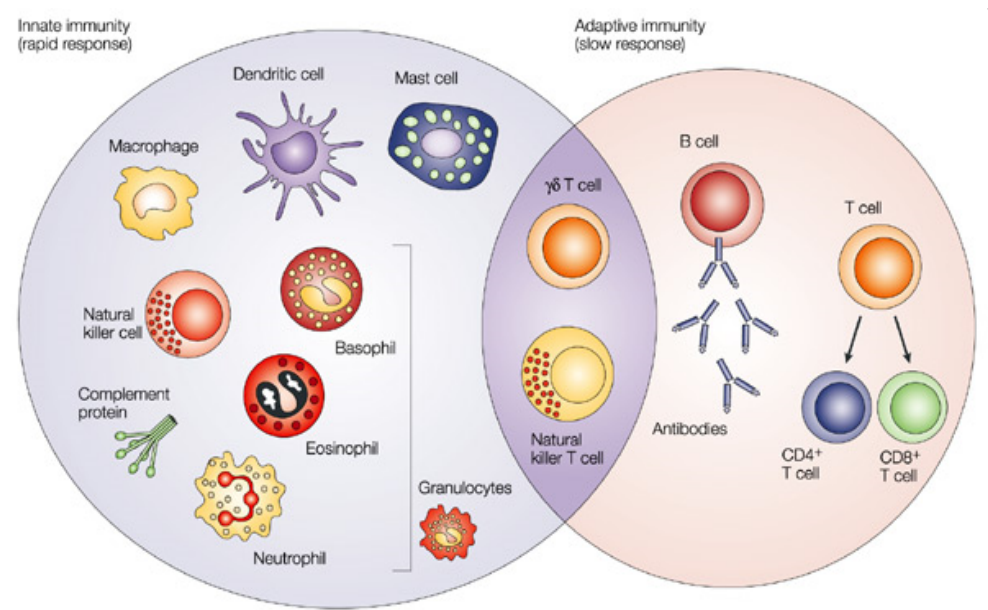


Immune System Organization Handout 1

The cells making up the immune system are classified broadly as “innate” and “adaptive”.

Innate cells can be further grouped by the absence (agranular) or presence (granular) of cytoplasmic inclusions or granules.



Dranoff G. Nat. Rev. Cancer. 2004. 4: 11-22

Modified from https://en.wikipedia.org/wiki/White_blood_cell

Type	Microscopic appearance	Diagram	Approx. % in adults <small>See also: Blood values</small>	Diameter (μm) ^[6]	Main targets ^[4]	Nucleus ^[4]	Granules ^[4]	Lifetime ^[6]
Neutrophil			62%	10–12	<ul style="list-style-type: none"> Bacteria Fungi 	Multilobed	Fine, faintly pink (H&E stain)	6 hours–few days (days in spleen and other tissue)
Eosinophil			2.3%	10–12	<ul style="list-style-type: none"> Larger parasites Modulate allergic inflammatory responses 	Bi-lobed	Full of pink-orange (H&E stain)	8–12 days (circulate for 4–5 hours)
Basophil			0.4%	12–15	<ul style="list-style-type: none"> Release histamine for inflammatory responses 	Bi-lobed or tri-lobed	Large blue	A few hours to a few days
Lymphocyte			30%	Small lymphocytes 7–8 Large lymphocytes 12–15	<ul style="list-style-type: none"> B cells: releases antibodies and assists activation of T cells T cells: <ul style="list-style-type: none"> CD4+ Th (T helper) cells: activate and regulate T and B cells CD8+ cytotoxic T cells: virus-infected and tumor cells. γδ T cells: bridge between innate and adaptive immune responses; phagocytosis Regulatory (suppressor) T cells: Returns the functioning of the immune system to normal operation after infection; prevents autoimmunity Natural killer cells: virus-infected and tumor cells. 	Deeply staining, eccentric	NK-cells and cytotoxic (CD8+) T-cells	Years for memory cells, weeks for all else.
Monocyte and Macrophage			5.3%	15–30 ^[7]	Monocytes migrate from the bloodstream to other tissues and differentiate into tissue resident macrophages, Kupffer cells in the liver.	Kidney shaped	None	Hours to days
Dendritic Cells	 (O'Neill et al. Blood 2014)			15–30	<p>Dominant role is to act as “Professional antigen presenting cells (APC)” which show pieces of pathogens to T cells in forms they can recognize</p> <p>Source of cytokines that shapes immune responses (IL-1, IL-6, IL-10, IL-12, IL-23)</p>	Kidney and Oval shaped	None	Days to months