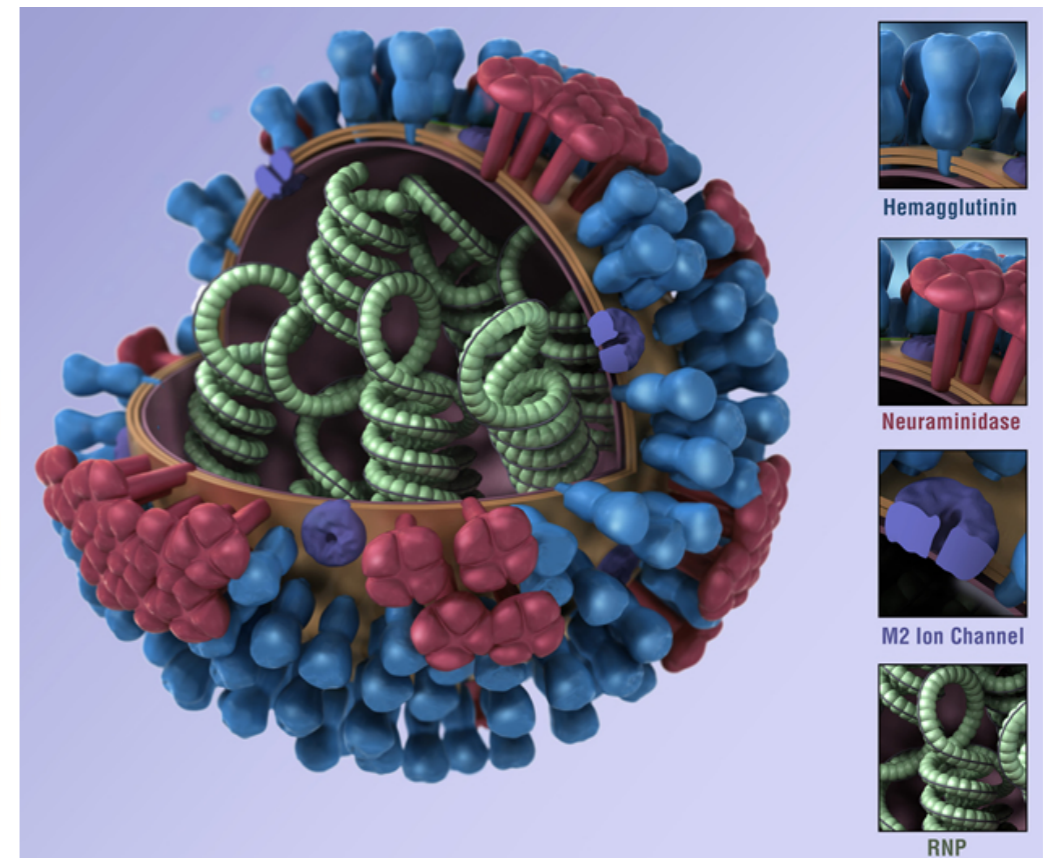
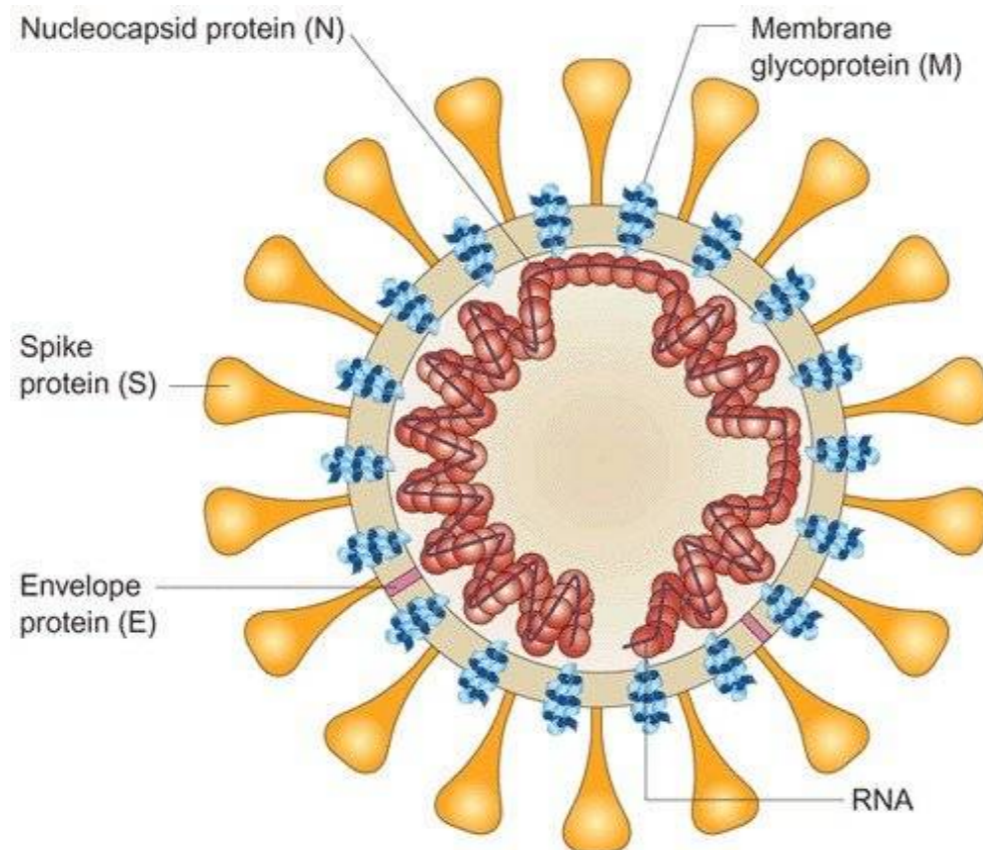


What are Antigens?

- On your white board, explain what an antigen is and give different types.

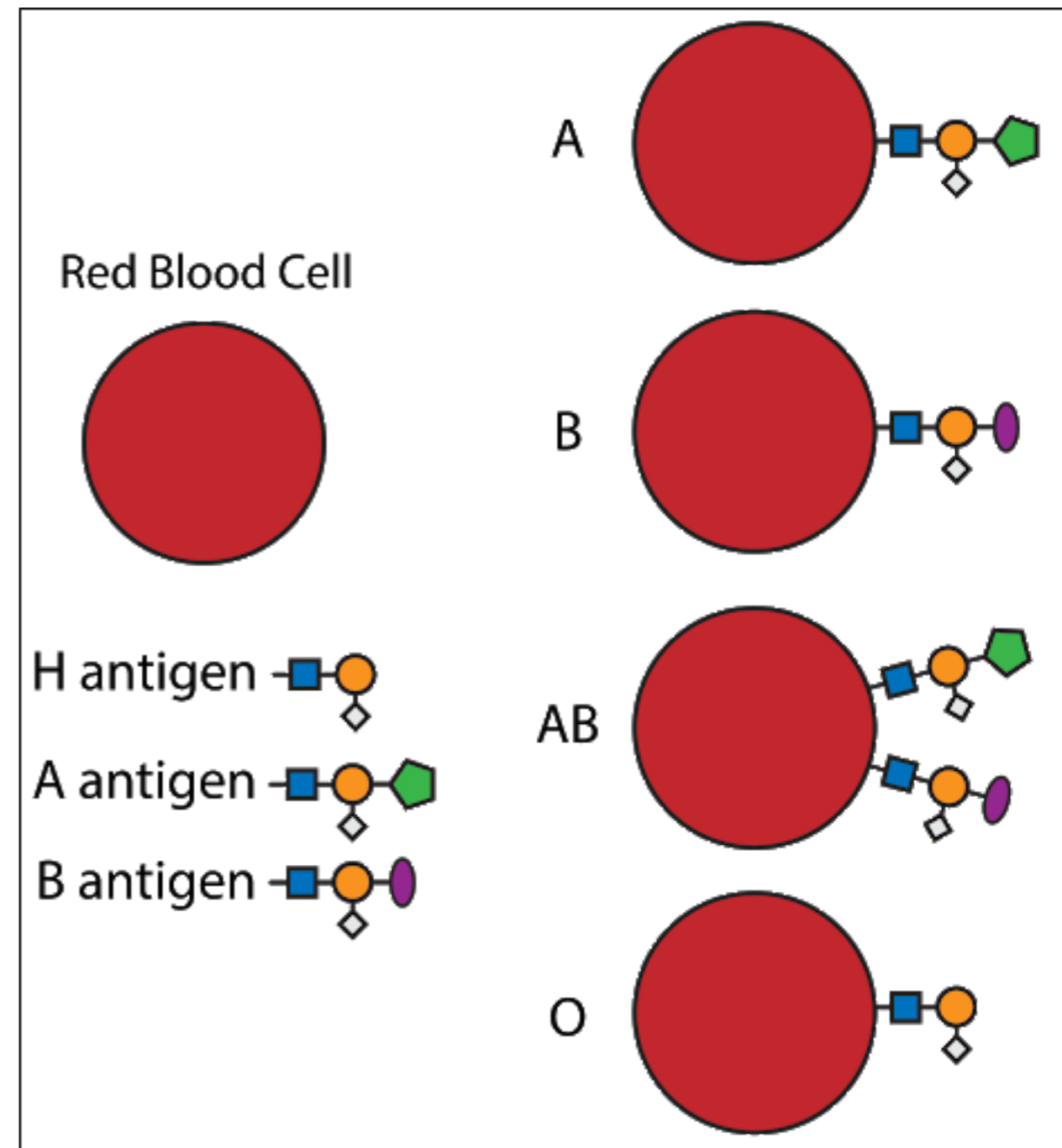
What are Antigens?

- Foreign Bodies that trigger a response?
 - ★ foreign proteins
 - ★ foreign polysaccharides
- Found on Viruses, Bacteria, Foreign cells, donated organs etc..

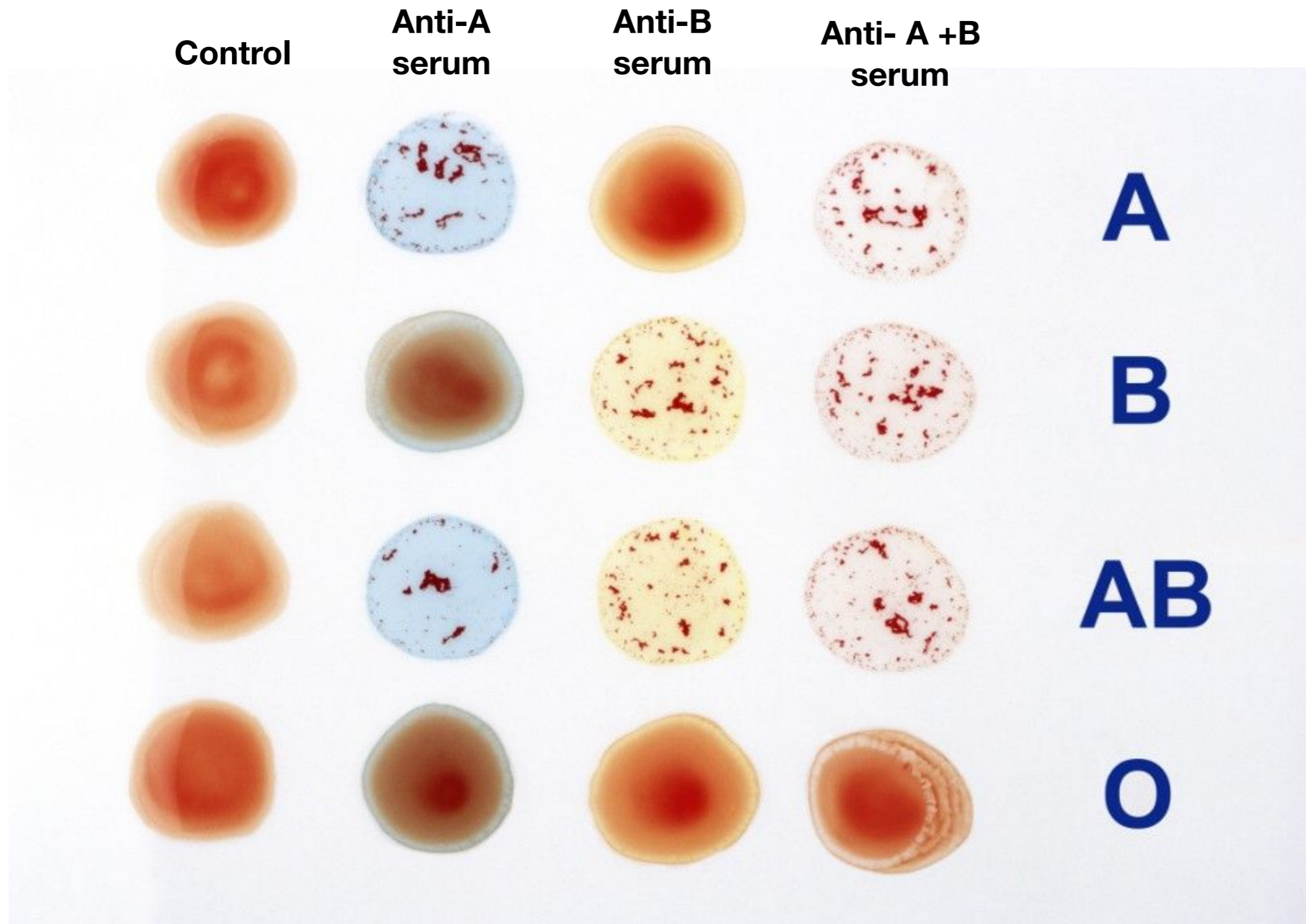


Antigens and Blood Transfusions/Donation?

- Antigens play a role in what blood a patient receives (A,B,O blood groups)
- foreign antigens are rejected by the recipient
- all three alleles involve the same basic antigen structure (H)
- while A and B have added differences (galactose -B, N-acetylgalactosamine - A)
- An incorrect blood type donation results in an agglutination or an immune response by antibodies present in the recipient



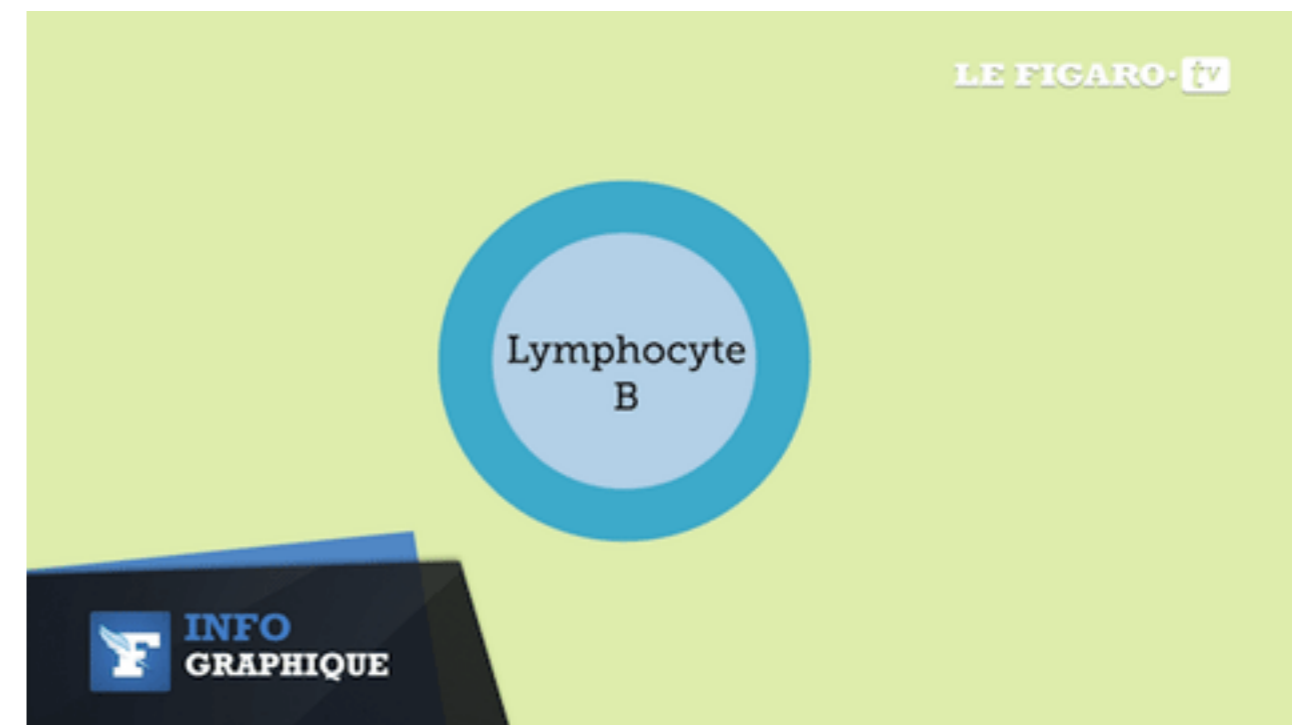
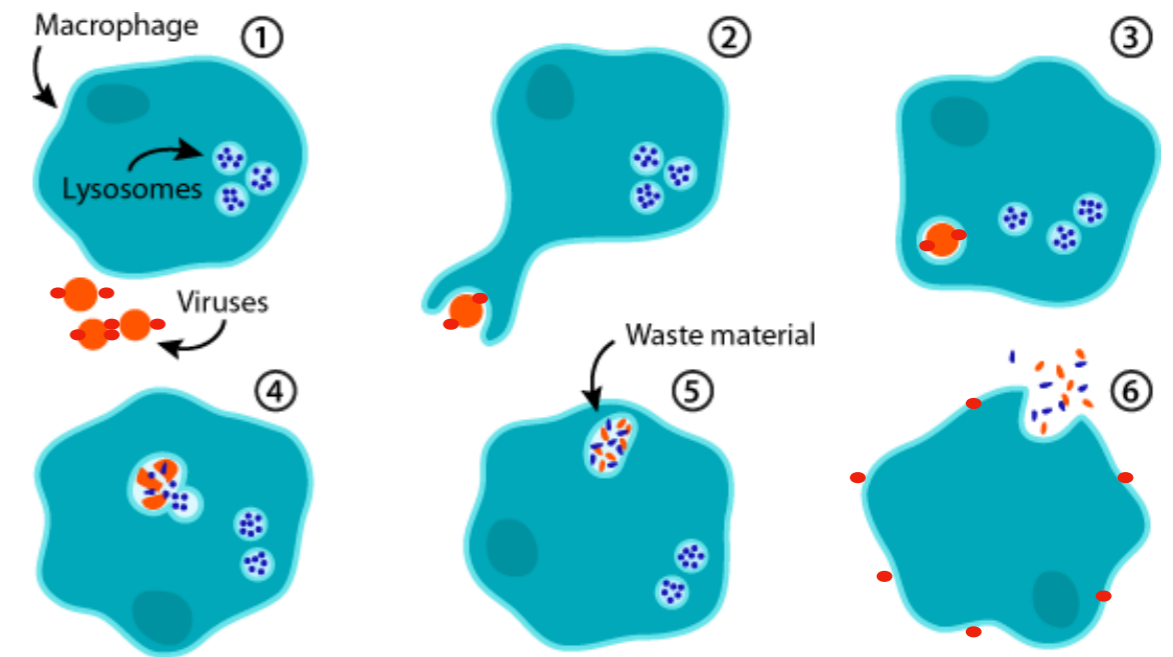
Antigens and Blood Transfusions/Donation?



The Specific Immune Response

“Challenge and Response”

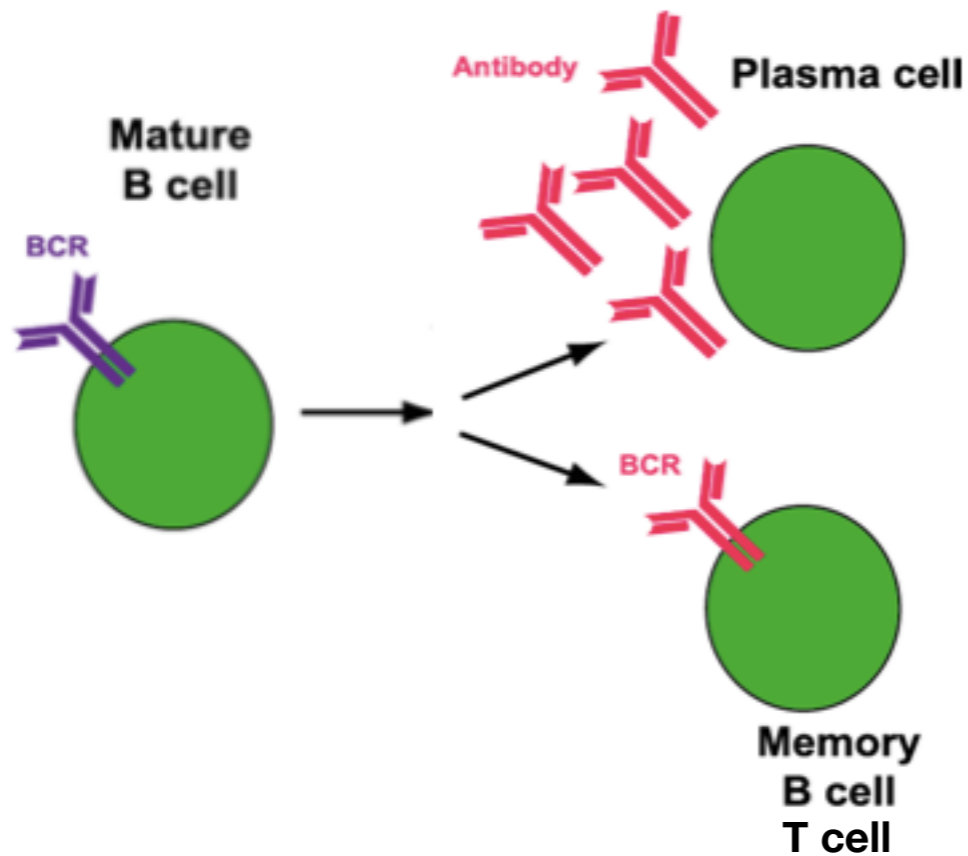
- Macrophage - engulf foreign particles (the challenge) and display their antigens
- T- lymphocytes with the correct receptors bind to the macrophages displayed antigens and are activated to seek and find the antigen specific B-lymphocyte
- only the B- lymphocytes that are specific to this antigen are activated to mature to plasma cells that produce antibodies
- some activated B lymphocytes divide rapidly to stimulate the production of memory cells that provide long term protection against this antigen invader.



The Specific Immune Response

“Challenge and Response”

- plasma cells (activated B cells)
 - produce antigen specific antibodies
 - divide to produce memory cells should the infection return.



- plasma cells have extensive ER to ramp up antibody production

The Specific Immune Response

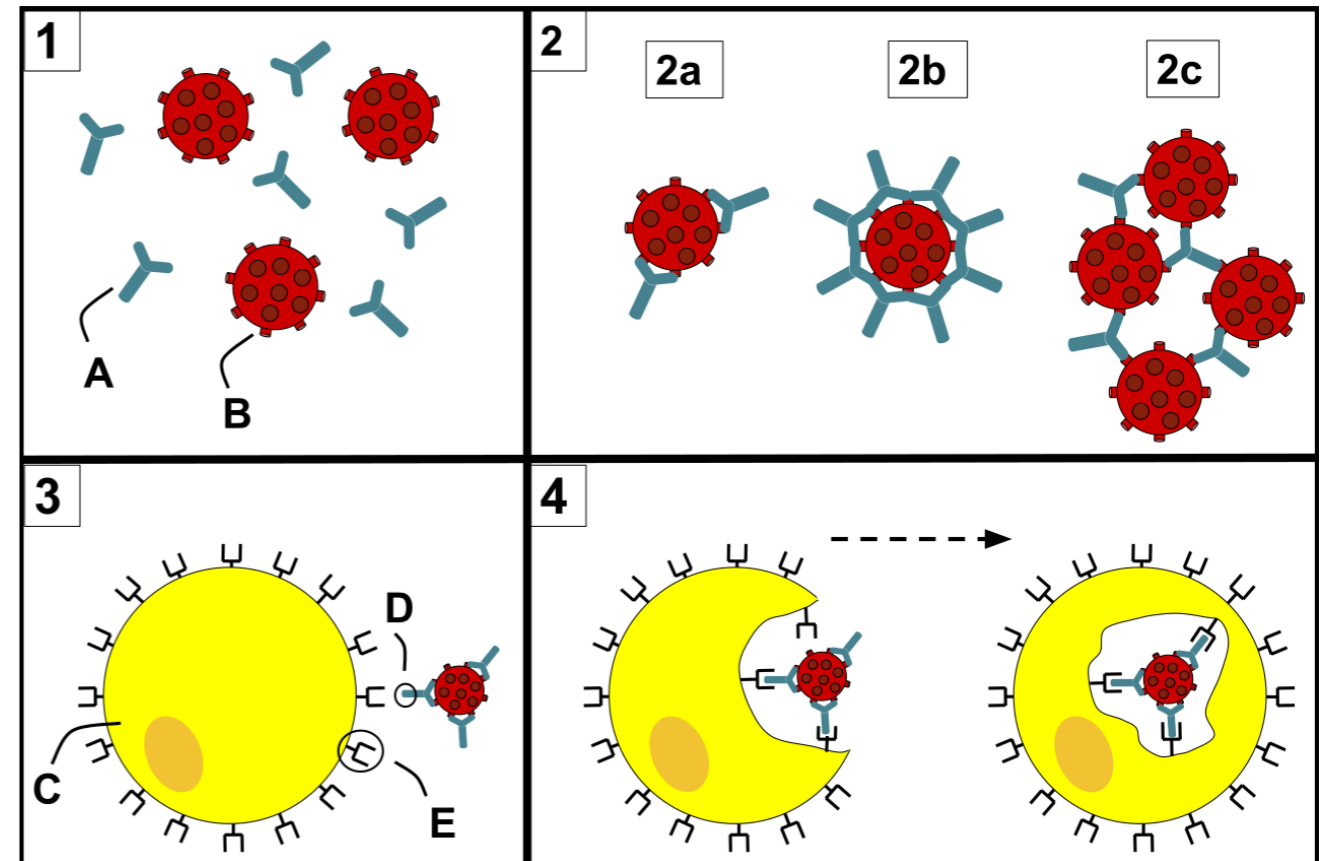
“Challenge and Response”



The Specific Immune Response

“Challenge and Response”

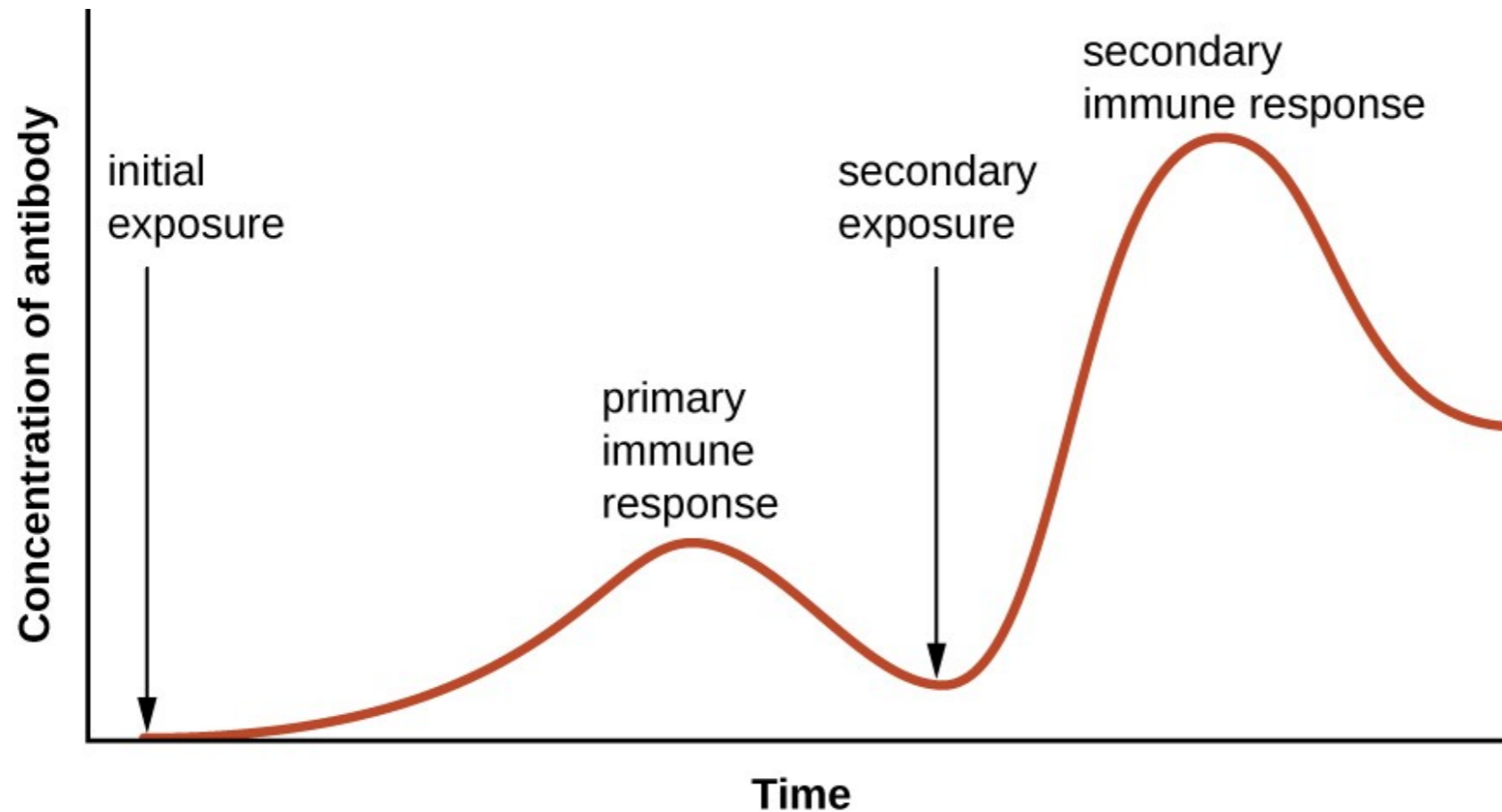
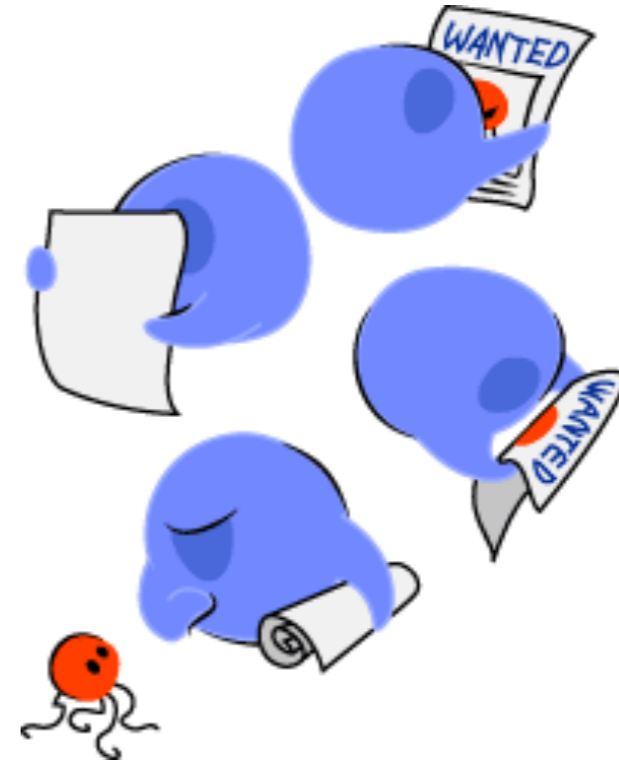
- The antibody
 1. **Opsonizations** - make the pathogen more visible to macrophages
 2. **Neutralize virus or bacteria** to prevent docking on native cells
 3. **Neutralizes toxins** from harming susceptible cells
 4. **Agglutination** - causing large masses to immobilize pathogen which gets phagocytized.
 5. **Activates a compliment** of protein that damage the pathogens membranes



The Specific Immune Response

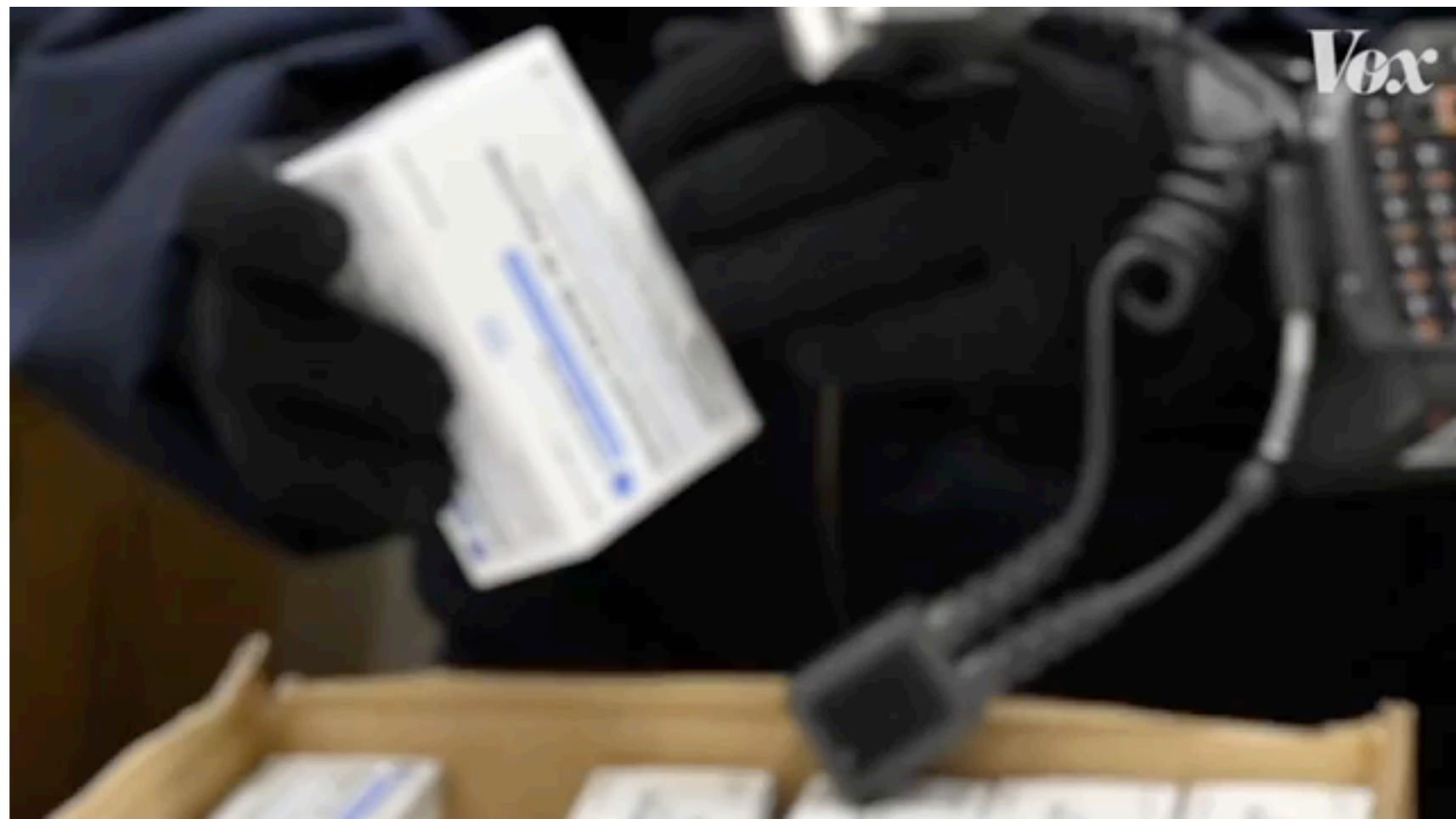
“Challenge and Response”

- Memory cells - provides a rapid and intense response should a second infection occurs



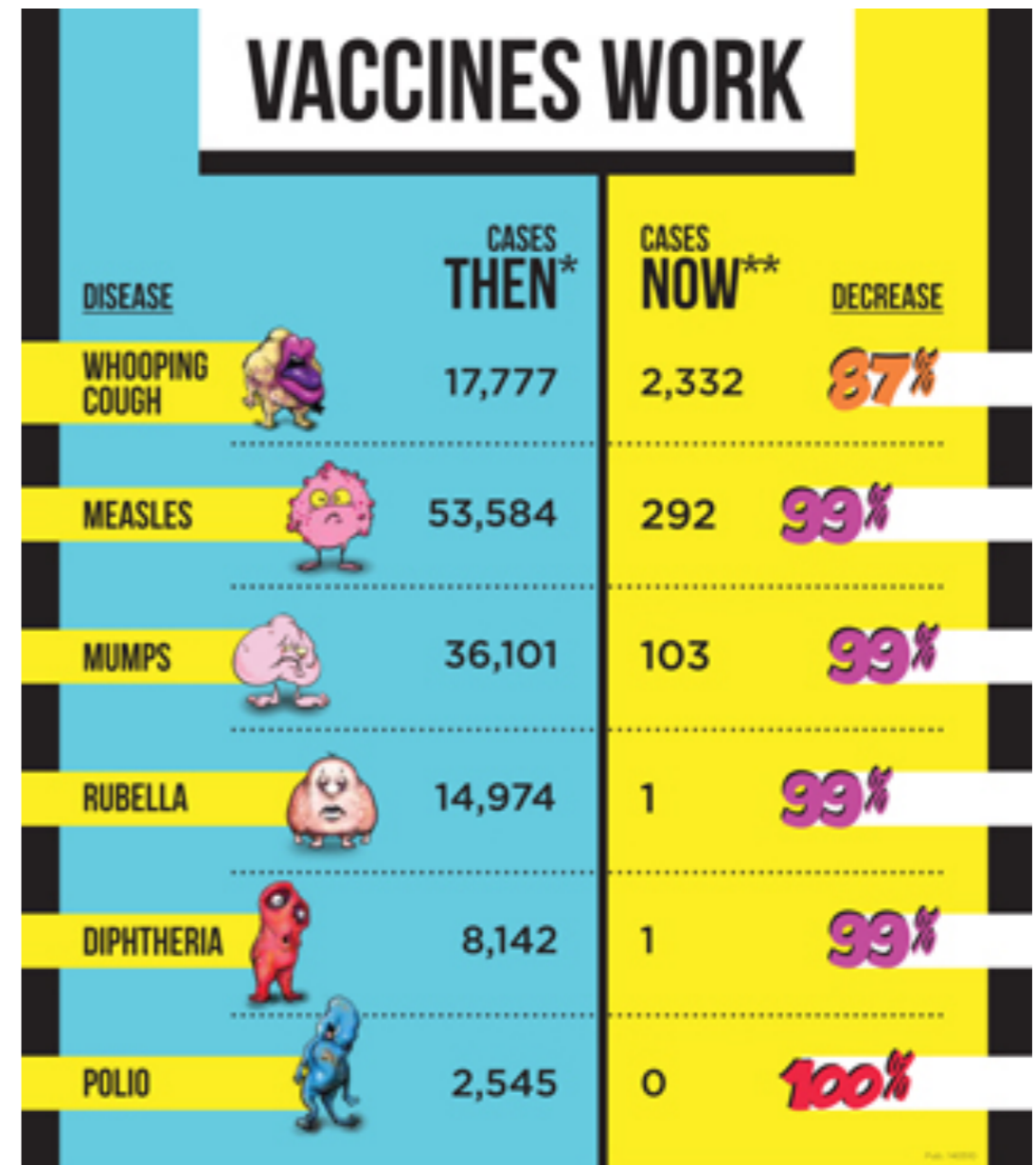
Vaccines and Immunity

- plasma cells (activated B cells)
 - produce antigen specific antibodies
 - divide to produce memory cells should the infection return.



Vaccines Types

- Inactivated Virus/bacteria - *Hepatitis, polio*
- Live-Attenuated Virus/bacteria - *Chicken pox, small pox*
- mRNA - *Covid-19*
- Subunit - *HPV, Shingles*



* Average number of cases reported annually in Canada during the five years before routine vaccine use or the closest possible five years where stable reporting was occurring.
 ** Average number of cases reported annually in Canada from 2011 to 2015.
 Some numbers are subject to change as reports are updated. For details about the data sources and methods, visit Canada.ca/vaccines.

Vaccines con't

- Read analysis of Data related to vaccine programs on page 471-2.
- Work on the Data based question on page 473

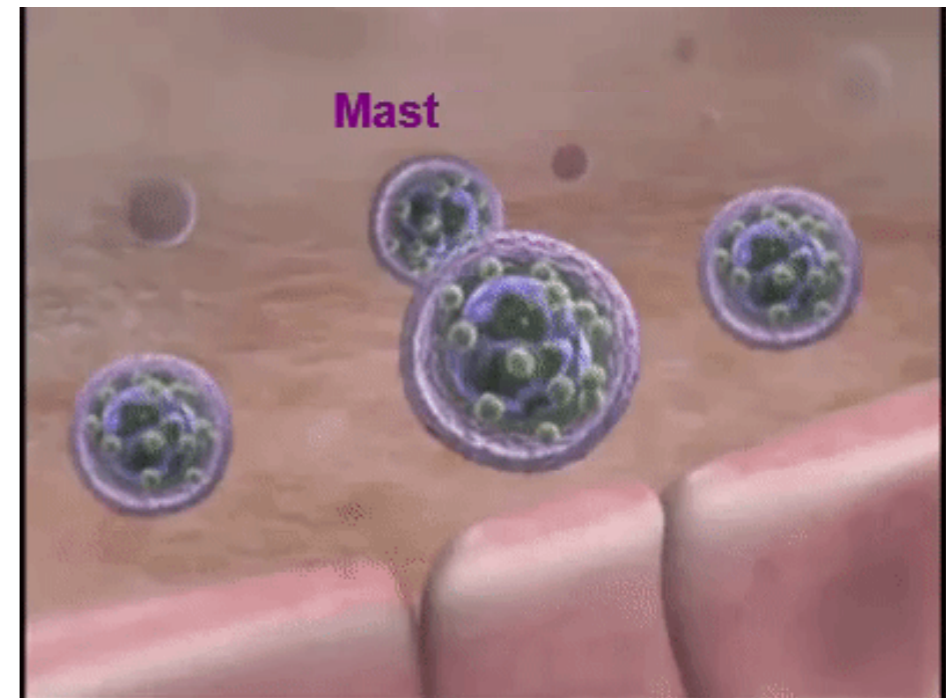
Zoonosis and Pathogens

- Pathogens tend to be species specific in the case of most Viruses
 - eg T-4 and bacteria
 - measles and polio in humans
- Zoonosis is when a pathogen crosses barriers, eg. rabies, Covid -19, bubonic plague, lyme disease, West Nile virus
- Results through close approximation of humans to animals



Histamines

- Are proteins released by mast cells (cells in connective tissue)
- causes dilation and leaking of small blood vessels
- results in more immune components brought to an area
- cause of itching, mucus, inflammation, and allergic rashes



Monoclonal antibodies

- mouse (rabbit is infected with desired antigen)
- mouse immune system (in spleen) will produce plasma cells that will produce the desired antibody
- produce a hybridoma (fusion the plasma cell with myeloma cancer cell)
- culture the desired hybridoma
- culture will produce the desired antibodies

