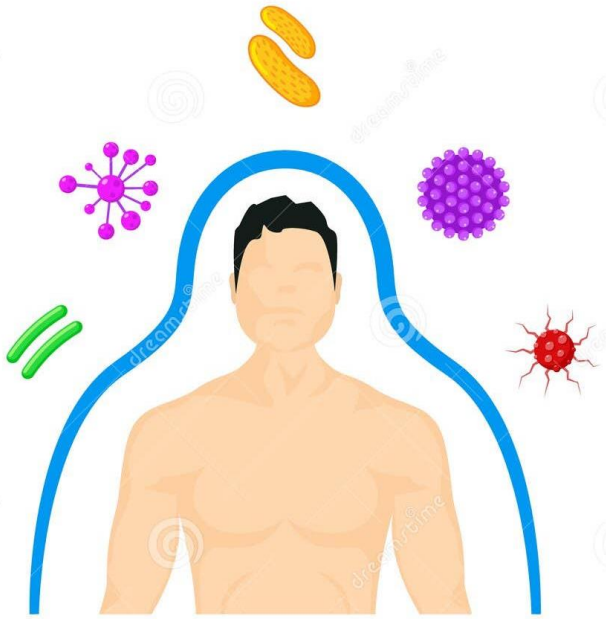
Introduction to Immunotherapy & its Interaction with Radiotherapy

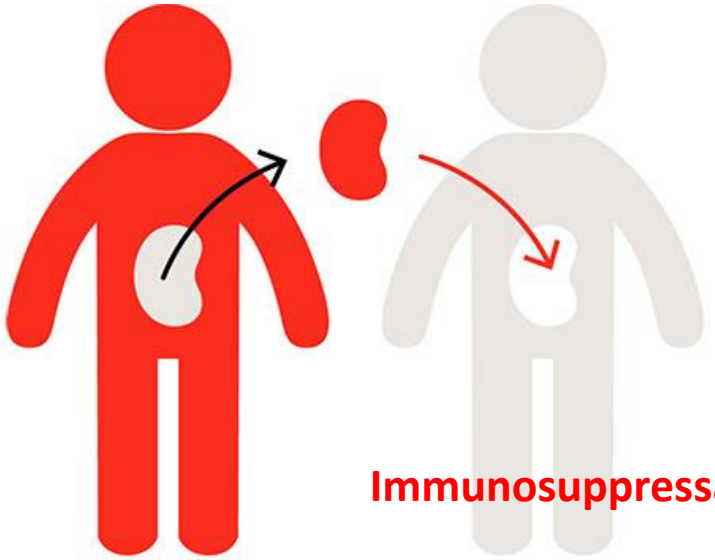
Prof Sunil Choudhary
Dept. of RT & RM
IMS, BHU


LIFEGUARD

What is Immunity?

*Ability of the body to defend itself against disease-causing organisms and **cancer cells**!!*





AIDS-defining cancers:

1. Kaposi sarcoma
2. Aggressive NHL
3. Cervical cancer

Non AIDS-defining cancers

1. H&N
2. Anal
3. Lung
4. Testicular
5. Skin
6. Liver
7. Hodgkin lymphoma

Common cancers

1. NHL
2. Lung
3. Kidney
4. Liver

Immune senescence

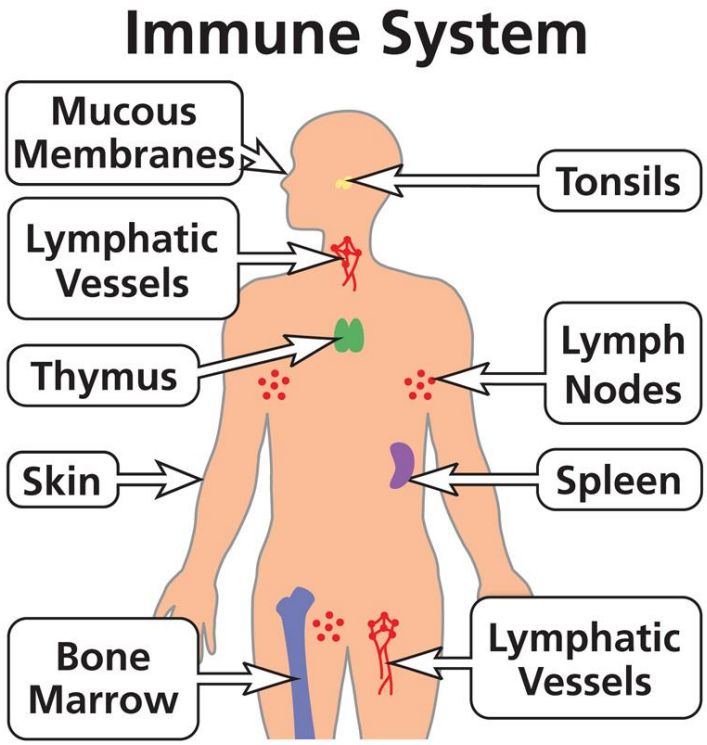
1. Thymic involution
2. Reduced levels of thymic hormones
3. Increase in number of immature T cells

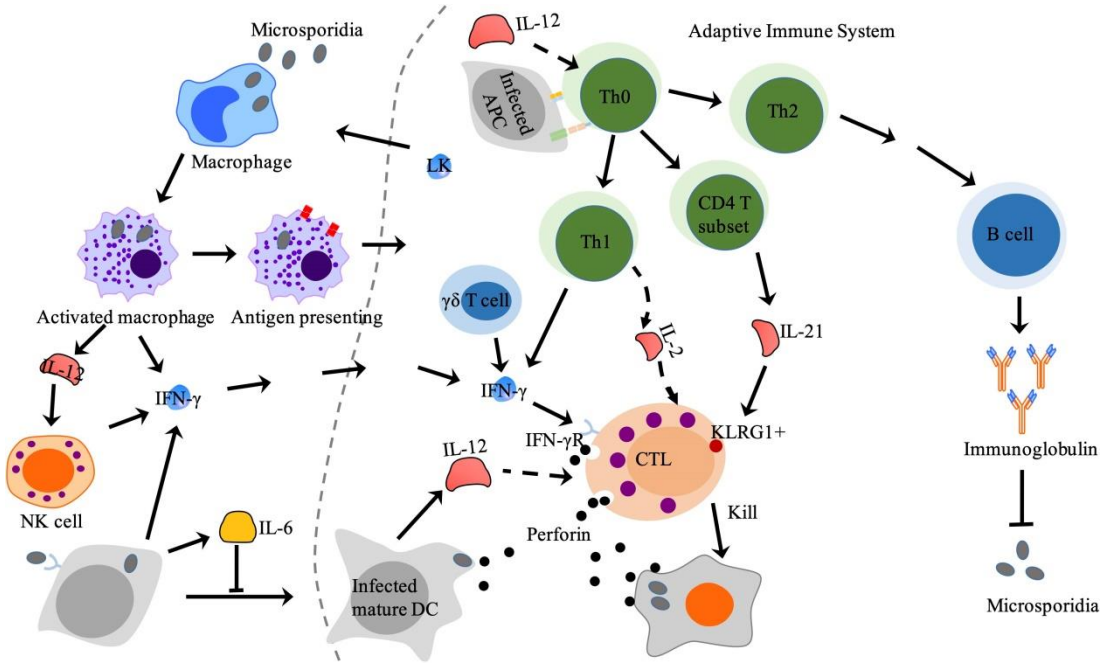
↓ **Immunosurveillance**

Risk of Cancer incidence increases??

Immune System

Network of cells, signals, organs that work





Innate vs Adaptive Immunity

innate vs adaptive.mp4

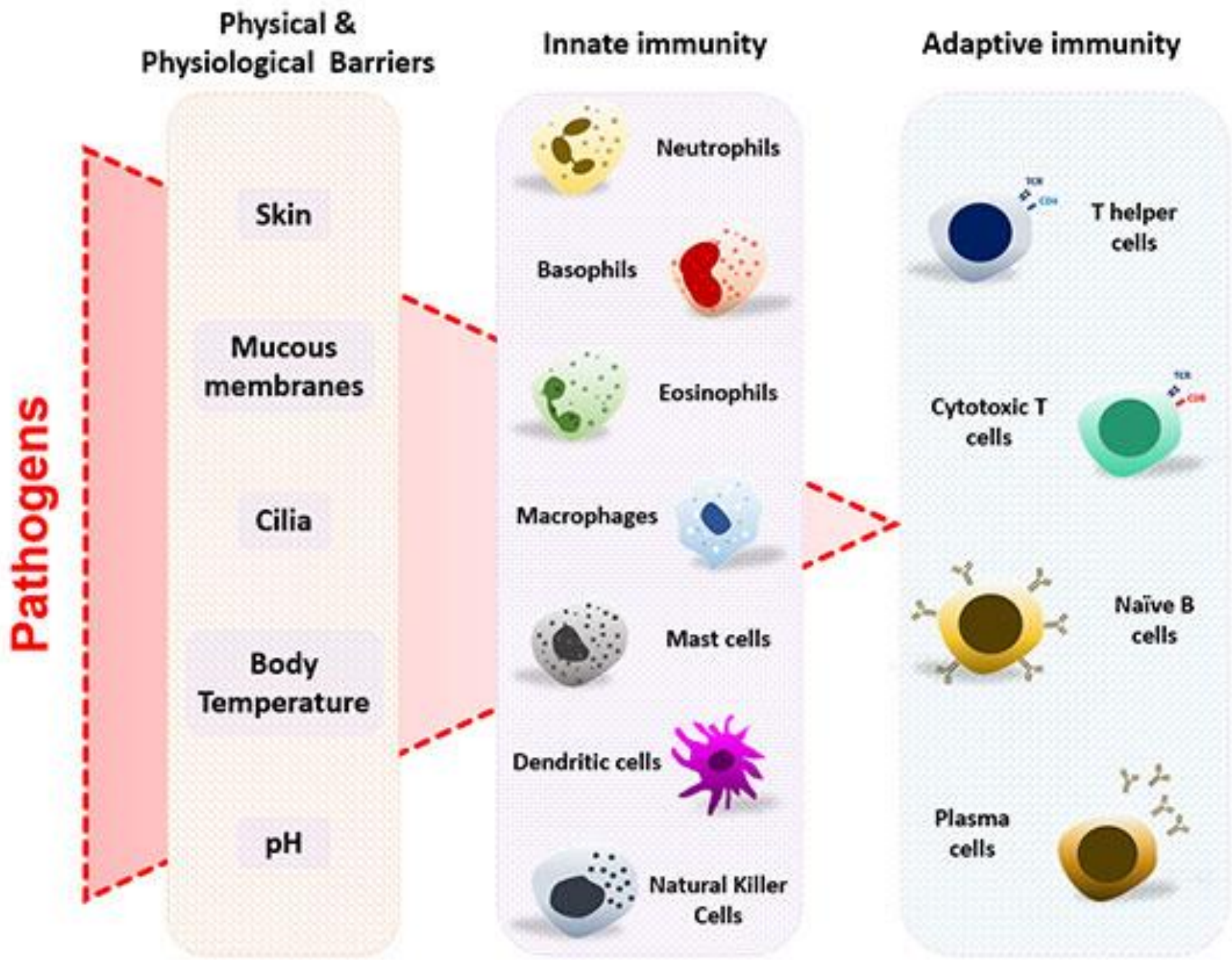
IMMUNE SYSTEM

INNATE IMMUNE RESPONSE

- ~ IMMEDIATE
- ~ NON-SPECIFIC
- ~ NO MEMORY

ADAPTIVE IMMUNE RESPONSE

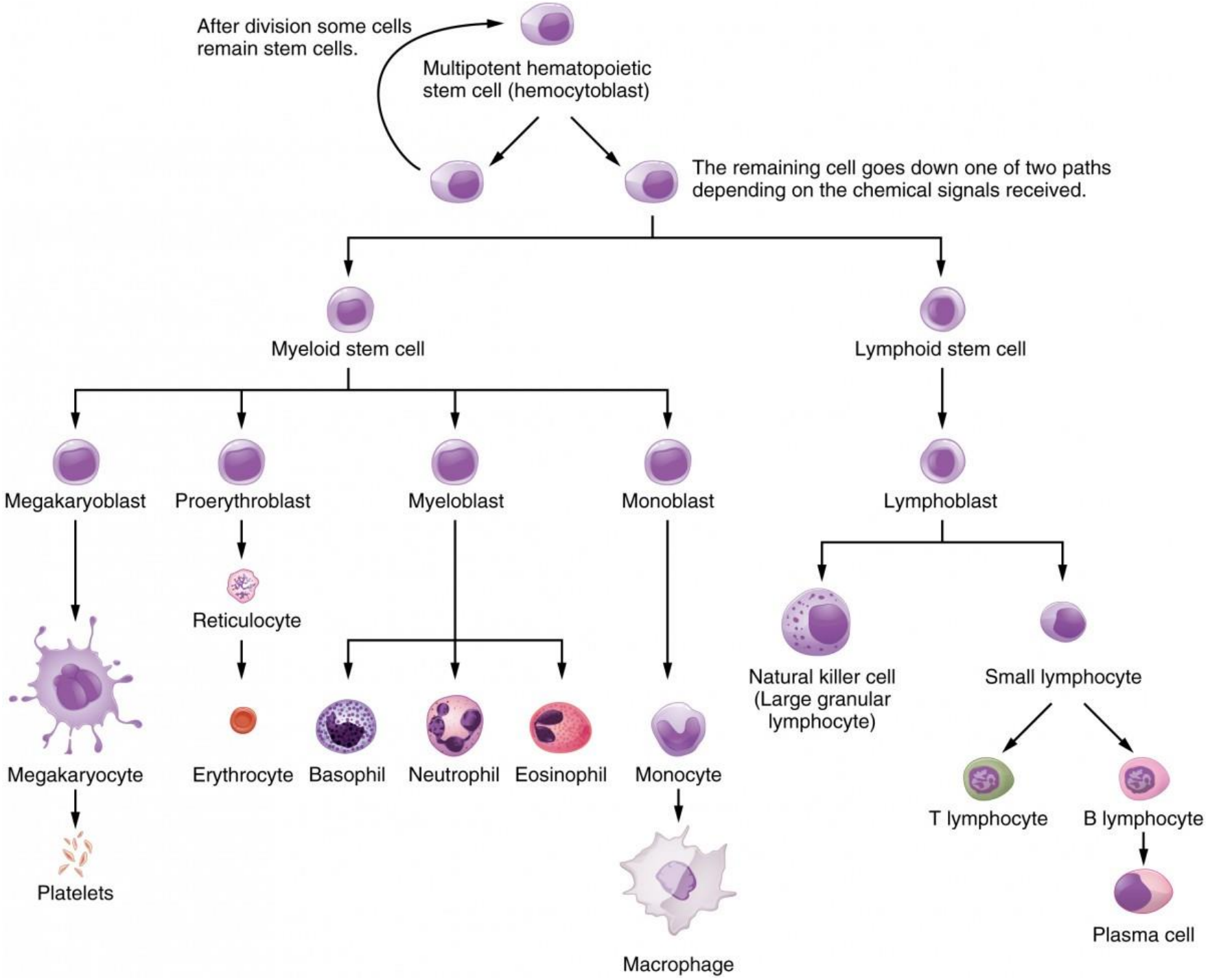
- ~ HIGHLY SPECIFIC
- ~ REMEMBERS
- ~ TAKES DAYS to WEEKS


Physical &
Physiological Barriers
Innate immunity
Adaptive immunity
Pathogens
Skin
Mucous membranes
Cilia
Body Temperature
pH
Neutrophils
Basophils
Eosinophils
Macrophages
Mast cells
Dendritic cells
Natural Killer Cells
T helper cells
Cytotoxic T cells
Naïve B cells
Plasma cells

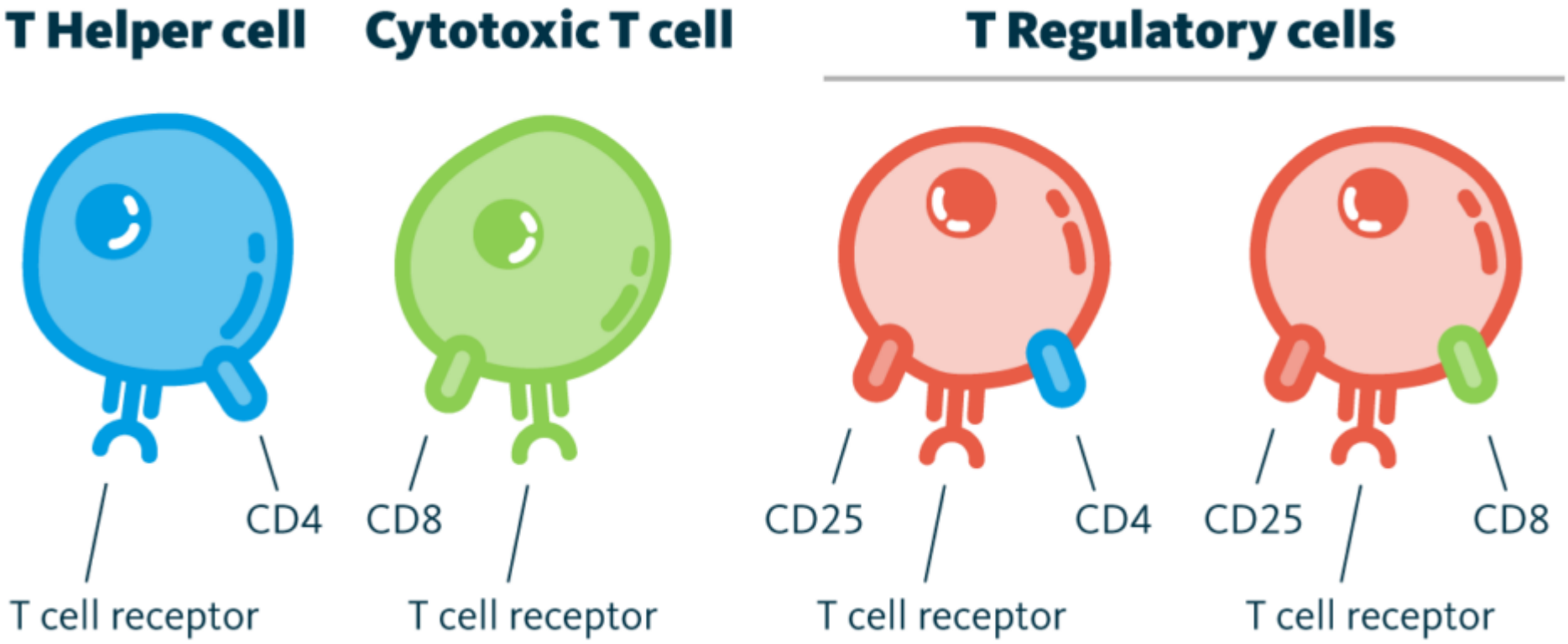
Adaptive Immunity

- T and B cell mediated
- B cell: antibody mediated immunity (humoral immunity)
- T cell: cell-mediated immunity

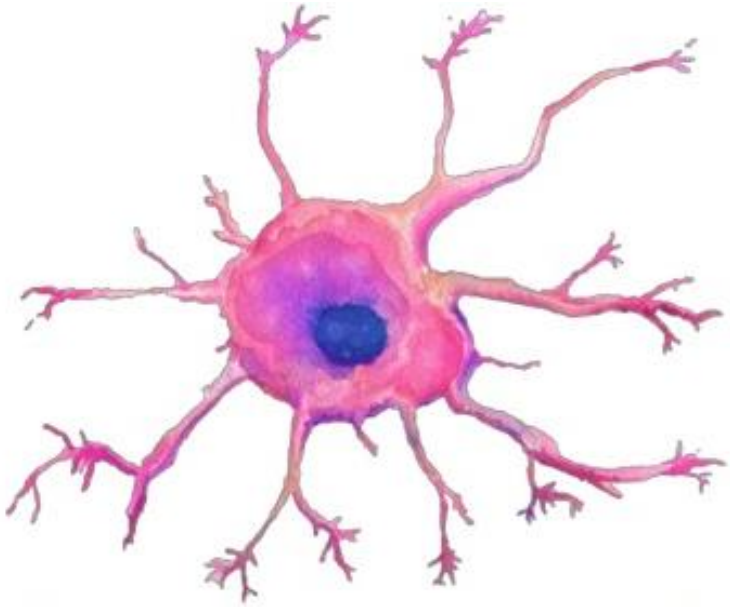

STEP 3
STEP 2
STEP 1


After division some cells remain stem cells.
Multipotent hematopoietic stem cell (hemocytoblast)
The remaining cell goes down one of two paths depending on the chemical signals received.
Myeloid stem cell
Lymphoid stem cell
Megakaryoblast
Proerythroblast
Myeloblast
Monoblast
Lymphoblast
Reticulocyte
Natural killer cell (Large granular lymphocyte)
Small lymphocyte
Megakaryocyte
Erythrocyte
Basophil
Neutrophil
Eosinophil
Monocyte
T lymphocyte
B lymphocyte
Platelets
Plasma cell
Macrophage

T cell (T lymphocyte)



Antigen presenting cells (APC)



Dendritic cell (DC)

Macrophage

B cell (put picture of B cell)

Macrophage

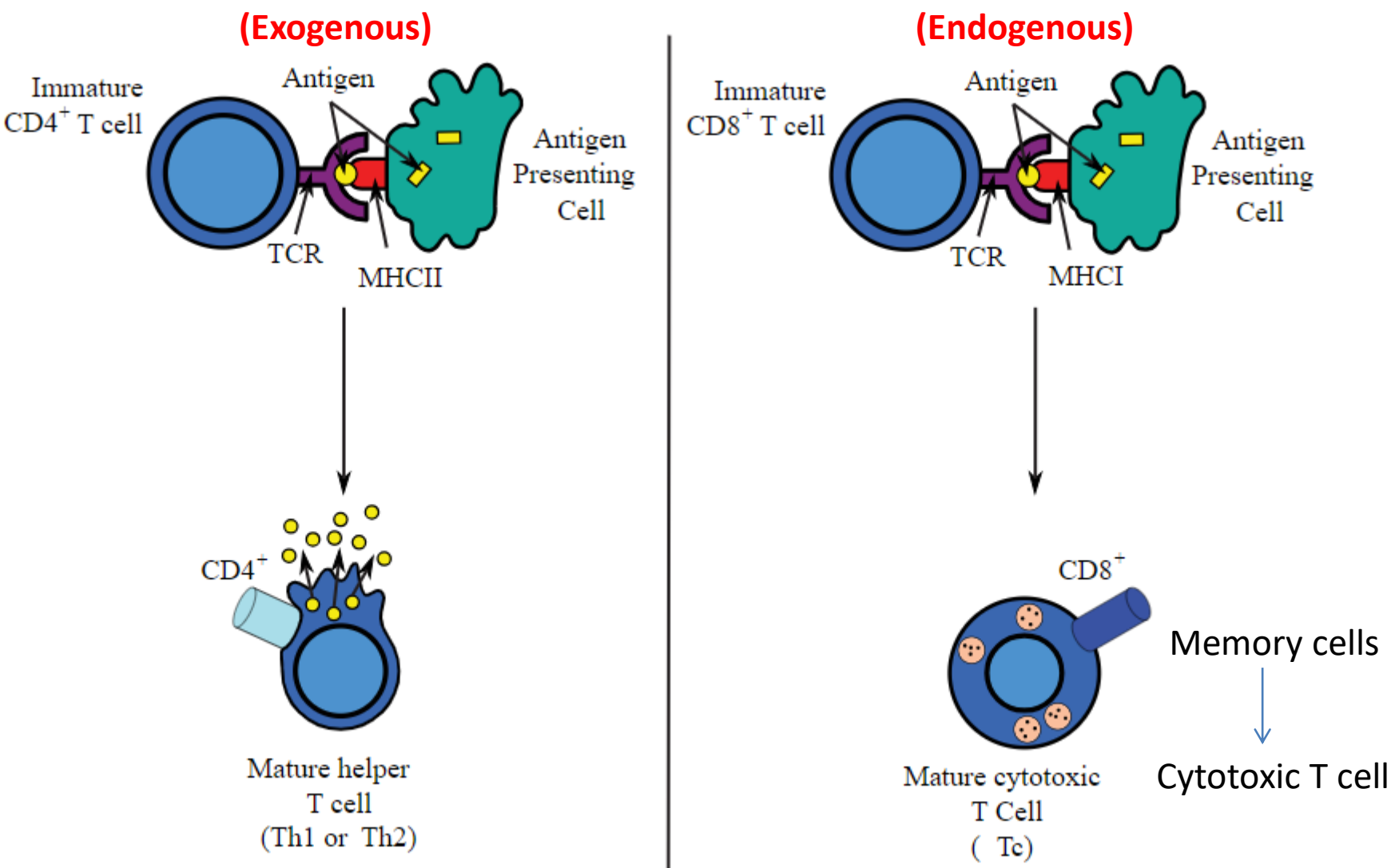
Functions:

a. Phagocytosis
b. Antigen presenting to T-cell
c. Secretion of cytokines

1. Alveolar macrophages: lungs
2. Histiocyte: connective tissue
3. Kuffer cells: liver
4. Mesengial cell: kidney
5. Microglial cell: brain
6. Osteoblast: bone
7. Langerhans cells: skin
8. Sinus histiocytes: lymph node

Antigen presenting cells (APC)

Antigen presenting cells.mp4

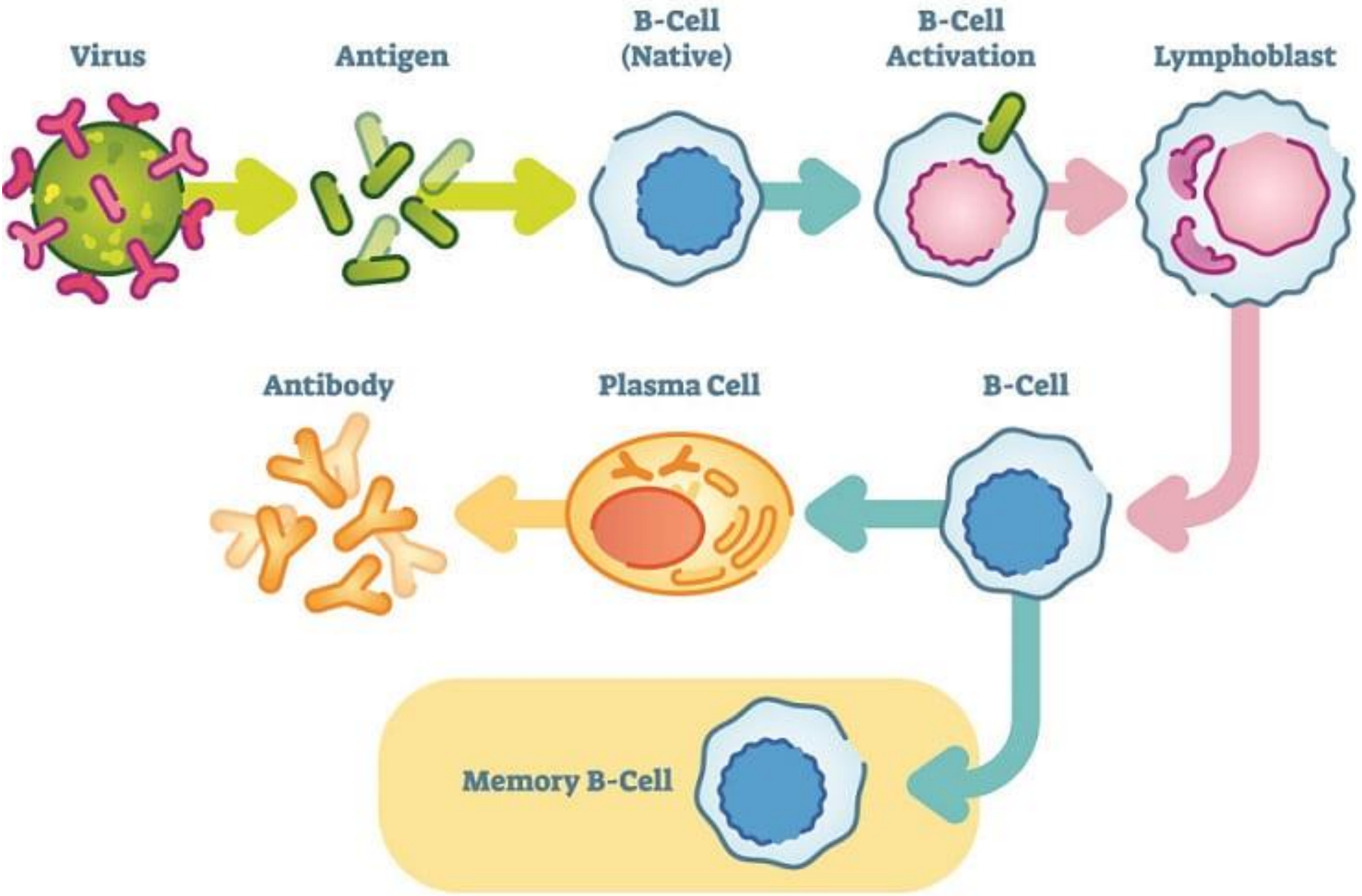


Th1: activate macrophages & cytotoxic T cells

Th2: activate B cells

T cells cannot recognize free antigens

Humoral Immunity



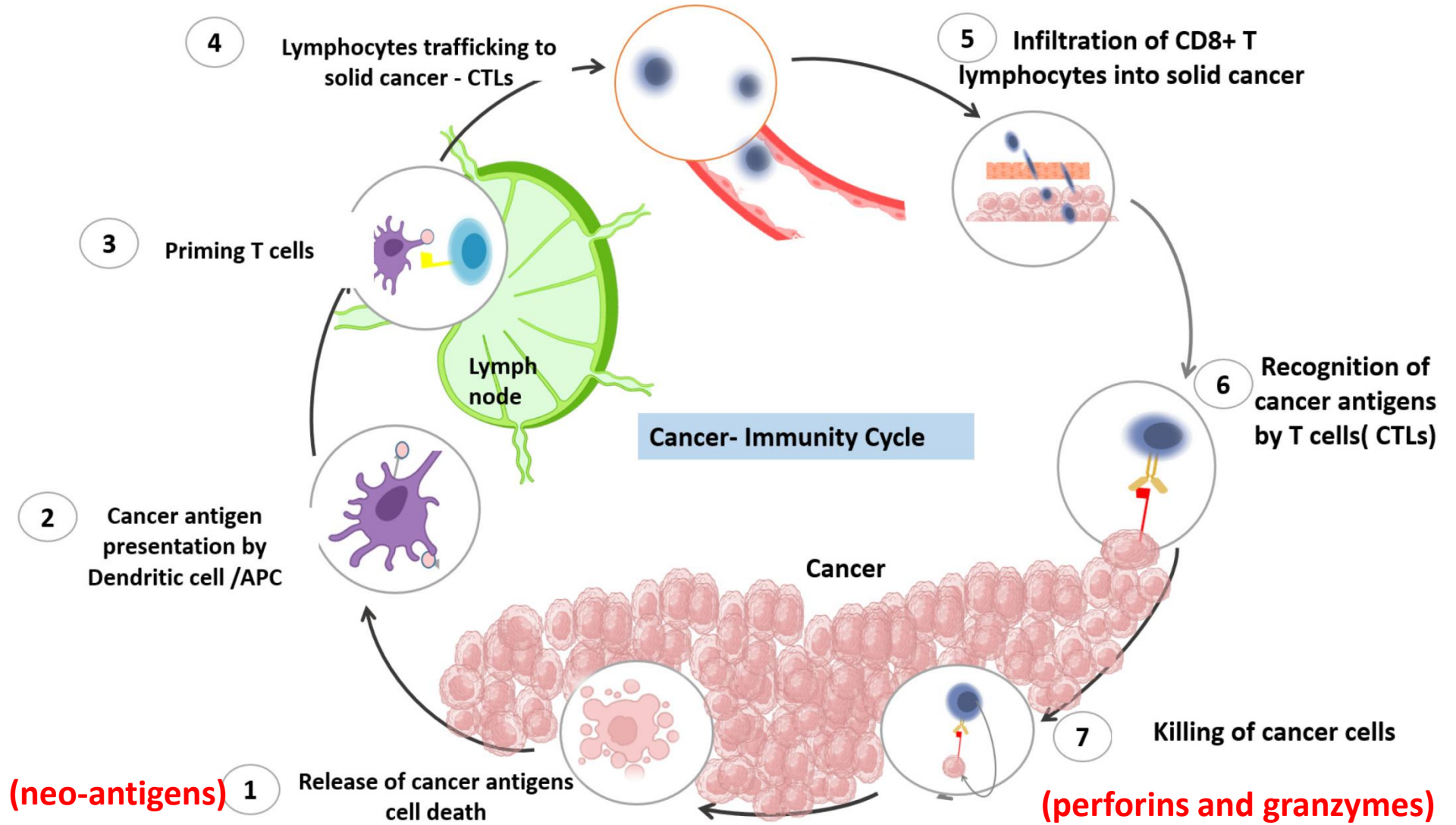
Cytokine

- Small, short-lived proteins
- Released by one cell to regulate the function of another cell
- Exert their influence on leukocytes, granulocytes, monocytes and macrophages
- Cytokines produced by leukocytes: interleukines
- Cytokines produced by lymphocytes: lymphokines
- Divided into 5 categories:
    a. Interleukins
    b. Interferons
    c. Colon-stimulating factors
    d. Tumor necrosis factors
    e. Growth factors

Tumor-suppressive roles of the Immune System

1. Acts against viruses which cause cancer
2. Resolves inflammation, a promoter of cancer
3. Recognizes (immunosurveillance) and kills tumor cells

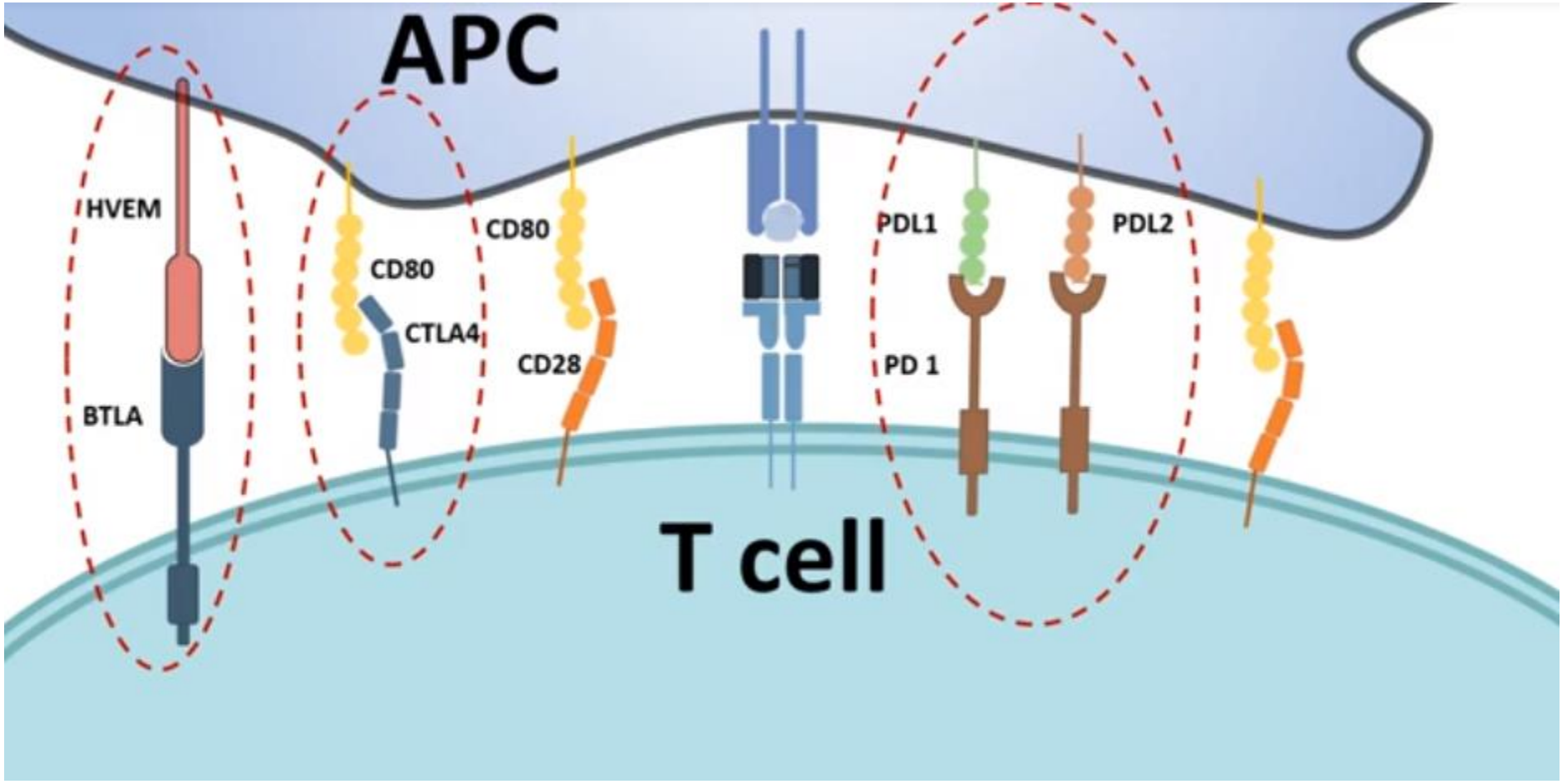
The Cancer Immunity Cycle



Cancer_Immune_Checkpoint_Inhibitors_from53s_to159.51s (2).mp4

CD 80 = B7.1

CD 86 = B7.2


APC
HVEM
BTLA
CD80
CTLA4
CD80
CD28
PDL1
PDL2
PD 1
T cell