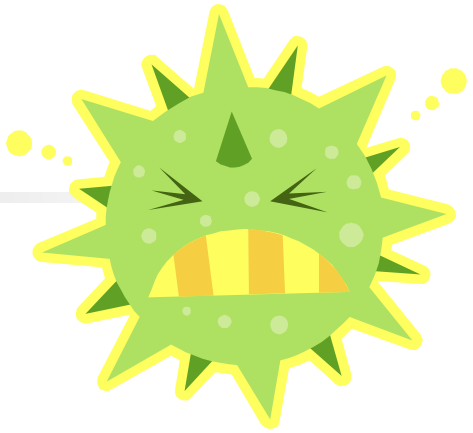
MILK AND IMMUNITY: COVID-19 PERSPECTIVE



Prof. Dr. Sohail Saqlain

Member (Health, Nutrition, Population & Emergency Services), Planning & Development Board, Government of Punjab

Immune System

- **Immunity**: resistance of a host to pathogens and their toxic effects
- **Immune System**: bodies defense system against disease (cells, tissues, and molecules that mediate resistance to infections)
- **White Blood Cells (WBCs)** fight infection through inactivating foreign substances or cells
  - soldiers of your defense system

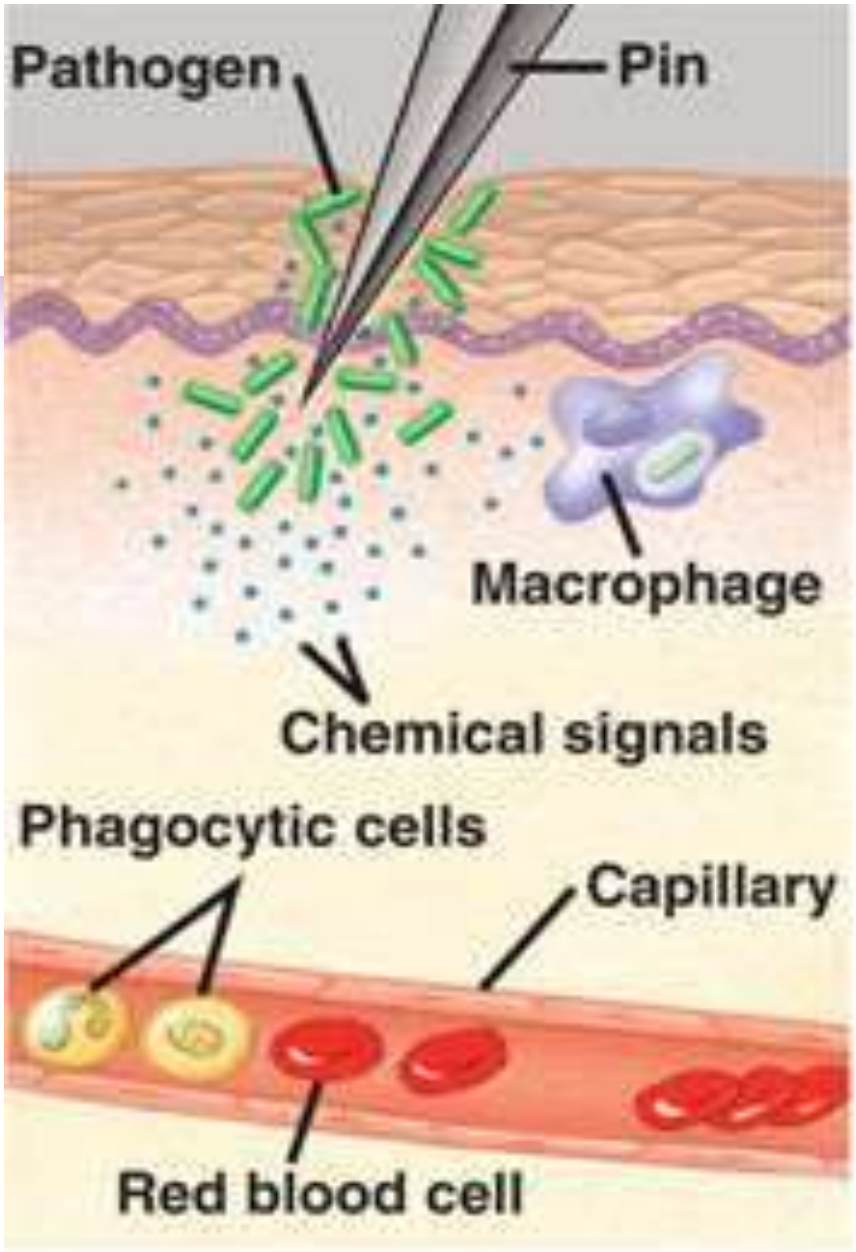
Immune Divisions Overview

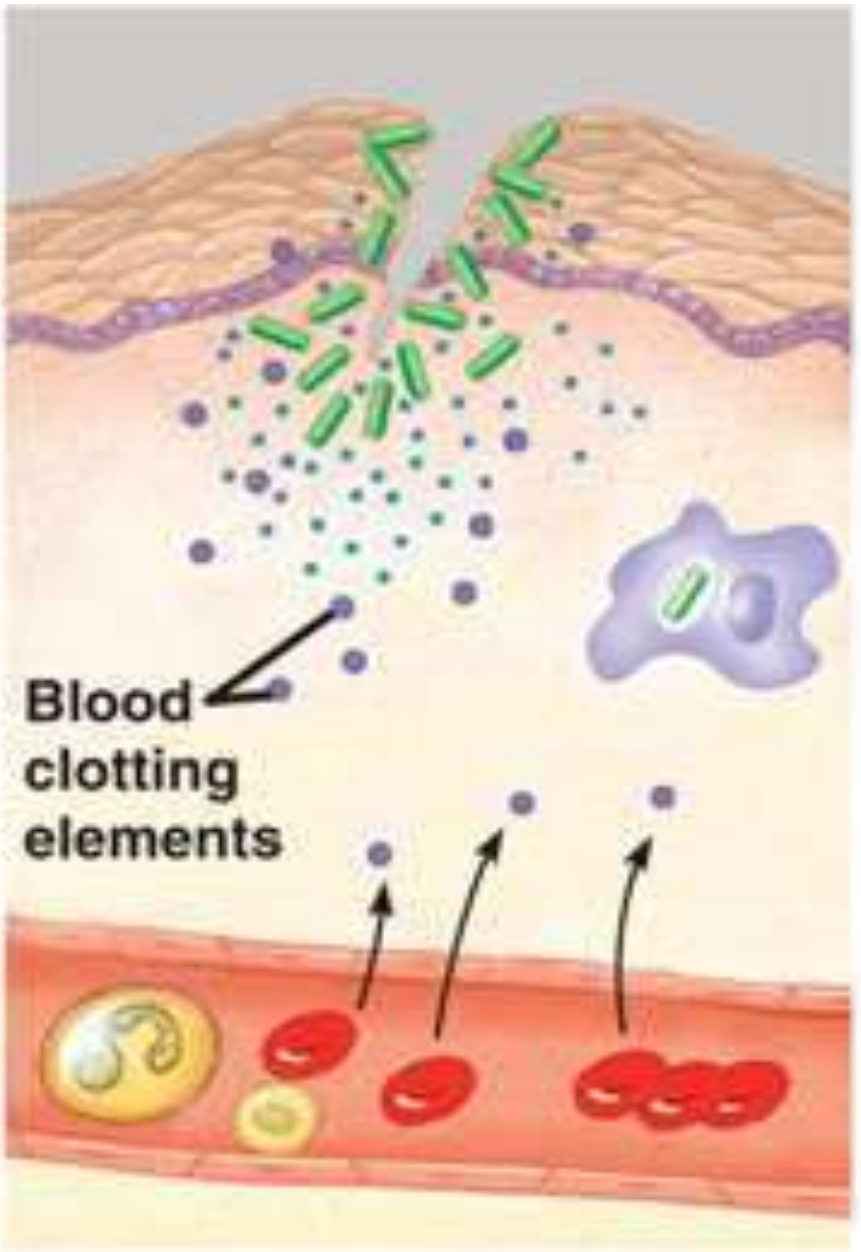
Nonspecific Defenses

- Body protects itself the **SAME** way regardless of what is invading it
- Fast-acting Response
- Lines of Defense
  - 1. Skin- protective barrier
  - 2. Fever- raises body temp. to kill infection
  - 3. Inflammation- swelling & redness

Specific Defenses

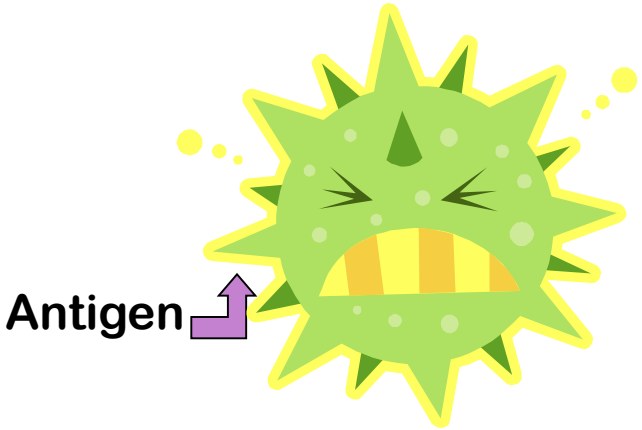
- Immune system attacks **Specific** pathogen
- **Pathogen** can be recognized by its **Antigen**


Pathogen
Pin
Macrophage
Chemical signals
Phagocytic cells
Capillary
Red blood cell
1

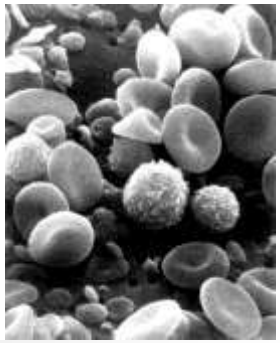

Blood clotting elements
2

Pathogens & Antigens

- Pathogens (things that infect you) contain antigens
- Antigens are like chemical markers (name tag) that tell what the pathogen is



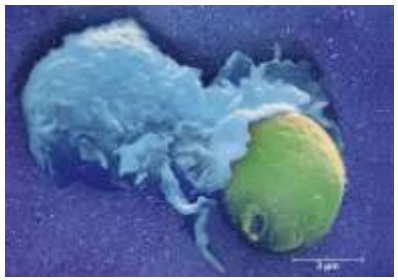
WBCs & Antibodies



- WBCs can recognize the antigens because they have antibodies.
- Antibodies are proteins that recognize and bind to the antigen because they fit together
  - Antibodies mark the pathogen for destruction

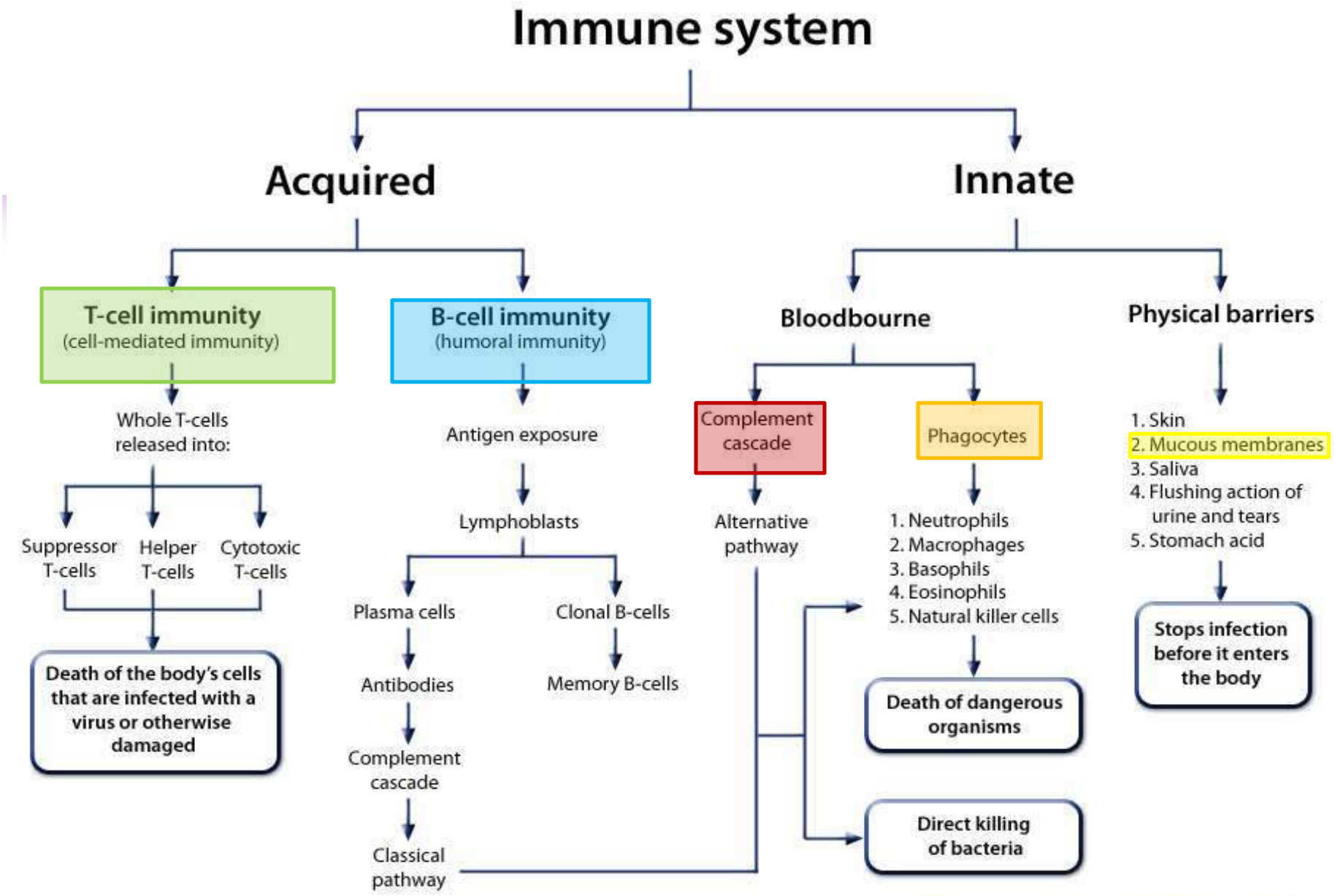
Types of WBCs

- White blood cells are produced by bone marrow & lymphatic glands
  - **Macrophages**: "eat" & destroy pathogens
  - **Lymphocytes** (B-cells & T-cells)
    - B-cells- make antibodies
    - T-cells- recognize & kill pathogen



Two types of Immunity

1. **Innate (non-adaptive)**
   - first line of immune response
   - relies on mechanisms that exist before infection
2. **Acquired (adaptive)**
   - Second line of response (if innate fails)
   - relies on mechanisms that adapt after infection
   - handled by T- and B- lymphocytes
   - one cell determines one antigenic determinant


Immune system
Acquired
Innate
T-cell immunity
(cell-mediated immunity)
B-cell immunity
(humoral immunity)
Bloodbourne
Physical barriers
Whole T-cells released into:
Suppressor T-cells
Helper T-cells
Cytotoxic T-cells
Death of the body's cells that are infected with a virus or otherwise damaged
Antigen exposure
Lymphoblasts
Plasma cells
Clonal B-cells
Antibodies
Memory B-cells
Complement cascade
Classical pathway
Complement cascade
Alternative pathway
Phagocytes
1. Neutrophils
2. Macrophages
3. Basophils
4. Eosinophils
5. Natural killer cells
Death of dangerous organisms
Direct killing of bacteria
1. Skin
2. Mucous membranes
3. Saliva
4. Flushing action of urine and tears
5. Stomach acid
Stops infection before it enters the body

Acquired Immunity

- Immunity is acquired after exposure to antigen
- 2 Kinds

	Active Immunity (you make antibodies in response to antigen)	**Passive Immunity** (you obtain antibodies from another source)
Natural	clinical, sub-clinical infection	via **breast milk**, placenta
Artificial	Vaccination: Live, killed, purified antigen vaccine	immune serum, immune cells

Nutrition-Immunity link

- **Macronutrient deficiency**
  - Protein, Calories
  - Malnutrition is the most common cause of immune deficiency world-wide
- **Micronutrient deficiency**
  - Elements, Vitamins
- **Over nutrition**
  - Excess of macronutrients

- **poor nutrition** has been shown to result in;
  - increased infections
  - slow healing from injury and infections
  - and complications from immune system dysfunction

Medical science has established that one of the most important factors in supporting a healthy, balanced immune system is good nutrition

Nutrition-Immunity link

- Experimental research and studies shows, a number of vitamins (A, B6, B12, folate, C, D & E) and trace elements (zinc, copper, selenium, iron) have been demonstrated to have key roles in supporting the human immune system and reducing risk of infections
- Not a cure for COVID-19 but healthy patterns of eating optimize the function of the immune system, improve immunometabolism, and are a modifiable contributor to the development of chronic disease that is highly associated with COVID-19 deaths.
- May have a positive impact on COVID-19 as it may be a way to support people at higher risk for the disease i.e. older people and people with pre-existing conditions (non-communicable diseases)

Importance of Milk in Improving Immunity during Covid-19 Pandemic

- The interplay between mother and child during pregnancy and after birth and the introduction of nutrition (breast-feeding and the introduction of solid foods) influence the development of immune system of the child
- Breast milk can be a source of antigens to which the immune system becomes tolerant easily
- Breast milk provides factors that modulate immune maturation and subsequently the immune response
- Breast milk provides factors that influence the microbiota and in turn affect antigen exposure and immune maturation

Thank you