General Pathology

Immunopathology

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Fundamentals

Immunity:

It is protection against infections. The immune system is the collection of cells and molecules that are responsible for:

1-Defending our body against pathogenic microbes in our environment.

2- Prevent the proliferation of cancer cells.

3- Mediate the healing of damaged tissue.

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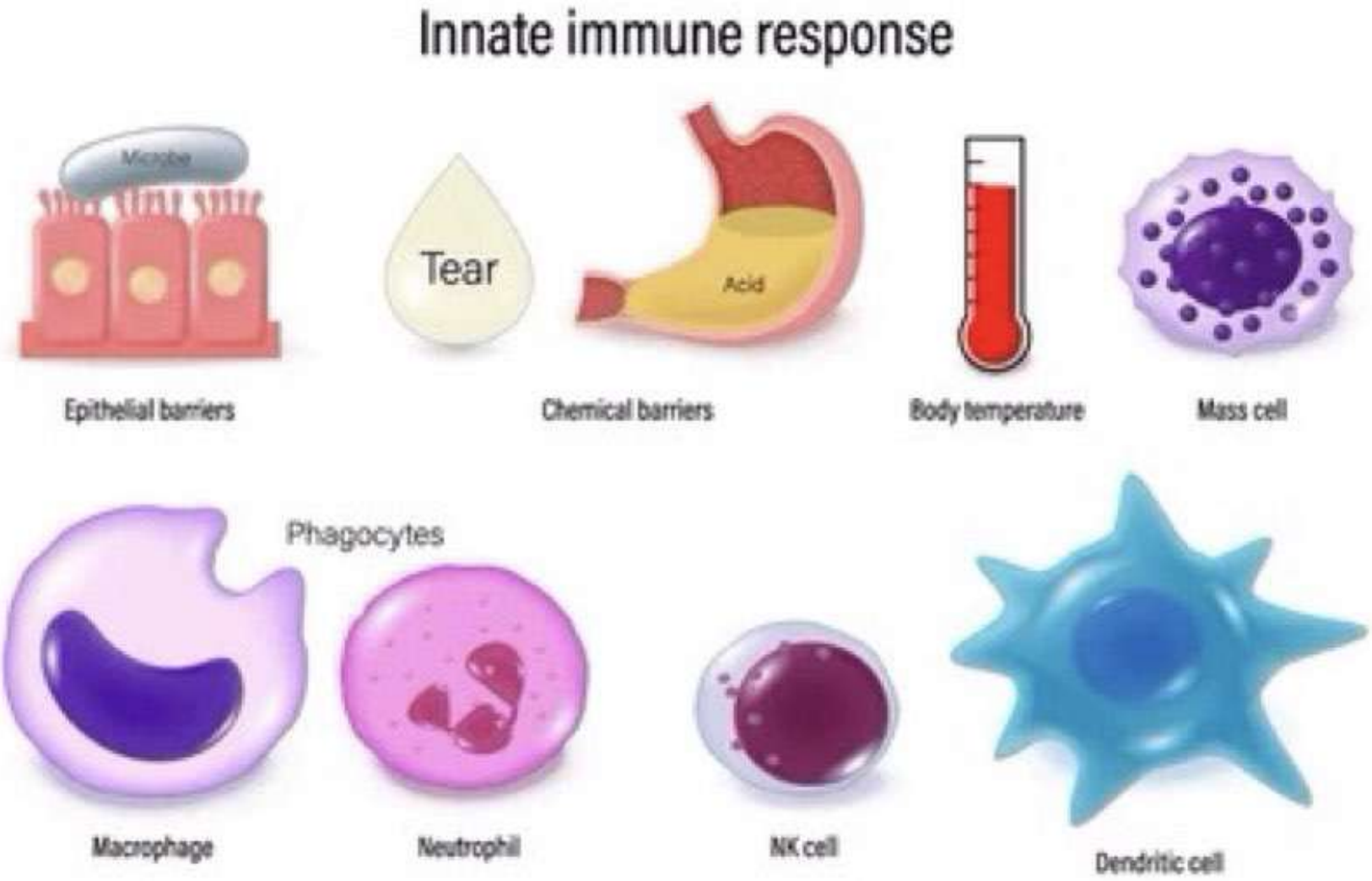
Innate: Always present, immediate (Barriers, Phagocytes, Natural Killer cells, Complement system).



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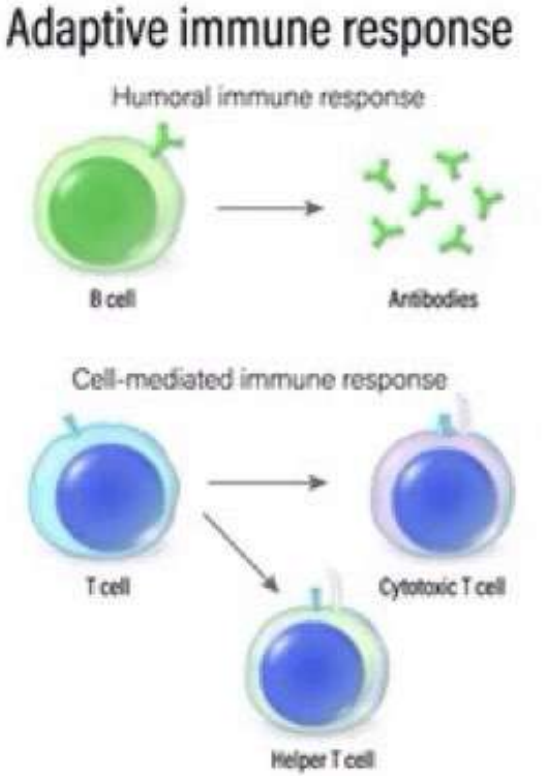
Adaptive: Specific, "adapts" (Lymphocytes).

Humoral: B cells \ Antibodies (Extracellular).

Cell-Mediated: T cells (Cytotoxic T-Lymphocytes kill, Helper T cells activate phagocytes) (Intracellular).



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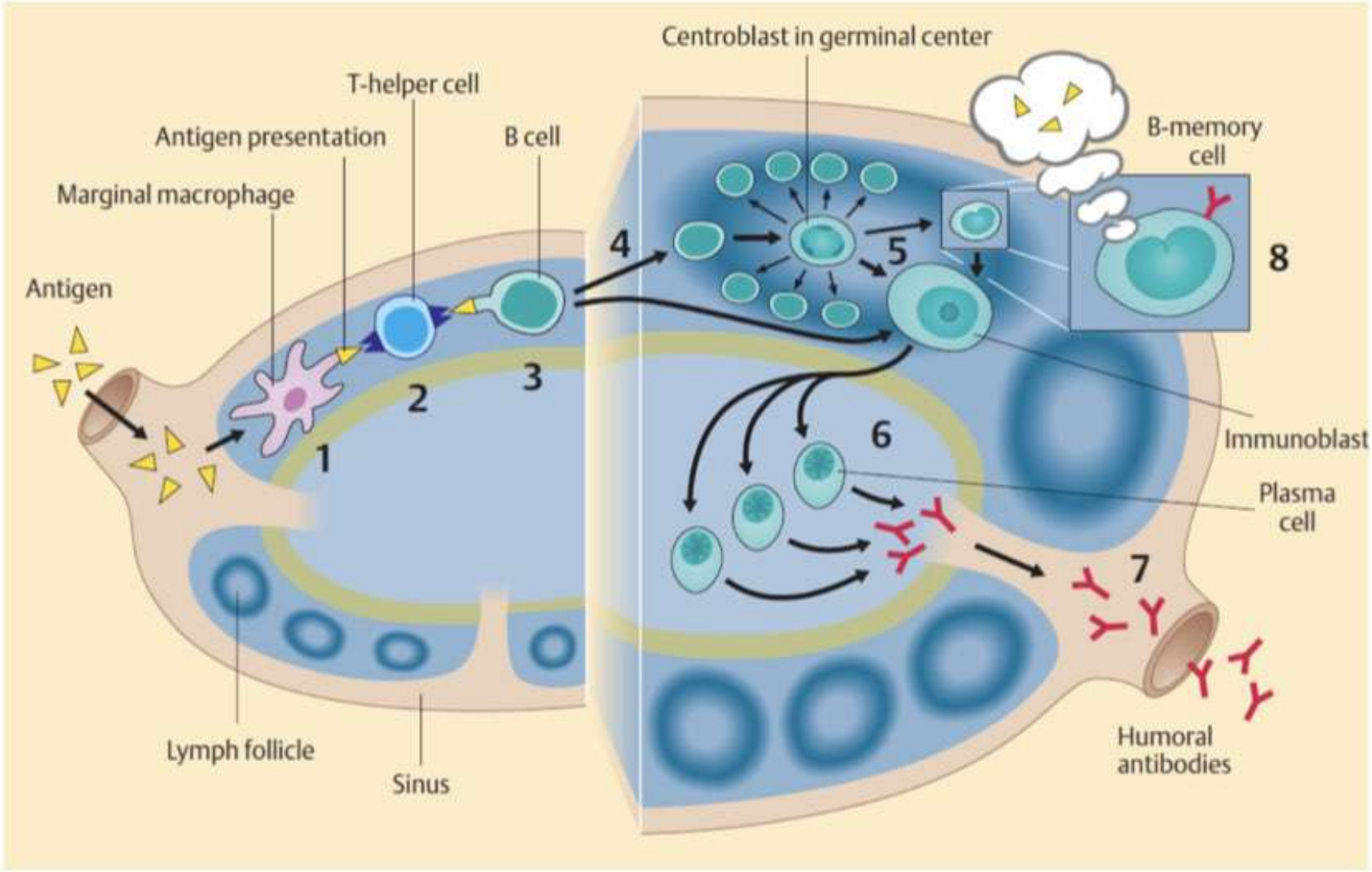

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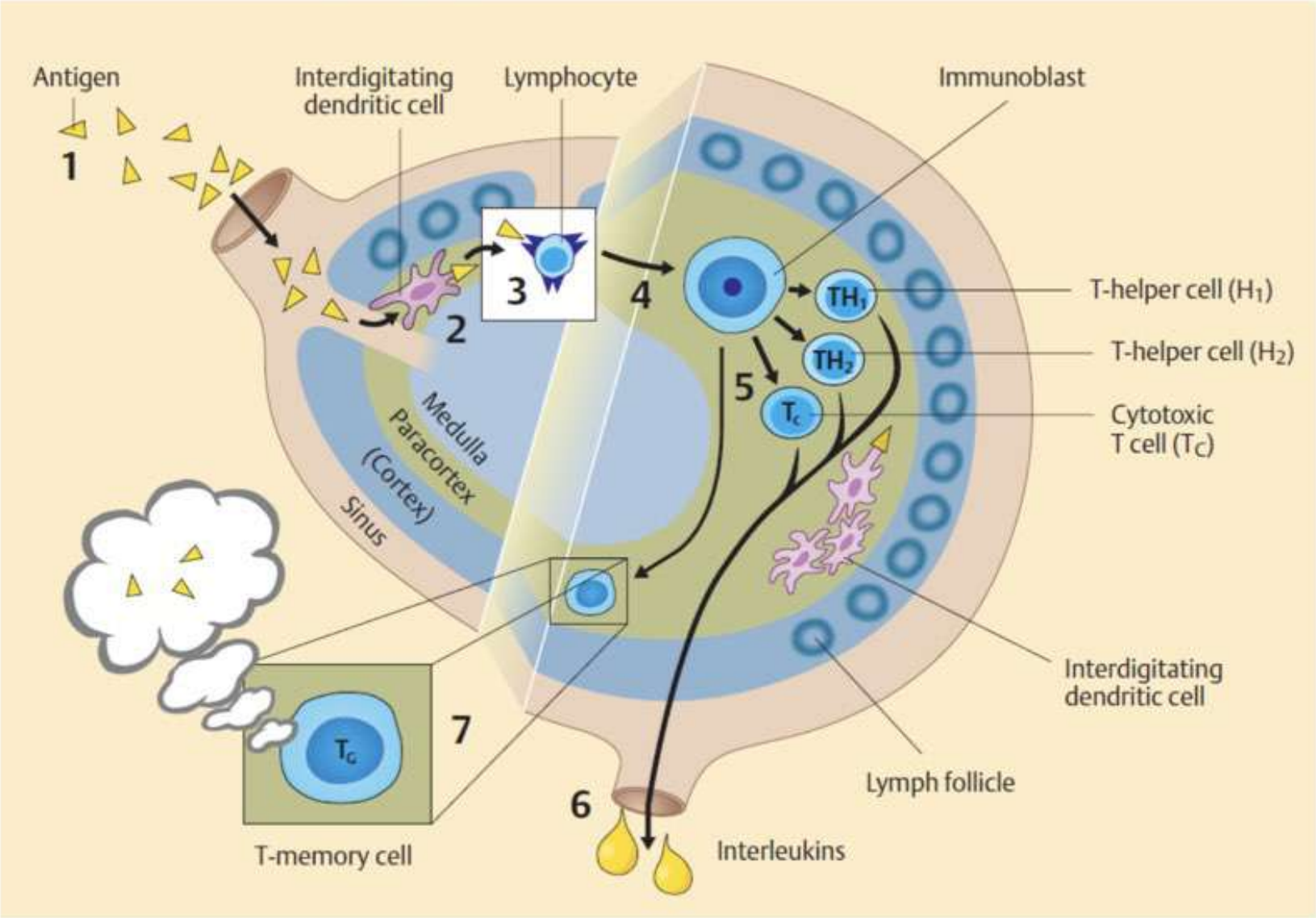

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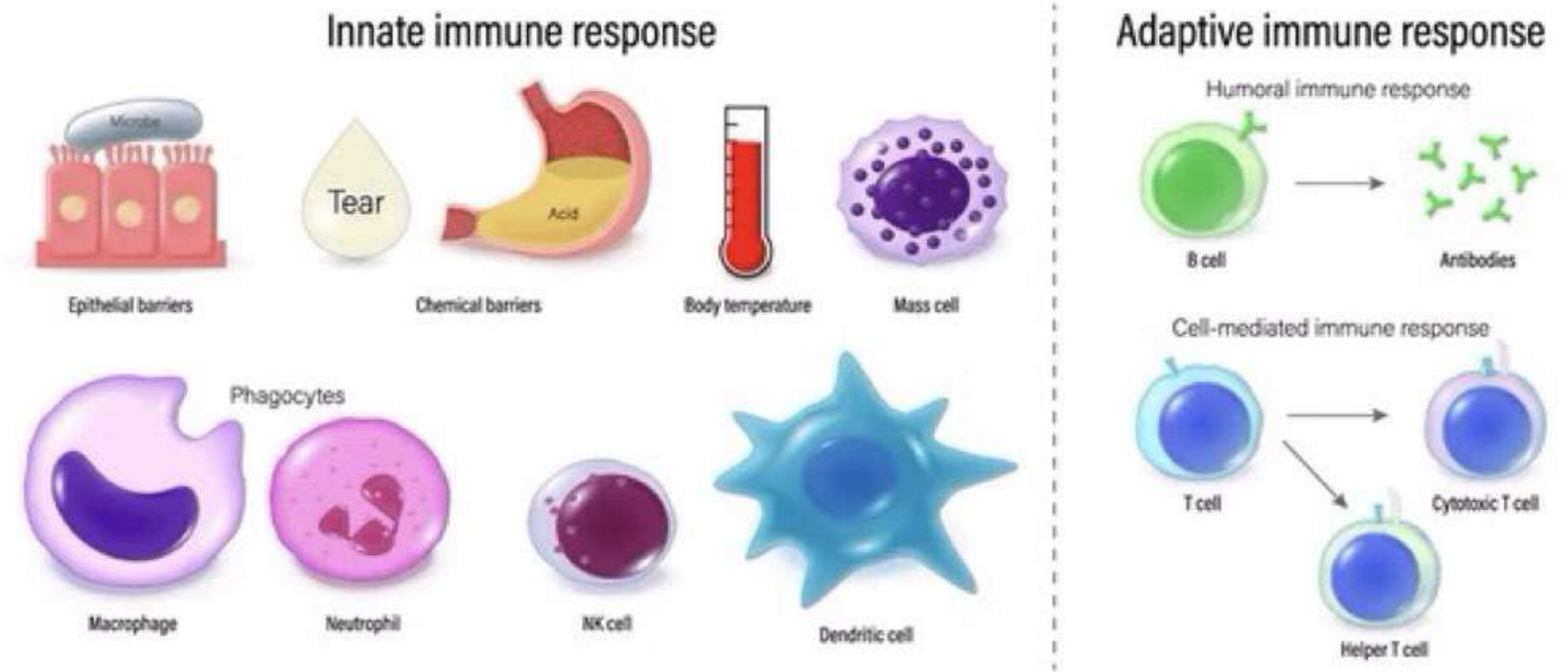
Key Cells:

Lymphocytes (T/B): Adaptive immunity mediators.

NK (natural killer) Cells: Innate, kill stressed/infected cells.

Antigen presenting cells (Dendritic cells/Macrophages): Capture and display antigens.



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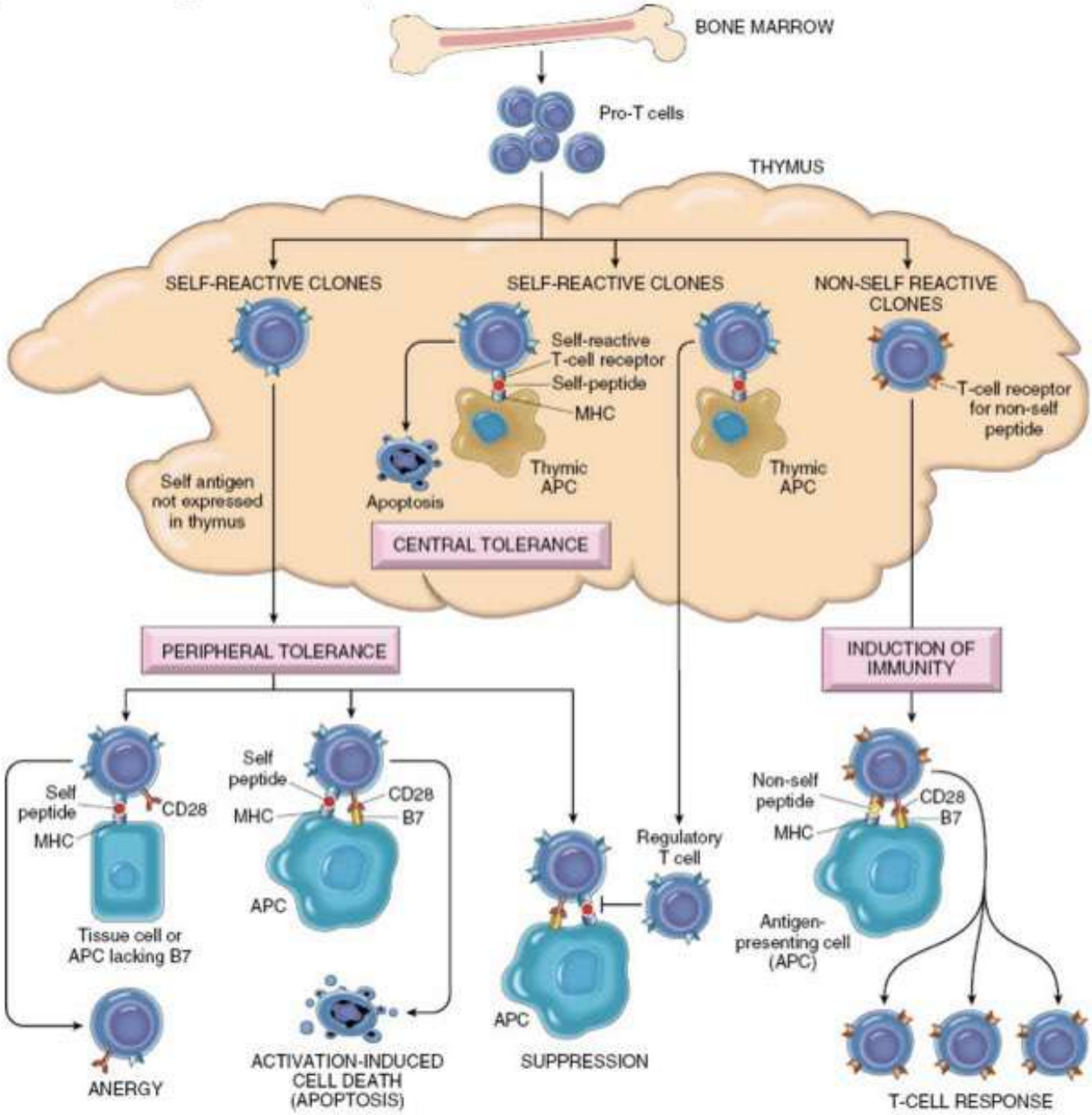
Immune tolerance: Central tolerance (Thymus/Bone Marrow deletion) & Peripheral tolerance (Anergy, T-regulatory cells).



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Immune System Diseases

Hypersensitivity

Hypersensitivity (Allergy) - **Exaggerated** Response

Type	Mediator	Key Mechanism	Examples
I (Immediate)	IgE, Mast cells	Degranulation (Histamine release)	Anaphylaxis, Hay Fever
II (Cytotoxic)	IgG, IgM	Antibody binding → Cell lysis/damage	Transfusion reactions, Hemolytic Anemia
III (Immune-Complex)	Ag-Ab Complexes	Deposition → Complement activation → Inflammation	SLE, Glomerulonephritis
IV (Cell-Mediated)	T cells	Delayed cytokine/CTL damage (no antibody)	Tuberculin test, Contact Dermatitis

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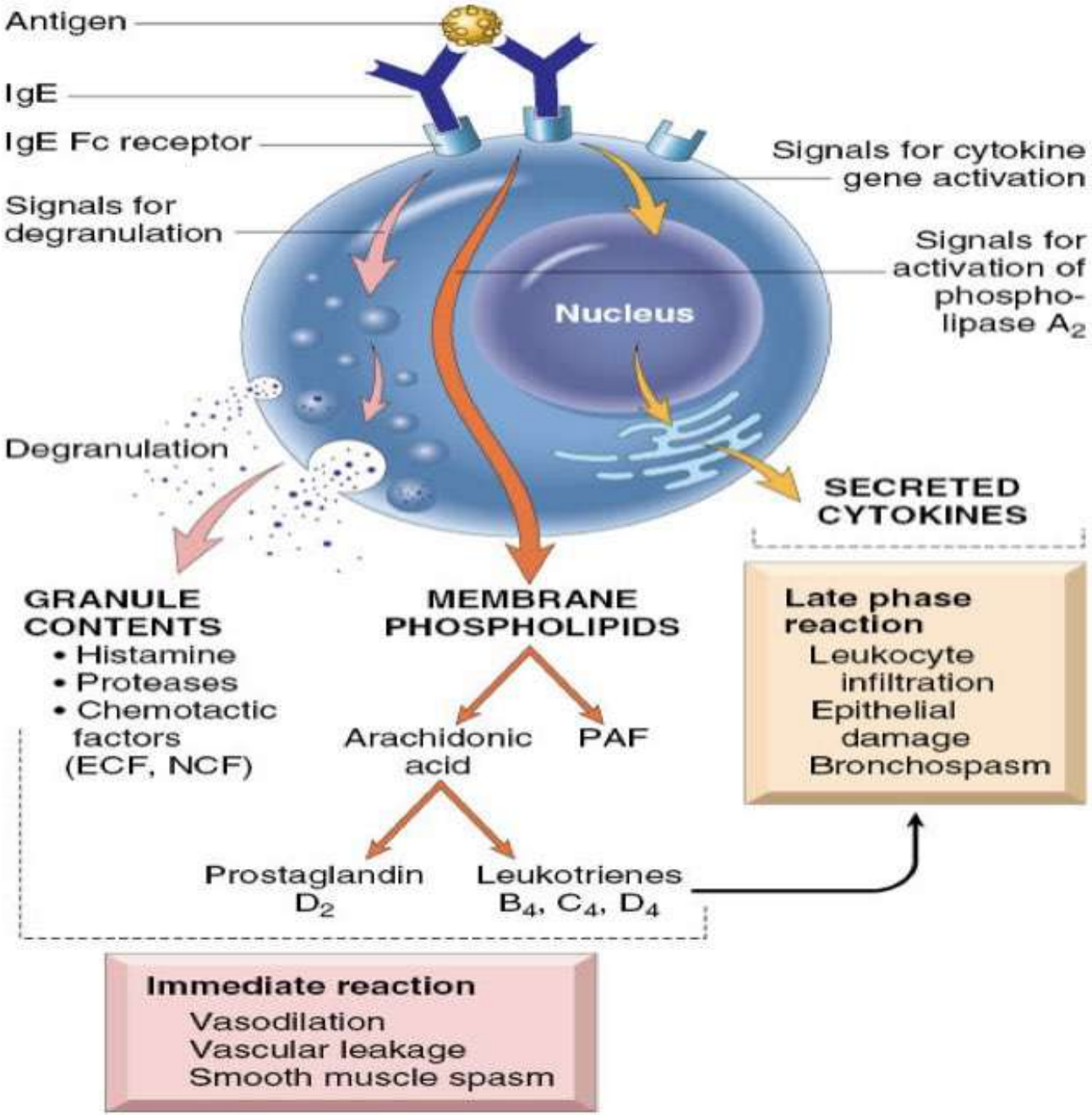
Type-I (Immediate) Hypersensitivity Reaction— IgE antibody+Mast cells.



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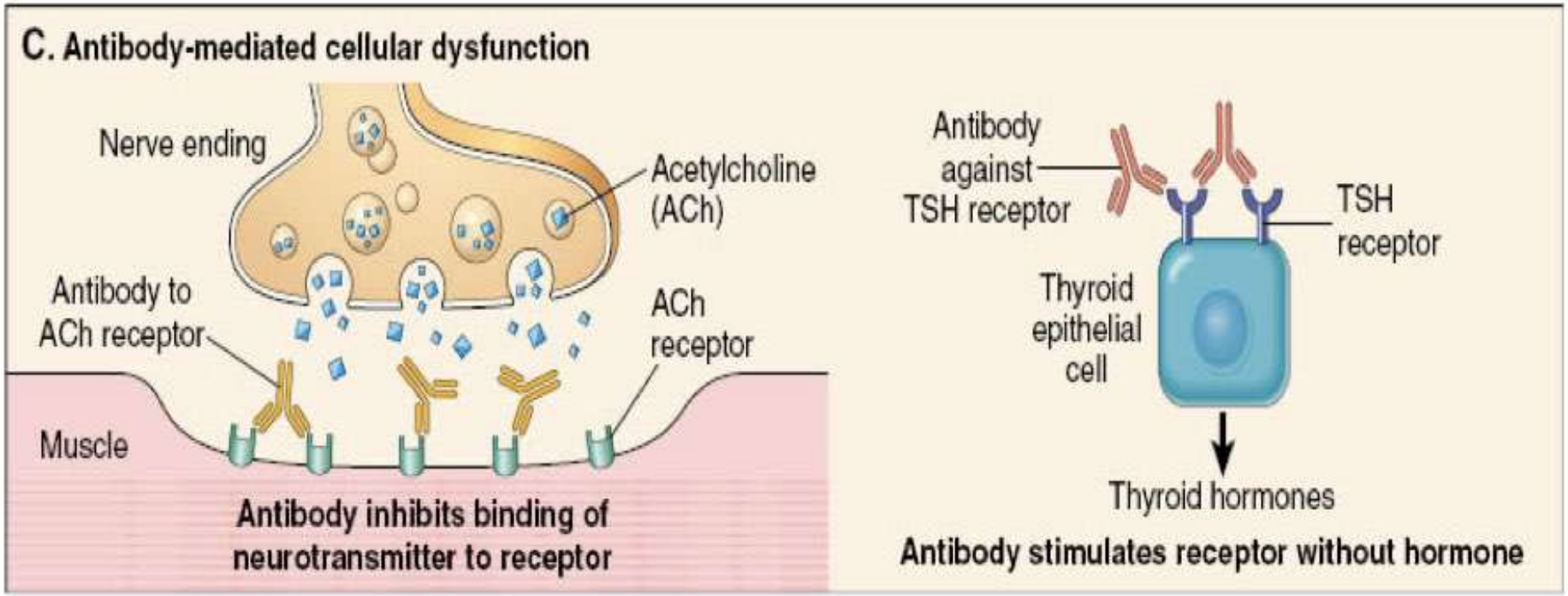
Type-II (Cytotoxic) Hypersensitivity Reaction—Ab-mediated.



Myasthenia Gravis-----Muscle blocking signal

Graves Disease-----Thyroid stimulating signal

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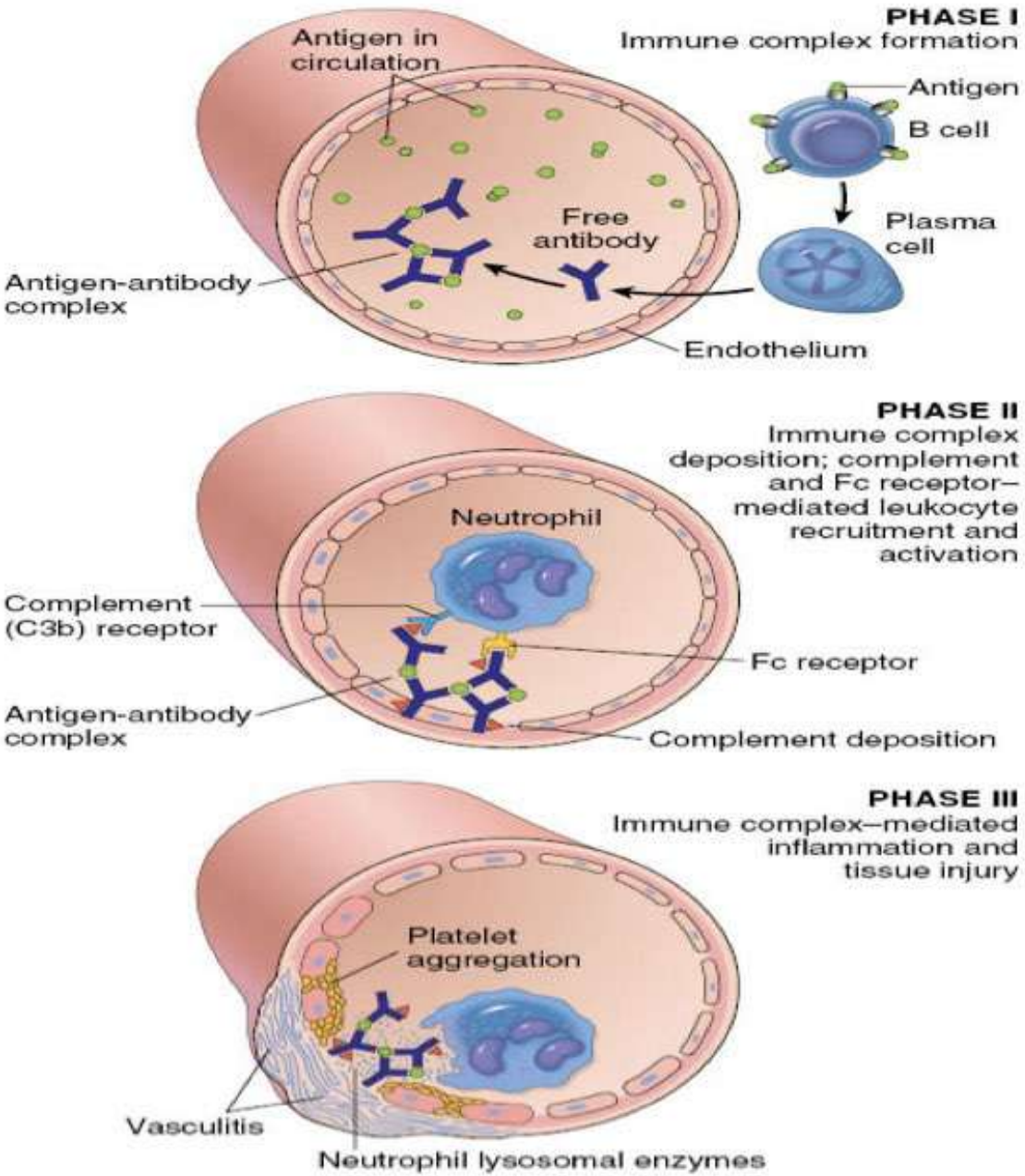
Type-III (Immune complex) Hypersensitivity Reaction—Ag+Ab—inflammation.



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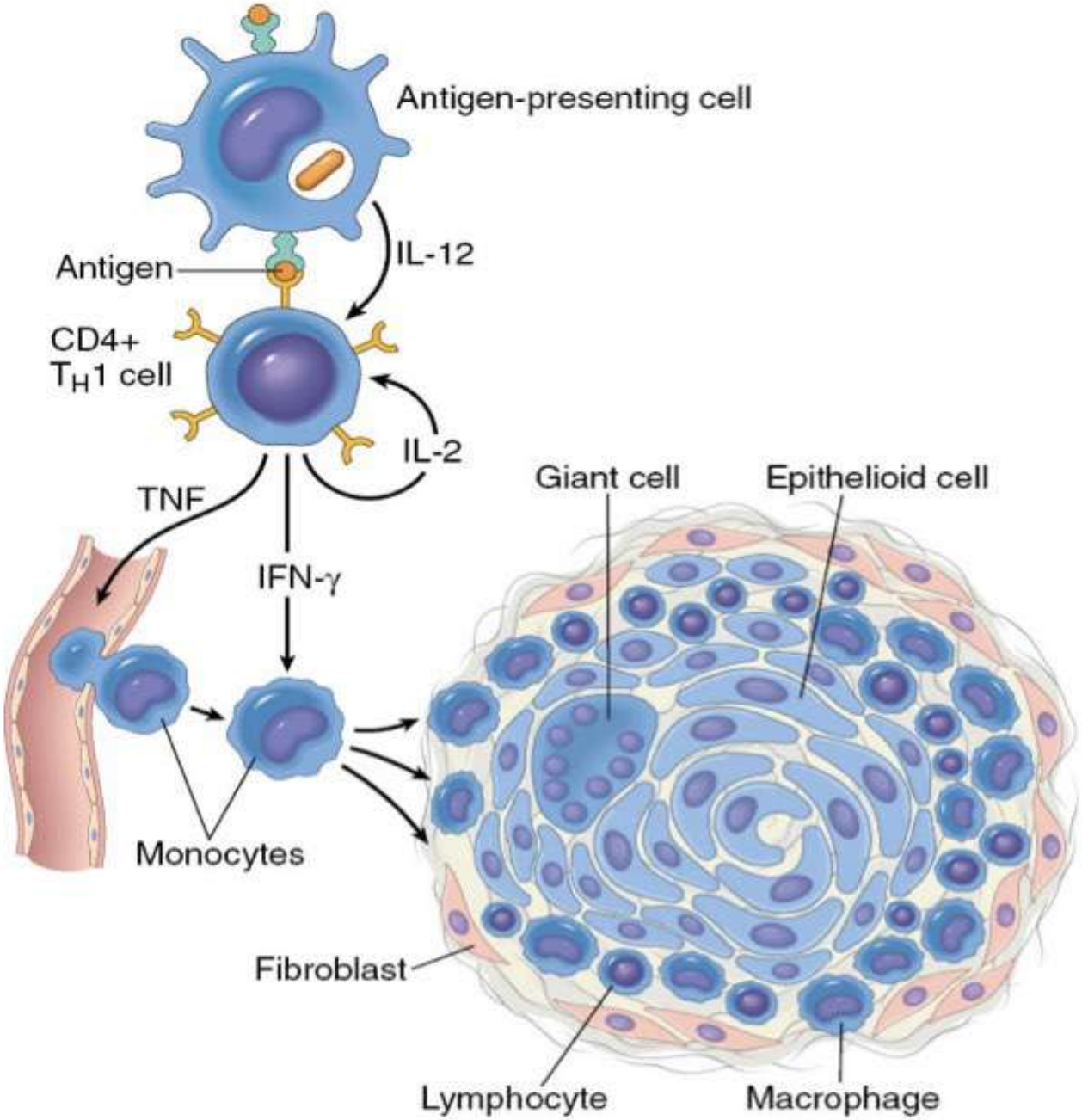
Type-IV (Delayed) Hypersensitivity Reaction—T-cell mediated.



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Autoimmune Disease

Autoimmune Disorders

Cause: Loss of Self-Tolerance (failure to distinguish self/non-self).

Triggers: Genetics human leukocyte antigen (HLA), Infection (Molecular Mimicry).

Examples: Systemic lupus erythematosus (SLE), Rheumatoid Arthritis (RA), Sjögren Syndrome (dry eyes/mouth).

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Transplant Pathology

Types of tissue transplants

- ***Autograft***: The transplant consists of the individual's own tissue (such as a skin graft).
- ***Isograft***: The transplant consists of tissue transferred between genetically identical individuals (a graft from an ***identical twin***).
- ***Allograft***: The transplant consists of tissue transferred between genetically dissimilar individuals of the ***same species*** (such as a human heart transplant).
- ***Xenograft***: The transplant consists of tissue transferred between ***different species*** (such as a porcine heart valve implanted in a human heart).

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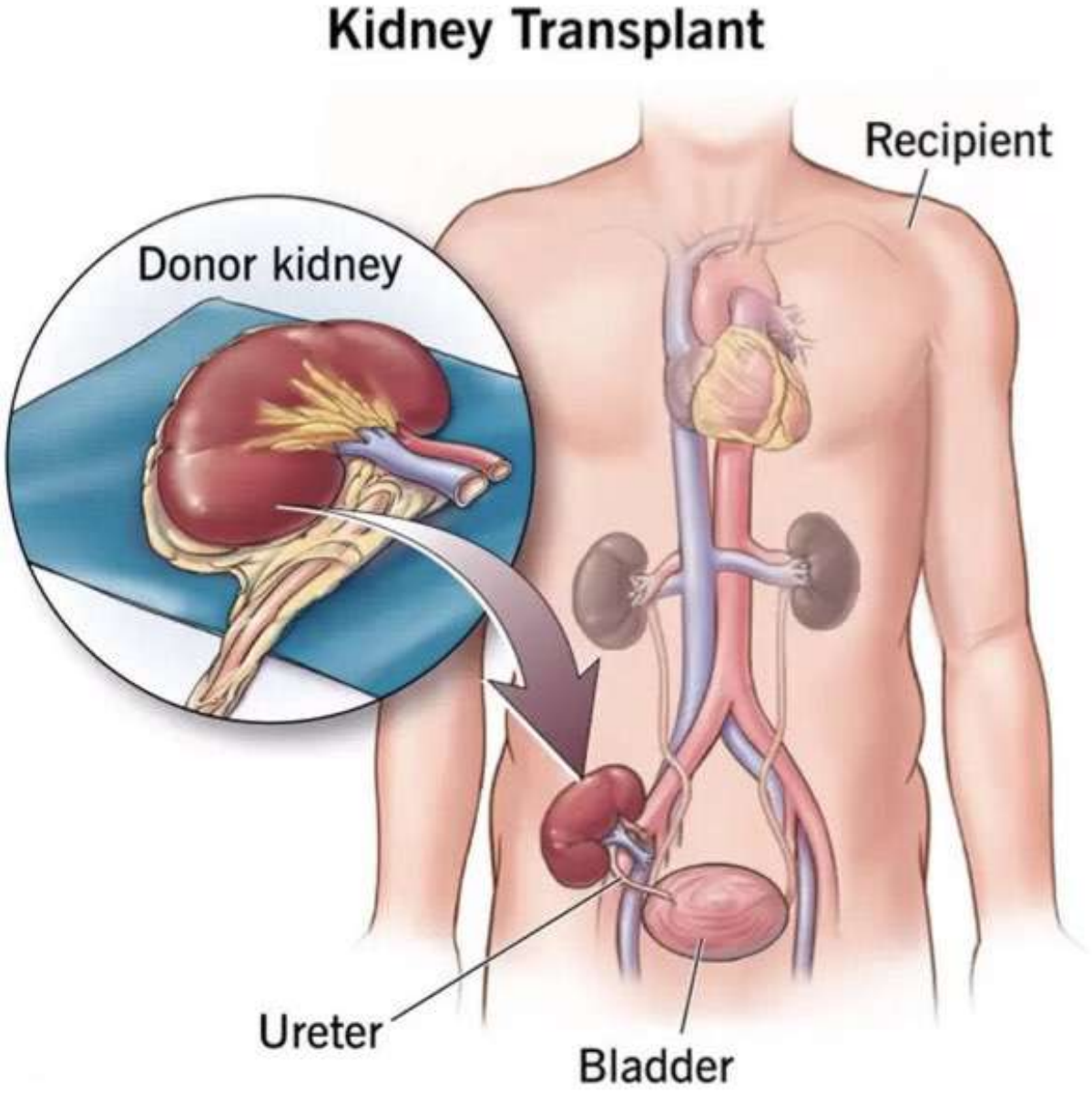
Transplant Rejection: Immune response against donor MHC (major histocompatibility complex) /HLA (human leukocyte antigen).



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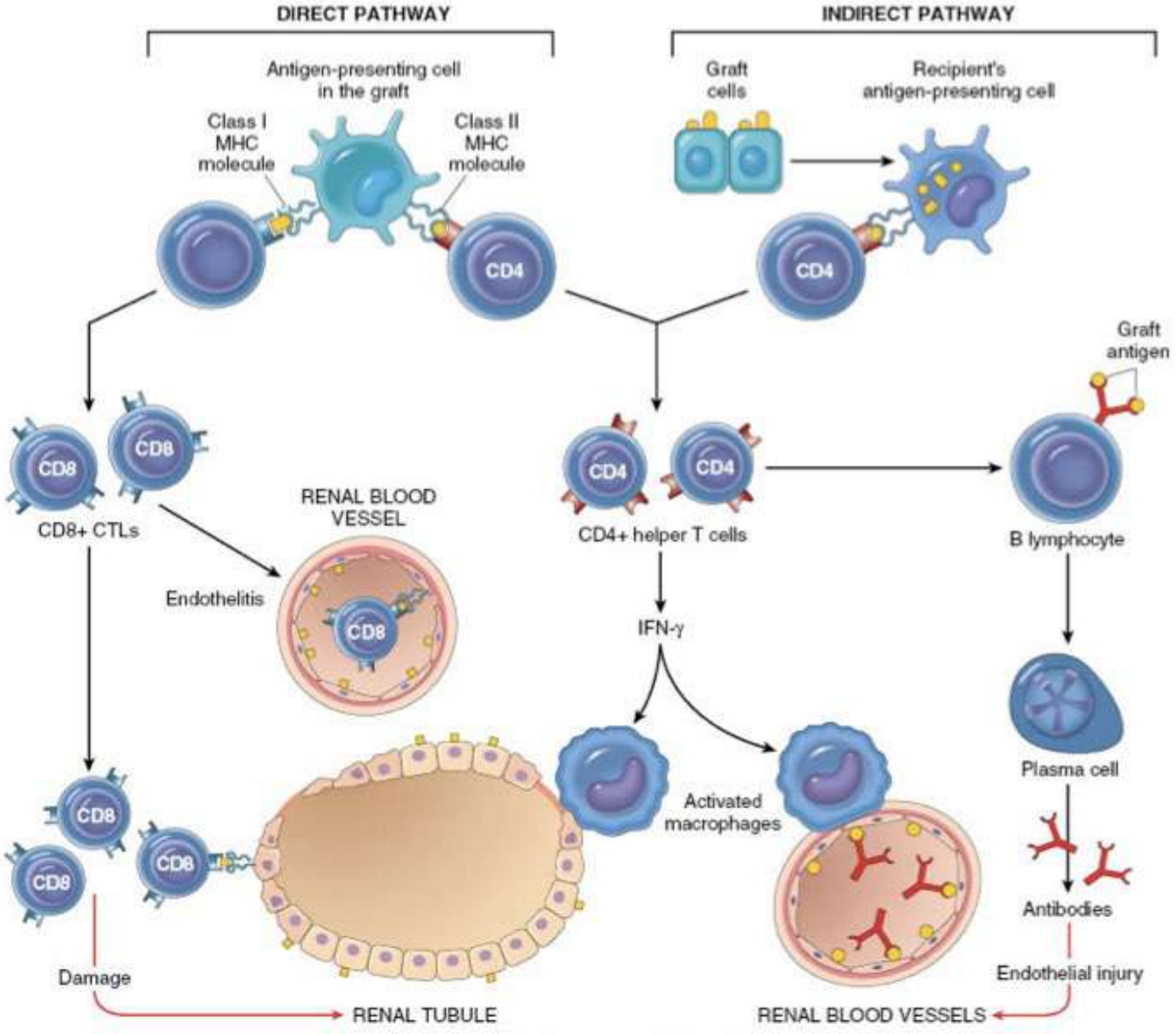
HVGD (host versus graft disease): Host attacks Graft (Hyperacute, Acute, Chronic) e.g., kidney transplant rejection.



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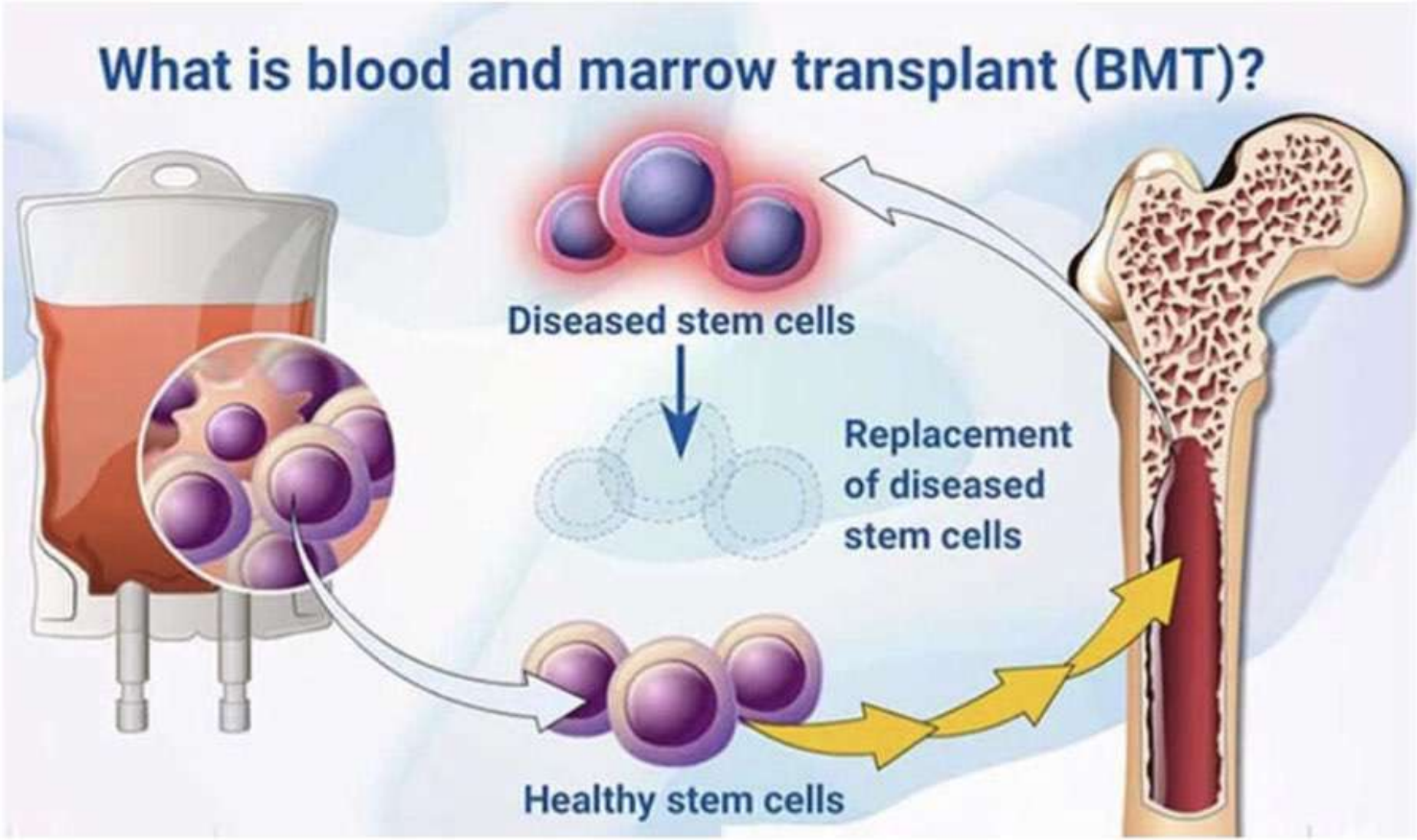
GVHD (graft versus host disease): Donor T cells attack Host (e.g., Bone Marrow Transplant).



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Immunodeficiency

Result: Increased infection/cancer risk.

Primary: Genetic defects.

Secondary: Acquired (e.g., malnutrition, HIV/AIDS).

AIDS (HIV): Depletes \CD4+T cells, leading to profound immunosuppression.

The most common cause of immune suppression is the use of steroids.

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