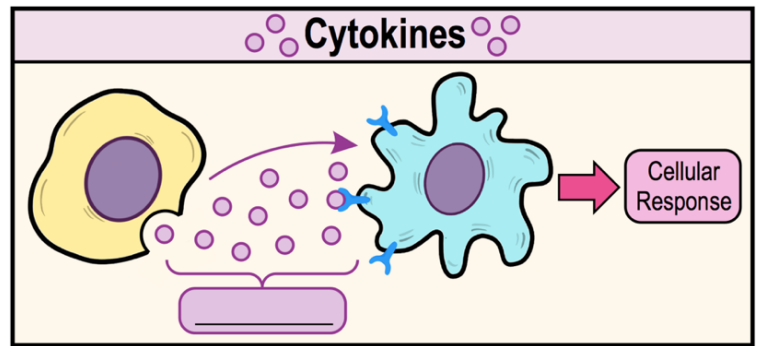
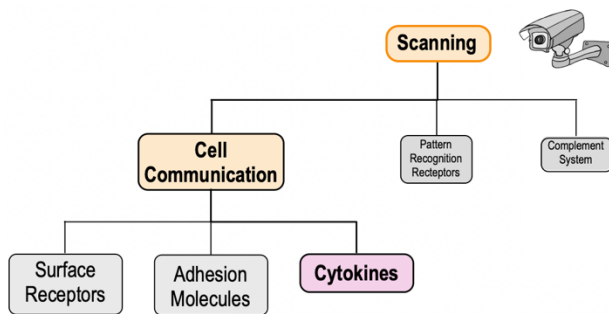


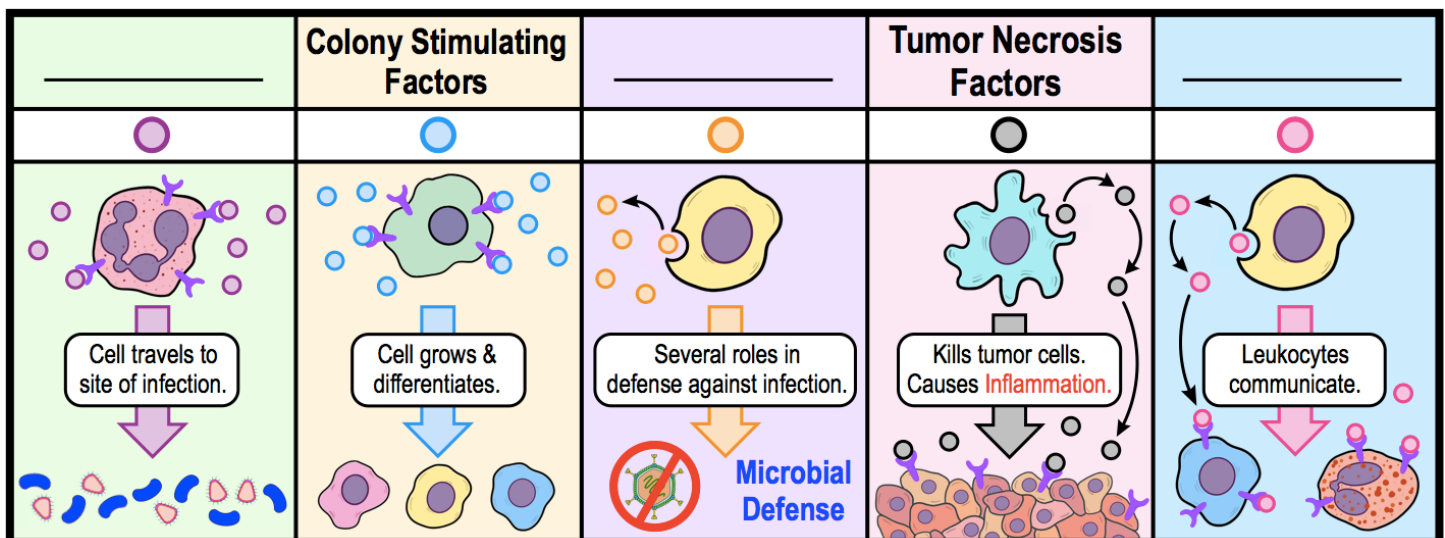
CONCEPT: CELL COMMUNICATION: CYTOKINES

- **Cytokines:** a broad group of soluble _____ that are the *communication* signals between cells.
 - Regulates *intensity & duration* of an _____ response by recruitment of cells (Ex. phagocytic cells).
 - Binding to a cell induces cellular changes such as *movement, differentiation, or cell* _____.
 - Different types of cytokines induce different effects on a cell when bound.



Types of Cytokines

- **Chemokines:** cytokines that allow for _____ (movement of a cell towards or away from a signal).
 - _____ immune cells so they can travel to infection sites.
- **Colony-Stimulating Factors:** *stimulate growth & differentiation* of immature _____ in bone marrow.
- **Interferons (_____s):** provides antiviral effects (defense against viruses) to neighboring cells.
- **_____ Necrosis Factor (TNF):** primary role is killing tumor cells but also initiates the *inflammatory* response.
 - Can also initiate _____ (programmed cell death) in infected cells.
- **Interleukins:** cytokines that serve as communication molecules between leukocytes.



CONCEPT: CELL COMMUNICATION: CYTOKINES

PRACTICE: How do cytokines function?





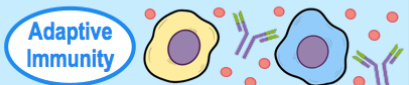

- a) They bind directly to microbes to enhance their chance of being ingested (phagocytosed).
- b) They are secreted in the phagolysosomes of macrophages to kill ingested microbes.
- c) They are secreted by one cell and trigger cellular response in another cell.
- d) They work as a complex of proteins to produce a hole in microbial cell membranes to lyse them.

PRACTICE: Which type of cytokine is used to recruit immune cells to the site of infection, inflammation, or tissue damage?

- a) Interferons.
- b) Chemokines.
- c) Interleukins.
- d) Tumor necrosis factors.

Types of Interleukins

- **Recall:** Interleukins are _____ that serve as communication molecules between leukocytes.
- There are *many* types of interleukins (ILs) including:

 Interleukins 		
IL-1	Promotes inflammation, fever, & _____ of macrophages & T cells.	
IL-2	Promotes rapid ____ cell proliferation.	
IL-4	Promotes _____ immune system response.	
IL-6	Promotes _____, fever, & proliferation of T cells & B cells.	

PRACTICE: If the body needs to stimulate the production and proliferation of B cells, which type of interleukin signal would it use?

- a) IL-2.
- b) IL-6.
- c) IL-4.
- d) IL-1.

CONCEPT: CELL COMMUNICATION: CYTOKINES

PRACTICE: The "voices" of a cell, which carry messages, are:

- a) Surface receptors.
- b) Platelets.
- c) Cytokines.
- d) Antigens.

PRACTICE: In what process is tumor necrosis factor (TNF) not involved?

- a) Chemotaxis of phagocytes.
- b) Fever.
- c) The inflammatory response.
- d) The classic complement pathway.

PRACTICE: During presentation of APC-bound antigen, macrophages and dendritic cells secrete the cytokine _____, which activates T helper cells.

- a) Interferon.
- b) Interleukin-1.
- c) Interleukin-2.
- d) Histamine.