

Cells and Tissues of the Immune System



Normal Blood Cell Counts

	Mean Number per Microliter	Normal Range
White blood cells (leukocytes)	7400	4500-11,000
Neutrophils	4400	1800-7700
Eosinophils	200	0-450
Basophils	40	0-200
Lymphocytes	2500	1000-4800
Monocytes	300	0-800



Hematopoiesis

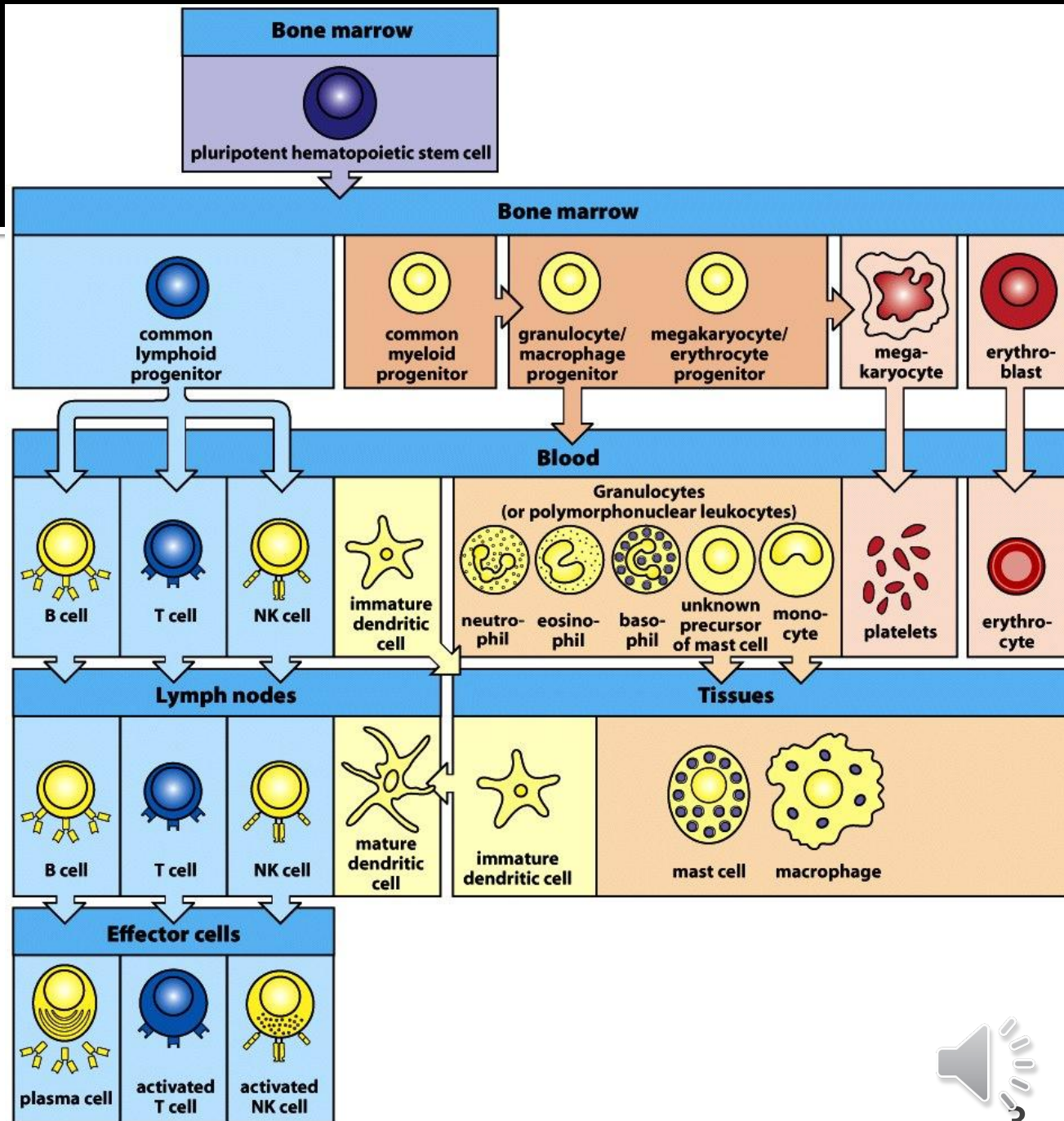


Figure 1-3 Immunobiology, 7ed. (© Garland Science 2008)



Neutrophils

Cell	Activated function
Neutrophil	Phagocytosis and activation of bactericidal mechanisms

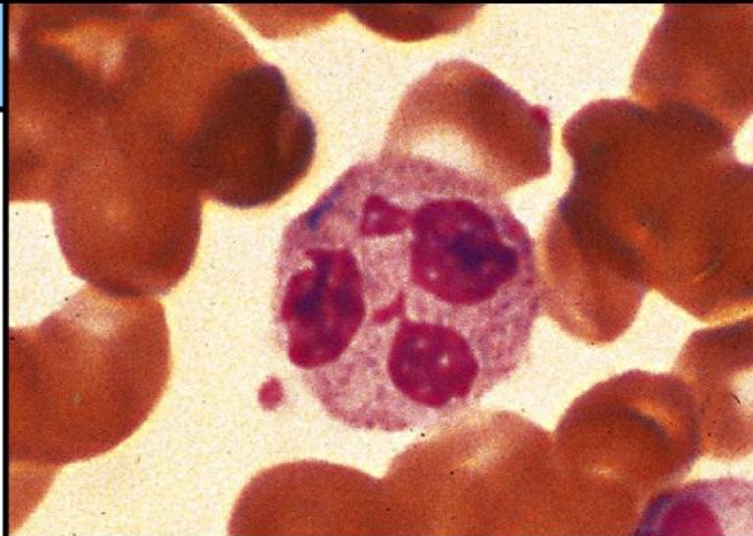


Figure 1-4 part 3 of 6 Immunobiology, 7ed. (© Garland Science 2008)

Mononuclear Phagocytes

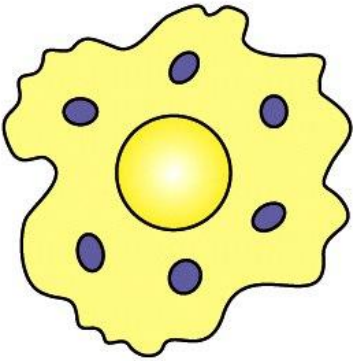
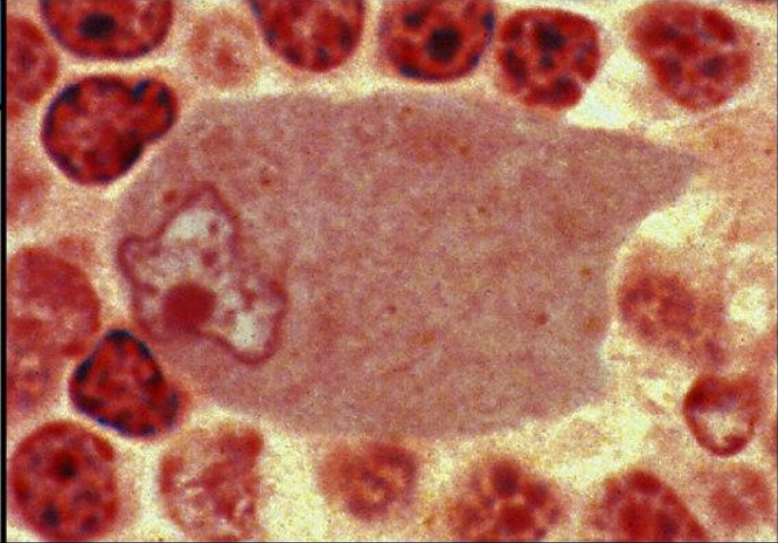
Cell	Activated function
Macrophage 	 <p>Phagocytosis and activation of bactericidal mechanisms</p> <p>Antigen presentation</p>

Figure 1-4 part 1 of 6 Immunobiology, 7ed. (© Garland Science 2008)

Dendritic Cells


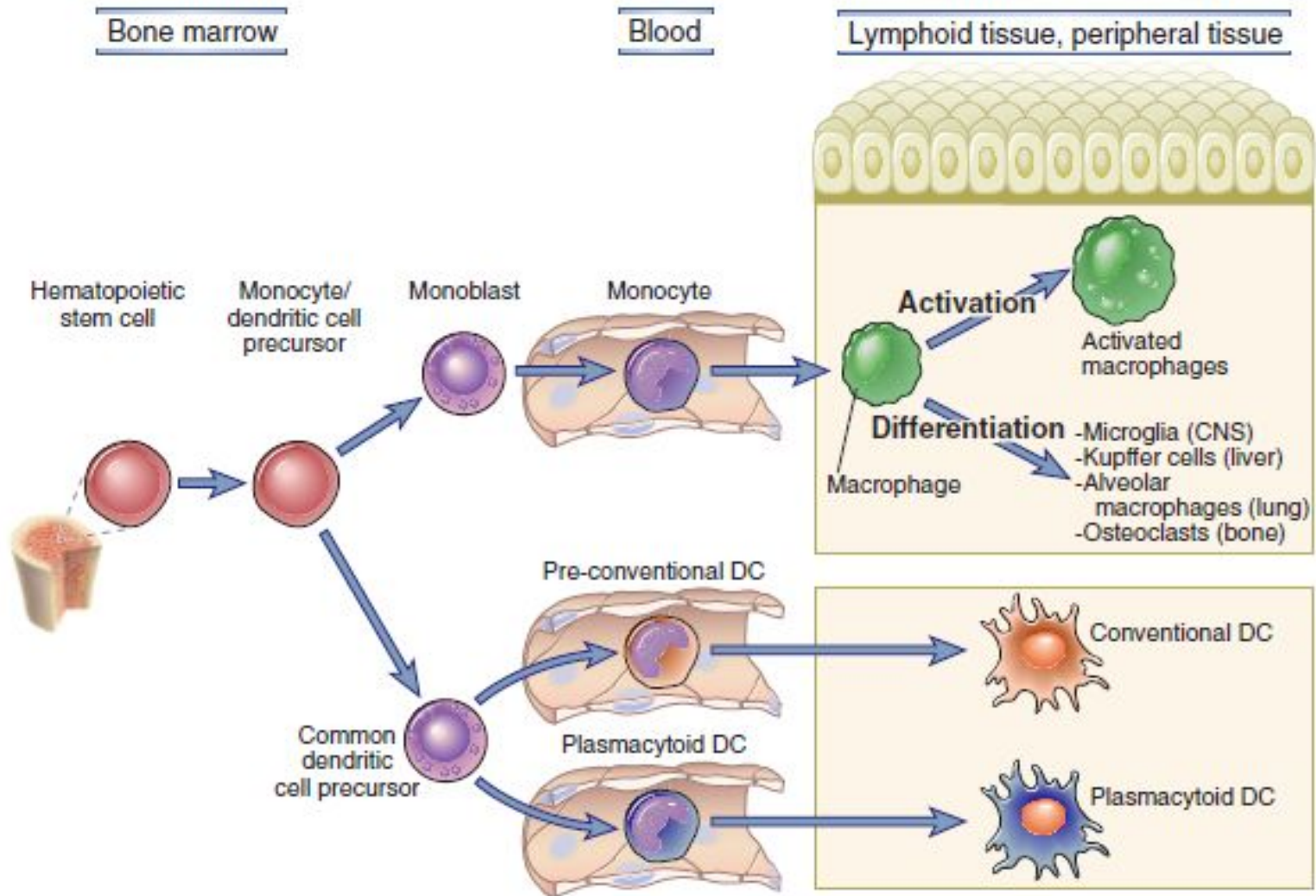
Cell		Activated function
Dendritic cell	 A micrograph showing a dendritic cell with a central body and several long, thin processes extending outwards. The cell is stained with a pinkish-purple dye, and there are many small, dark, granular structures visible within the cell and its processes.	Antigen uptake in peripheral sites Antigen presentation

Figure 1-4 part 2 of 6 Immunobiology, 7ed. (© Garland Science 2008)



Maturation of mononuclear phagocytes and dendritic cells.



Mast Cells

Cell		Activated function
Mast cell		Release of granules containing histamine and active agents
		

Figure 1-4 part 6 of 6 Immunobiology, 7ed. (© Garland Science 2008)



Basophils

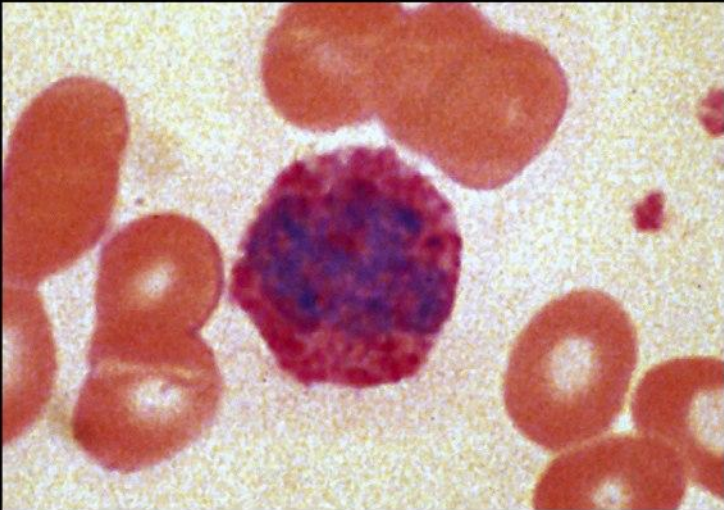
Cell		Activated function
Basophil	 A light micrograph showing a central basophil with a dark purple, granular nucleus and reddish-orange cytoplasm. It is surrounded by several red blood cells, which appear as reddish-orange discs.	Unknown

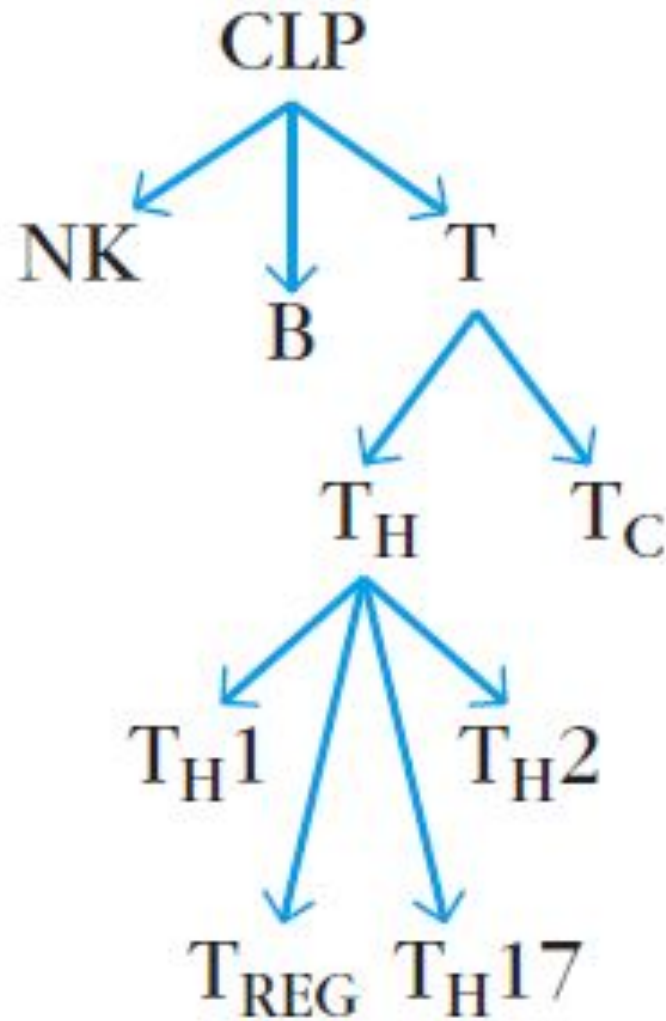
Figure 1-4 part 5 of 6 Immunobiology, 7ed. (© Garland Science 2008)

Eosinophils

Cell		Activated function
Eosinophil		Killing of antibody-coated parasites
		

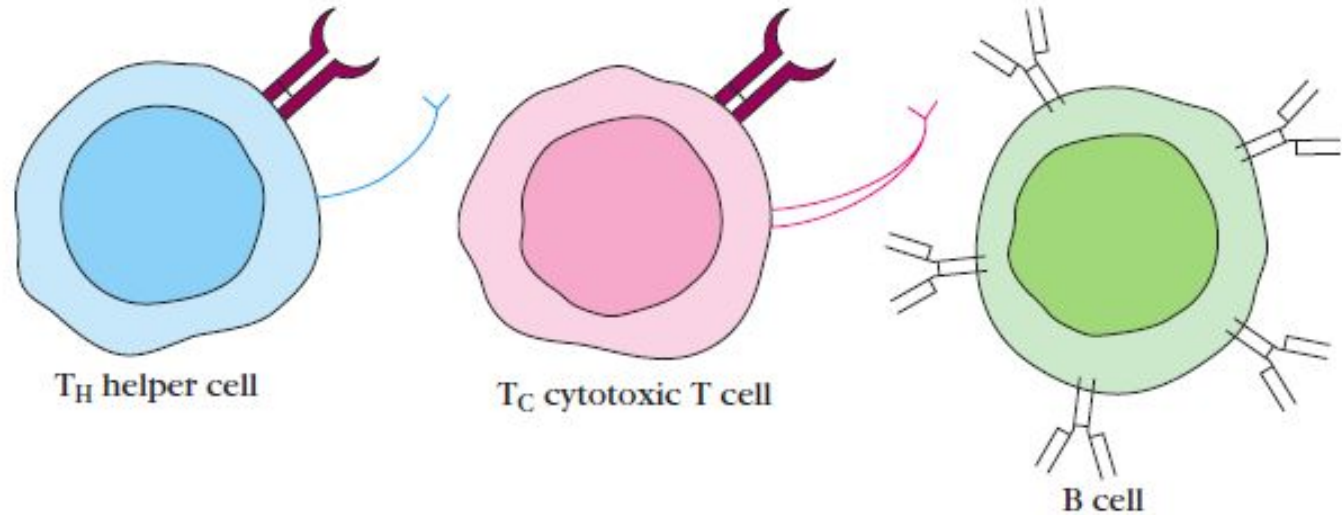
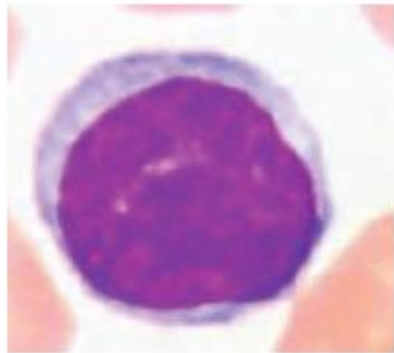
Figure 1-4 part 4 of 6 Immunobiology, 7ed. (© Garland Science 2008)

Lymphocytes



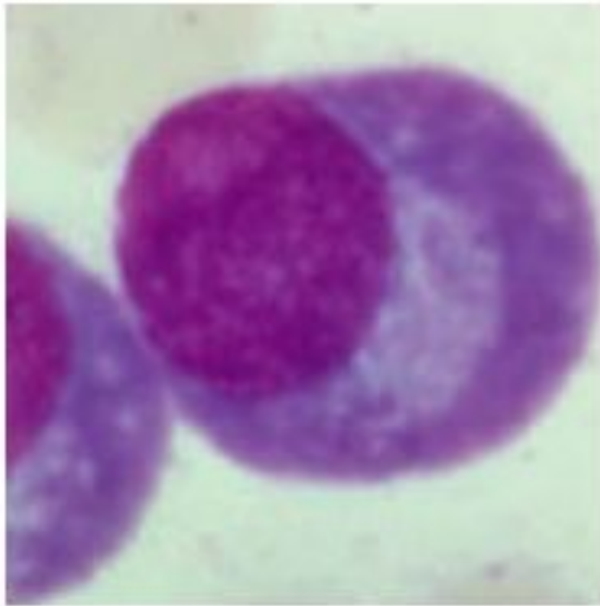
T cells and B cells

(a) Lymphocyte

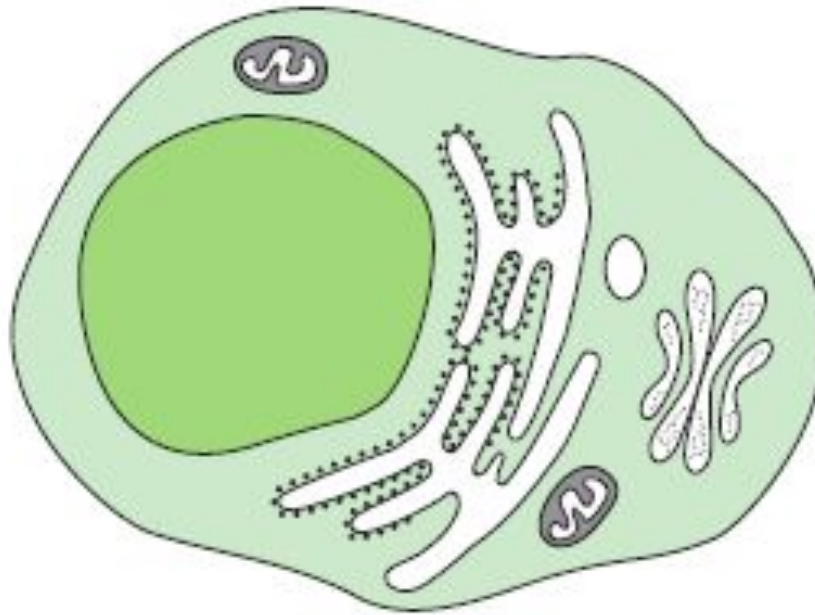


Plasma cell

(c) Plasma cell

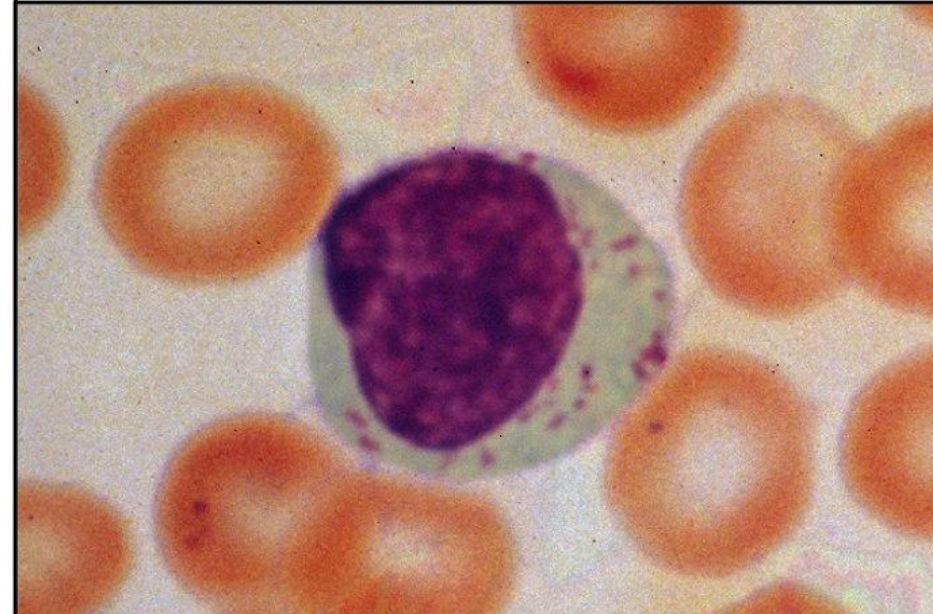
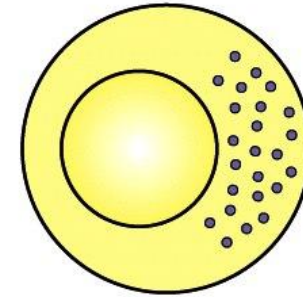


Plasma cell



NK cell

Natural killer (NK) cell



Releases lytic granules that kill some virus-infected cells

CD marker

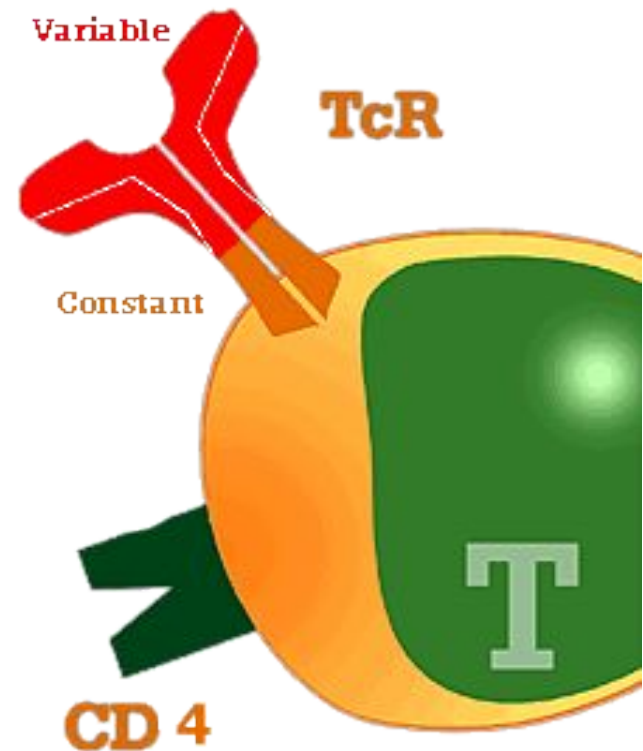


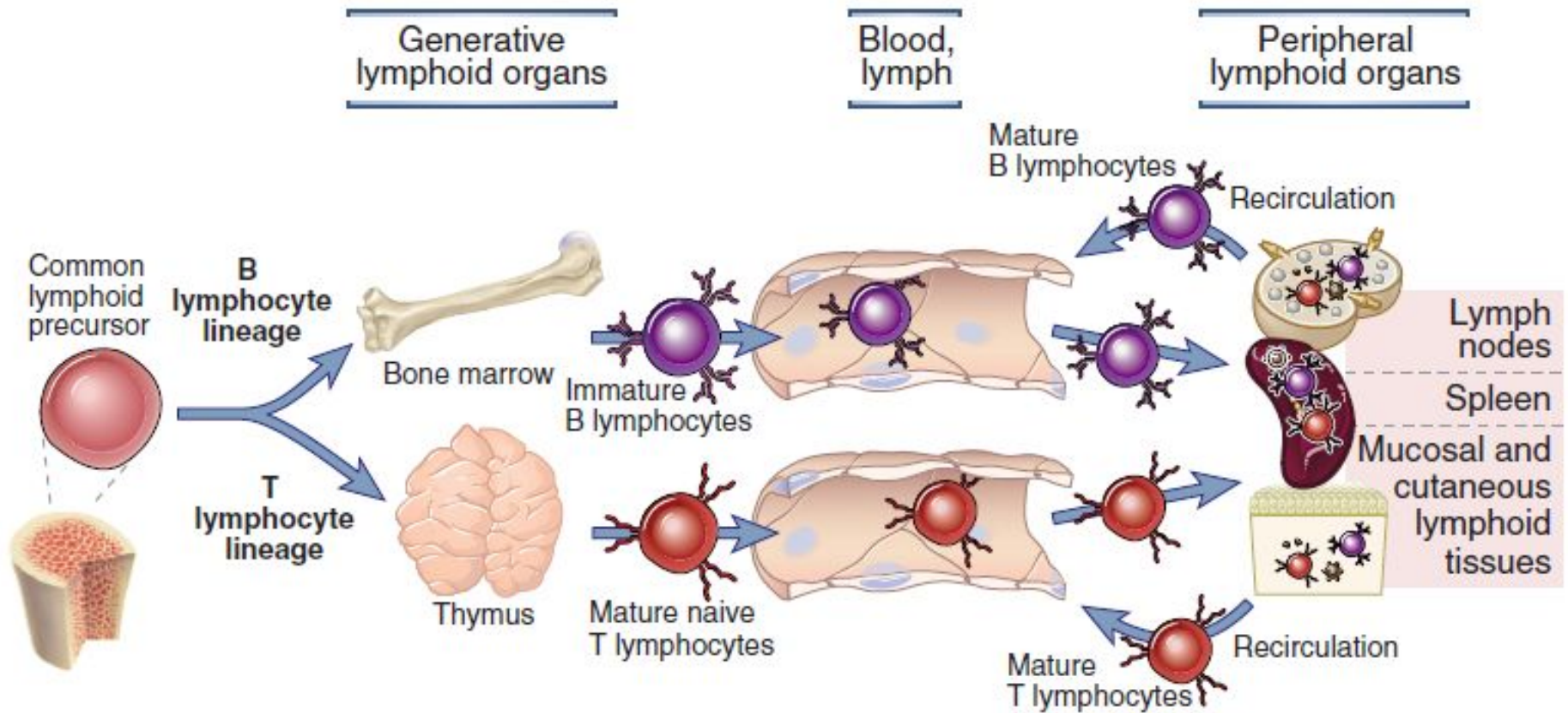
TABLE 2-3

Common CD markers used to distinguish functional lymphocyte subpopulations

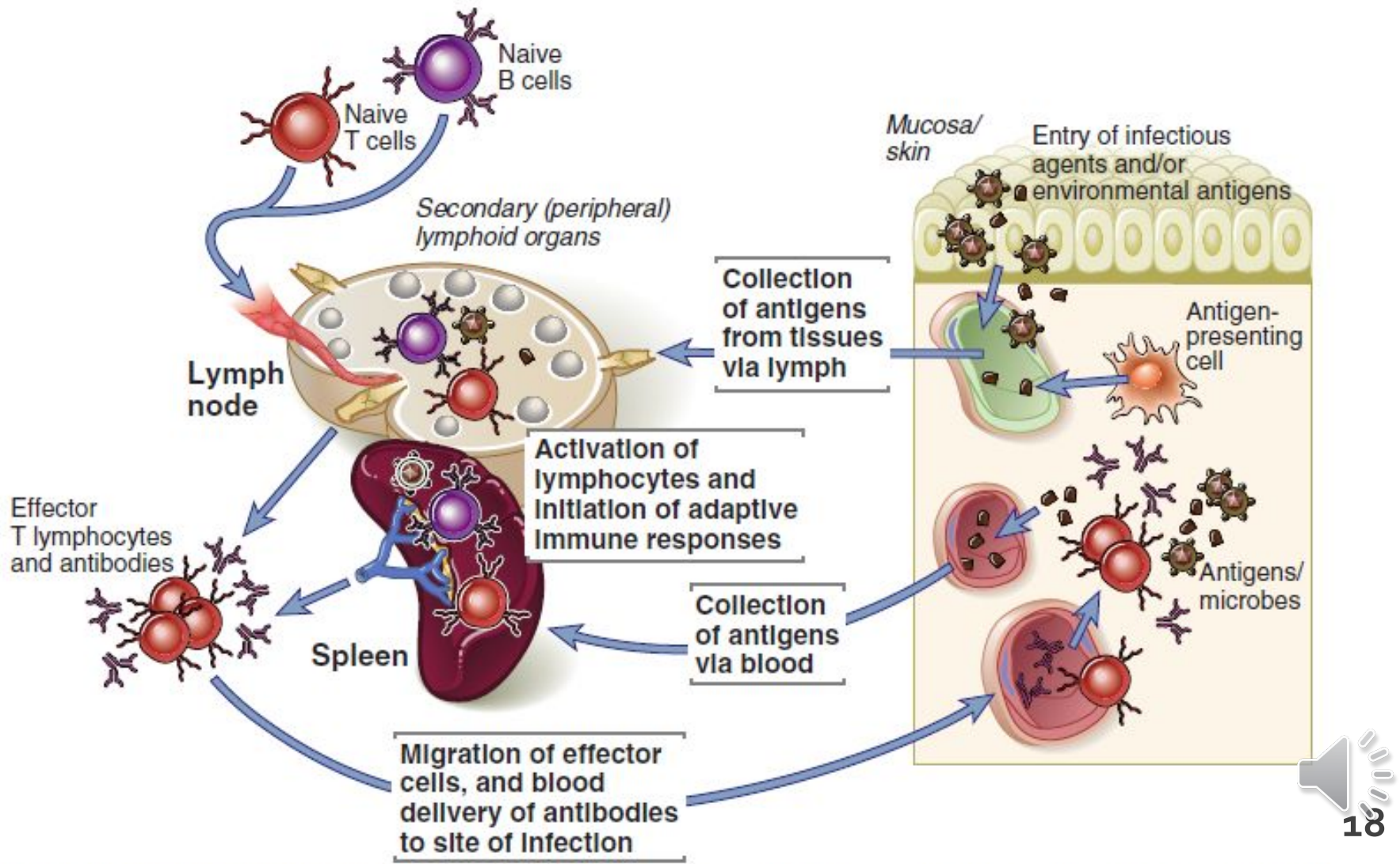
CD designation	Function	B cell	T _H	T _C	NK cell
CD2	Adhesion molecule; signal transduction	—	+	+	+
CD3	Signal transduction element of T-cell receptor	—	+	+	—
CD4	Adhesion molecule that binds to class II MHC molecules; signal transduction	—	+	—	—
CD5	Unknown	+	+	+	+
CD8	Adhesion molecule that binds to class I MHC molecules; signal transduction	—	—	+	(variable)
CD16 (Fc γ RIII)	Low-affinity receptor for Fc region of IgG	—	—	—	+
CD19	Signal transduction; CD21 co-receptor	+	—	—	—
CD21 (CR2)	Receptor for complement (C3d and Epstein-Barr virus)	+	—	—	—
CD28	Receptor for costimulatory B7 molecule on antigen-presenting cells	—	+	+	—
CD32 (Fc γ RII)	Receptor for Fc region of IgG	+	—	—	—
CD35 (CR1)	Receptor for complement (C3b)	+	—	—	—
CD40	Signal transduction	+	—	—	—
CD45	Signal transduction	+	+	+	+
CD56	Adhesion molecule	—	—	—	+



Development of Lymphocytes



The anatomy of lymphocyte activation



Immune system

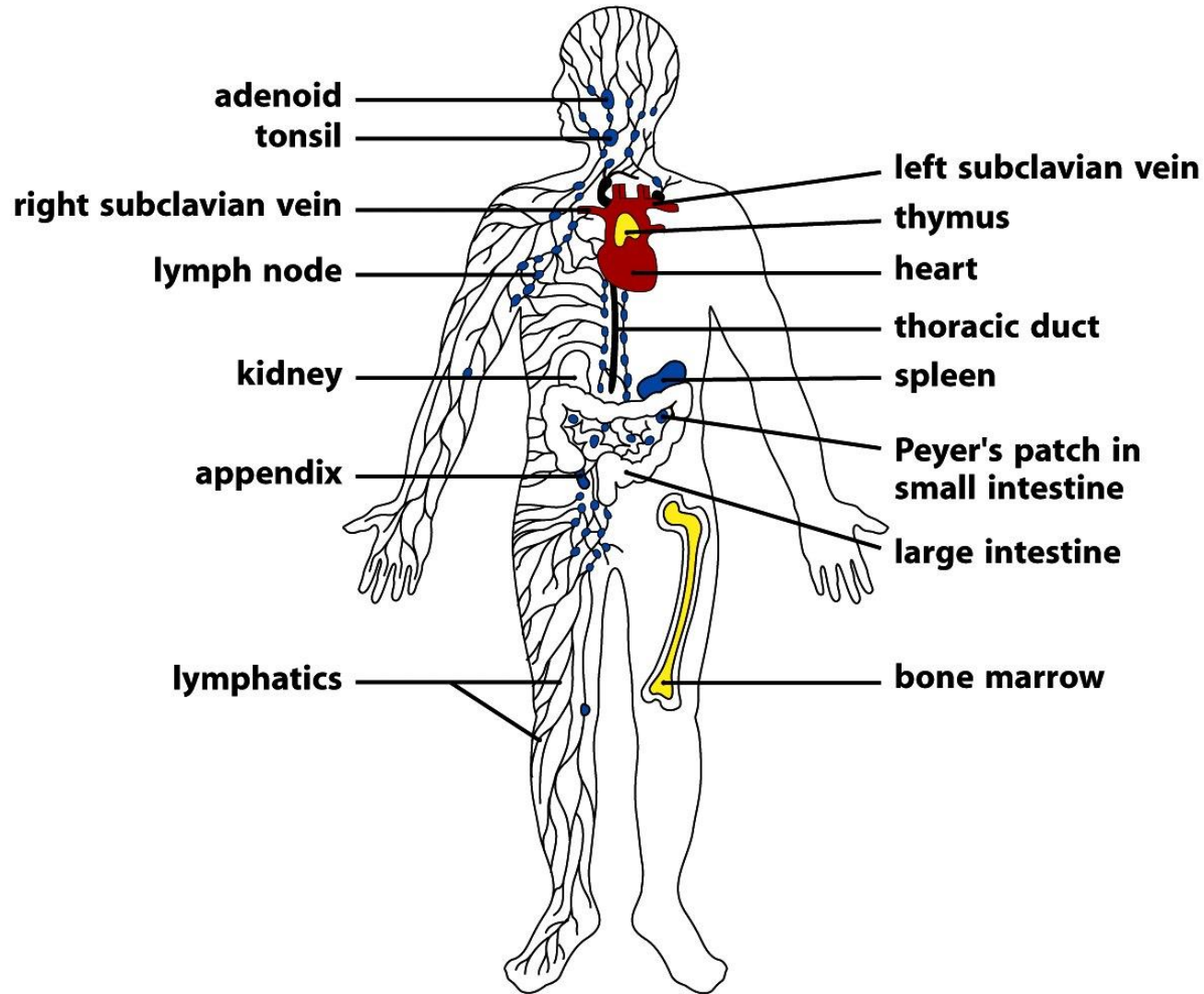
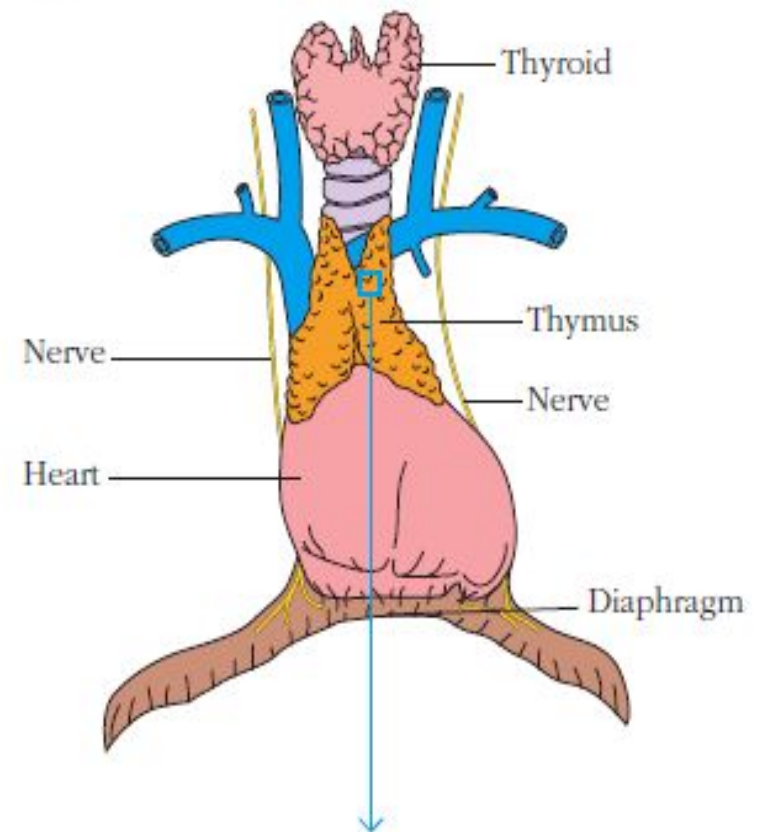
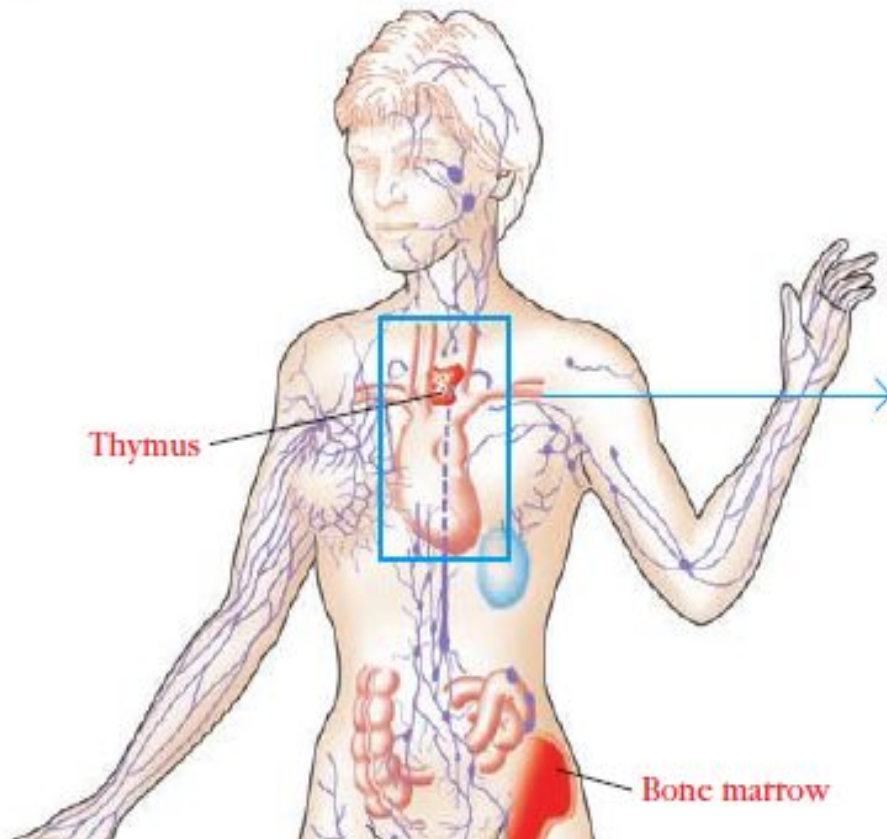
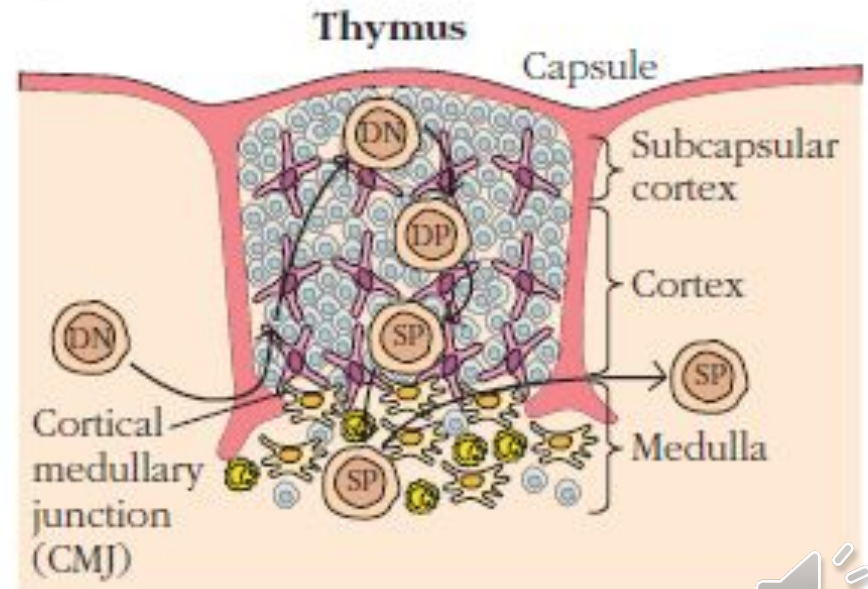
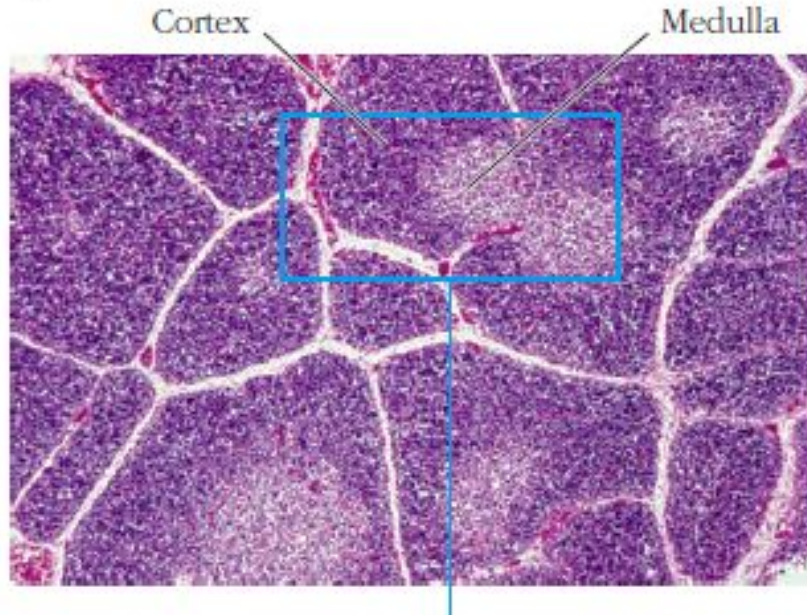


Figure 1-7 Immunobiology, 7ed. (© Garland Science 2008)

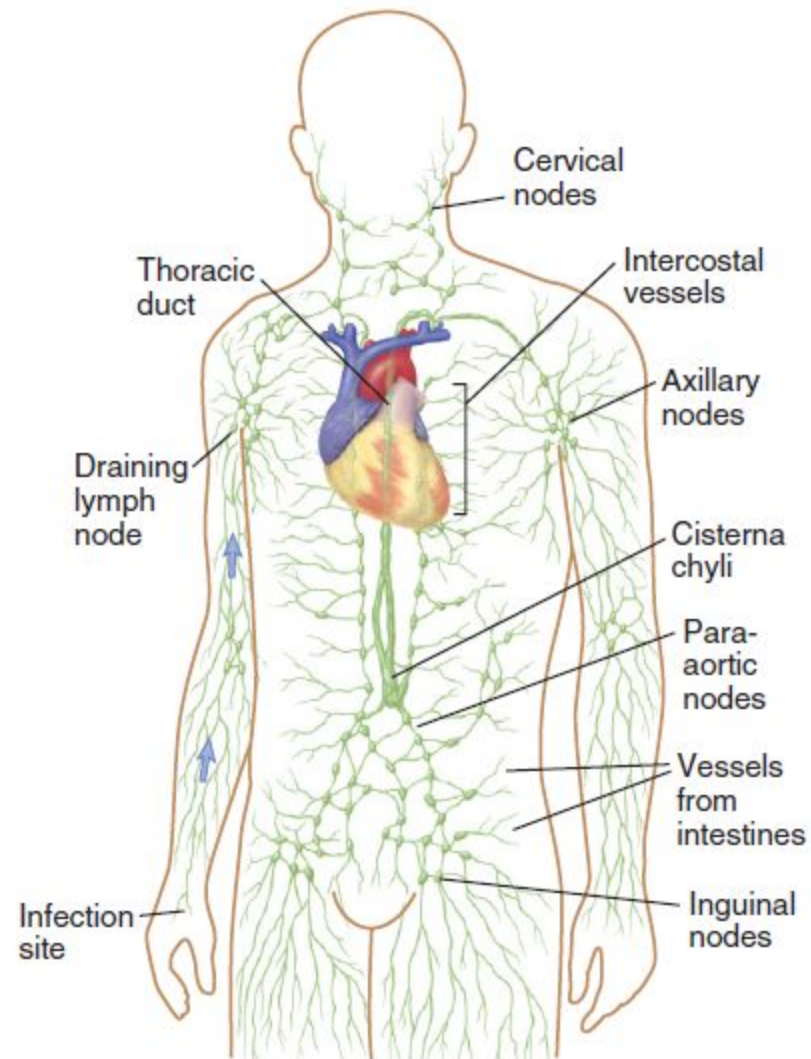
Thymus: Gross anatomy



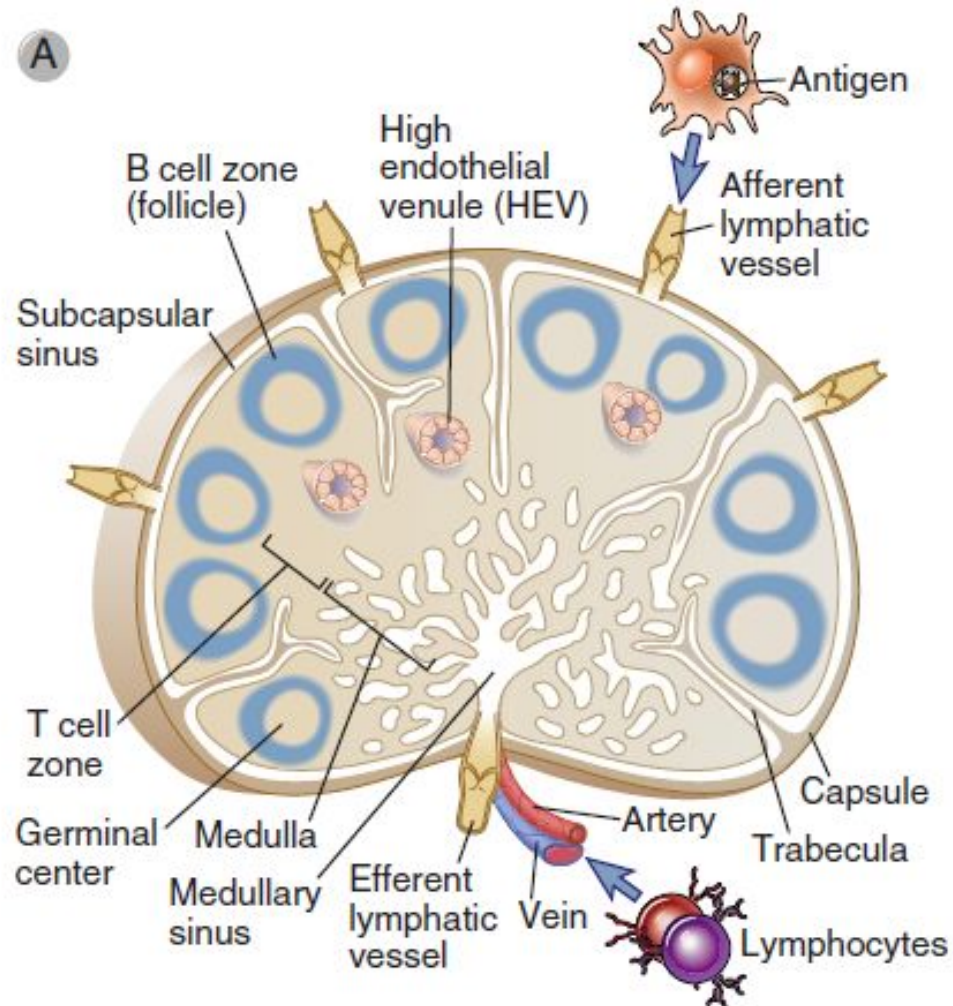
Thymus : morphology



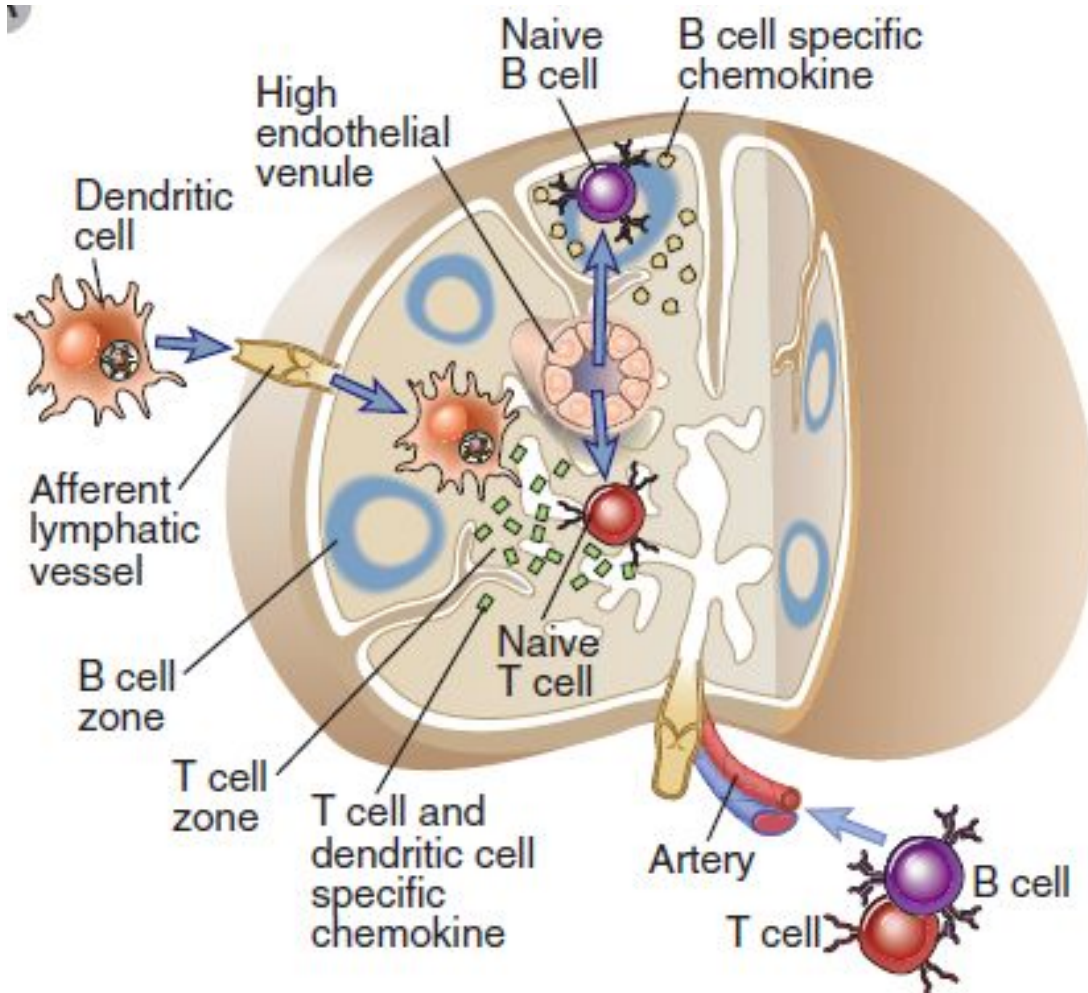
The Lymphatic System



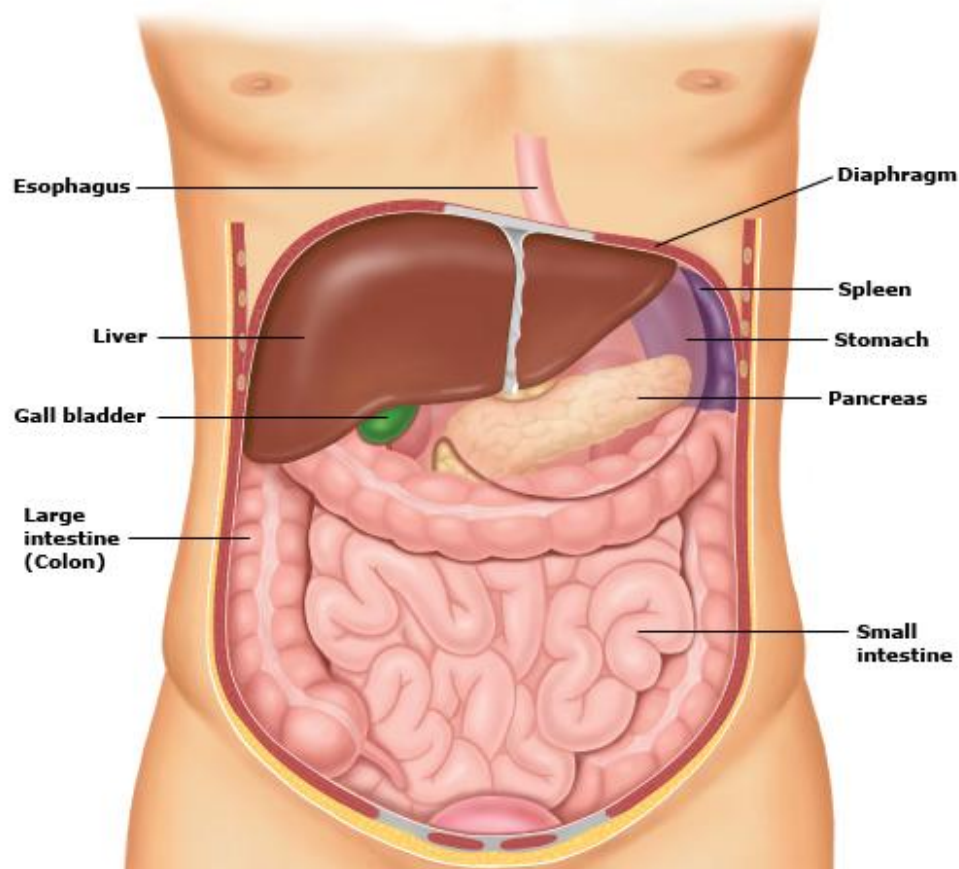
Morphology of a lymph node



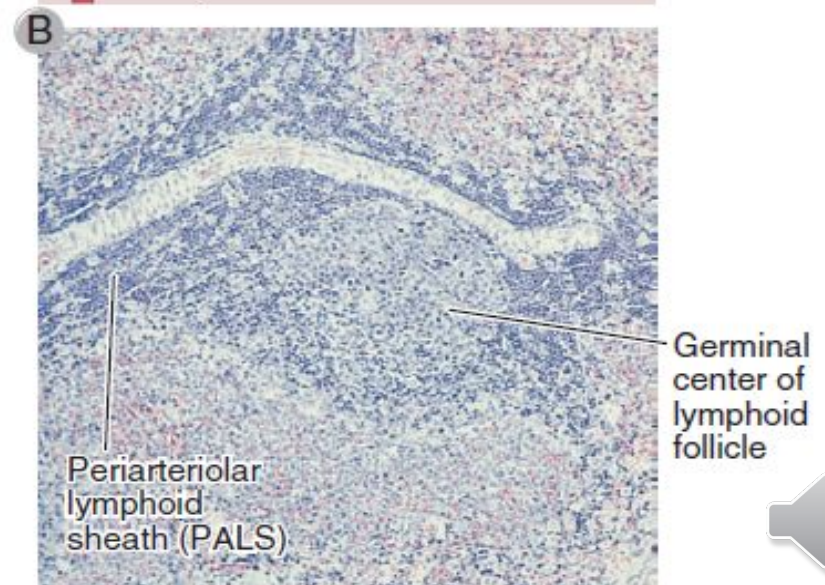
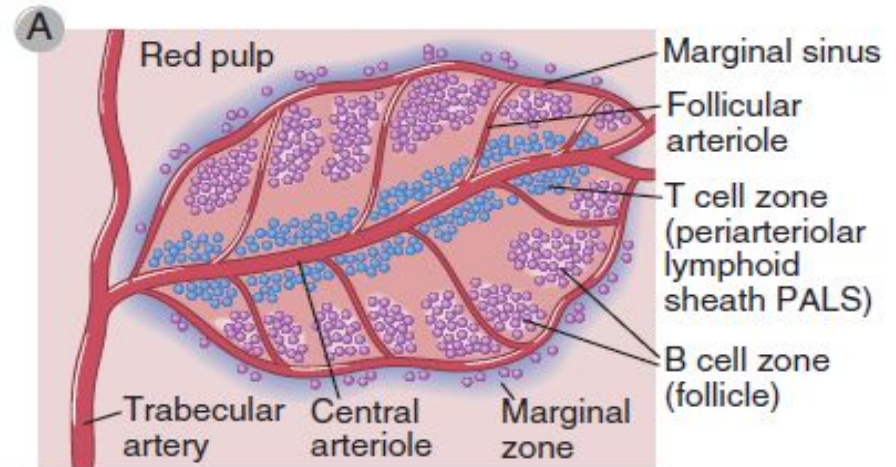
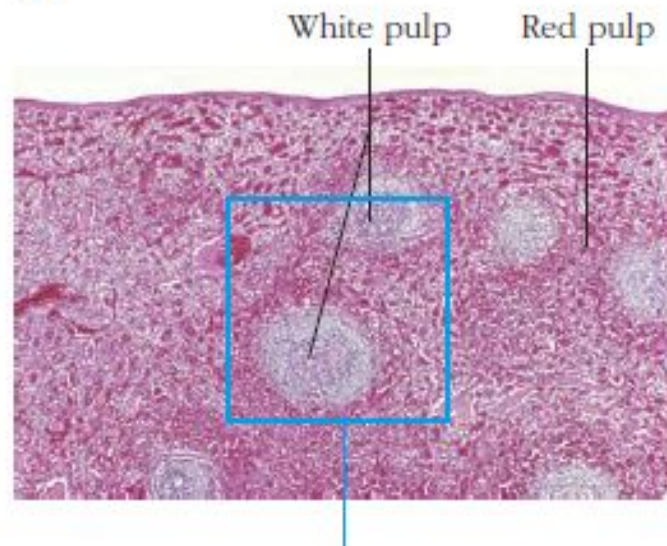
Segregation of B cells and T cells in a lymph node



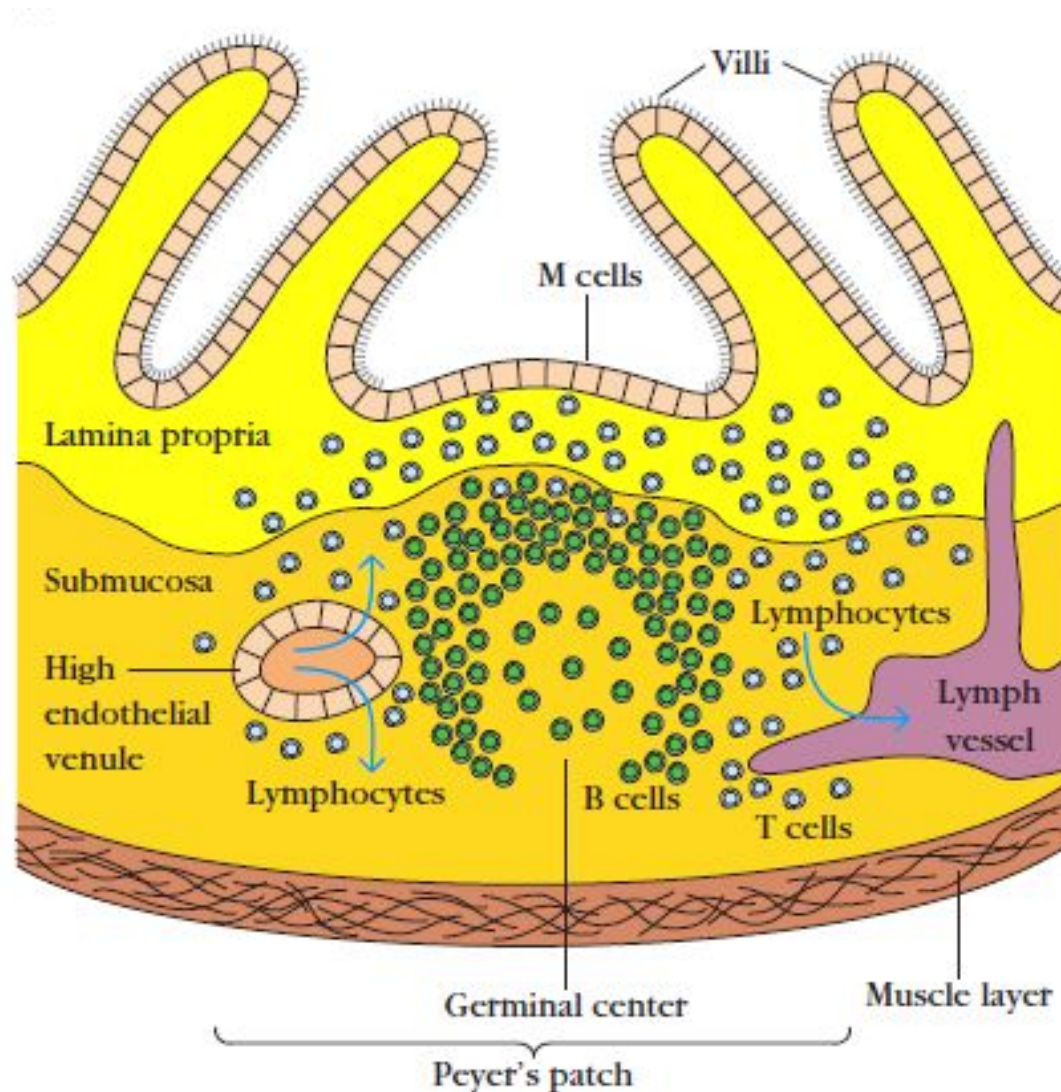
Spleen : Gross anatomy



Spleen : morphology



Mucosa-associated lymphoid tissue (MALT)



پیروزی یعنی: توانایی رفتن از یک شکست به شکستی دیگر بدون از دست دادن اشتیاق!



**Victory is about moving from one failure to another
without losing the enthusiasm!**