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Pathogens (such as bacteria, fungi, and viruses)

INNATE IMMUNITY (all animals)

- Recognition of traits shared by broad ranges of pathogens, using a small set of receptors
- Rapid response

Barrier defenses:

Skin Mucous membranes Secretions

Internal defenses:

Phagocytic cells Natural killer cells Antimicrobial proteins Inflammatory response

ADAPTIVE IMMUNITY (vertebrates only)

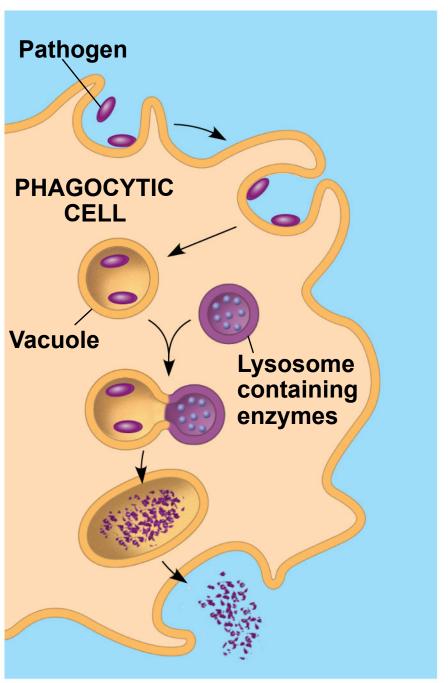
- Recognition of traits specific to particular pathogens, using a vast array of receptors
- Slower response

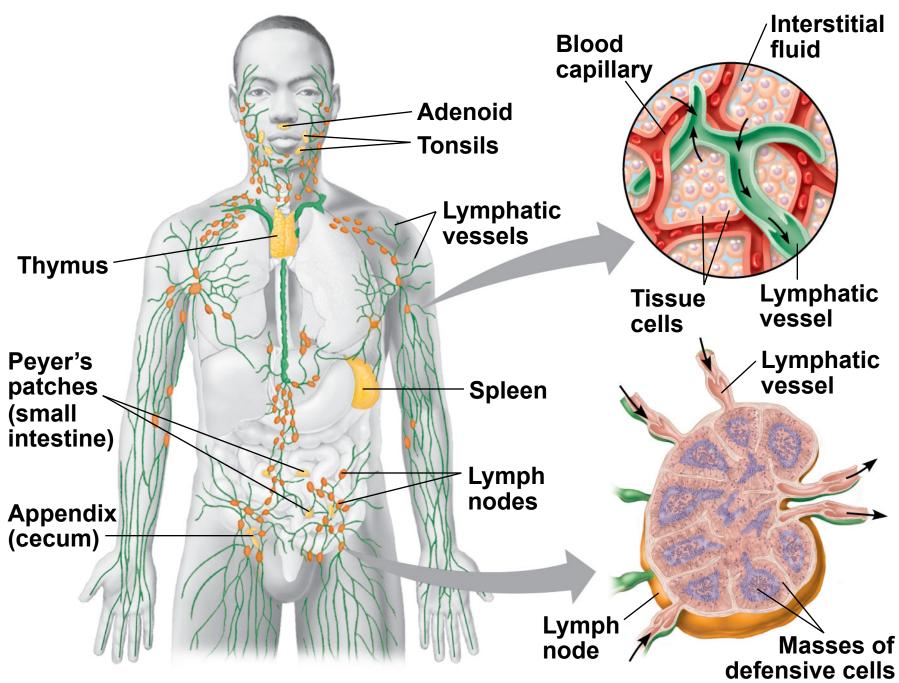
Humoral response:

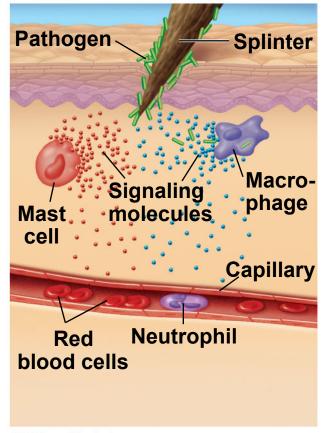
Antibodies defend against infection in body fluids.

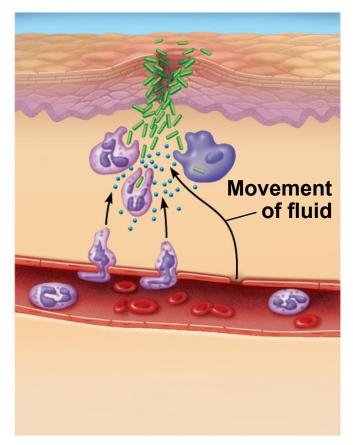
Cell-mediated response:

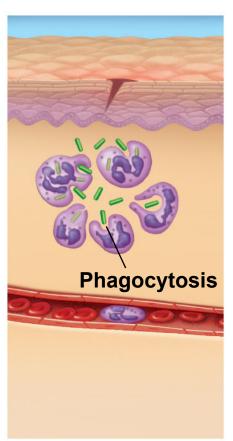
Cytotoxic cells defend against infection in body cells.



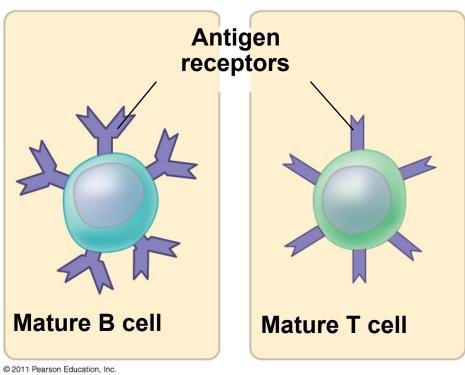


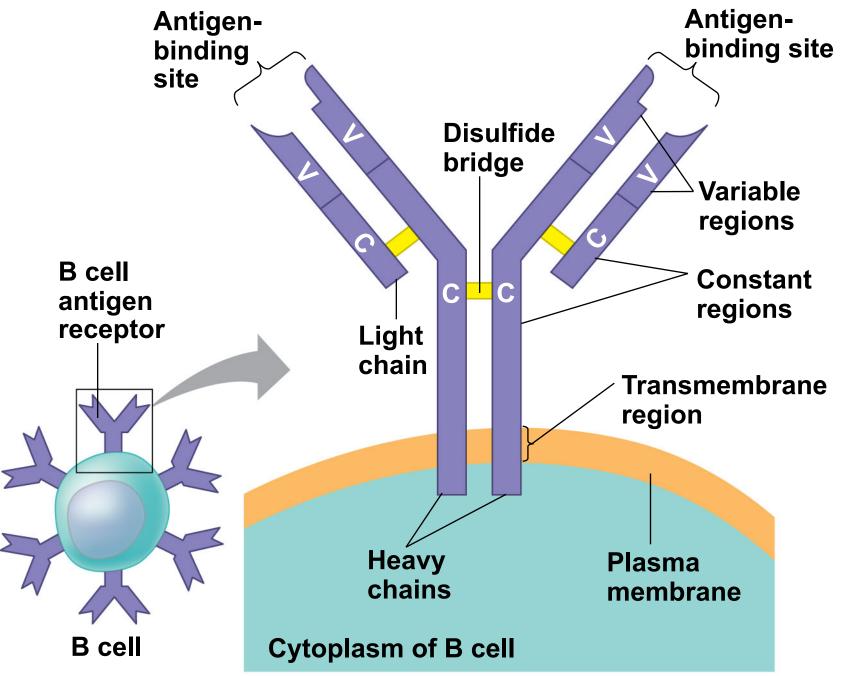


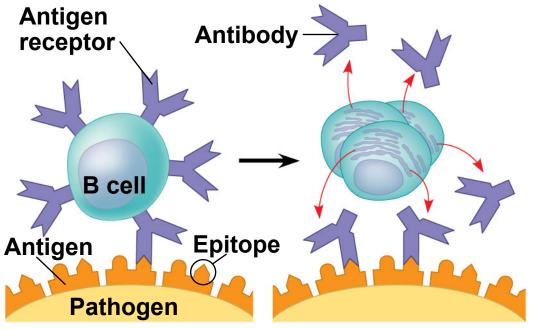




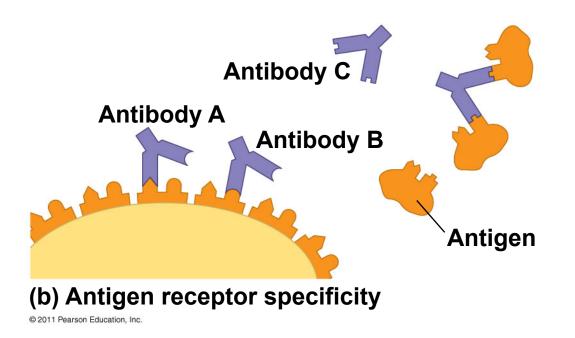
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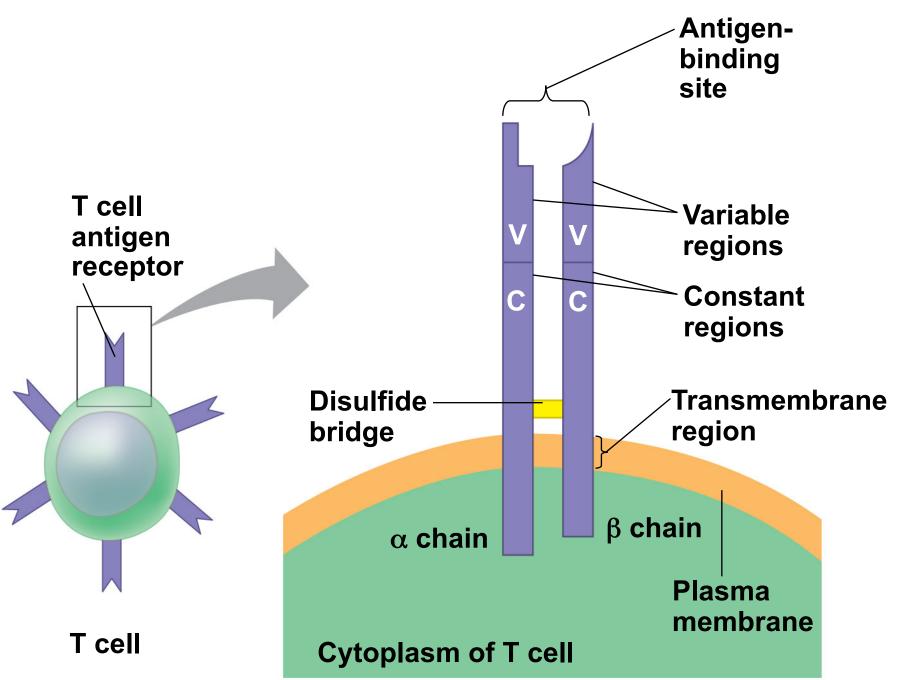


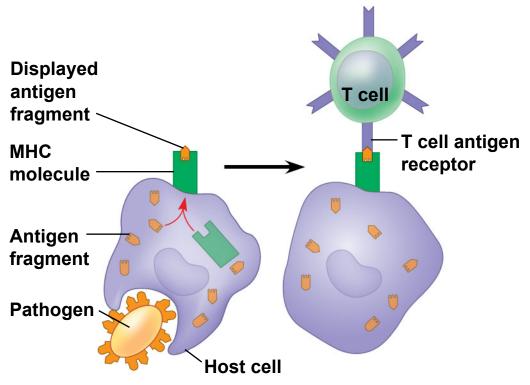




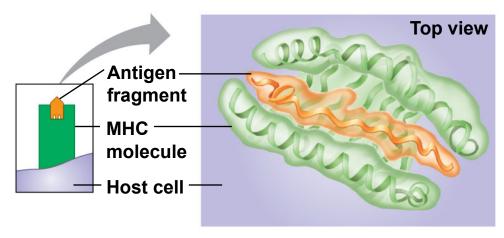
(a) B cell antigen receptors and antibodies



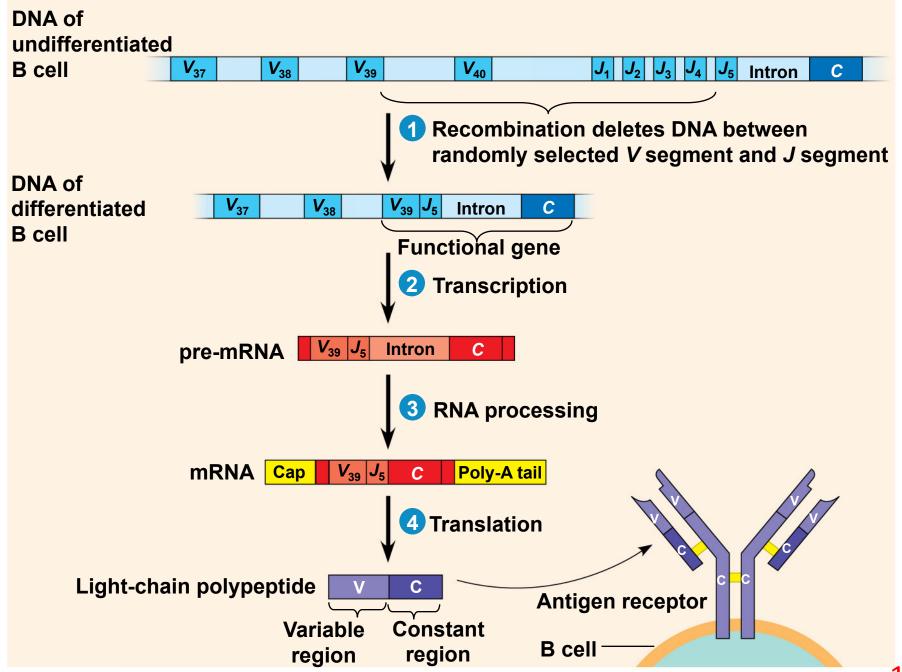


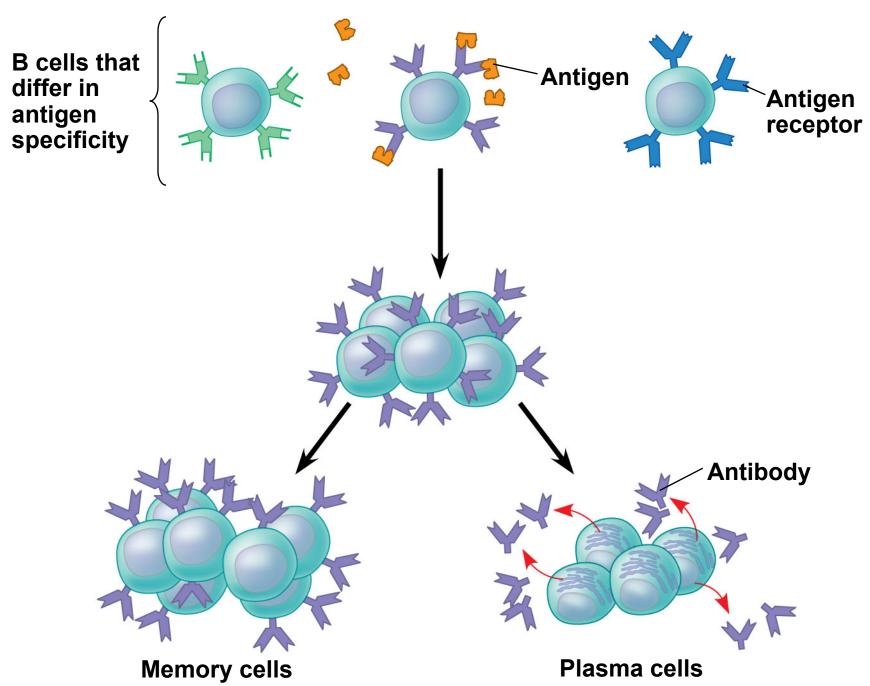


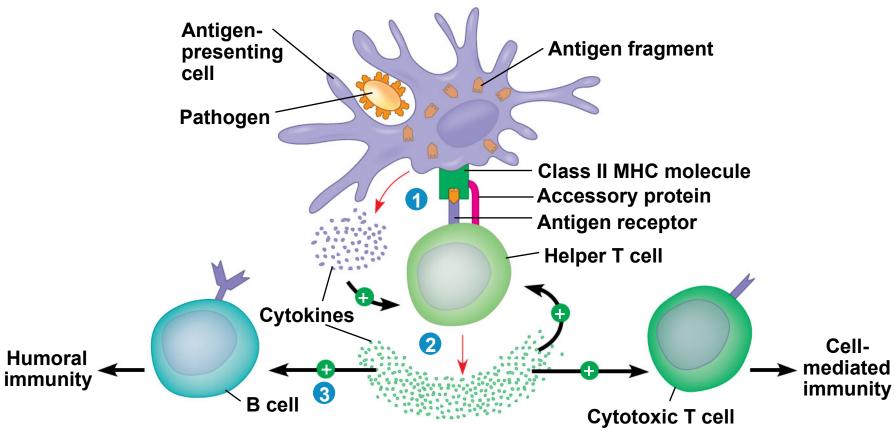
(a) Antigen recognition by a T cell

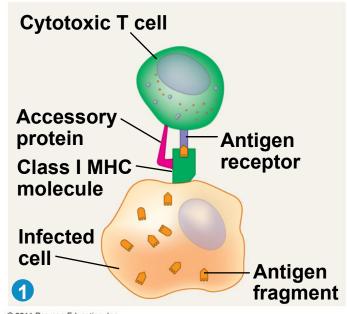


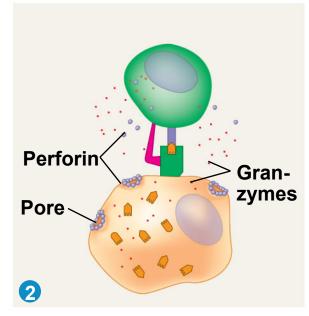
(b) A closer look at antigen presentation

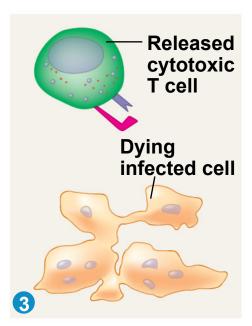


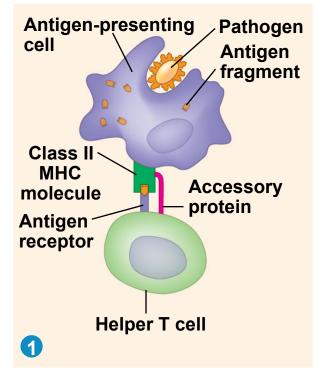


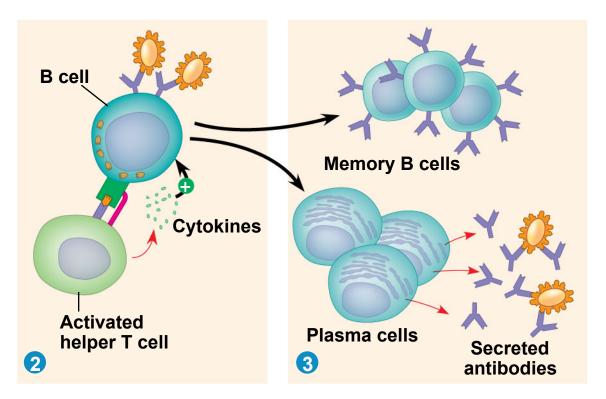












Neutralization Opsonization Antibody Virus

Bacterium Macrophage

Activation of complement system and pore formation

