

CELLS OF IMMUNE SYSTEM

Immune system has large collection of cells . The all blood cells are formed by hematopoiesis. Hematopoiesis is refers to the formation and development of the cells. Hematopoiesis continues throughout the adulthood. It estimated that the acerage human produces 3.7×10^{11} blood cells per day. In humans it starts in the yolk sac in the first weeks of embryonic development.

Cells of immune system

a) B cells

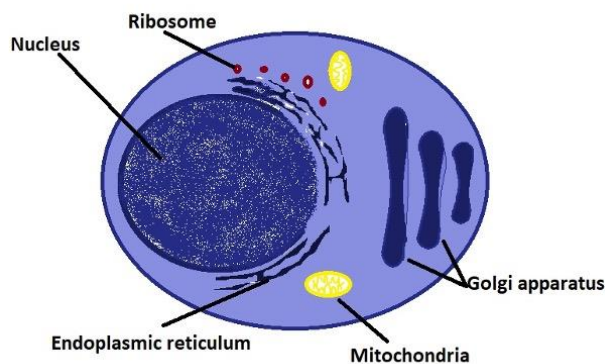
Account for 10 to 15 percent of lymphocytes. They are called B cells because they are first discovered in *Bursa of fabrics* in birds. B cell maturation takes place in bone marrow.

B cells plays 2 imp.role in protection of body

1. Antigen production
2. Presenting antigen to T cells and therefore providing signals for T cell activation

Plasma cells

Plasma cells are the B cells that are responsible for the production and secretion of single antibody type . Immunity is kept for as long as the plasma cells continues to secrete antibodies.



Plasma cell

Memory B cells

These are also formed after stimulation. These cells migrate to the lymph nodes, where they remain ready for further rounds of activation should be the same antigen ever be encountered again.

b) T cells

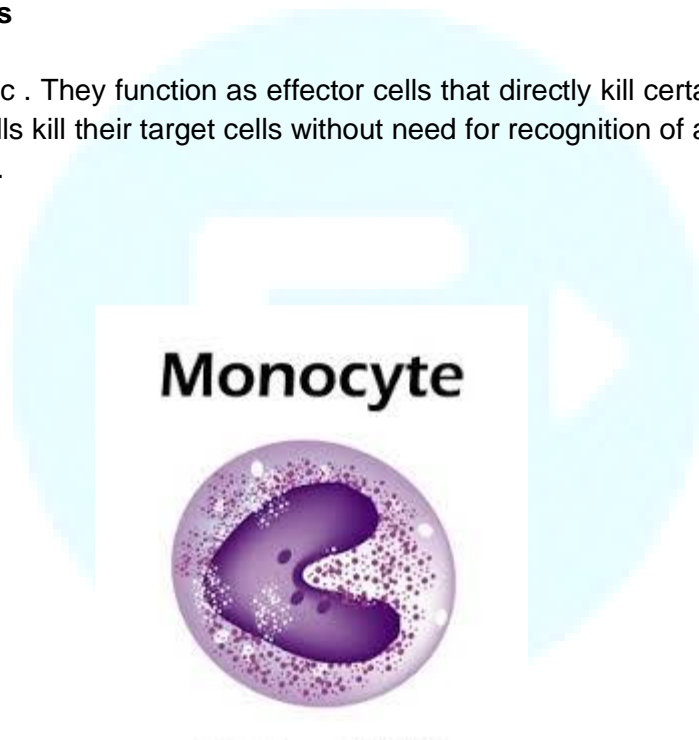
T lymphocytes are usually divided into 2 major subsets that are functionally and phenotypically different. T helper cells, also called CD4+ T cells, are involved in coordination and regulation of immunological response. They function to mediate responses by the secretion of cytokines that stimulate B lymphocytes to secrete antibodies and Tc cells to get activated in cytotoxic T lymphocytes.

The second type of T lymphocytes is cytotoxic T lymphocytes. These cells are involved in direct killing of tumor cells, virus infected cells.

c) **Natural killer cells**

They are similar to Tc. They function as effector cells that directly kill certain tumours and virus infected cells. NK cells kill their target cells without need for recognition of antigen in association with MHC molecules.

d) **Monocytes**



It is a type of WBC. They are largest type of WBCs and can differentiate into macrophages. Monocytes compose 2% to 10% of all leukocytes in the human body. As monocytes begin to travel, they enter major organs such as liver and pancreas.

e) Macrophages

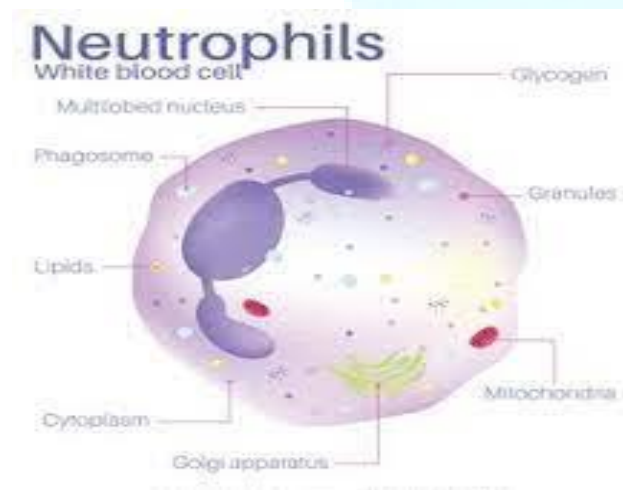


Besides their role in phagocytosis, they function as antigen presenting cells ,because they ingest foreign materials and present these antigens to other cells of immune systems such as T cells and B cells. This is the step in initiation of immunological response

f) Dendritic cells

Originate from bone marrow and function as APCs. Dendritic cells are more efficient APCs than macrophages. These cells are found in lymphoid organs,blood stream and other tissues of the body .

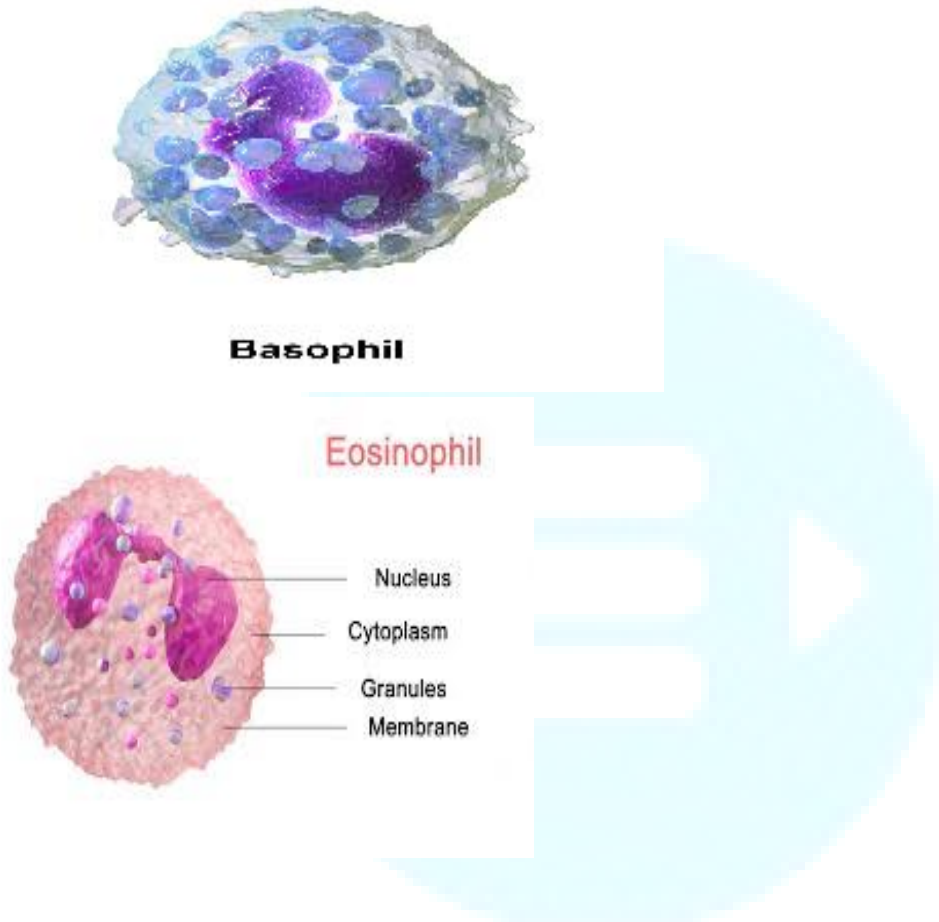
g) Neutrophils



Neutrophils are phagocytes that travel throughout the body. These cells are normally found in blood stream and are most abundant phagocytes. During the acute phase of inflammation

Neutrophils migrate toward the site of inflammation and are usually first cells to arrive scene of infection.









h) Basophils and eosinophils



They are related to neutrophils. They secrete chemical mediators that involved in defending against parasites and play a role in allergic reactions .

i) Mast cells

These cells are reside in connective tissue and mucous membranes, and regulate the inflammatory response. They most often associated with allergy and anaphylaxis.

Cell	Image	% in adults	Nucleus	Functions	Lifetime	Main targets
Macrophage*		Varies	Varies	<ul style="list-style-type: none"> Phagocytosis Antigen presentation to T cells 	Months – years	<ul style="list-style-type: none"> Various
Neutrophil		40-75%	Multi-lobed	<ul style="list-style-type: none"> Phagocytosis Degranulation (discharge of contents of a cell) 	6 hours – few days	<ul style="list-style-type: none"> Bacteria Fungi
Eosinophil		1-6%	Bi-lobed	<ul style="list-style-type: none"> Degranulation Release of enzymes, growth factors, cytokines 	8-12 days (circulate for 4-5 hours)	<ul style="list-style-type: none"> Parasites Various allergic tissues
Basophil		< 1%	Bi- or tri-lobed	<ul style="list-style-type: none"> Degranulation Release of histamine, enzymes, cytokines 	Lifetime uncertain; likely a few hours – few days	<ul style="list-style-type: none"> Various allergic tissues
Mast cell		Common in tissues	Central, single-lobed	<ul style="list-style-type: none"> Degranulation Release of histamine, enzymes, cytokines 	Months to years	<ul style="list-style-type: none"> Parasites Various allergic tissues
Lymphocytes (T cells)		20-40%	Deeply staining, eccentric	<p>T helper (Th) cells (CD4+): immune response mediators</p> <p>Cytotoxic T cells (CD8+): cell destruction</p>	Weeks to years	<ul style="list-style-type: none"> Th cells: intracellular bacteria Cytotoxic T cells: virus infected and tumour cells Natural killer cells: virus-infected and tumour cells
Monocyte		2-6%	Kidney shaped	Differentiate into macrophages and dendritic cells to elicit an immune response	Hours – days	<ul style="list-style-type: none"> Various
Natural killer (NK) cell		15% (varies) of circulating lymphocytes and tissues	Single-lobed	<ul style="list-style-type: none"> Tumour rejection Destruction of infected cells Release of perforin and granzymes which induce apoptosis 	7-10 days	<ul style="list-style-type: none"> Viruses Tumour cells