

Exams will be in person

Question Details

[Export to CSV](#)[Export to Excel](#)

☐ Has Start Date

8/18/...

☐ Has End Date

8/25/...

Apply

(Number of First Attempts: 89)

[What do the statistics on this page mean?](#)

Question 1Difficulty: 1

what is your preferred format of exam

→ in person	<div></div>	48 (53.93 %)	Average Grade: 0.54 / 1 (53.93 %) Standard Deviation: 50.13 % Point Biserial: 0.99 Discrimination Index: 100.00 %
online	<div></div>	26 (29.21 %)	
do not care	<div></div>	15 (16.85 %)	

UC 114 8 pm-9:30 pm

Please bring pencils - scantron

Please email me with DRC accommodations one week ahead of scheduled time

One week ahead also for foreseen conflicts.

Make up will be within one week due to illness.

BrightSpace Introduction

Mail - Deng, Qing - Outlook x Calendar - Deng, Qing - Outlook x Schedule - Fall 2022 BIOL 53700 - x +

← → ↻ purdue.brightspace.com/d2l/le/content/595677/Home

Course Home Content Classlist Grades Class Progress Course Tools ▾ Help ▾

Search Topics 🔍

Syllabus

Bookmarks

Course Schedule 2

Table of Contents 232

iclicker registration ✓

Course Content 218

Schedule 2

Lectures 215

University Policies 5

Accessibility Information 3

Library Course Guide 6

Schedule ▾ [Print](#)

[Download](#)

60 % 3 of 5 topics complete

Materials

[BIOL53700_Schedule_2022](#) ▾ ✓
Word Document

[Lockdown Browser student instruction](#) ▾
PDF document

[RLDB-Instructor FYI](#) ▾ ✓
PDF document

[2022 introduction](#) ▾ •
PDF document

General

[BIOL537 2020 intro and brightspace](#) ▾ Updated ✓

BrightSpace Introduction

The screenshot shows the BrightSpace LMS interface for a course. The browser tabs at the top include 'Outlook', 'Calendar - Deng, Qing - Outlook', and 'Lectures - Fall 2022 BIOL 53700'. The address bar shows the URL: purdue.brightspace.com/d2l/le/content/595677/Home.

Left Sidebar (Lectures):

Lecture	Count
Lecture 3	4
Lecture 4	9
Lecture 5	5
Lecture 6	12
Lecture 7	7
Lecture 8	7
Lecture 9	9
Lecture 10	7
Lecture 11	6
Lecture 12	7
Lecture 13	8
Lecture 14	6
Lecture 15	6
Lecture 16	9
Lecture 17	6
Lecture 18	11

Main Content Area (Lecture 1):

- Lecture 1** (Dropdown arrow)
- Reading** (2 items)
 - Lecture 1 quiz** (Assignment)
 - Overdue - yesterday at 11:59 PM
- Lecture 1** (PDF document) (Checkmark)
- Lecture 1-key** (Word Document)
 - Starts Aug 25, 2022 10:30 AM
- BIOL537-Lec1-1-2020 (18:47)** (External Learning Tool)
- BIOL537-Lec1-2-2020 (15:09)** (External Learning Tool)
- BIOL537-Lec1-3-2020 (14:12)** (External Learning Tool)
- Fall 2021 - BIOL537 - Deng 1** (External Learning Tool) (Checkmark)
- Fall 2022 - BIOL537 - Deng 1** (External Learning Tool)

At the bottom, there is a search bar labeled 'here to search' and a Windows taskbar with various application icons.

Major Concepts

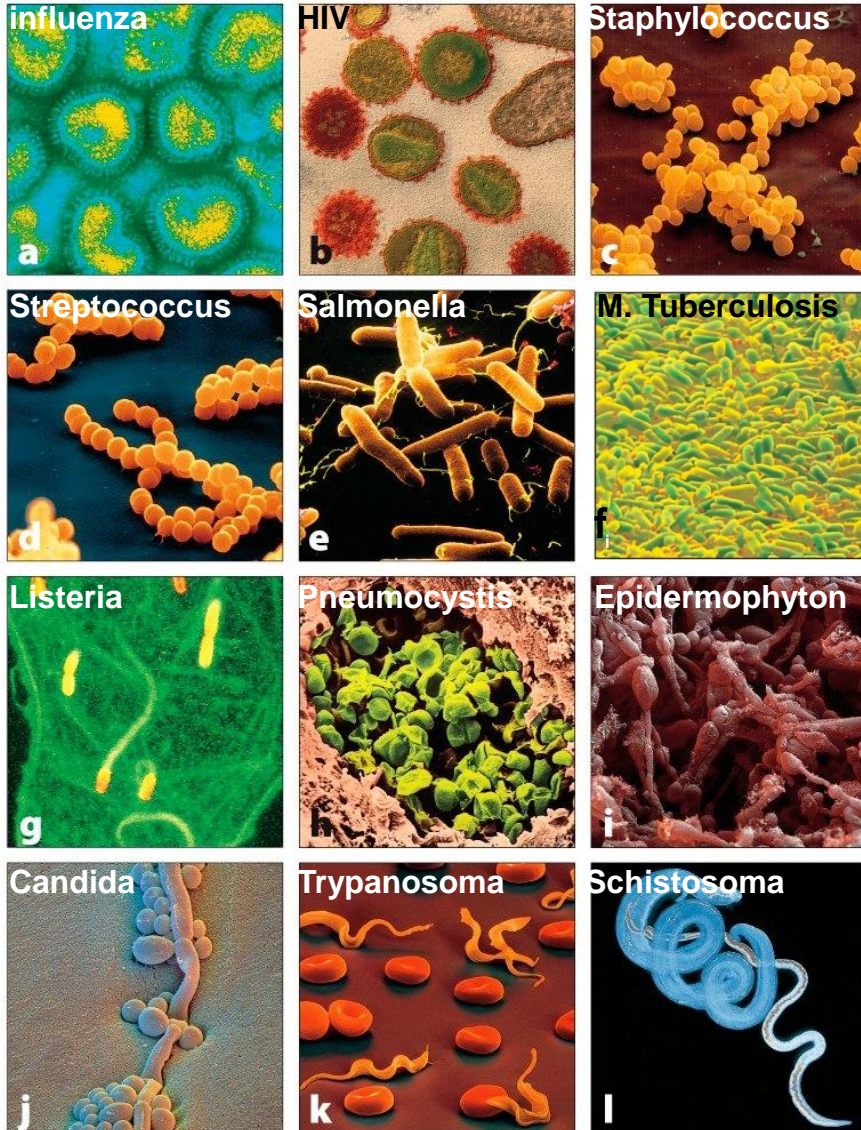


Figure 1.3 The Immune System, 3ed. (© Garland Science 2009)

Pathogen: An infectious agent

Extracellular: pathogen that can replicate outside the cell

- bacteria (c, d), parasites (k, l), fungus (h, i, j)

Intracellular: pathogen that requires cellular environment to replicate

- bacteria (e, f, g), viruses (a, b)

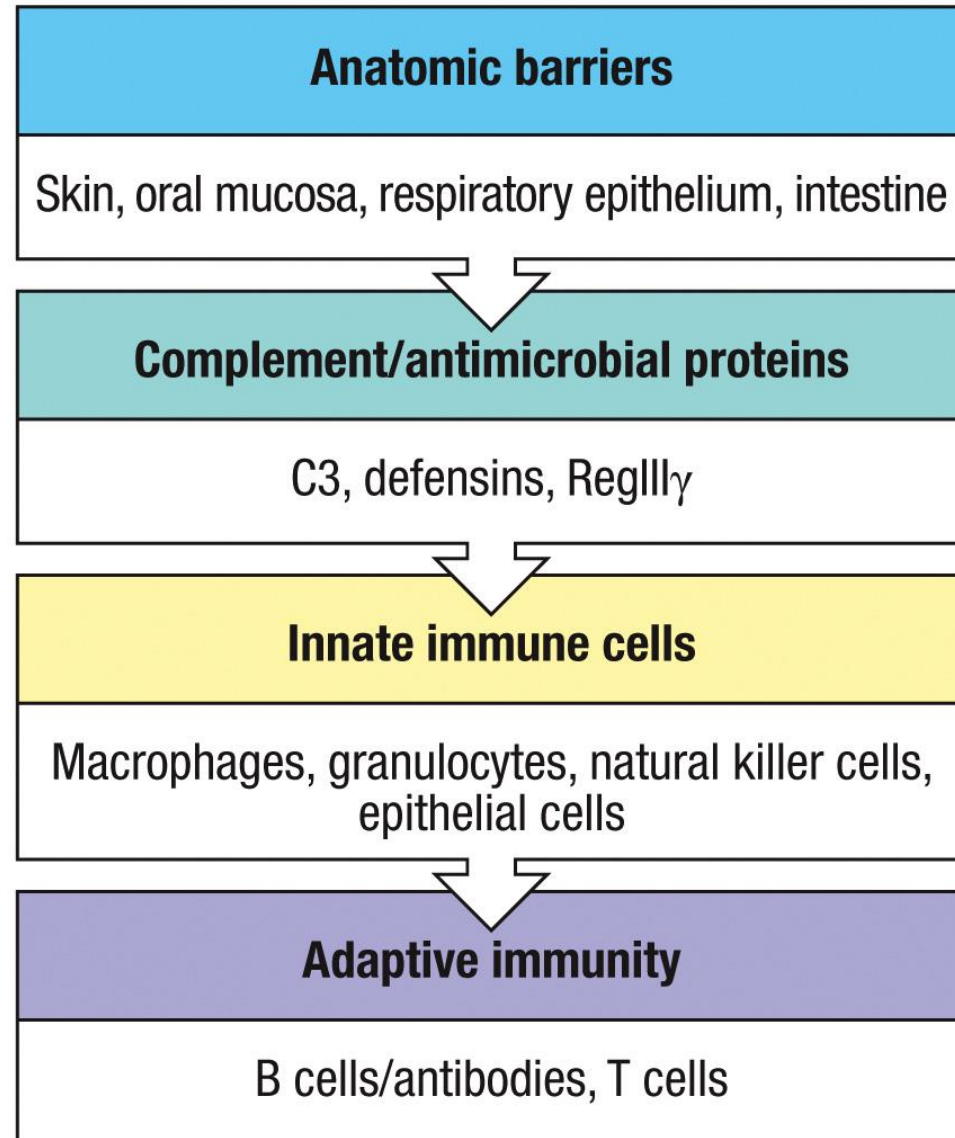
Mucosal immunity: response mounted at the mucosal surface

Innate immunity: early phase of host response to pathogen

Adaptive immunity: response of an antigen-specific lymphocyte to an infection

Antigen: a molecule which can stimulate an adaptive immune response

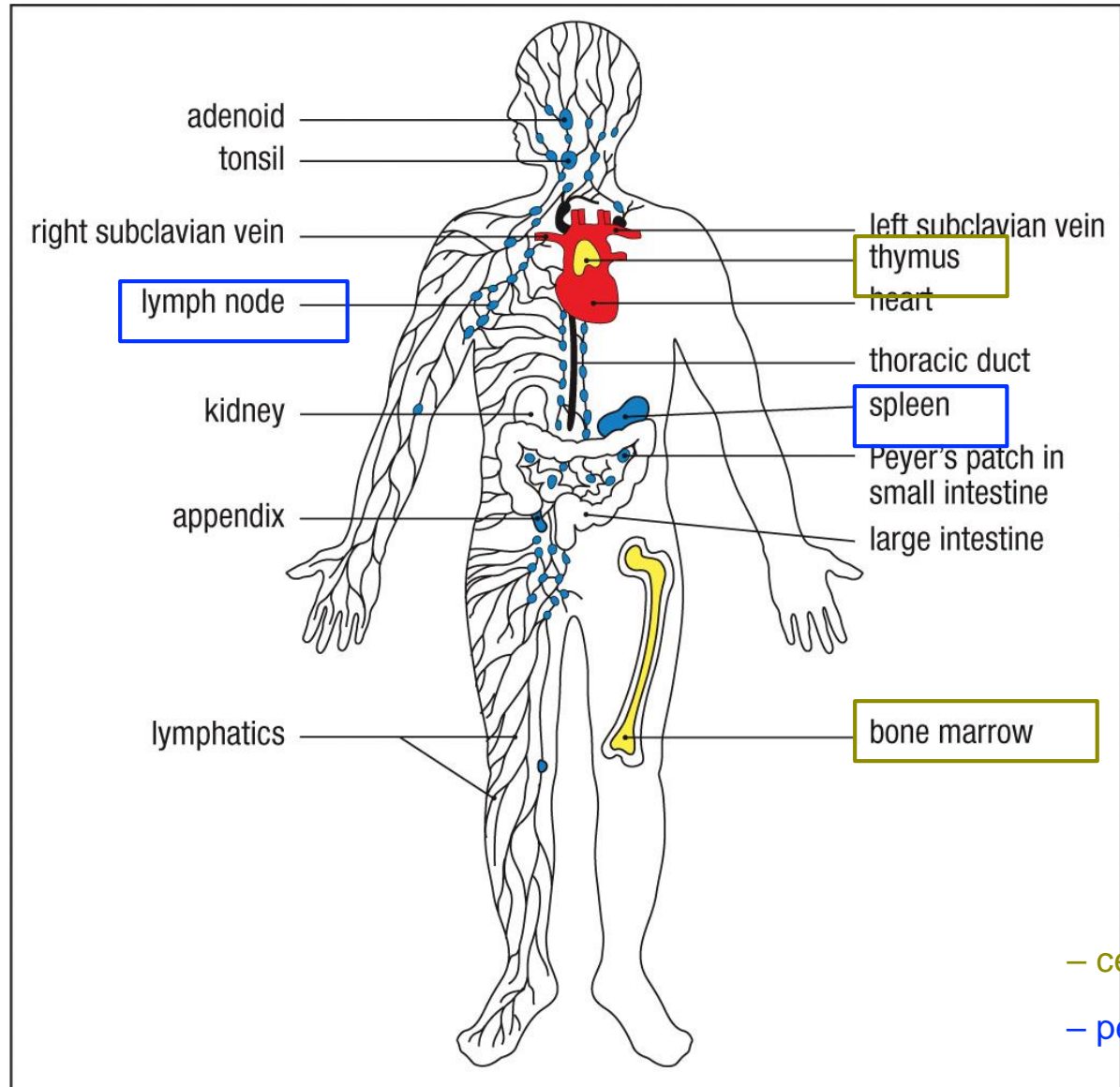
Barriers, Cells and Cytokines



Outline

- Cells and tissues of the immune system
- Case study: Congenital Asplenia

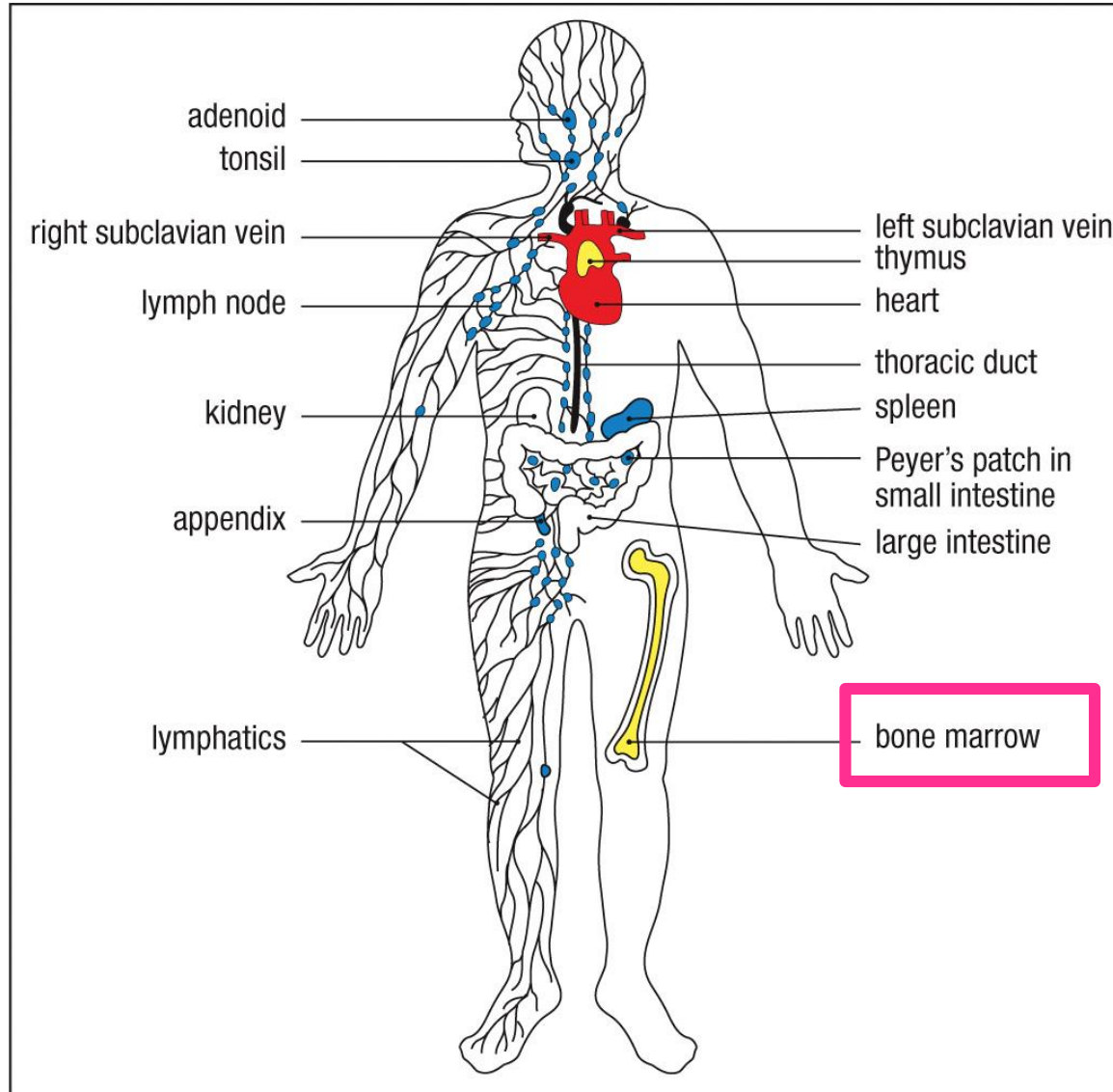
Lymphoid Tissue



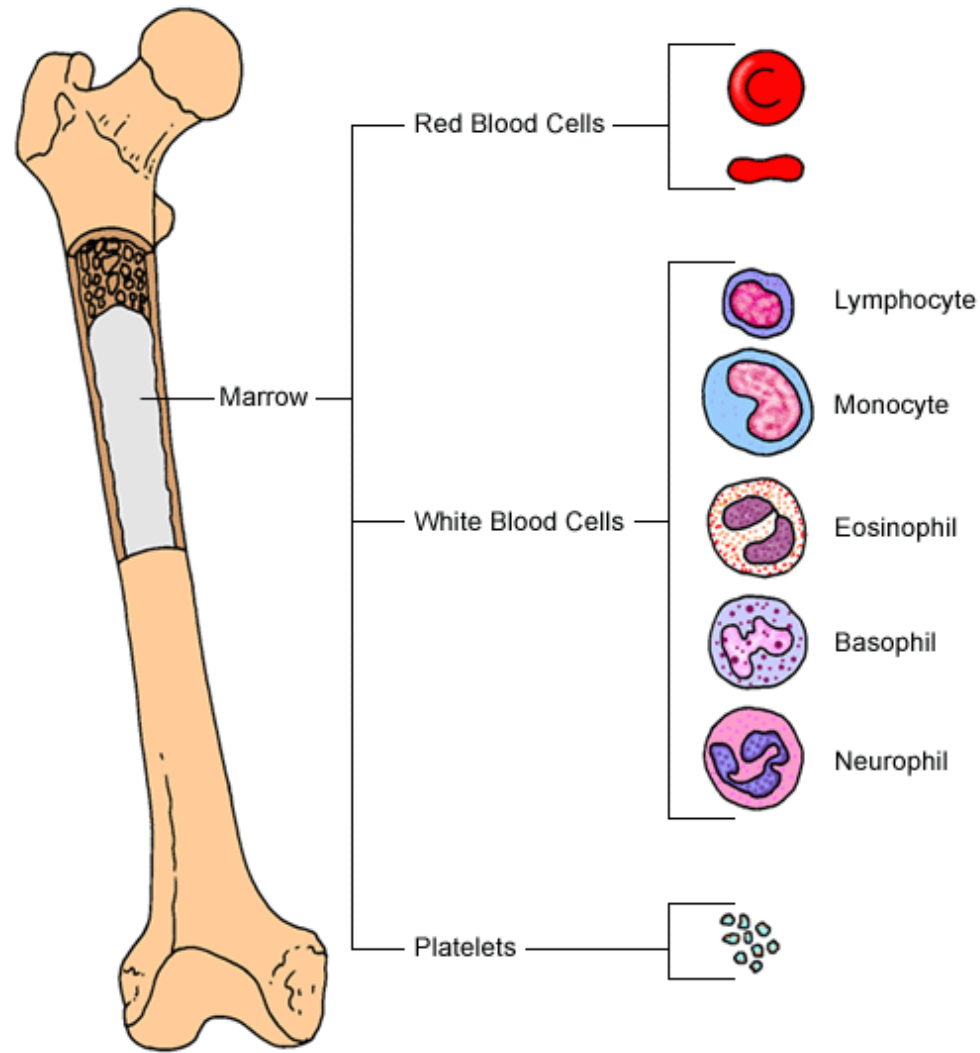
Lymphoid Tissue

- central lymphoid organ: where lymphocytes form and mature
- peripheral lymphoid organ: the sites of lymphocyte activation by antigens

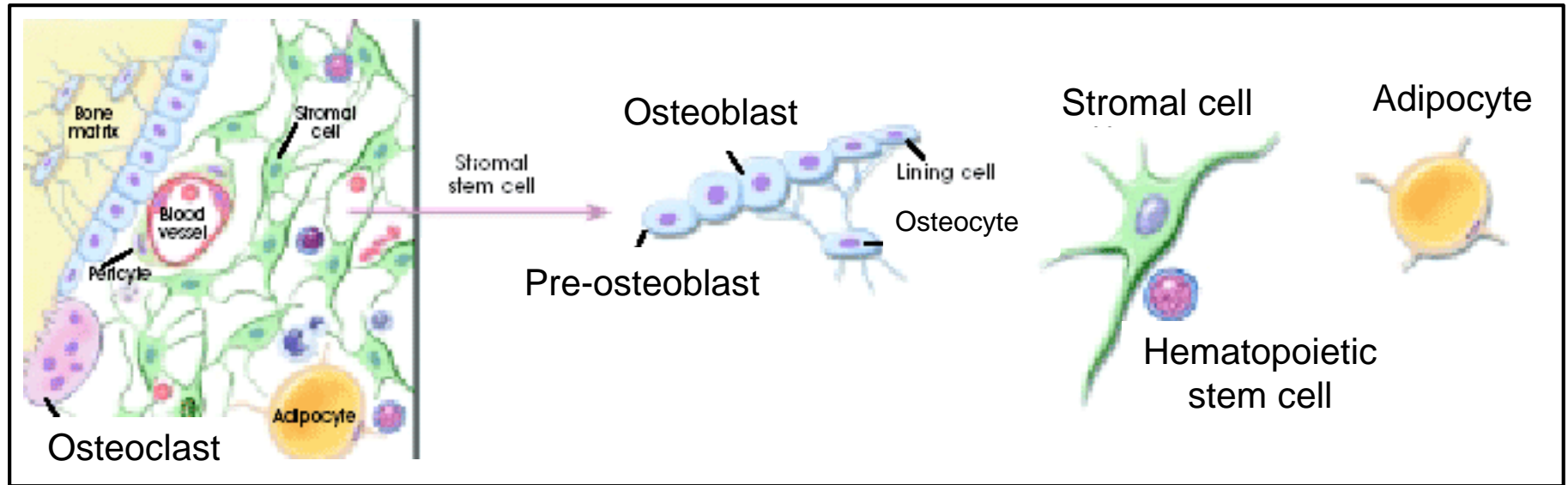
Bone Marrow Is the Site of Adult Hematopoiesis



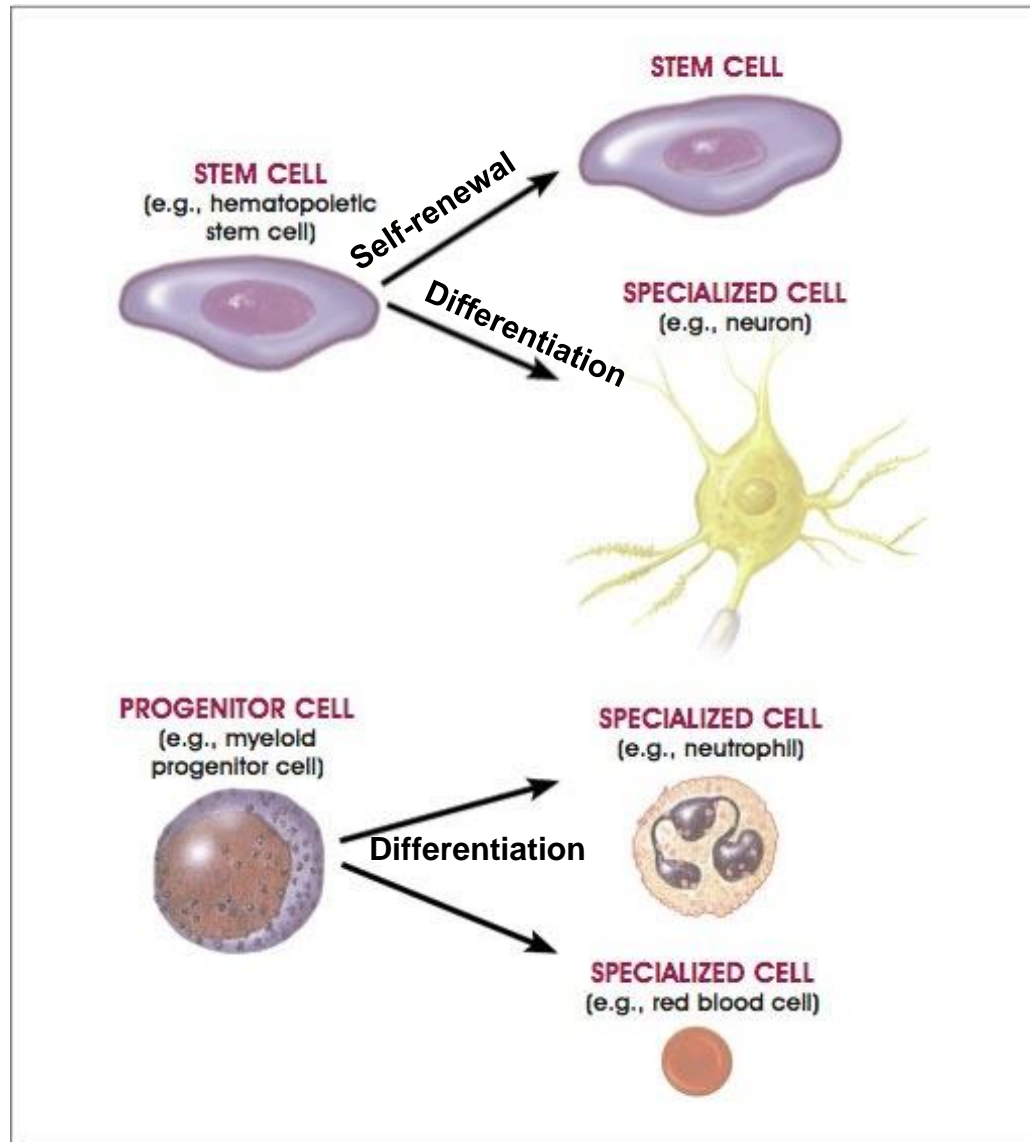
Hematopoietic Cells Develop in the Bone Marrow



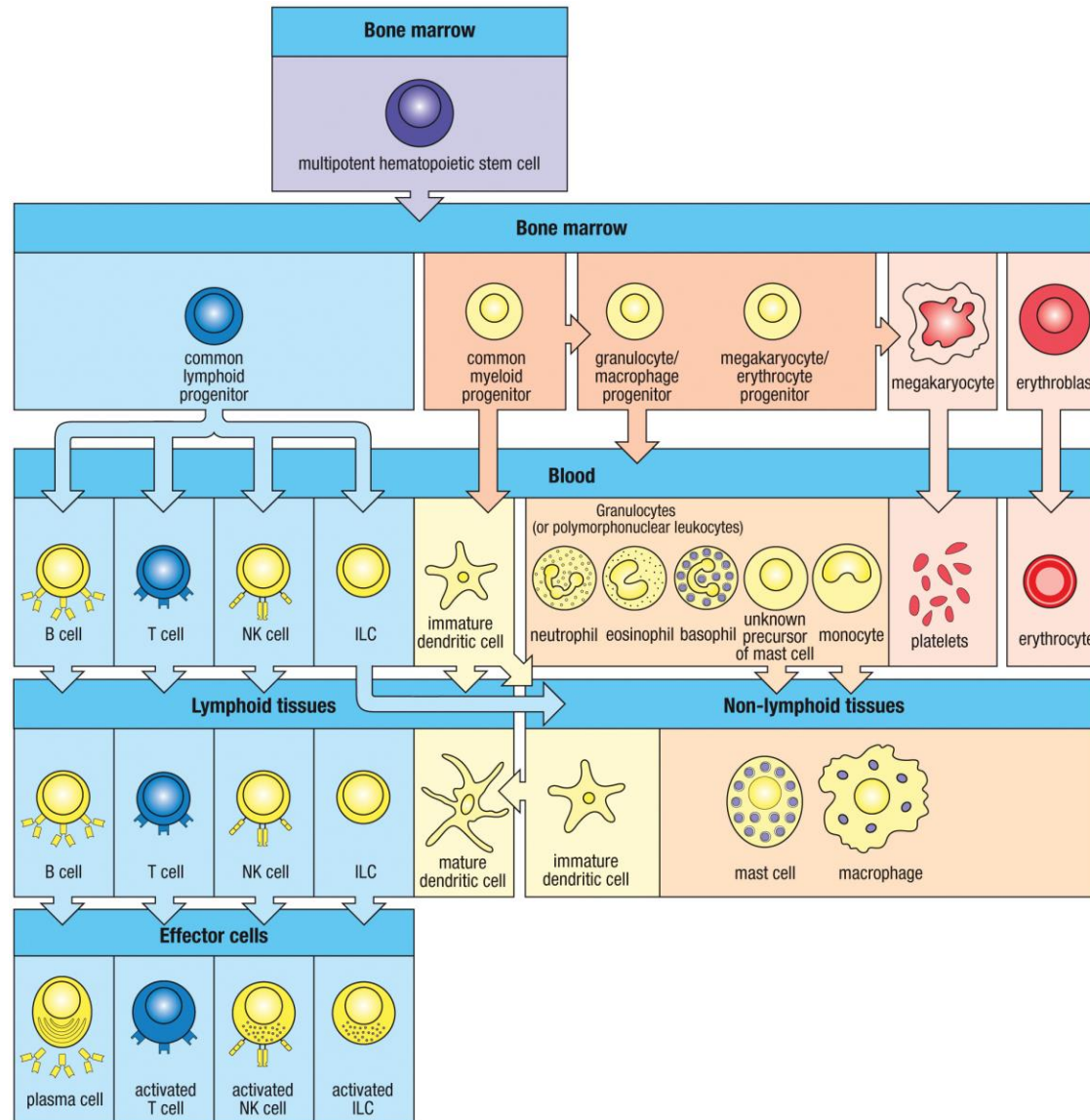
Bone Marrow Stromal Cells Support Hematopoiesis



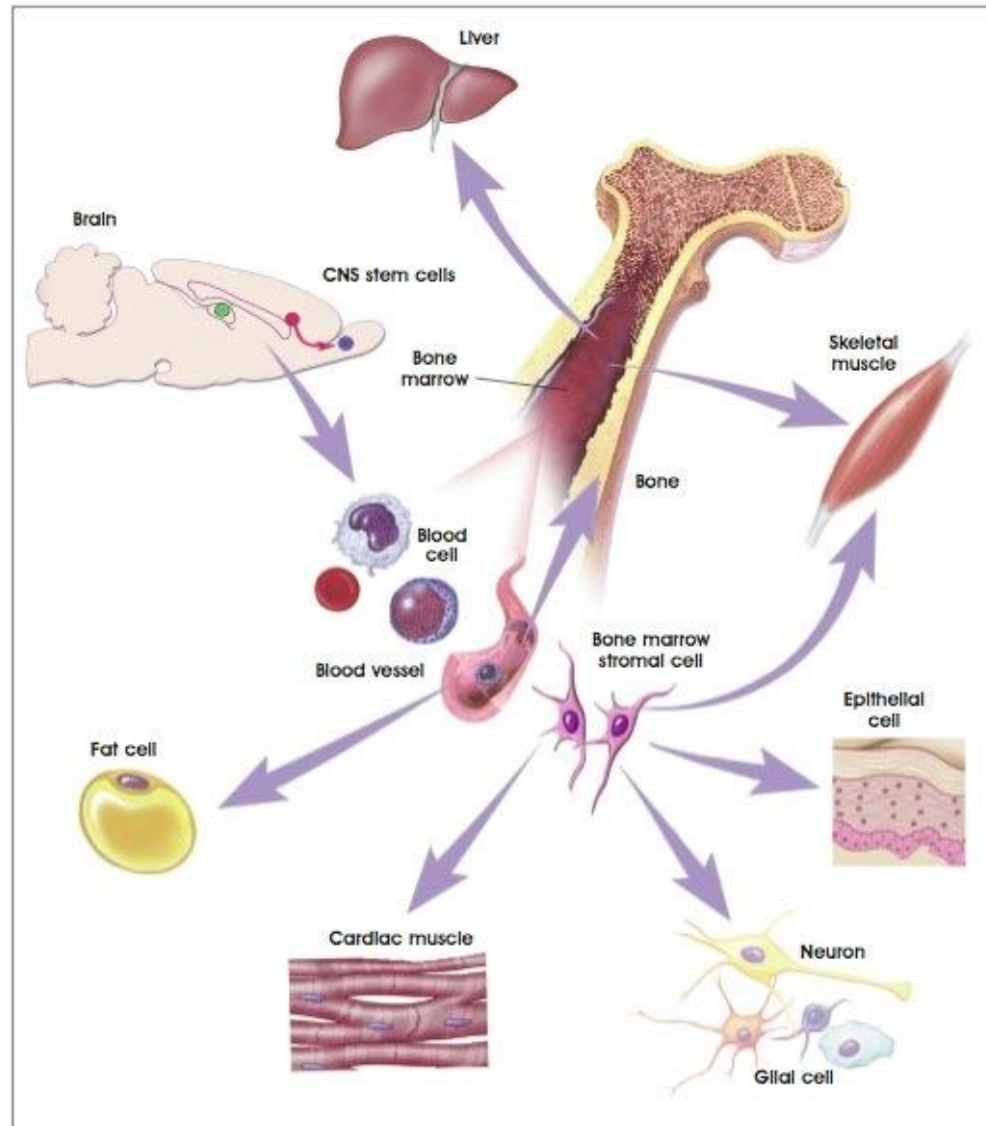
Distinguishing Features of Progenitor and Stem Cells



Hematopoiesis



Plasticity of Bone Marrow Stem Cells



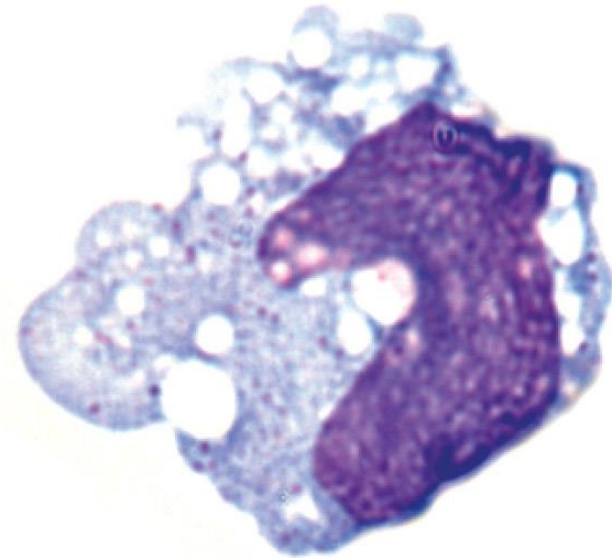
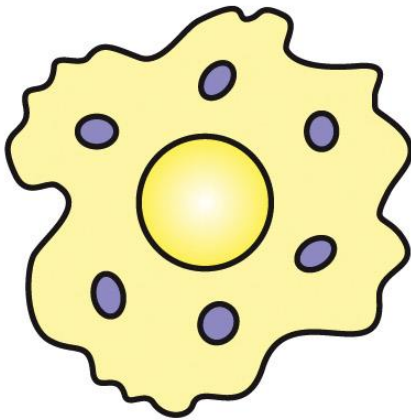
Myeloid Cells

<div data-bbox="610 248 767 282" data-label="Section-Header"> <h2>Macrophage</h2> </div> <div data-bbox="446 339 917 511" data-label="Image"> </div> <div data-bbox="432 536 944 594" data-label="Text"> <p>Phagocytosis and activation of bactericidal mechanisms Antigen presentation and cytokine production</p> </div>	<div data-bbox="1228 248 1358 282" data-label="Section-Header"> <h2>Eosinophil</h2> </div> <div data-bbox="1070 354 1508 491" data-label="Image"> </div> <div data-bbox="1132 536 1454 568" data-label="Text"> <p>Killing of antibody-coated parasites</p> </div>
<div data-bbox="606 645 770 679" data-label="Section-Header"> <h2>Dendritic cell</h2> </div> <div data-bbox="440 715 960 919" data-label="Image"> </div> <div data-bbox="479 936 894 993" data-label="Text"> <p>Antigen uptake in peripheral sites Antigen presentation and cytokine production</p> </div>	<div data-bbox="1238 631 1348 665" data-label="Section-Header"> <h2>Basophil</h2> </div> <div data-bbox="1076 739 1499 858" data-label="Image"> </div> <div data-bbox="1064 918 1526 975" data-label="Text"> <p>Promotion of allergic responses and augmentation of anti-parasitic immunity</p> </div>
<div data-bbox="624 1042 753 1076" data-label="Section-Header"> <h2>Neutrophil</h2> </div> <div data-bbox="465 1150 908 1286" data-label="Image"> </div> <div data-bbox="432 1333 944 1365" data-label="Text"> <p>Phagocytosis and activation of bactericidal mechanisms</p> </div>	<div data-bbox="1238 1023 1348 1058" data-label="Section-Header"> <h2>Mast cell</h2> </div> <div data-bbox="1070 1122 1543 1279" data-label="Image"> </div> <div data-bbox="1087 1315 1503 1372" data-label="Text"> <p>Release of granules containing histamine and active agents</p> </div>

(all): Yasodha Natkunam

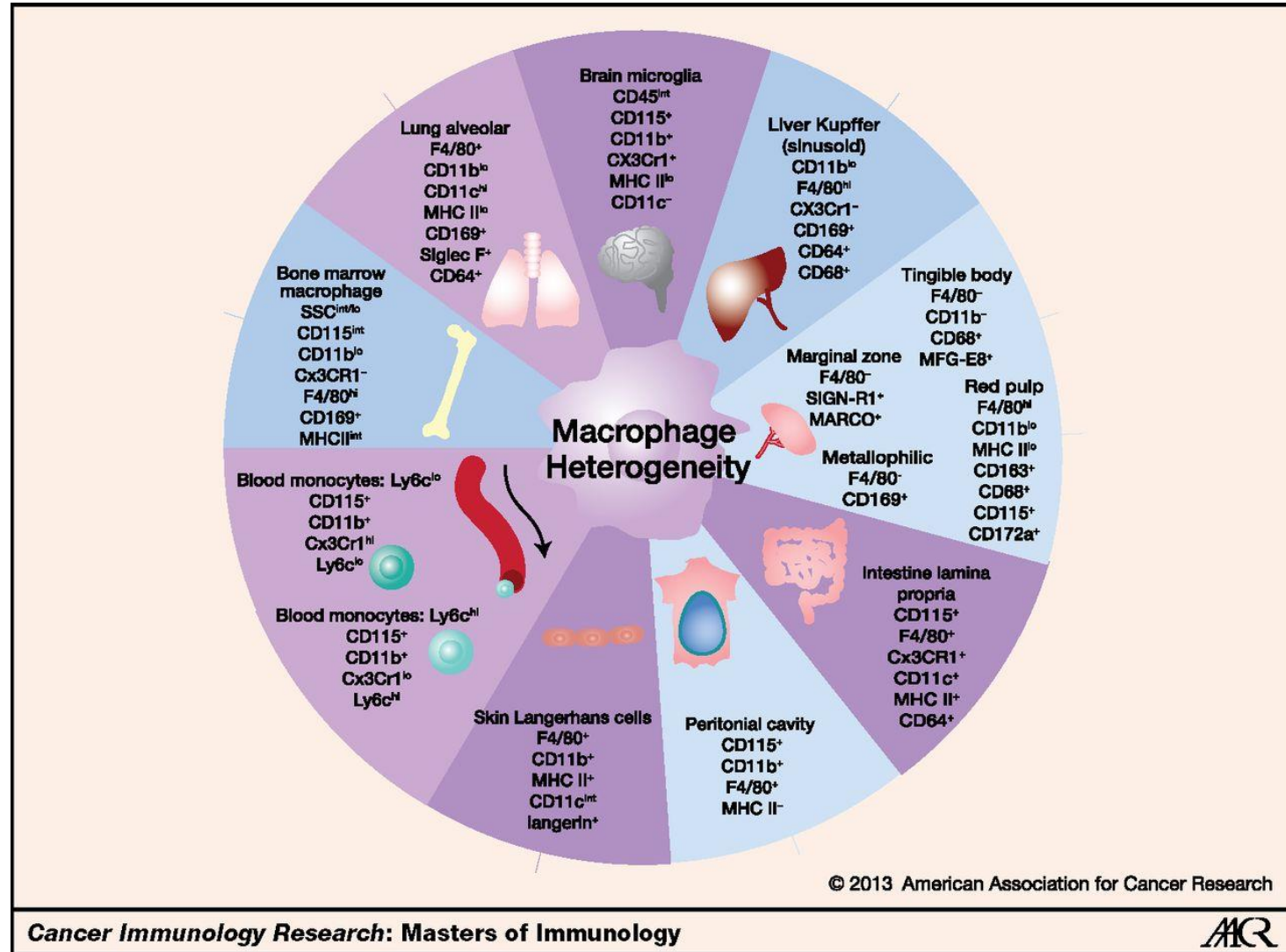
Macrophage

Macrophage

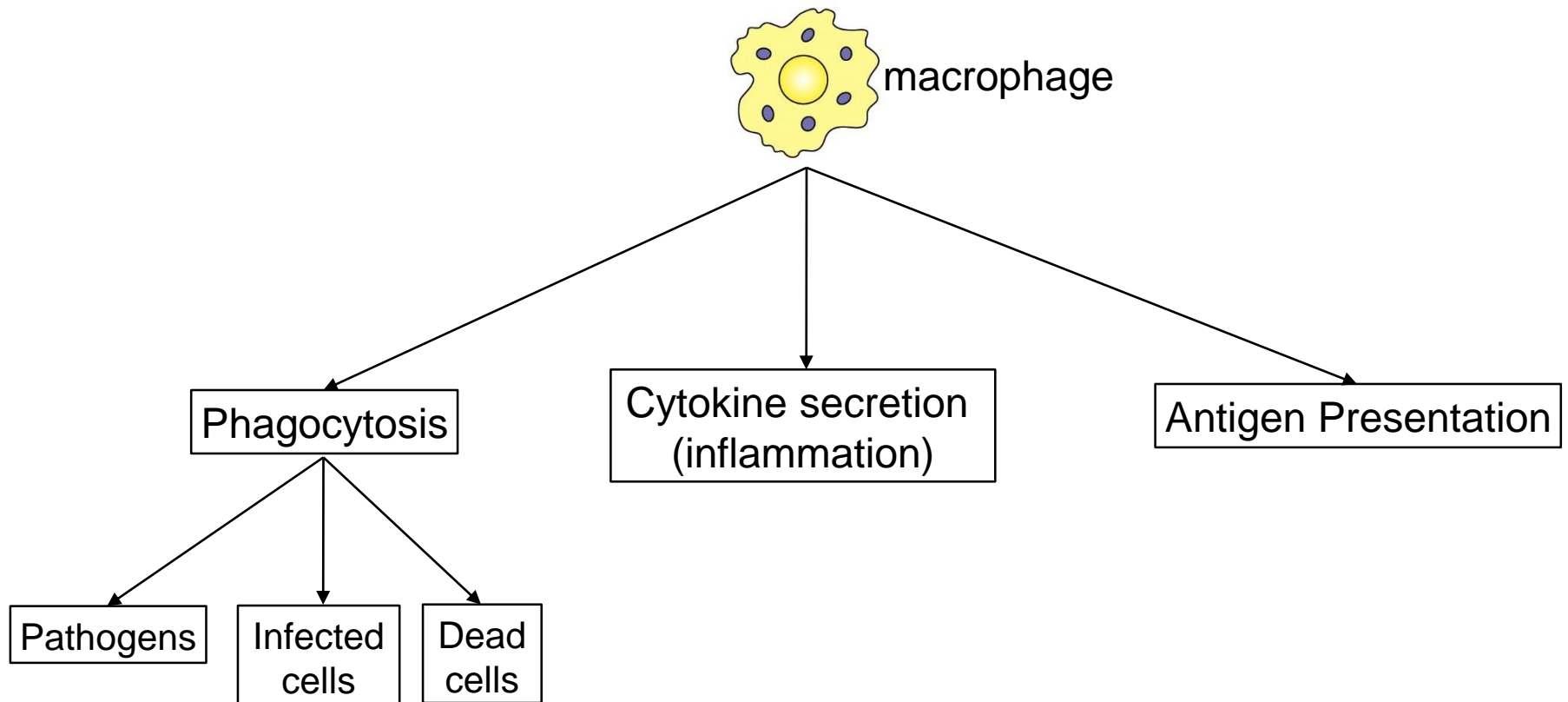


Phagocytosis and activation of bactericidal mechanisms
Antigen presentation and cytokine production

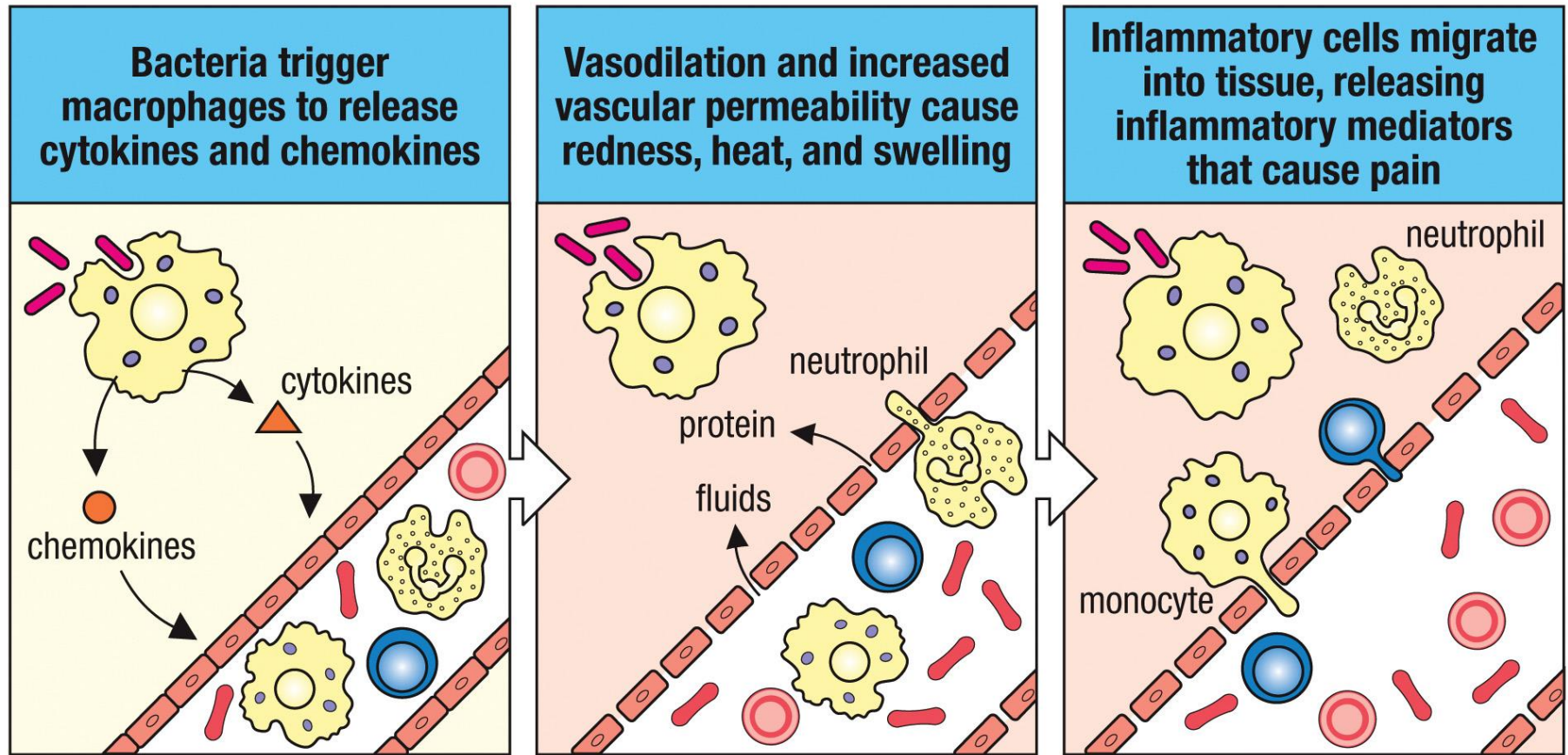
Tissue resident macrophages



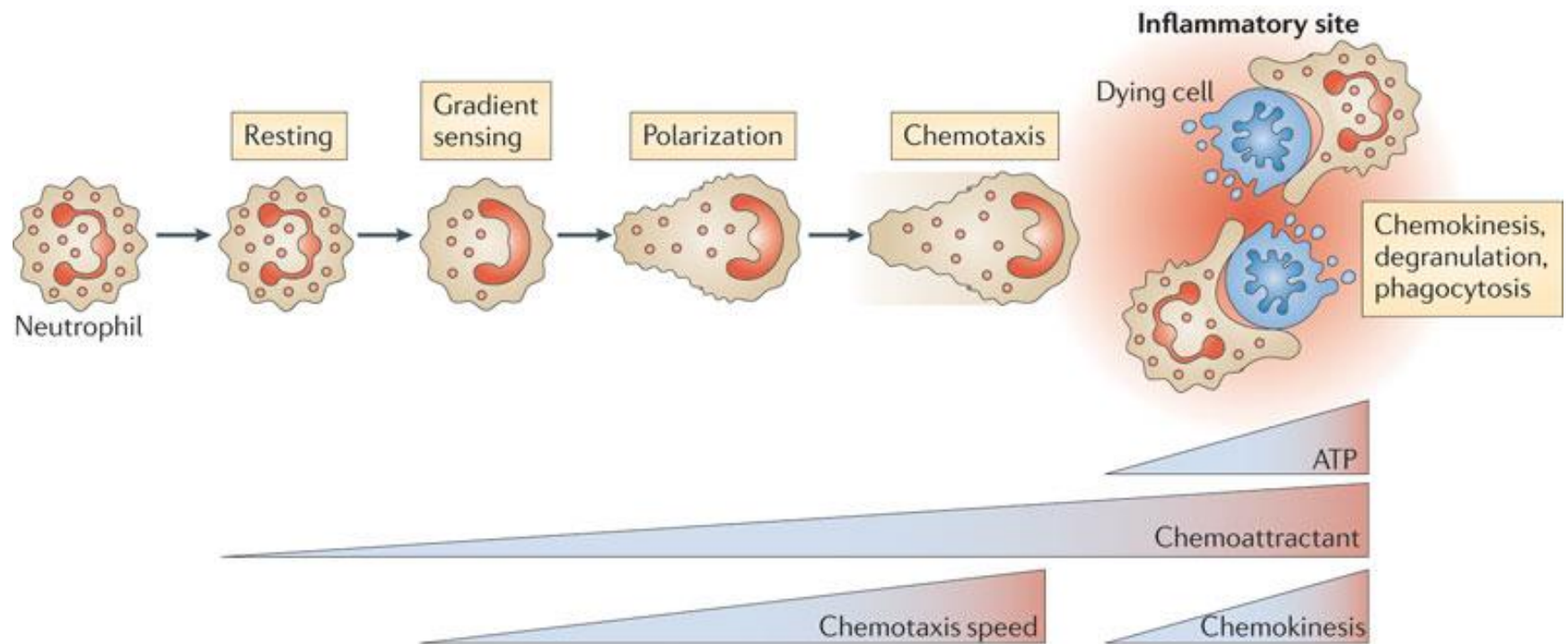
Macrophage Function



Macrophages Initiate an Immune Response And Recruit Other Immune Cells to Sites of Infection

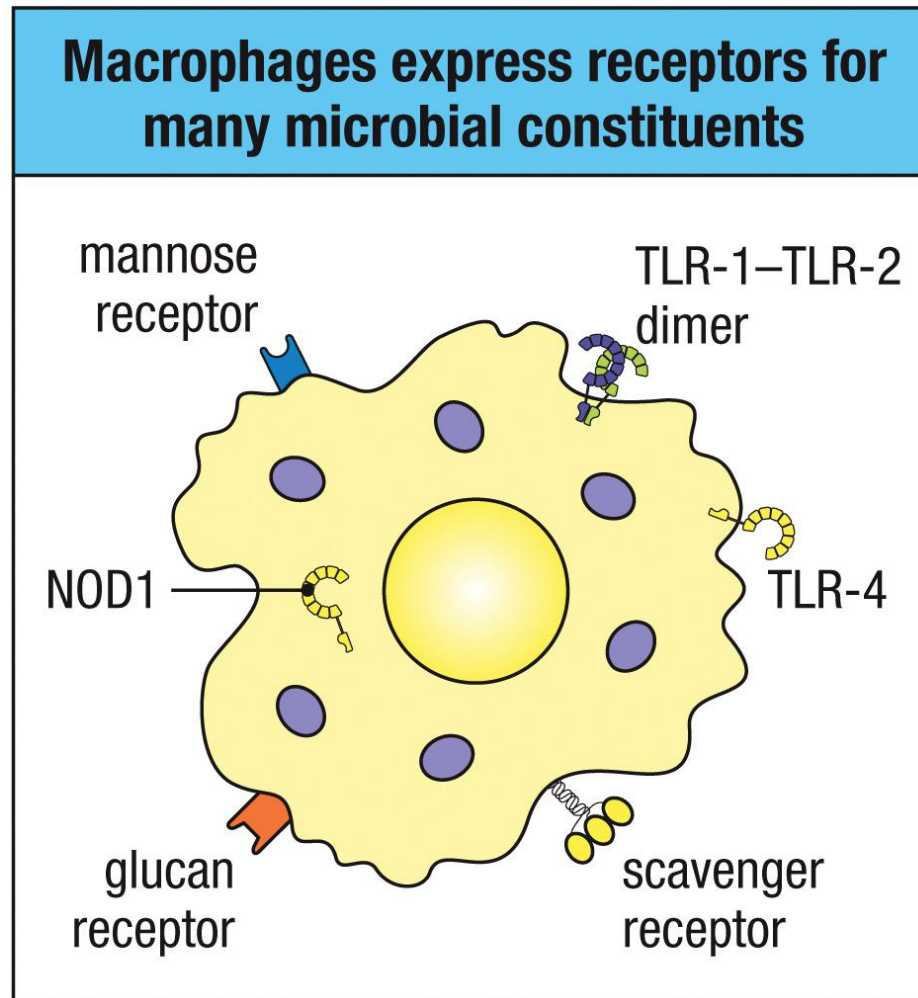


Homing of Leukocytes is Mediated By Chemokines



Nature Reviews | Immunology

Pathogen Receptors On Macrophages

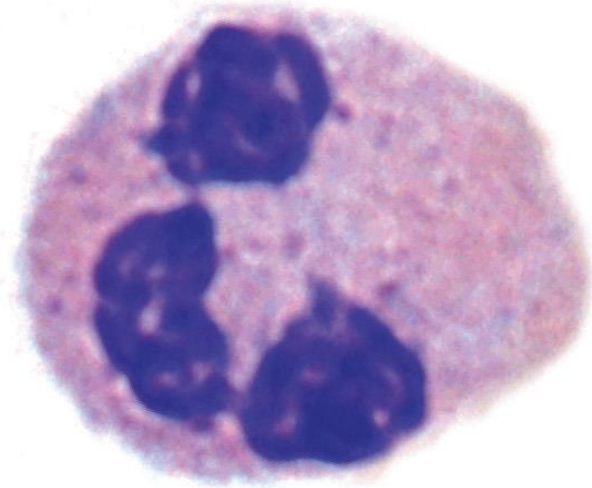
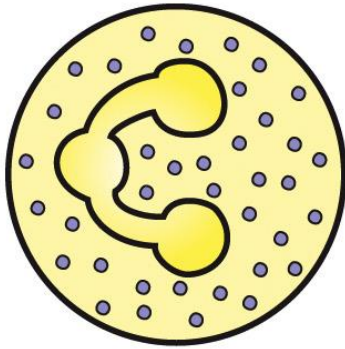


Receptor expression is constant, is not adapted based on the nature of the pathogen (unlike the receptors of the adaptive immune response).

- No problems with self-recognition

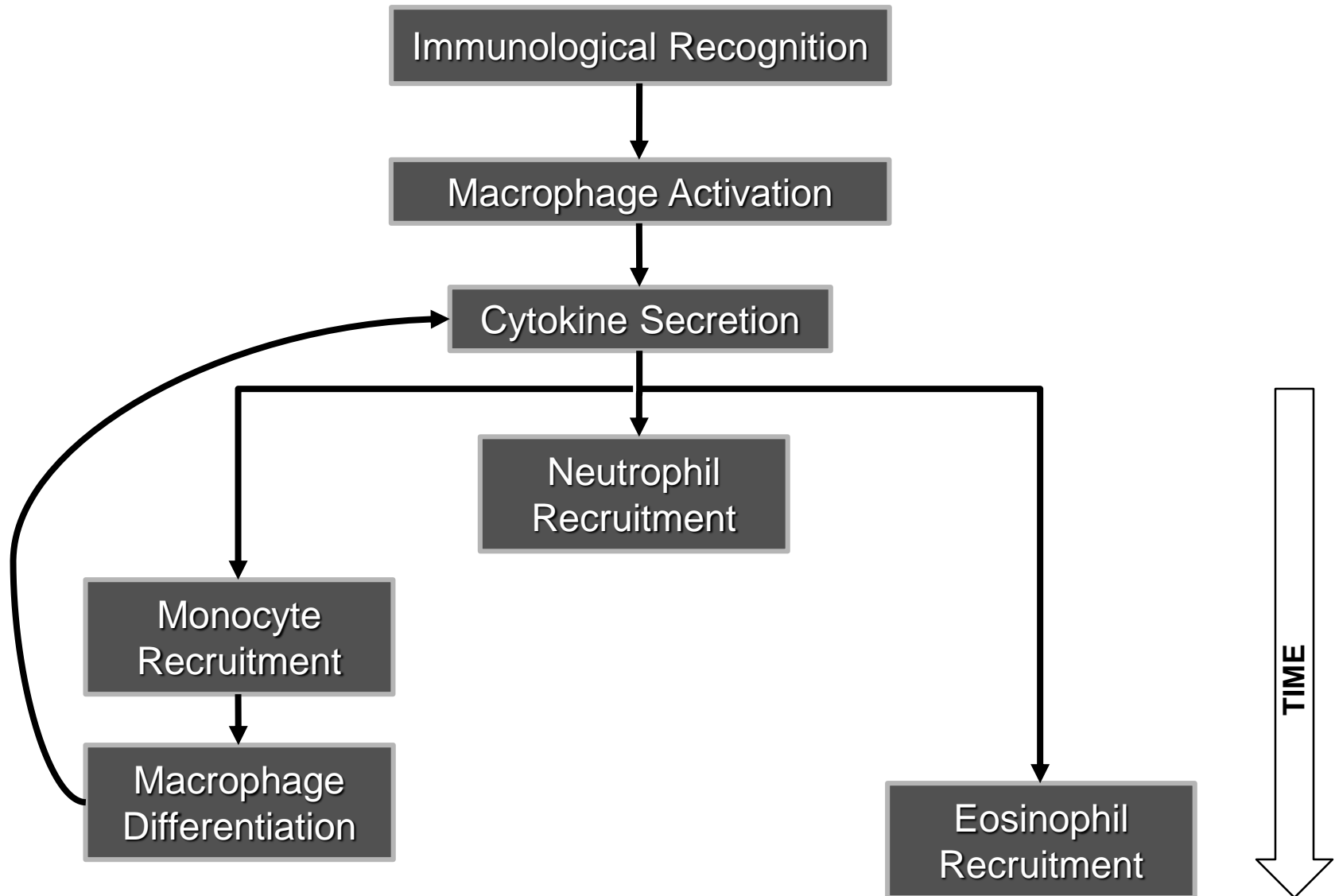
Neutrophils Phagocytose Pathogens

Neutrophil

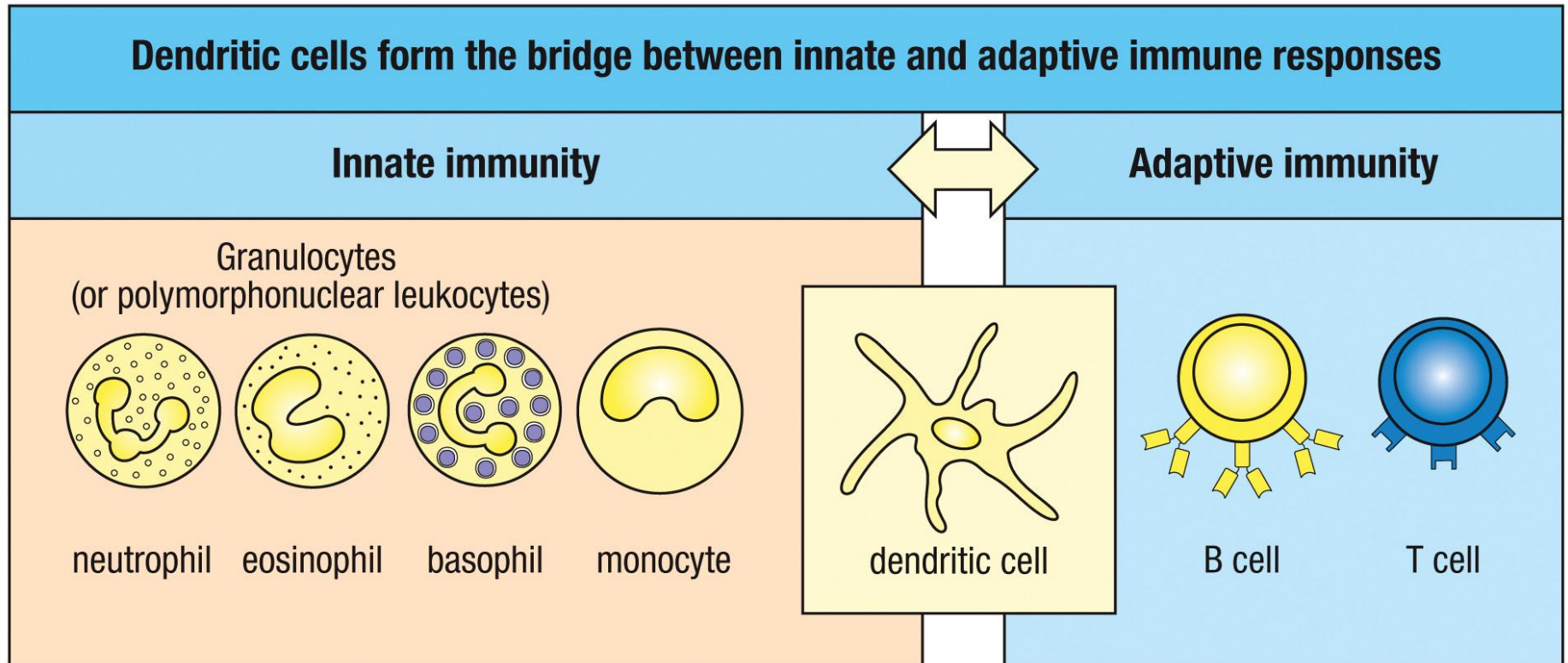


Phagocytosis and activation of bactericidal mechanisms

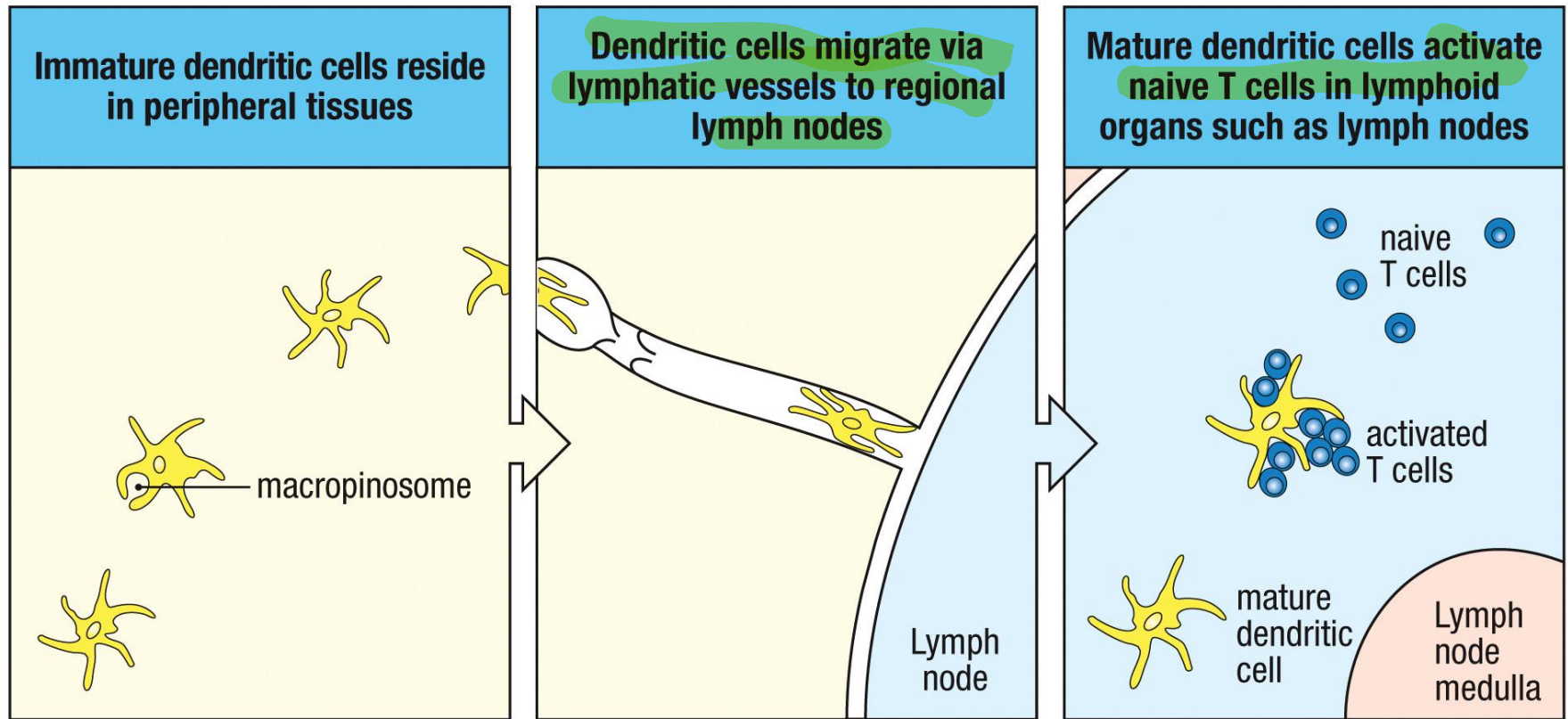
Timecourse of Innate Immune Response



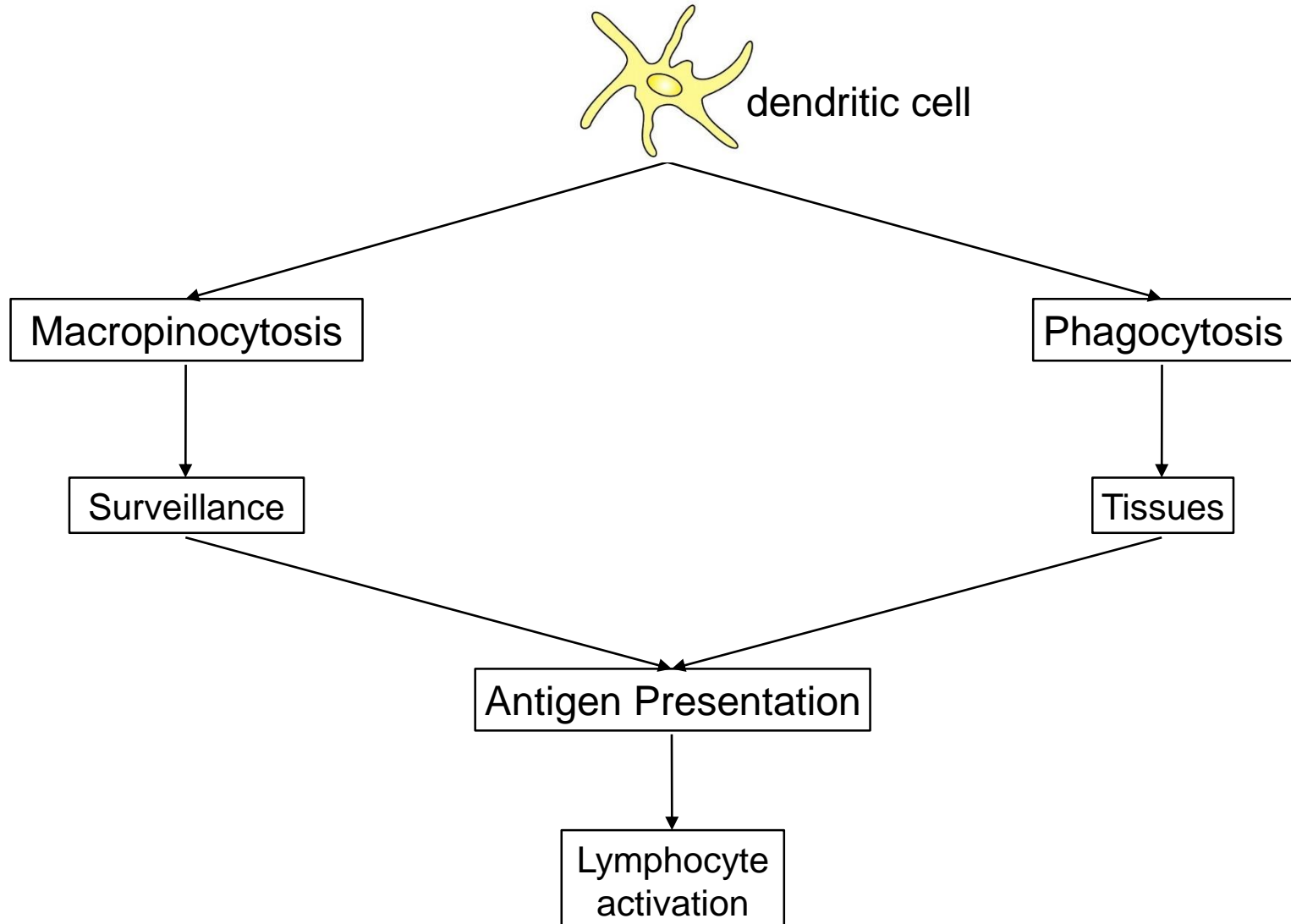
Dendritic Cell



Dendritic Cells Initiate Adaptive Immune Responses



Dendritic Cell Function

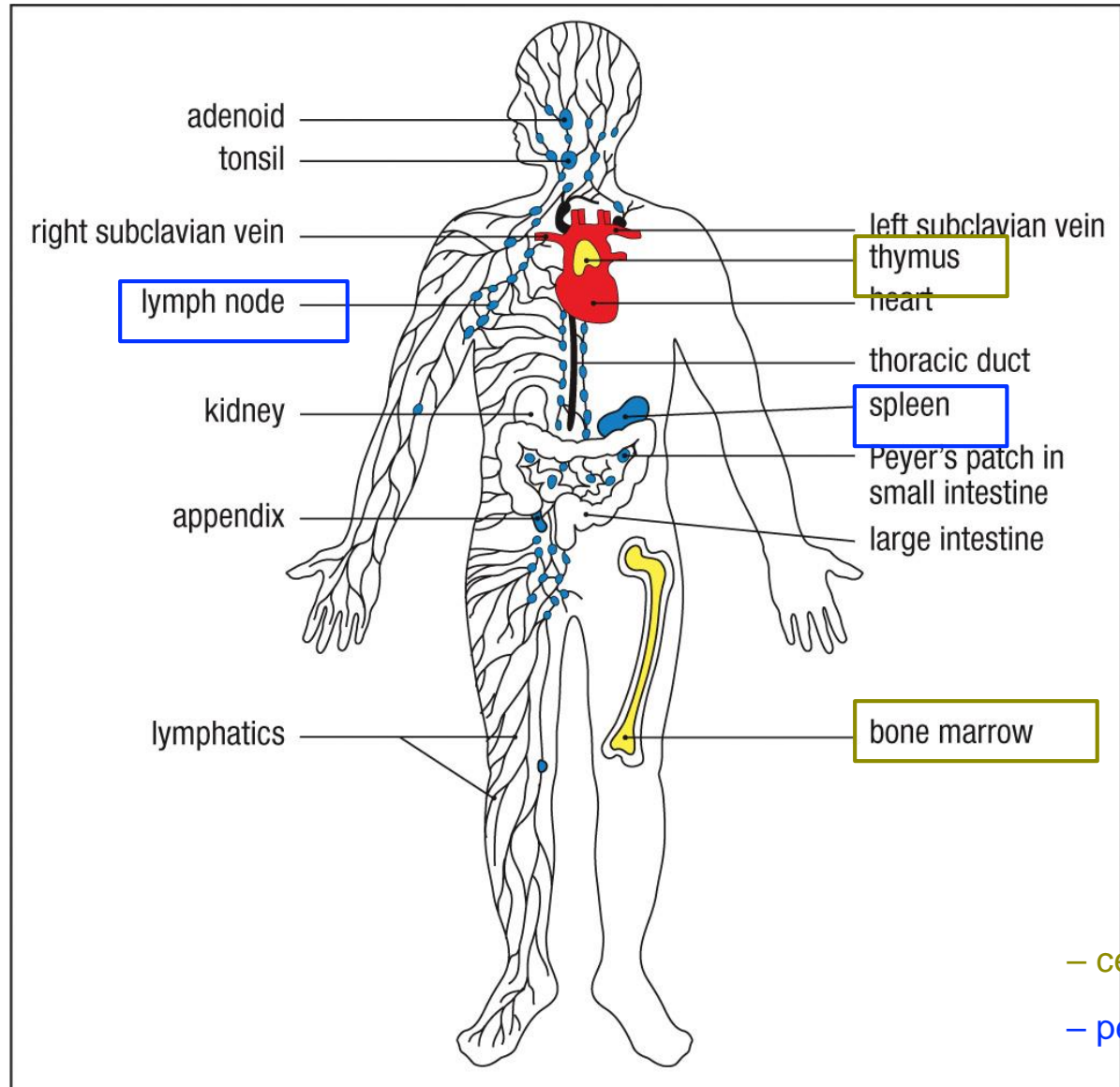


Question

What are the functions of macrophages?

What are the functions of dendritic cells?

Lymphoid Tissue



Lymphoid Organs: Sites of Antigen Encounter

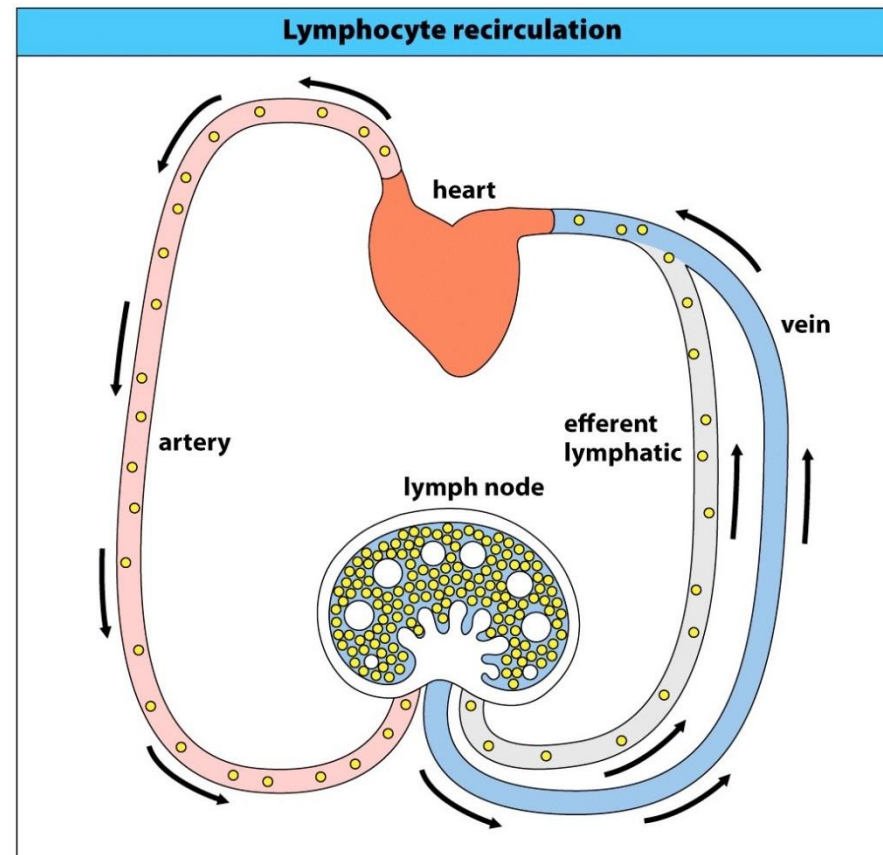
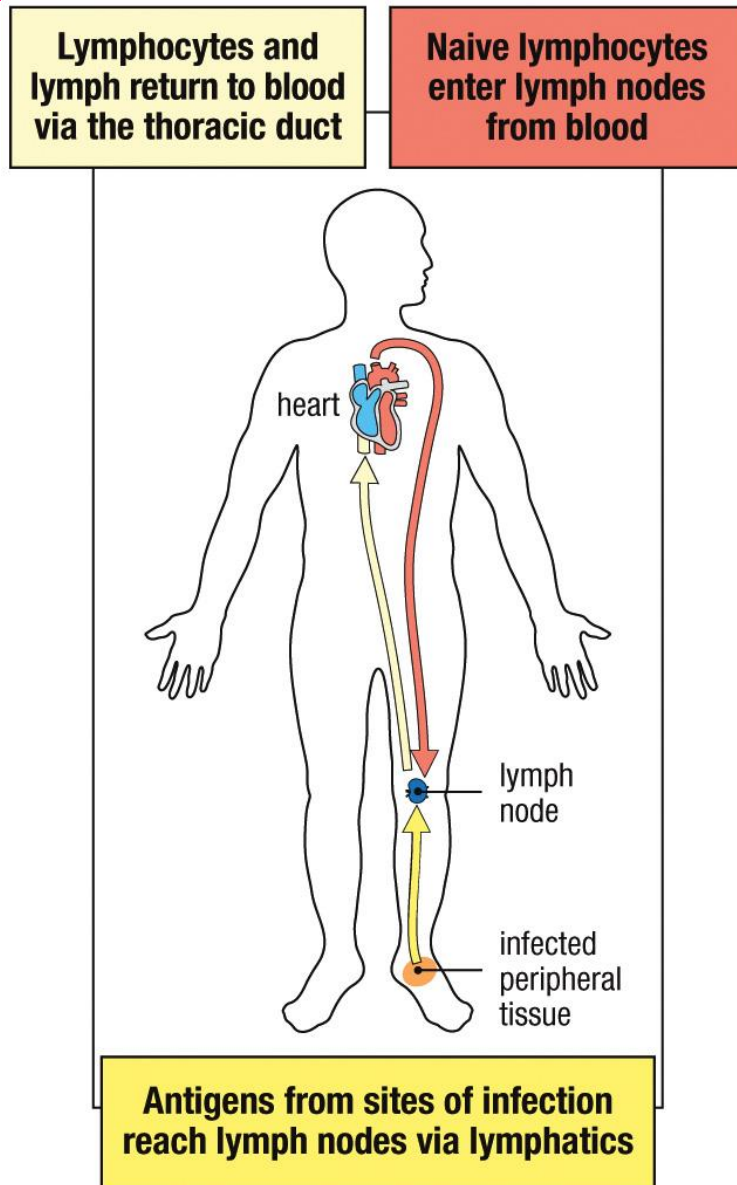
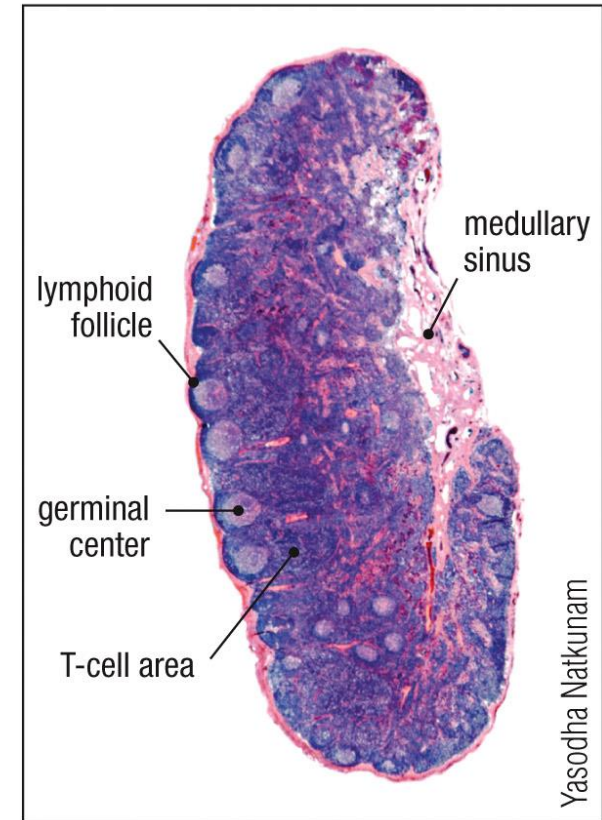
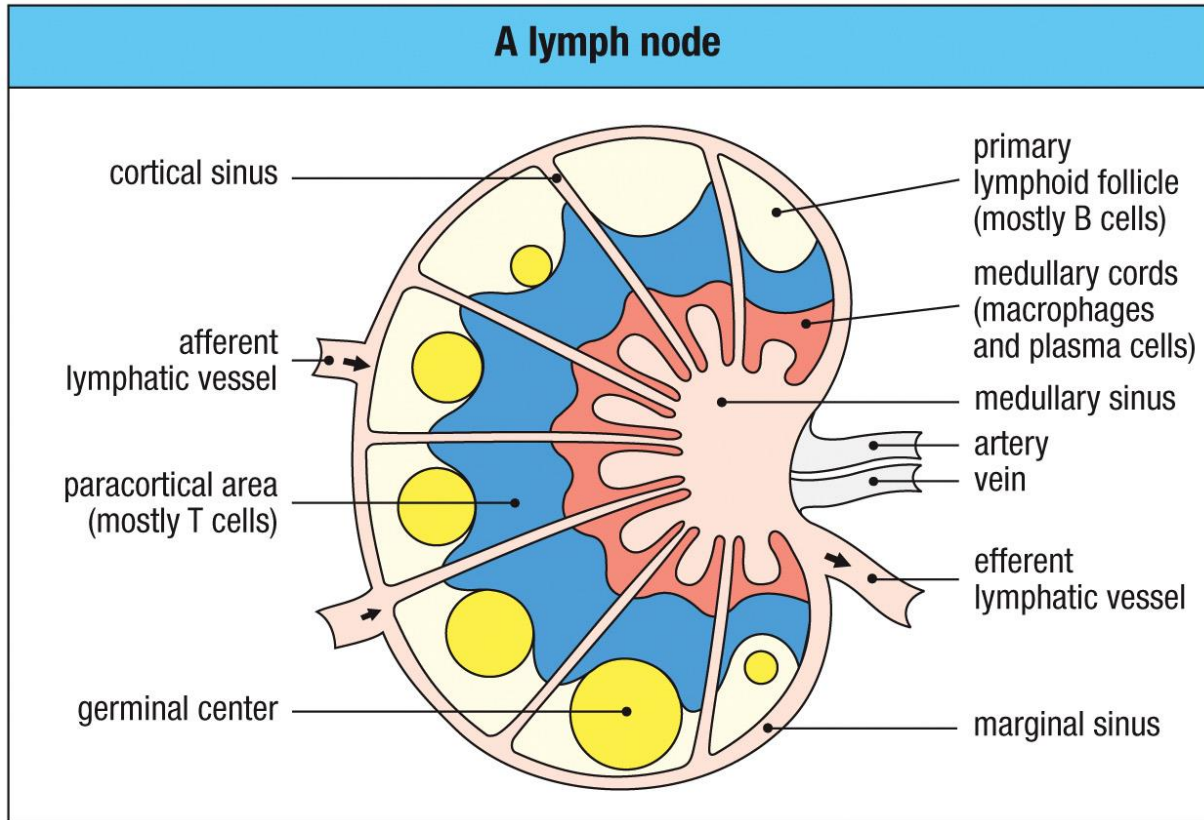


Figure 1.19 The Immune System, 3ed. (© Garland Science 2009)

Organization of a Lymph Node



Cellular Traffic to the Lymph Node

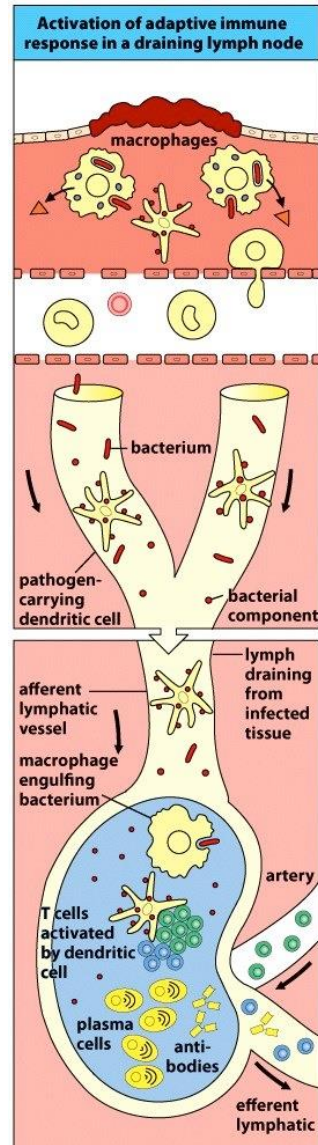


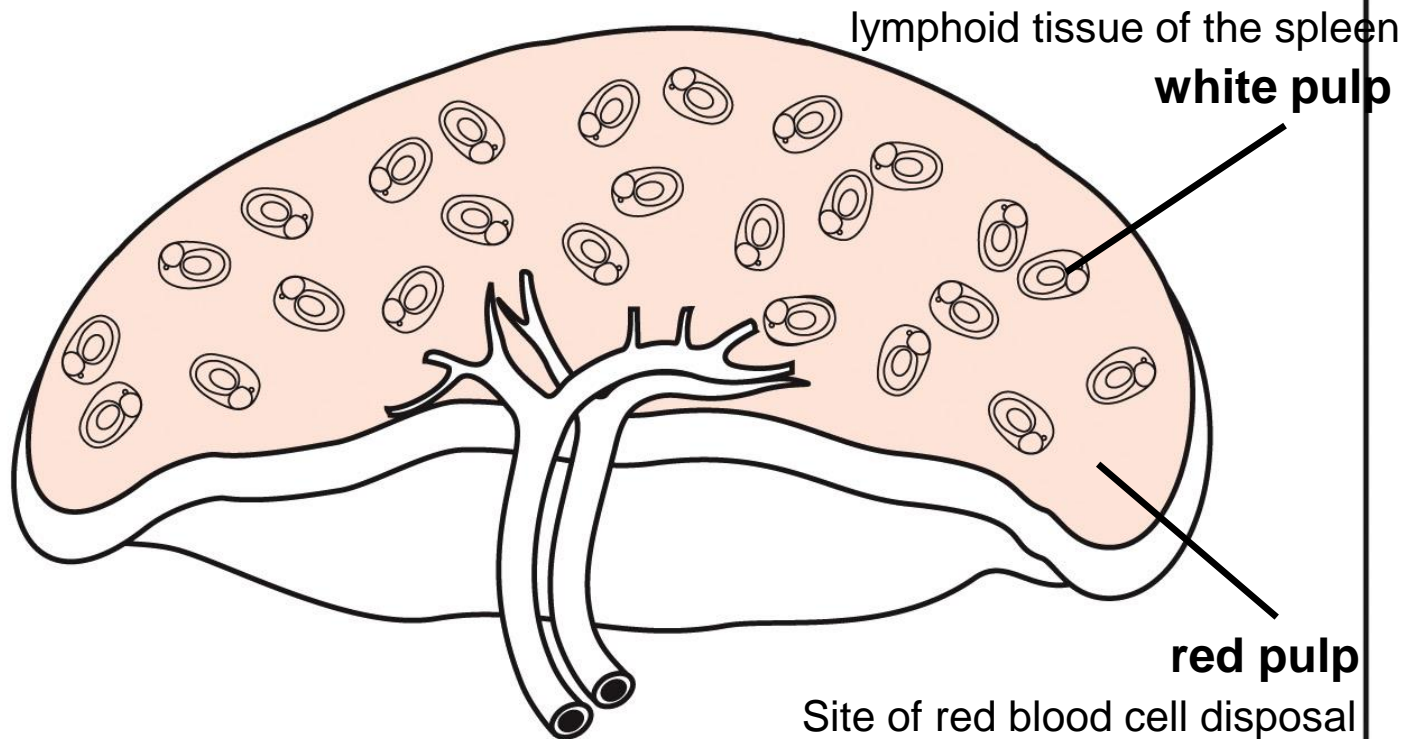
Figure 1.22 The Immune System, 3ed. (© Garland Science 2009)

Macrophages in the lymph node

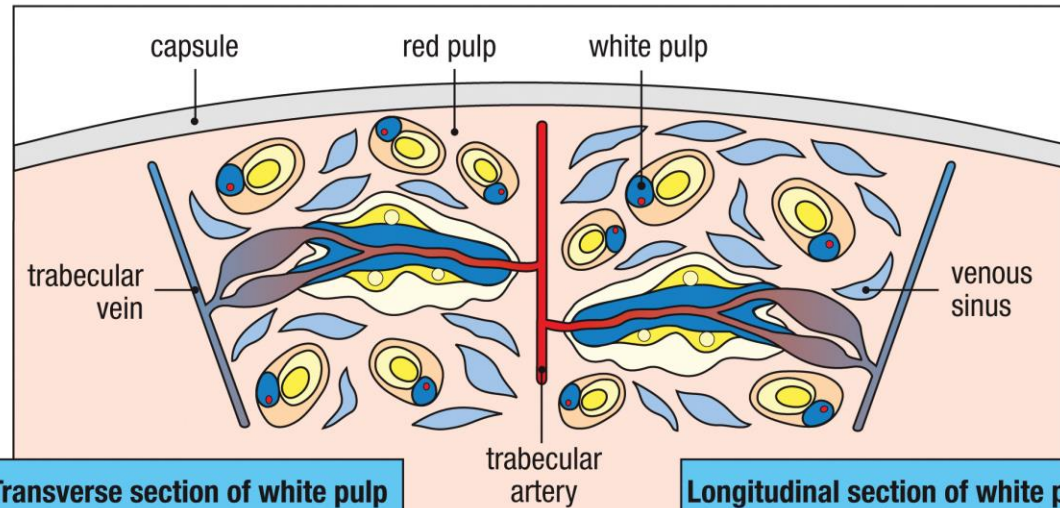
- Engulf free pathogen
- Antigen presentation
- Prevent the spread of the infection from the lymphatic system

Spleen

Immune responses to blood-borne pathogens



Lymphoid Tissues of the Spleen



Transverse section of white pulp

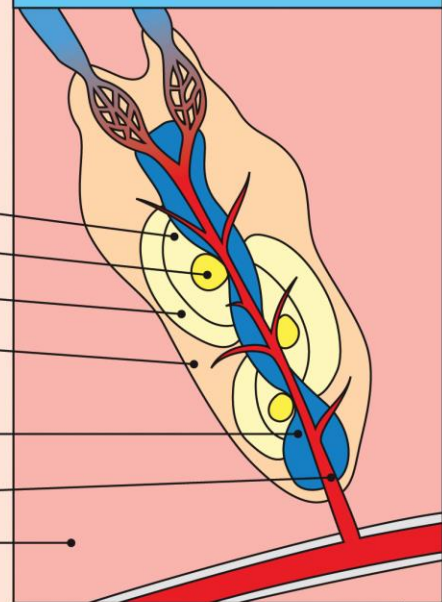
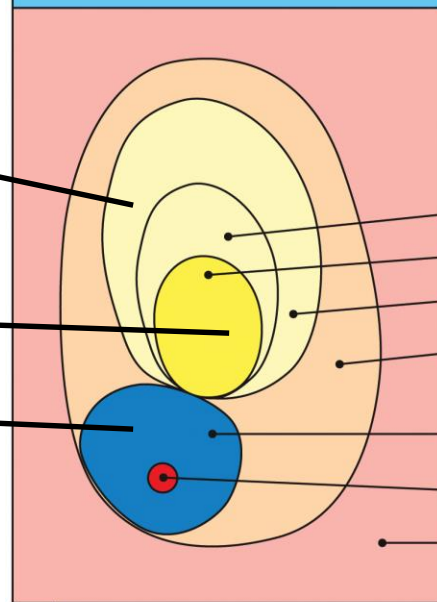
Longitudinal section of white pulp

Macrophages
Dendritic cells
Marginal zone B cells

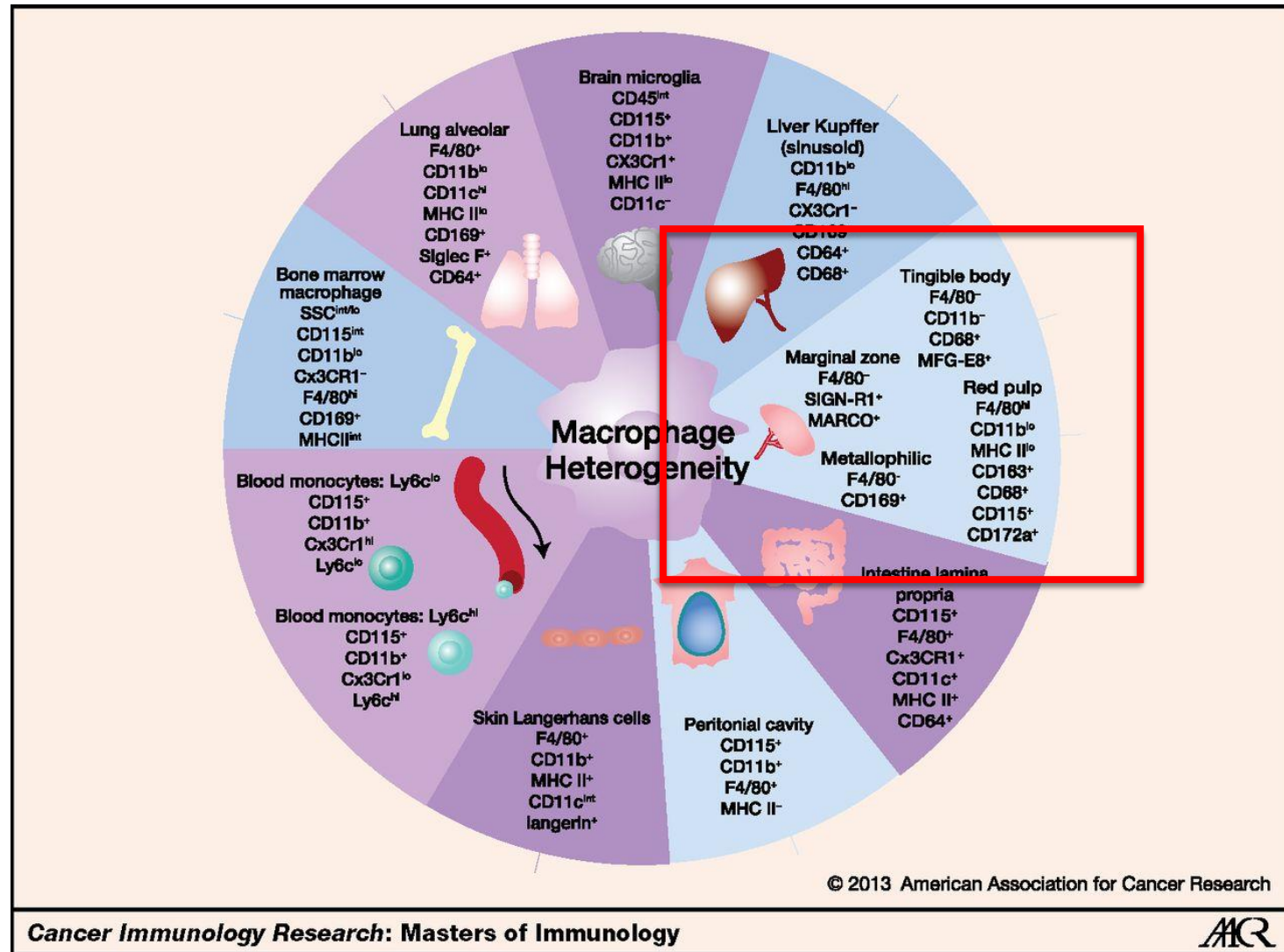
B cells

T cells

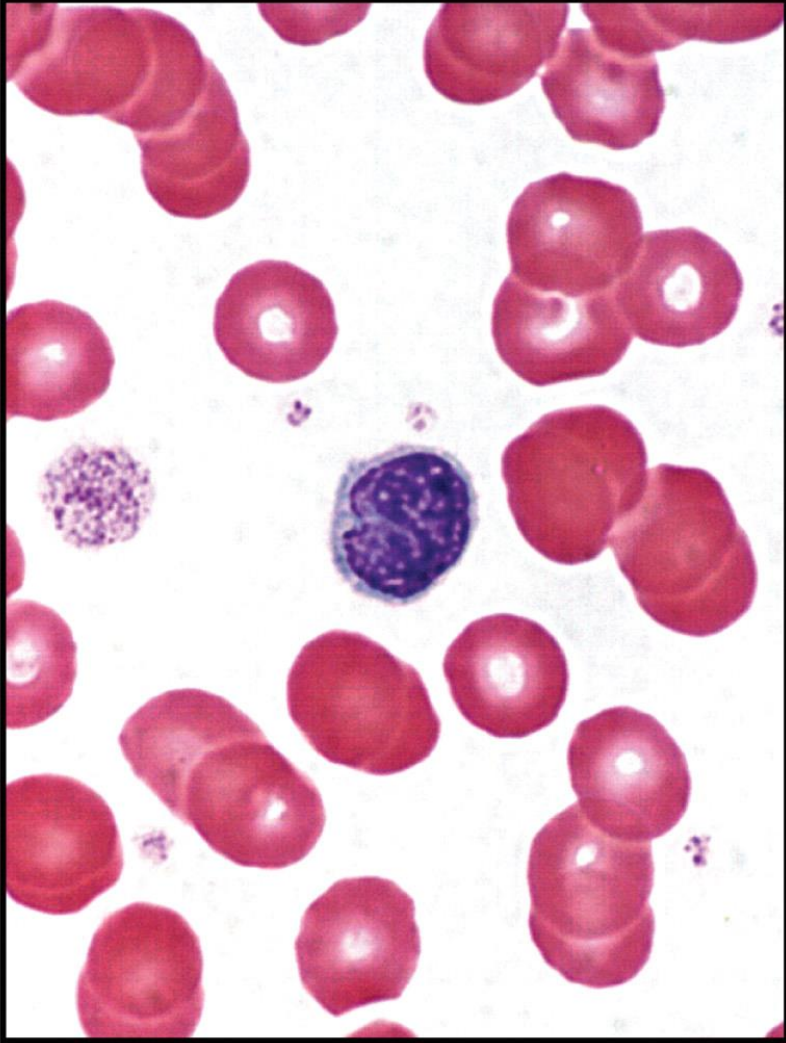
B-cell corona
germinal center
marginal zone
perifollicular zone
periarteriolar lymphoid sheath
central arteriole
red pulp



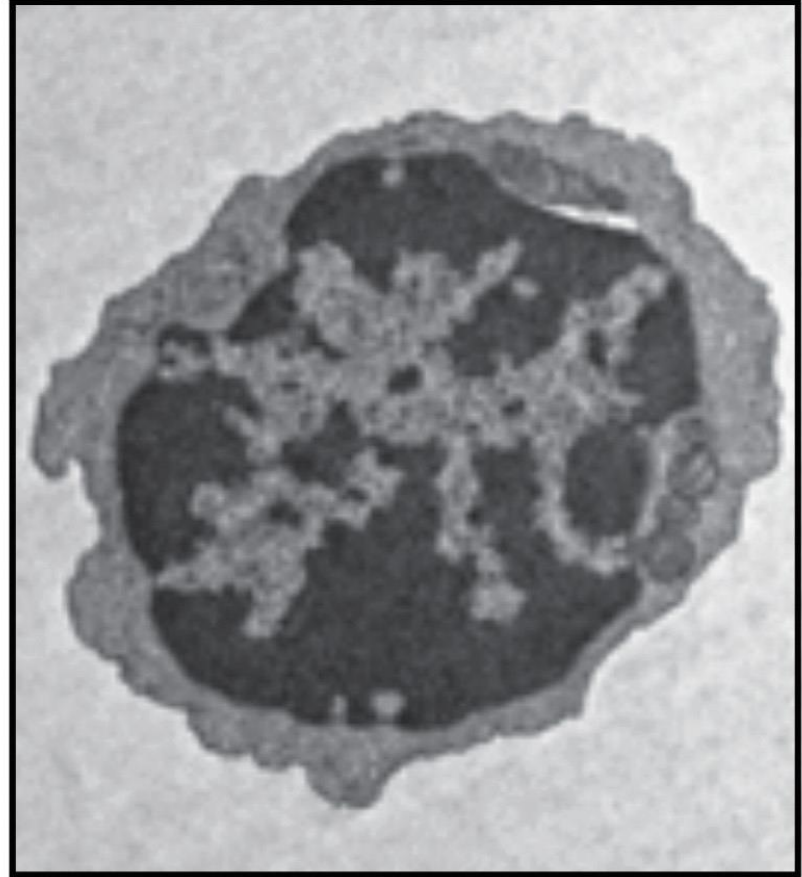
Tissue resident macrophages



Lymphocyte



Michael Ross/Science Source



Rawlings et al. (2011) *EMBO J* (2011) 30: 263–276. Reprinted with permission © Wiley

Stages of Lymphocyte Development

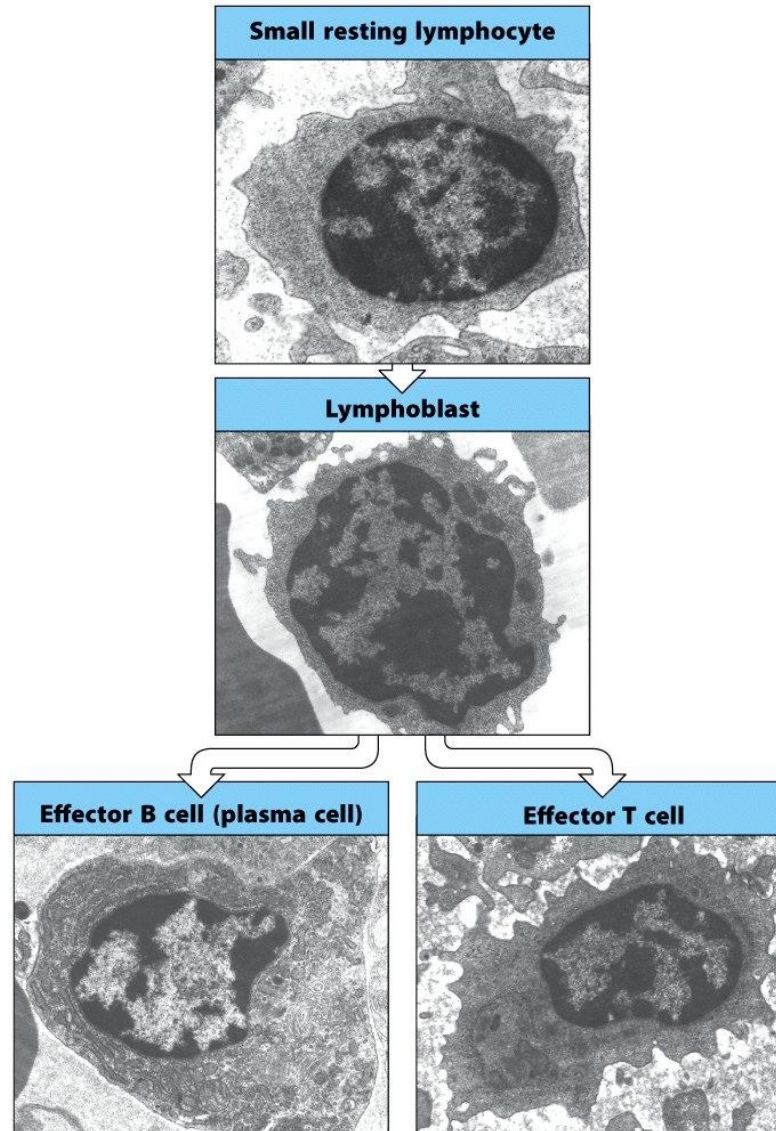
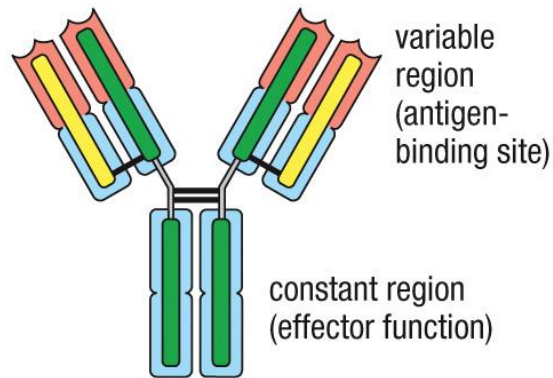


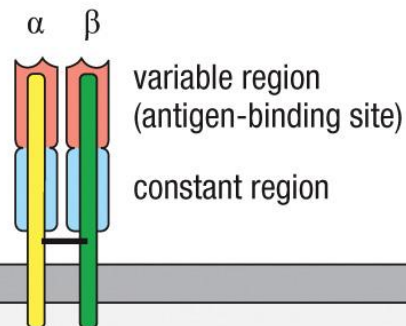
Figure 1-23 Immunobiology, 7ed. (© Garland Science 2008)

Antigen Receptors

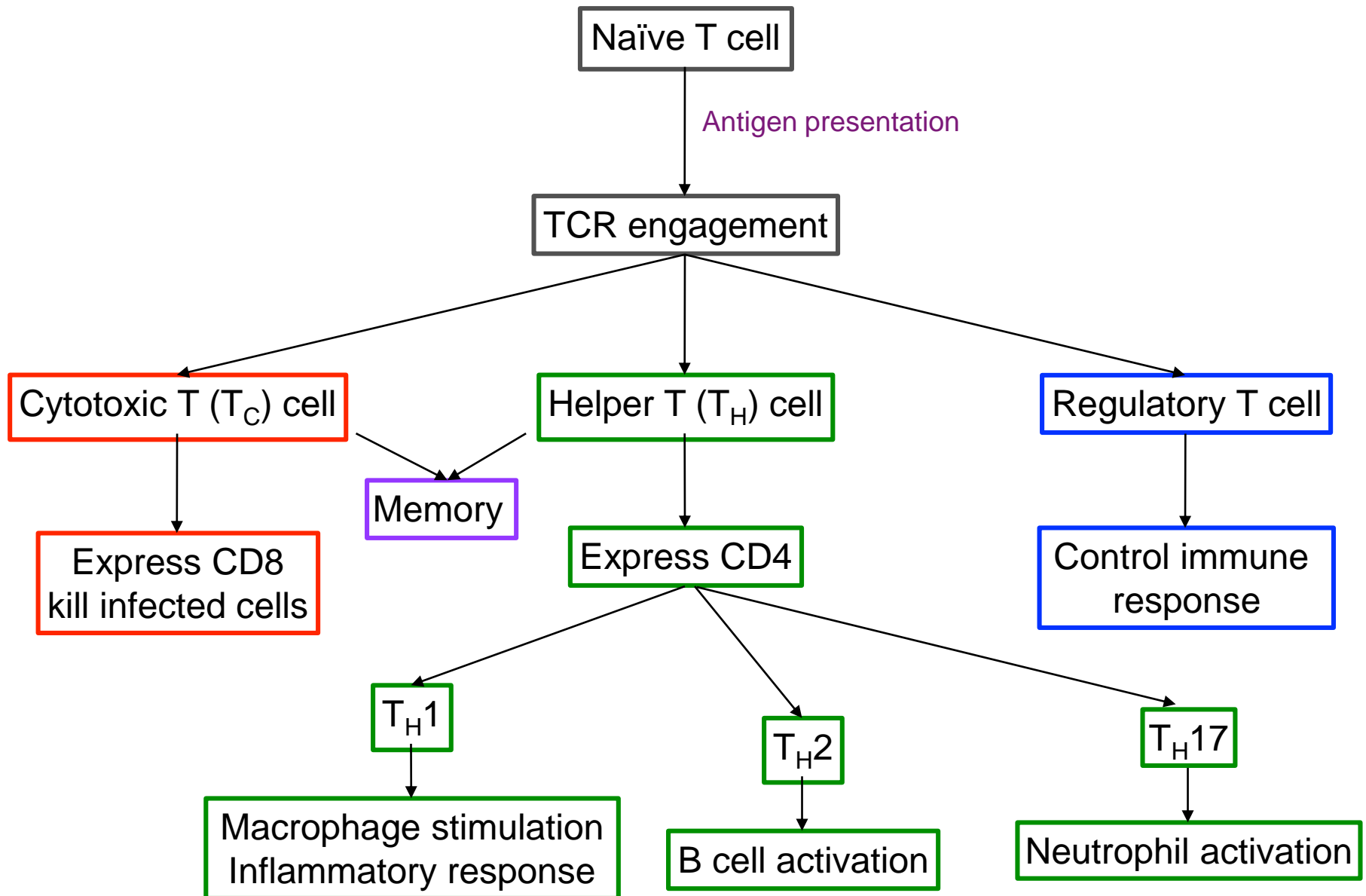
Schematic structure of an antibody molecule



Schematic structure of the T-cell receptor

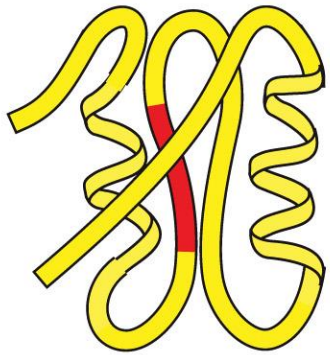


T Lymphocyte Differentiation

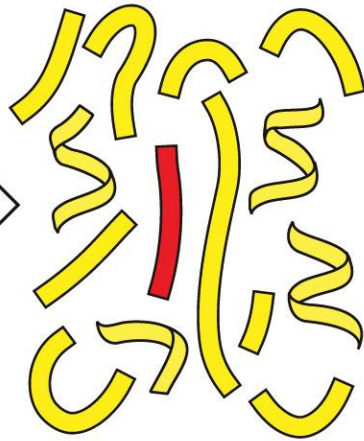


T Cell Receptors

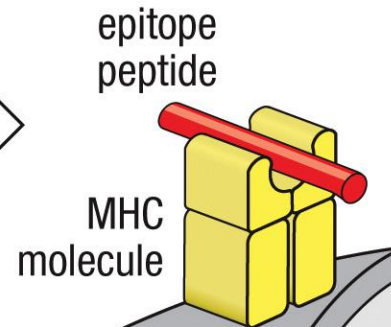
The epitopes recognized by T-cell receptors are often buried



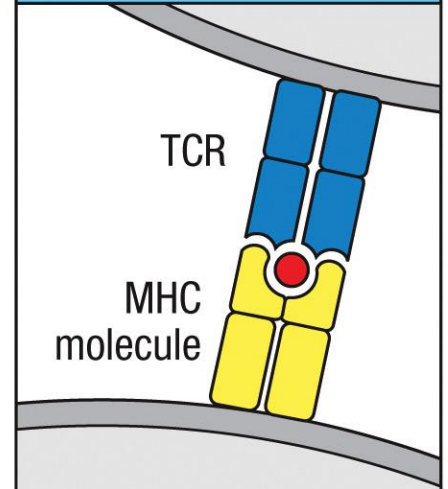
The antigen must first be broken down into peptide fragments



The epitope peptide binds to a self molecule, an MHC molecule



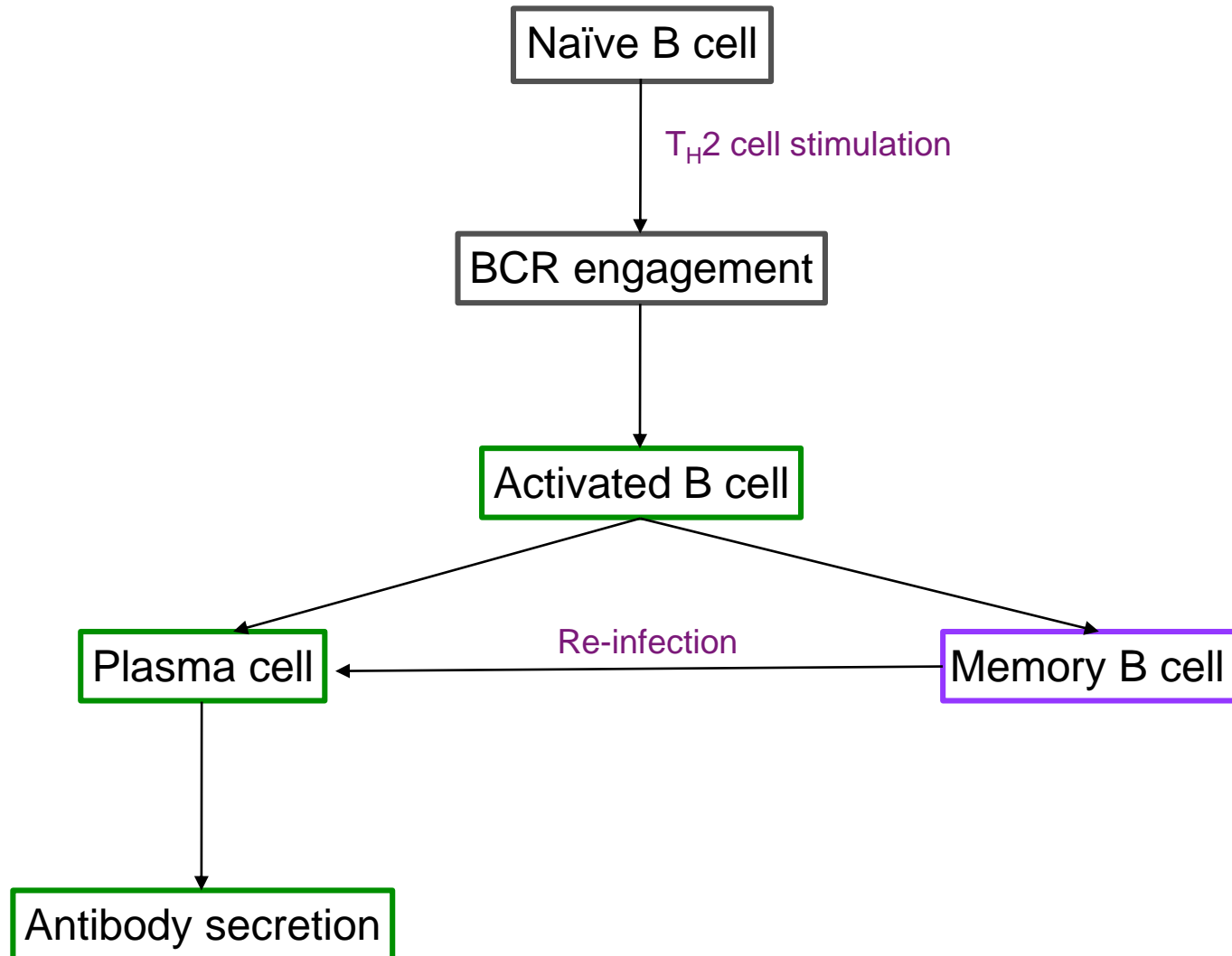
The T-cell receptor binds to a complex of MHC molecule and epitope peptide



T Lymphocyte Function

Effector module	Cell types, functions, and mechanisms
Cytotoxicity	NK cells, CD8 T cells
	Elimination of virally infected and metabolically stressed cells
Intracellular immunity (Type 1)	ILC1, T _H 1 cells
	Elimination of intracellular pathogens; activation of macrophages
Mucosal and barrier immunity (Type 2)	ILC2, T _H 2 cells
	Elimination and expulsion of parasites; recruitment of eosinophils, basophils, and mast cells
Extracellular immunity (Type 3)	ILC3, T _H 17 cells
	Elimination of extracellular bacteria and fungi; recruitment and activation of neutrophils

B Lymphocyte Differentiation



Question

- What is the central lymphatic organ? What is its function?
- What are the two major peripheral lymphatic organs? What are their functions?

Outline

- Cells and tissues of the immune system
- **Case study: Congenital Asplenia**

Congenital Asplenia: Case Study

Patient:

- 10 month old female
- dead on arrival in emergency room
- prior illness, 2 weeks
- cultures positive for *H. influenzae* (bacterial)

Family history:

- Ancestors: Consanguineous marriages
- Sister, 3 years old, severe *H. influenzae* infection, recovered
- Brother, 5 years old, bacterial pneumonia at 21 & 27 months, and 3.5 years, recovered

Tests:

- Both siblings have normal responses to typhoid vaccine & tetanus toxoid
- Both siblings have impaired response to vaccination with sheep red blood cells (RBCs)
- Abnormal colloidal gold (^{198}Au) scan

Congenital Asplenia: Case Study

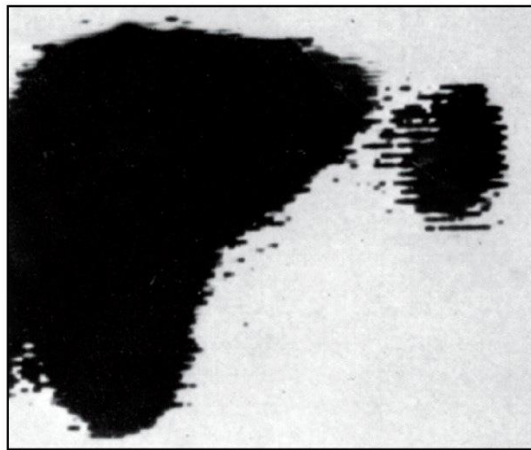
Why did the infant die?

NORMAL RESPONSES	IMPAIRED RESPONSES
Typhoid vaccine	Sheep RBCs
Subcutaneous vaccine (under the skin)	Intravenous vaccine
Response in lymph node	Response in spleen

Congenital Asplenia: Case Study

Colloidal gold (^{198}Au) scan

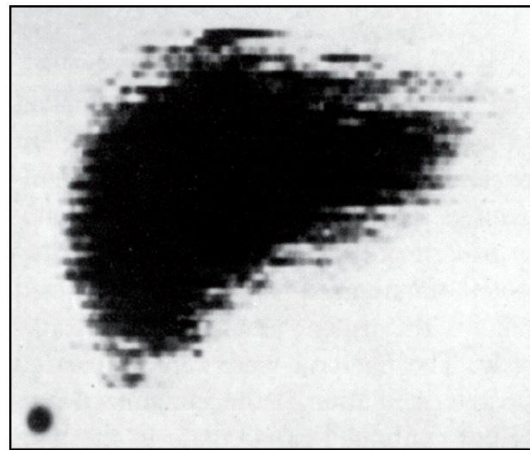
Mother



Liver

Spleen

Children



Congenital Asplenia: Case Study

Baby S.V. died of bacteremia

Due to her inability to mount an adaptive response against a pathogen in her blood stream.

Absent of spleen

Congenital Asplenia: Case Study

Absent or non-functional spleen

Susceptible to bloodstream infections by microorganisms against which they have no antibodies

- Streptococcus pneumonia
- Haemophilus influenzae

Treatment

Prophylactic antibiotics

Immunization