

SBI3C

Fighting Microbes

It's War!

**From the moment we're born,
It's a 24/7 struggle against microbes.**





Immunity

Innate

- means “from birth”
- defenses we are born with
- proteins & cells

Acquired

- defenses we achieve during our lifetime
- arise from contact and exposure





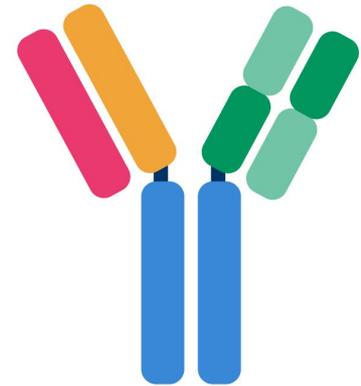
Immunity

Humoral

- proteins in our body fluids, like blood plasma and tears
- **antibodies**

Cell Mediated

- defense responses carried out by our white blood cells (WBC)



WHITE BLOOD CELL

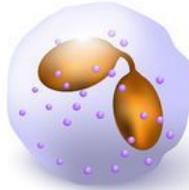
Granulocytes

Neutrophil



(phagocytosing a bacteria and other pathogens)

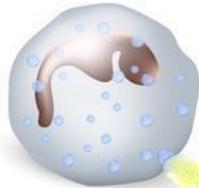
Eosinophil



(control mechanisms associated with allergy)

Basophil

(contain histamine and heparin)



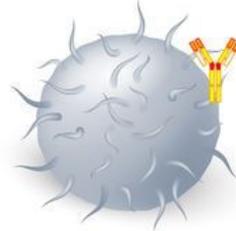
Histamine release from the basophils

Agranulocytes

Monocyte (phagocytosis)



Lymphocyte (secretion of antibodies)



Granular =
have a 'grainy'
cytoplasm

Agranular =
have a clear
cytoplasm



Our Army

Soldiers: Cells

- **Monocytes** and **Neutrophils** attack & destroy
- **Lymphocytes** secrete antibodies
- **Basophils & Eosinophils** handle parasites, allergies

Weapons: Antibodies

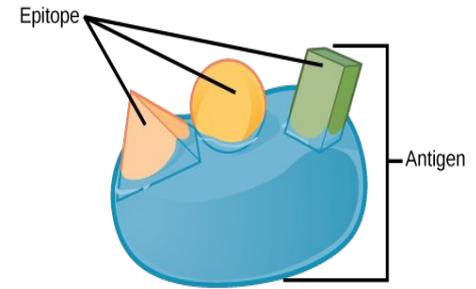
- Y-shaped proteins
- Made in response to an **Antigen**, a protein on a virus or bacterium



Strategy

Antigens

- Macrophages & Neutrophils recognize them as foreign
- They attack, destroy the cell, and pass the antigen to a Lymphocyte

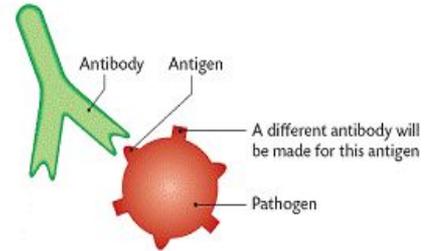


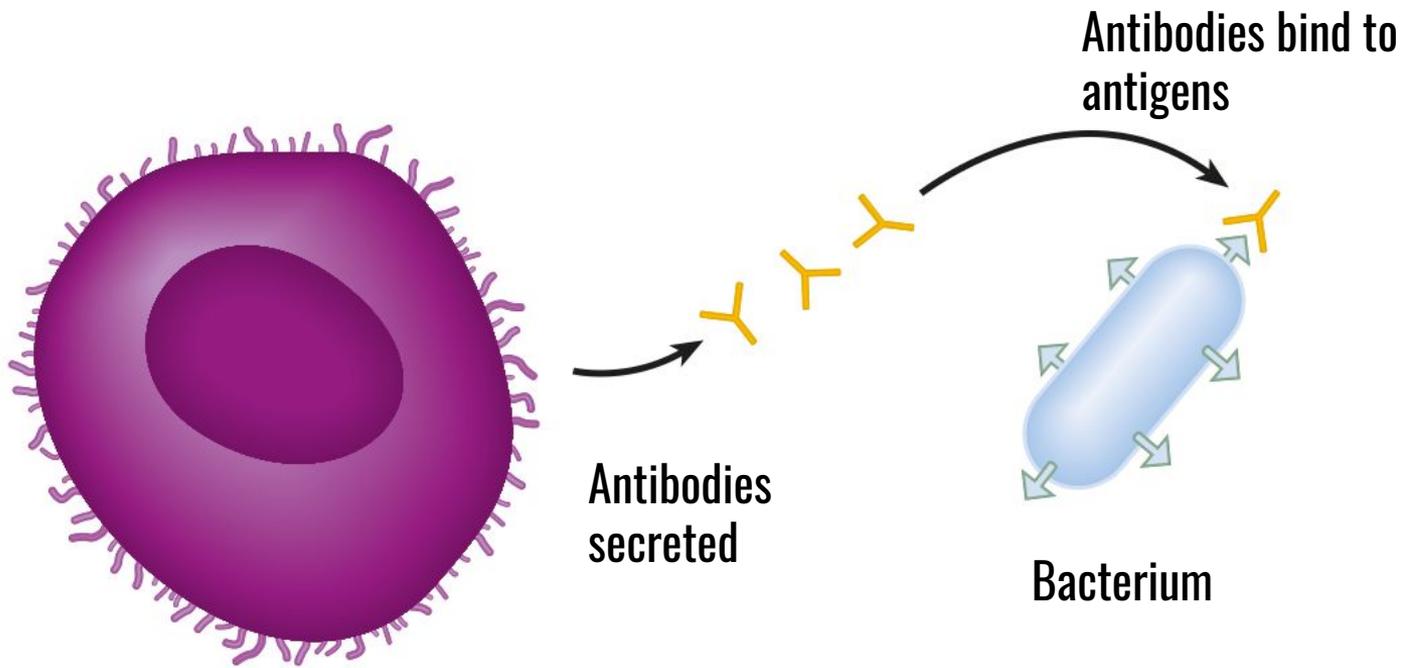


Strategy

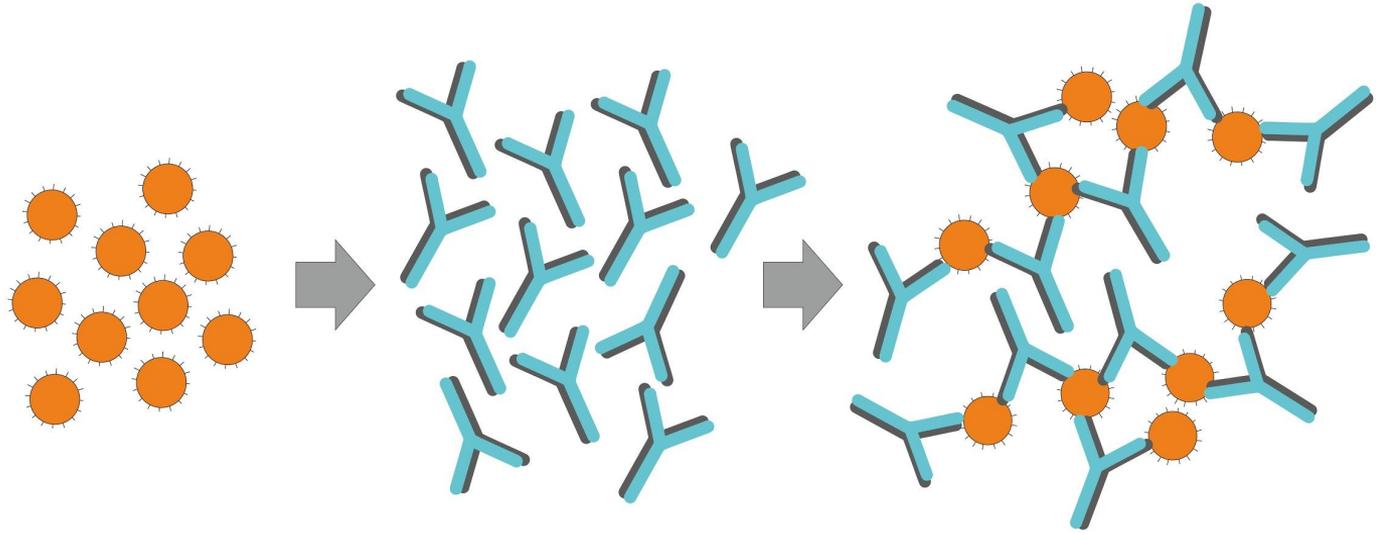
Antibodies

- produced by Lymphocytes based on the shape of the antigen
- Secreted into the blood plasma, they search for microbes and disable them
- It's like a lock & key, or velcro hooks & loops



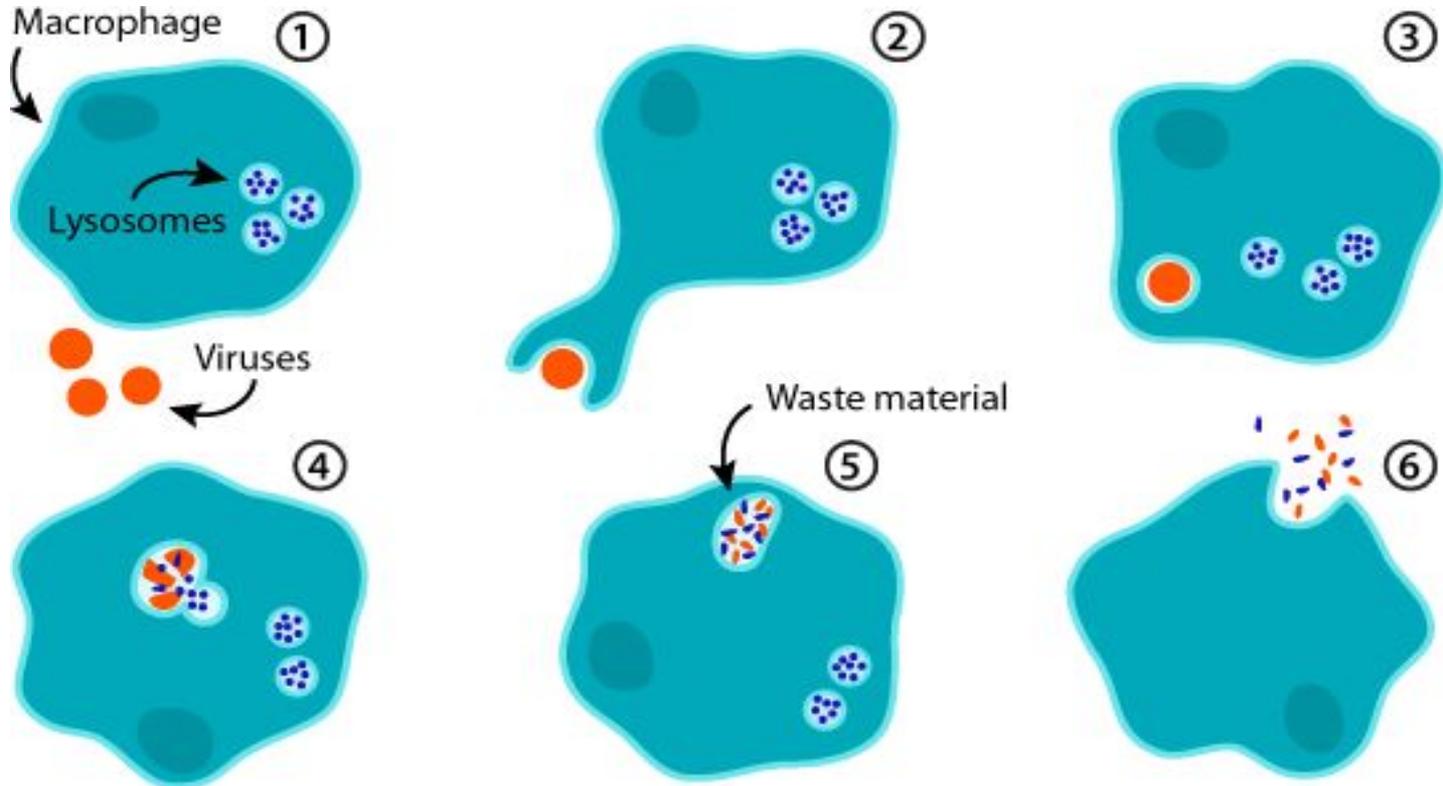


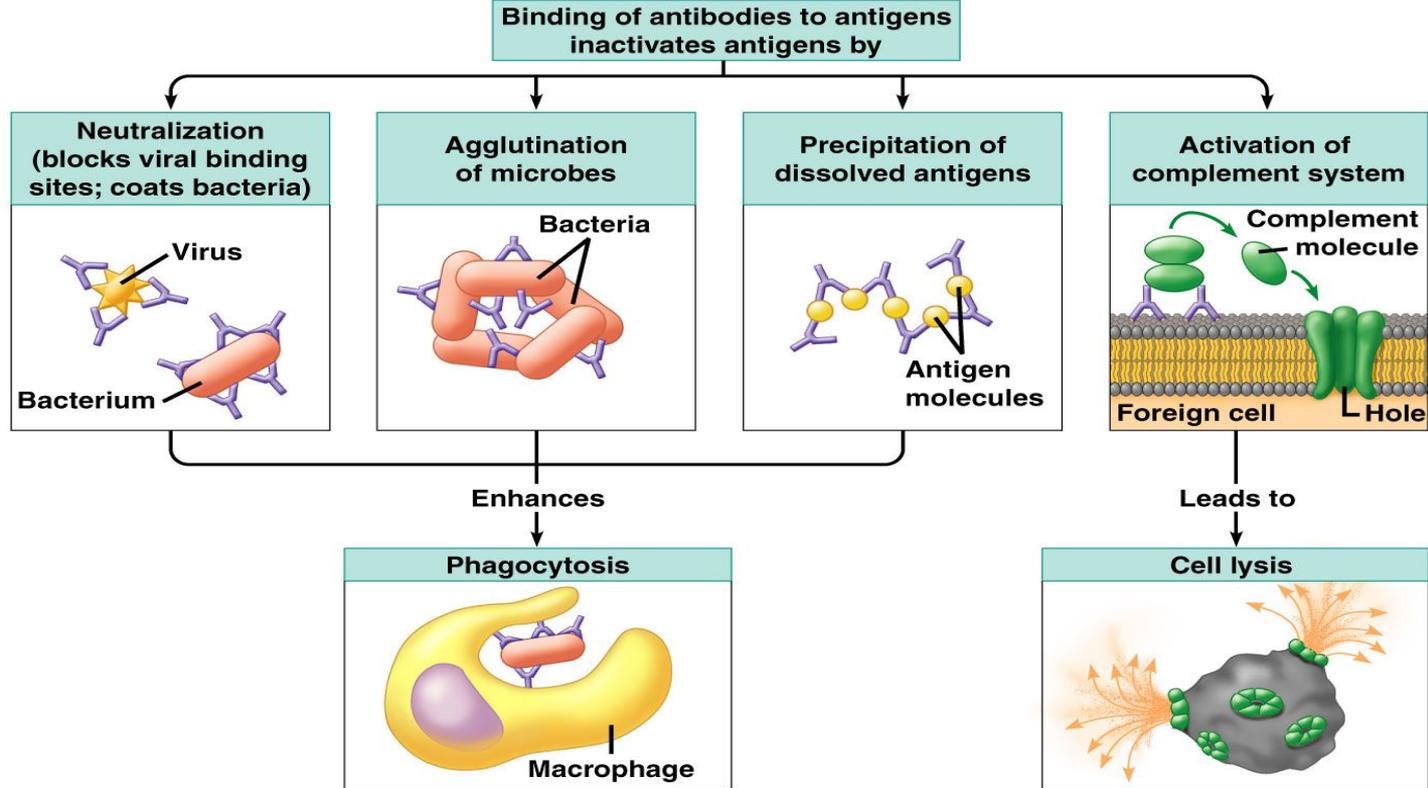
Lymphocyte



Antigen - Antibody binding can lead to **Agglutination**, or clumping of microbes

After the battle, Macrophages “clean up” using phagocytosis







Reinforcements

Antibiotics

- Medicines that fight bacteria and fungi
- Taken orally or intravenously (IV into a vein)

Vaccines

- Solutions containing pieces of a microbe, antigens, or “tamed” attenuated microbes
- Trick our WBC to mount a defence
- Intramuscular injection
- Nasal inhalation

Immunization

- Your body’s response to a vaccine
- Acquired Immunity
- Life long, but some ‘boosters’ needed

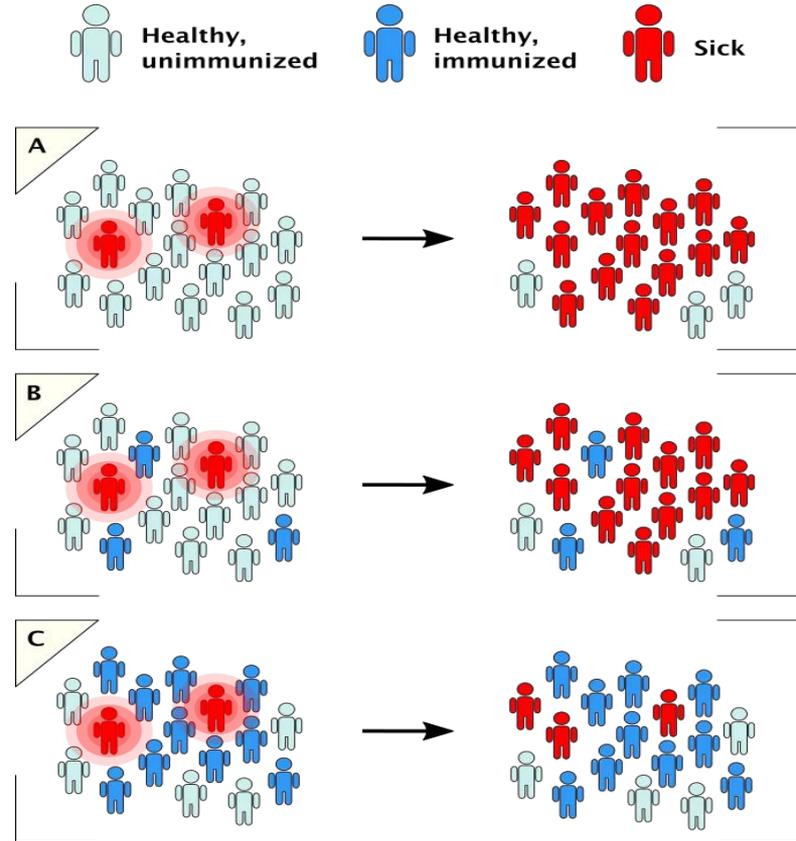


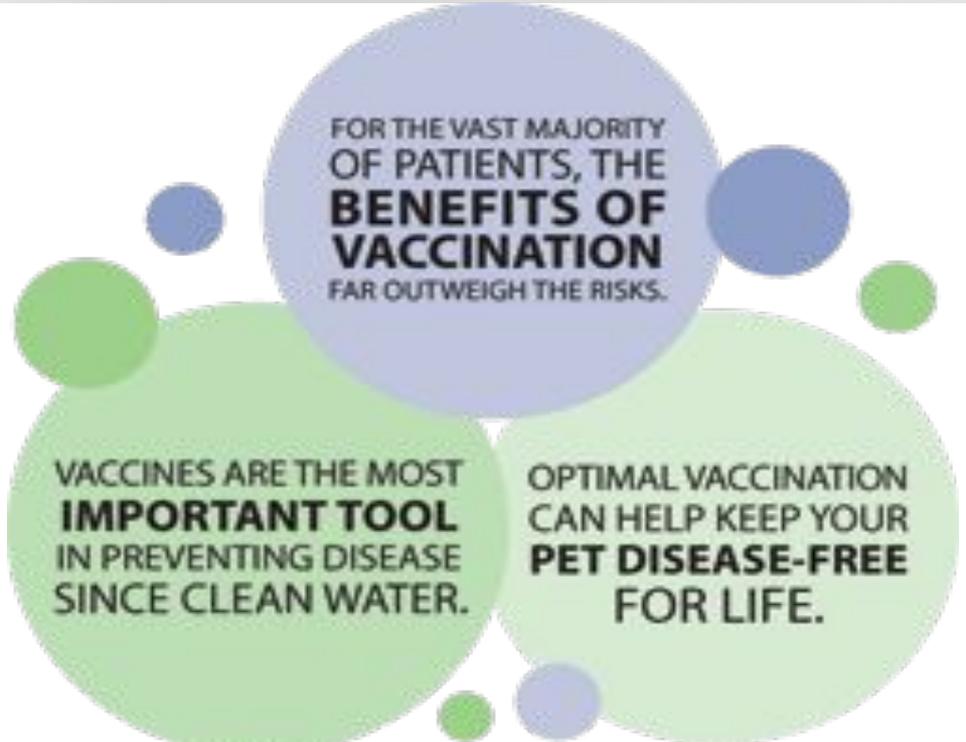
Herd immunity.

(A) When *no one* in a population is vaccinated, infections can spread rapidly and become an outbreak.

(B) When *some* individuals are vaccinated, they are individually protected from an infection. However, if the number of people vaccinated is too low, the infection can still spread.

(C) When a large enough proportion of the population is vaccinated. Outbreaks are prevented from spreading, and individuals who are unvaccinated are still protected.





FOR THE VAST MAJORITY
OF PATIENTS, THE
**BENEFITS OF
VACCINATION**
FAR OUTWEIGH THE RISKS.

VACCINES ARE THE MOST
IMPORTANT TOOL
IN PREVENTING DISEASE
SINCE CLEAN WATER.

OPTIMAL VACCINATION
CAN HELP KEEP YOUR
PET DISEASE-FREE
FOR LIFE.

**Vaccines are the CORNERSTONE
of preventive medicine.**

Well son, when you were a baby the internet and your mom's yoga teacher told us that vaccines were bad. Anyway sorry your legs don't work.

