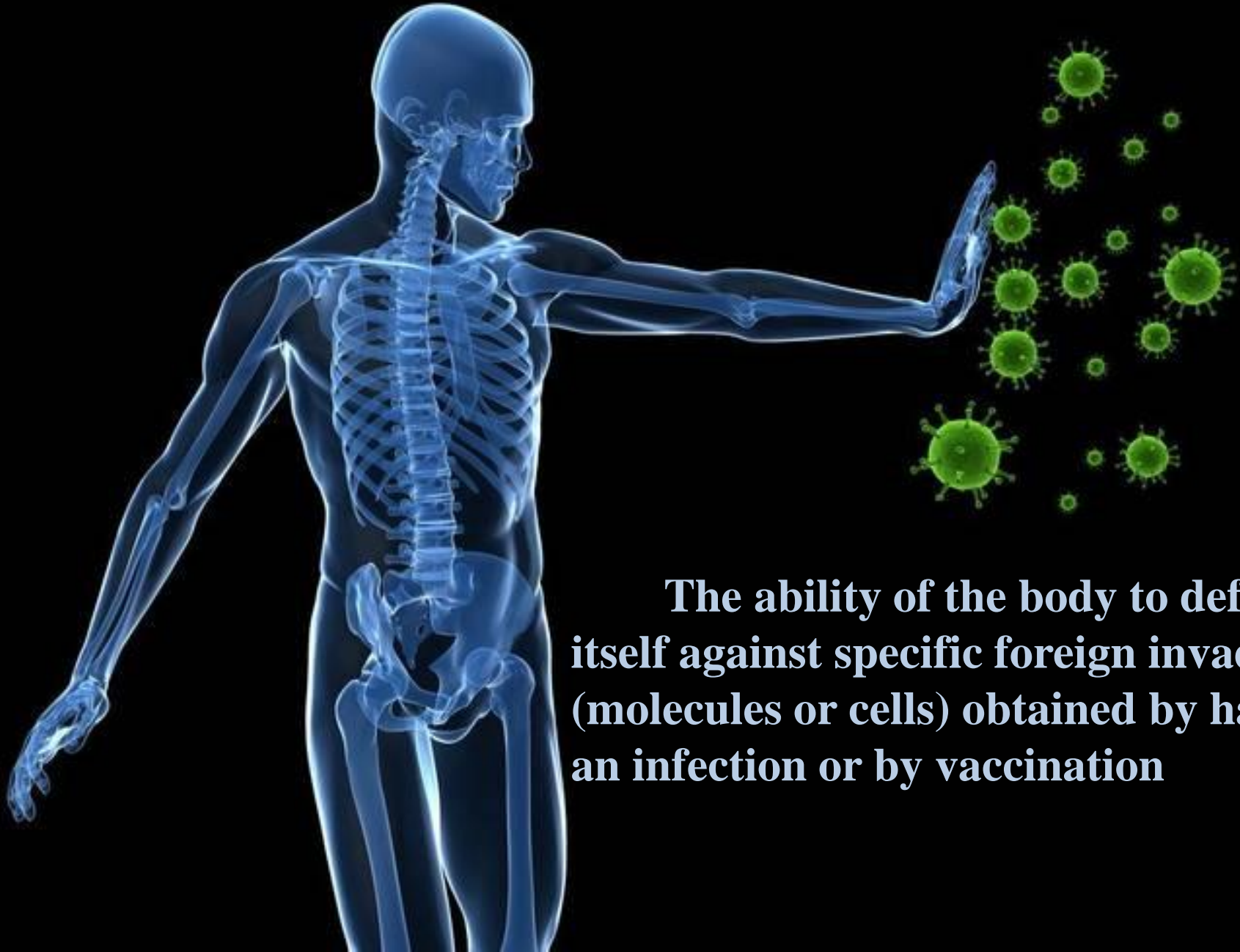


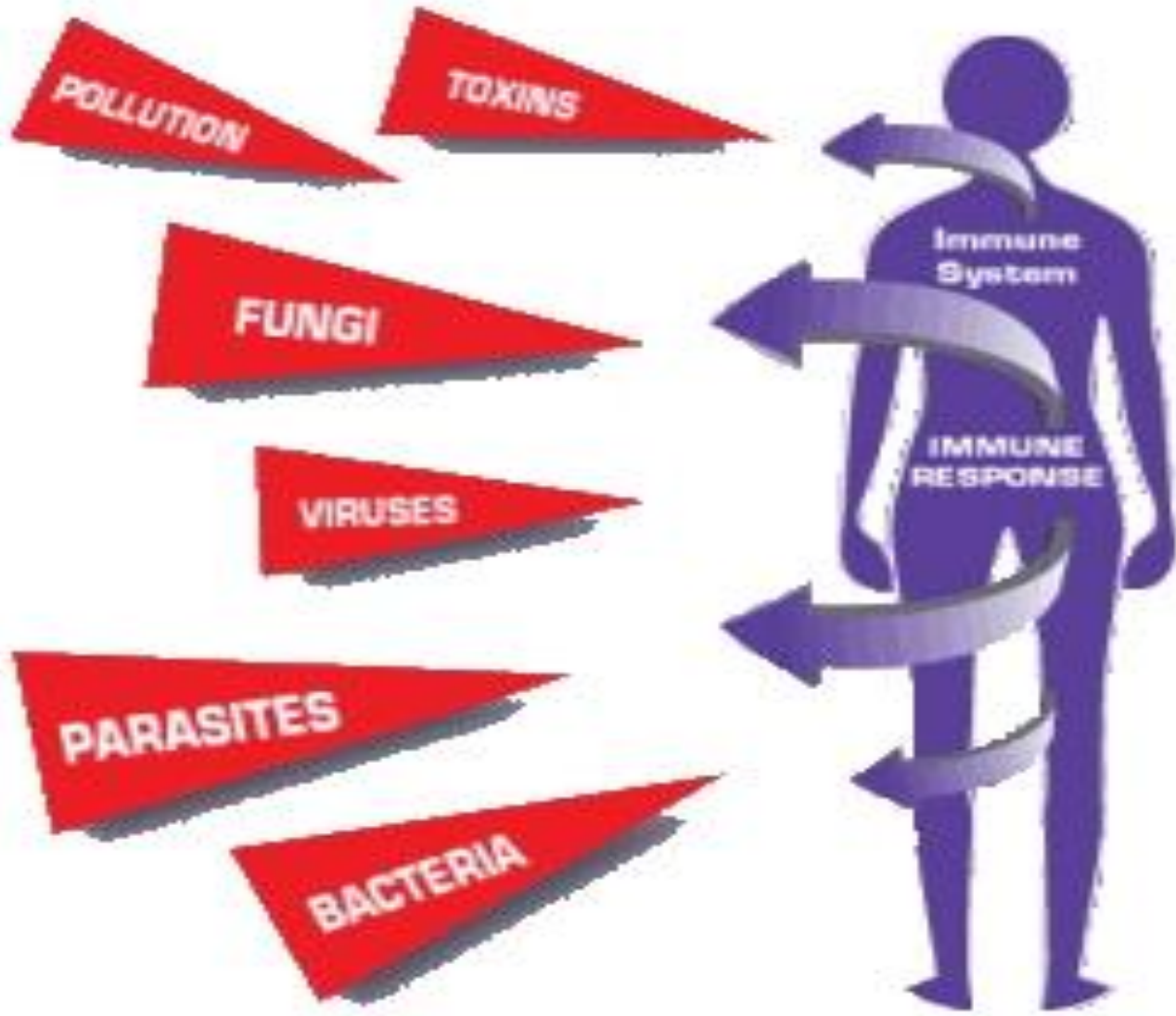
Immunology & Innate immunity

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Immunity

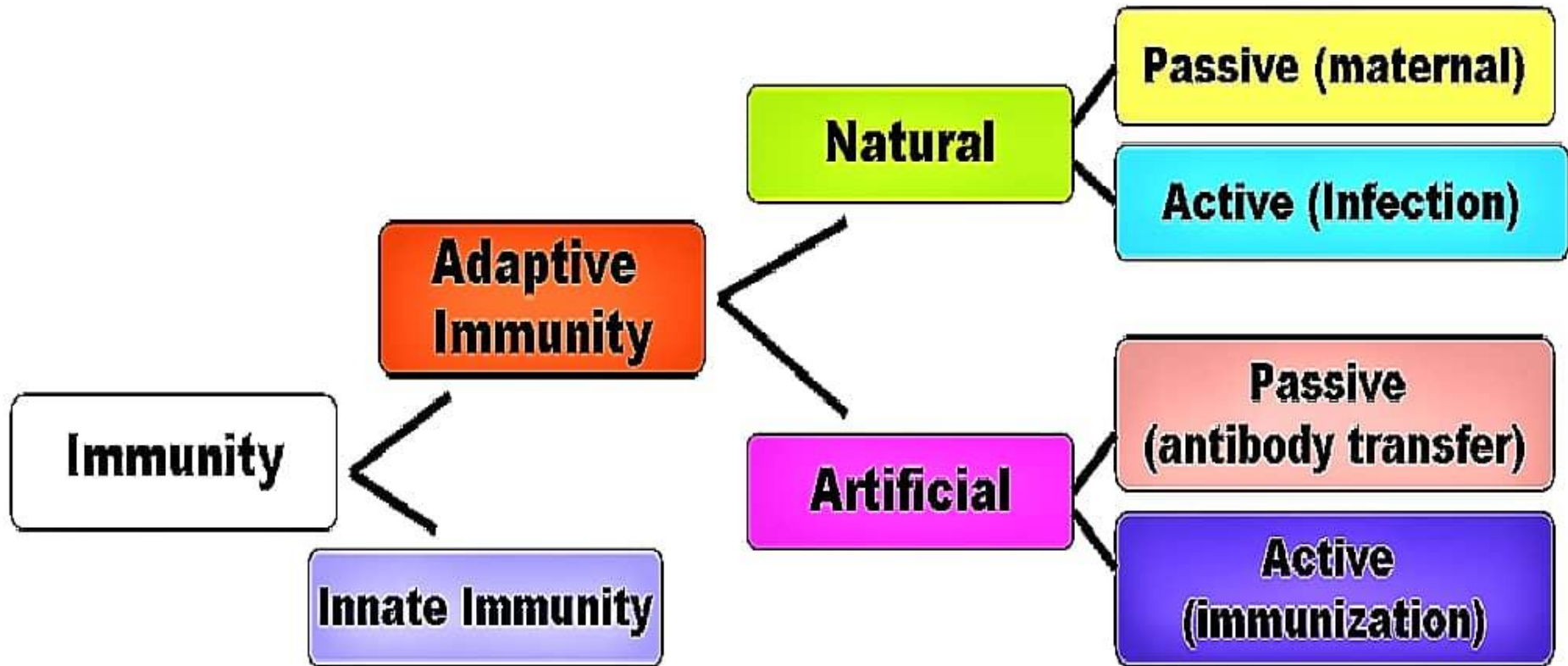


The ability of the body to defend itself against specific foreign invaders (molecules or cells) obtained by having an infection or by vaccination



Immunology

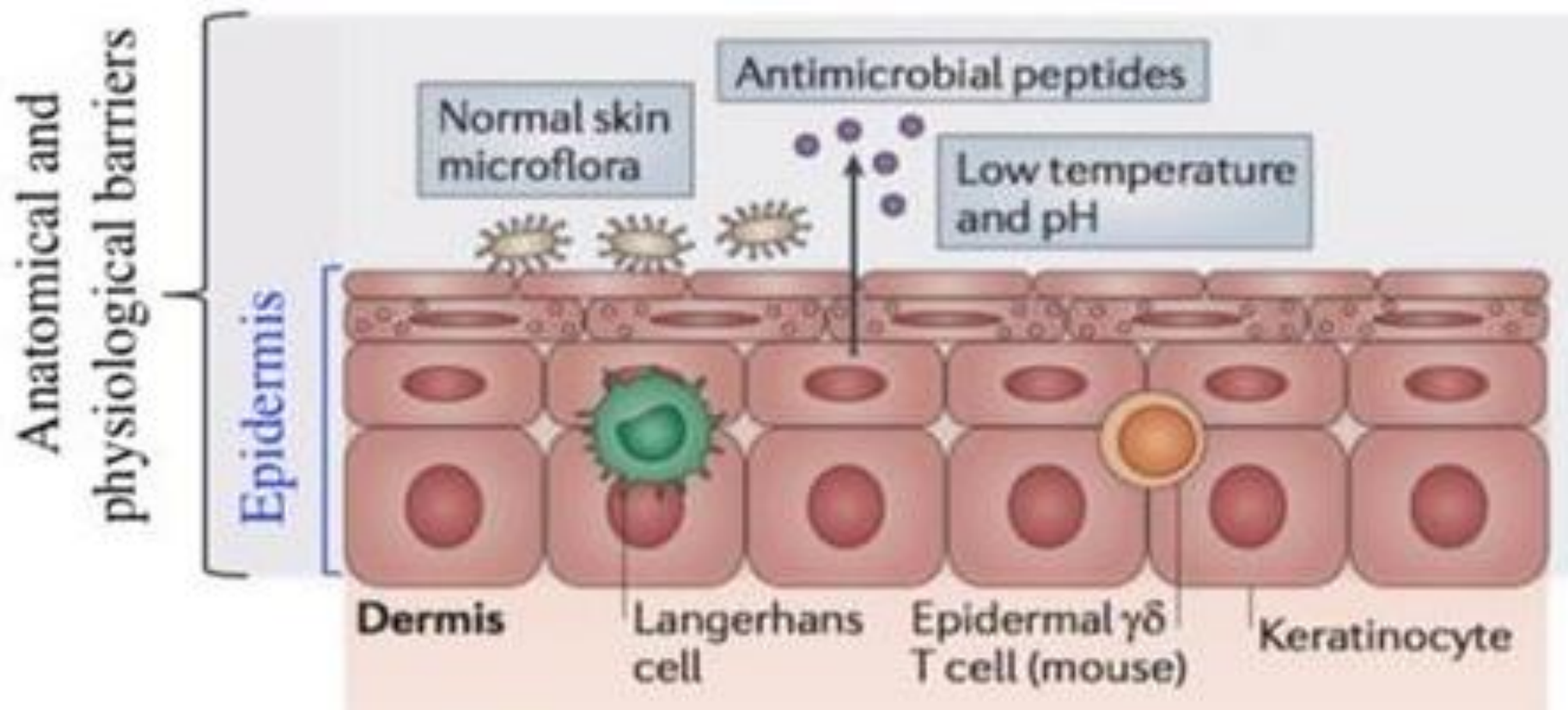
The science that studies the structure and function of the immune system as well as the ways in which the body protects itself from diseases and infections.



1- Innate immunity :-

- Antigen-nonspecific defense mechanisms that a host uses immediately or within several hours after exposure to almost any microbe .

- Anatomical barriers:- like skin and mucous membrane .



Chemical factors

- 1- Fatty acids in sweat inhibit the growth of bacteria.
- 2- Lysozyme and phospholipase found in tears, saliva and nasal secretions can breakdown the cell wall of bacteria and destabilize bacterial membranes.
- 3- The low pH of sweat and gastric secretions prevents growth of bacteria.
- 4- Defensins (low molecular weight proteins) found in the lung and gastrointestinal tract have antimicrobial activity.

Biological factors

The normal flora of the skin and in the gastrointestinal tract can prevent the colonization of pathogenic bacteria by secreting toxic substances or by competing with pathogenic bacteria for nutrients or attachment to cell surfaces.

- Mechanical removal factor :- cilia of the respiratory ,Coughing and sneezing reflexes ,peristalsis clears the gut, flushing action of urine, tears and saliva clean eyes and mouth.

- Biochemical

- Receptor-driven (eg. **Pattern Recognition Receptors (PRR) that recognize Pathogen-Associated Molecular Patterns (PAMP)**)

*What are the
Pattern Recognition
Receptors (PRRs)*

*And what are the
Pathogen-
Associated
Molecular Patterns
(PAMP)*



Pattern Recognition Receptors (PRRs)

Natural or innate immune system receptors that recognize pathogen-associated molecular patterns (PAMPs) produced by microorganisms.



Pathogen-associated molecular patterns (PAMPs) are molecular structures or molecules that are shared by most pathogenic bacteria and some viruses.

PRRs are primarily expressed by

- Antigen presenting (macrophage and dendritic cells)
- But can also be expressed by other cells (both immune and non-immune cells).

The PRRs are either localized on

- The cell surface to detect extracellular pathogens
- Within the endosomes and cellular matrix where they detect intracellular invading viruses.

PRRs involved in :-

- 1- Activating pro-inflammatory signaling pathways
- 2- Stimulating phagocytic responses (macrophages, neutrophils and dendritic cells)
- 3- Binding to micro-organisms as secreted proteins.

These receptors enhance natural immune responses against microbes

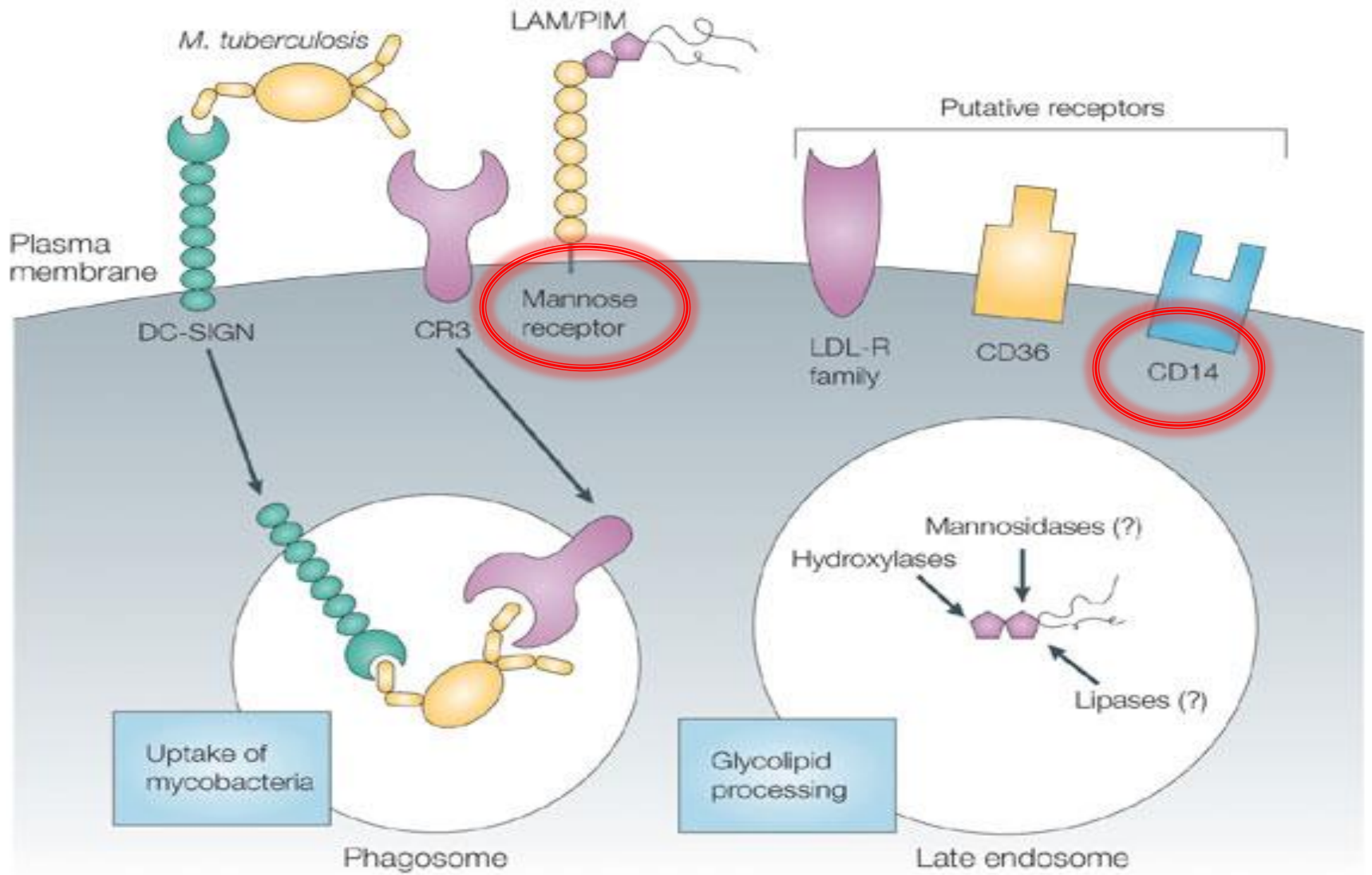
PRR classification :-

PRRs can be classified in a number of ways such as by function (e.g. signaling or endocytic) or by localization. Here we have classified the PRRs by localization:-

- 1- **Membrane bound PRRs** :-like Toll-like receptors ([TLR](#)) and C-type lectin receptors (CLR)
- 2- **Cytoplasmic (intracellular) PRRs** like Nucleotide oligomerization (NOD) like receptors (NLR)
- 3-**Secreted PRRs** it is a number of PRRs can be secreted by cells, and bind directly to invading micro-organisms

Example:-

- 1- CD14 receptors on macrophages that bind bacterial endotoxin to activate macrophages
- 2- The mannose receptor on phagocytes that bind microbial glycoproteins or glycolipids ,leads to proinflammatory cytokine expression.



pathogen-associated molecular patterns or (PAMPS)

- 1- LPS from the gram-negative cell wall,
- 2- Peptidoglycan and lipoteichoic acids from the gram- positive cell wall,
- 3- The sugar mannose (a terminal sugar common in microbial glycolipids and glycoprotein's but rare in those of humans)
- 4- Bacterial and viral unmethylated DNA
- 5- Bacterial flagellant,
- 6- The amino acid *N*-formylmethionine found in bacterial proteins,
- 7- Double-stranded and single-stranded RNA from viruses,
- 8- Glucans from fungal cell walls

Q// The pattern recognition receptors (PRRs) is

a) The mannose receptor on phagocytes

b) LPS from the gram-negative cell wall

c) Bacterial flagellant

d) Bacterial and viral unmethylated DNA