

# Innate and Adaptive Immunity

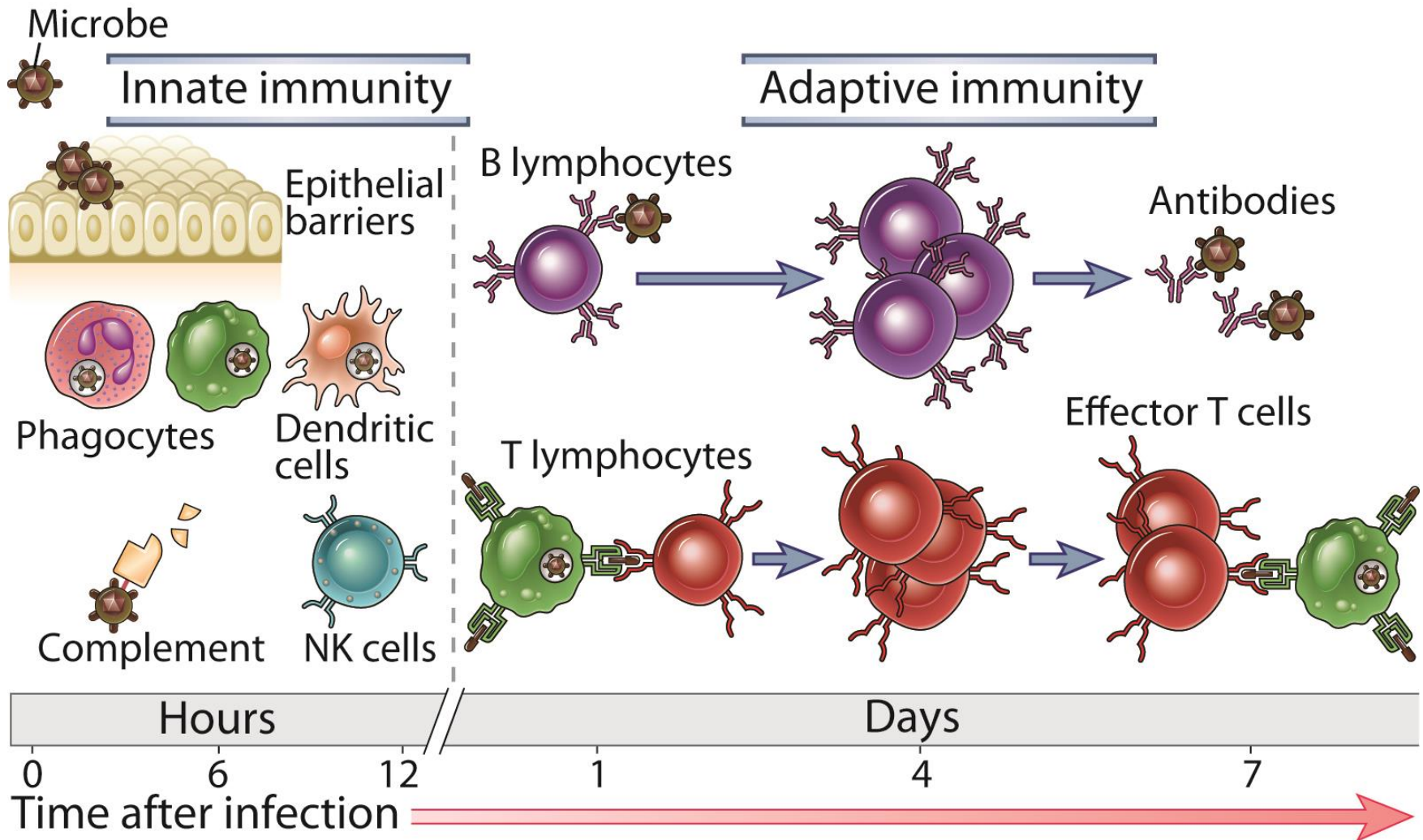
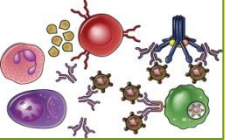


Fig. 1-1



# Innate and Adaptive Immunity

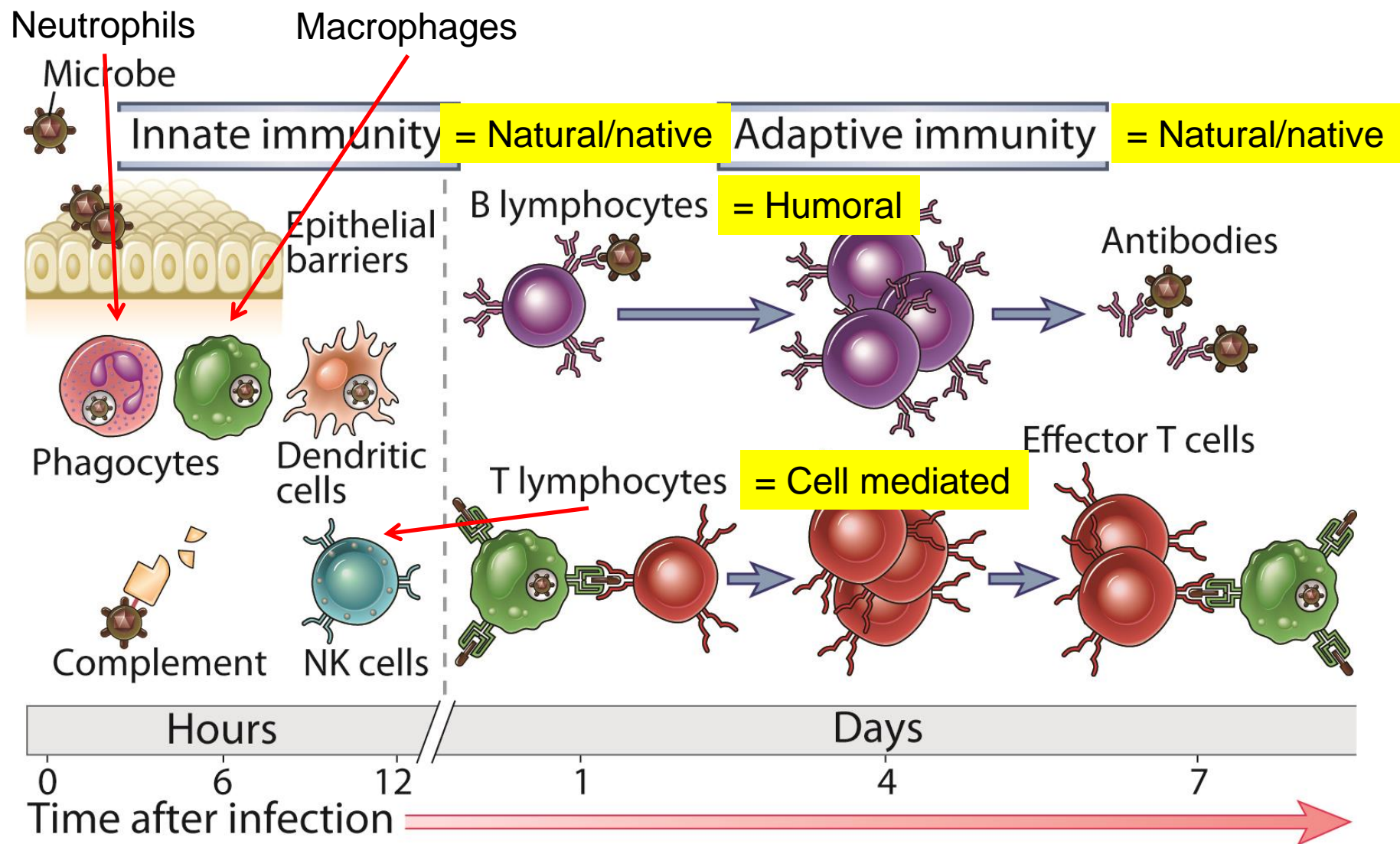
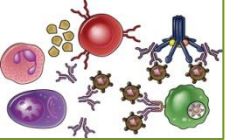
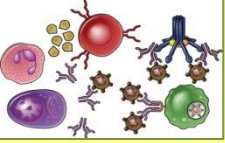


Fig. 1-1



# Features of Innate and Adaptive Immunity

	Innate	adaptive
<b>Characteristics</b>		
<b>Specificity</b>	For molecules shared by groups of related microbes and molecules produced by damaged host cells	For microbial and monomicrobial antigens
<b>Diversity</b>	Limited germline encoded	Very large, Receptors are produced by somatic recombination of gene segments
<b>Memory</b>	none	yes
<b>Nonreactive to self</b>	yes	yes
<b>Components</b>		
<b>Cellular and chemical barriers</b>	Skin, mucosal epithelia, antimicrobial molecules	Lymphocytes in epithelia, antibodies secreted at epithelial surfaces
<b>Blood proteins</b>	Complements, others	Antibodies
<b>Cells</b>	Phagocytes (Macrophages, Neutrophils) Natural killer cells	Lymphocytes



# Types of Adaptive Immunity


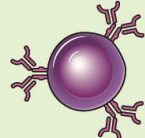
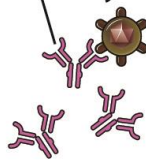
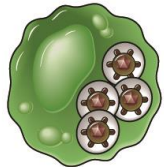
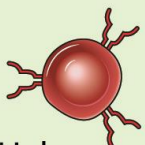
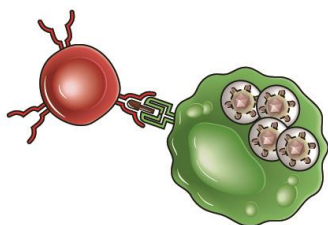
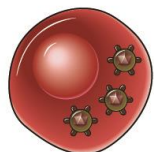
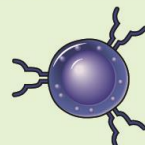
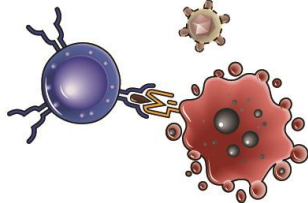
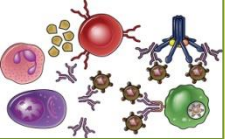
	Microbe	Responding lymphocytes	Effector mechanism	Transferred by	Functions
Humoral immunity	 Extracellular microbes	 B lymphocyte	 Secreted antibody	Serum (antibodies)	Block infections and eliminate extracellular microbes
Cell-mediated immunity	 Phagocytosed microbes in macrophage	 Helper T lymphocyte		Cells (T lymphocytes)	Activate macrophages to kill phagocytosed microbes
	 Intracellular microbes (e.g., viruses)	 Cytotoxic T lymphocyte		Cells (T lymphocytes)	Kill infected cells and eliminate reservoirs of infection

Fig. 1-2





# Active and Passive Immunity

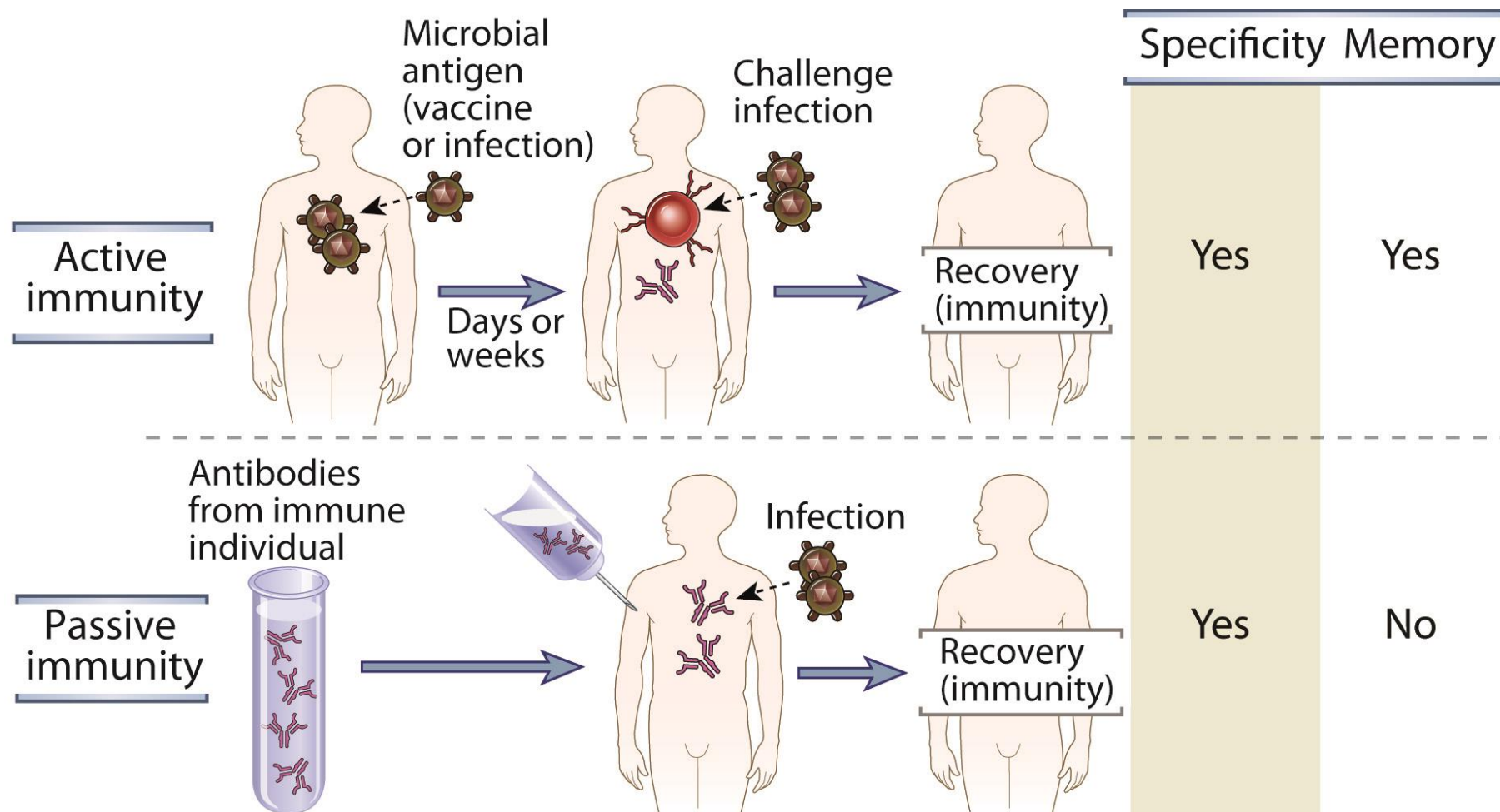
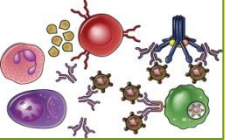


Fig. 1-3



# Specificity Memory and Contraction

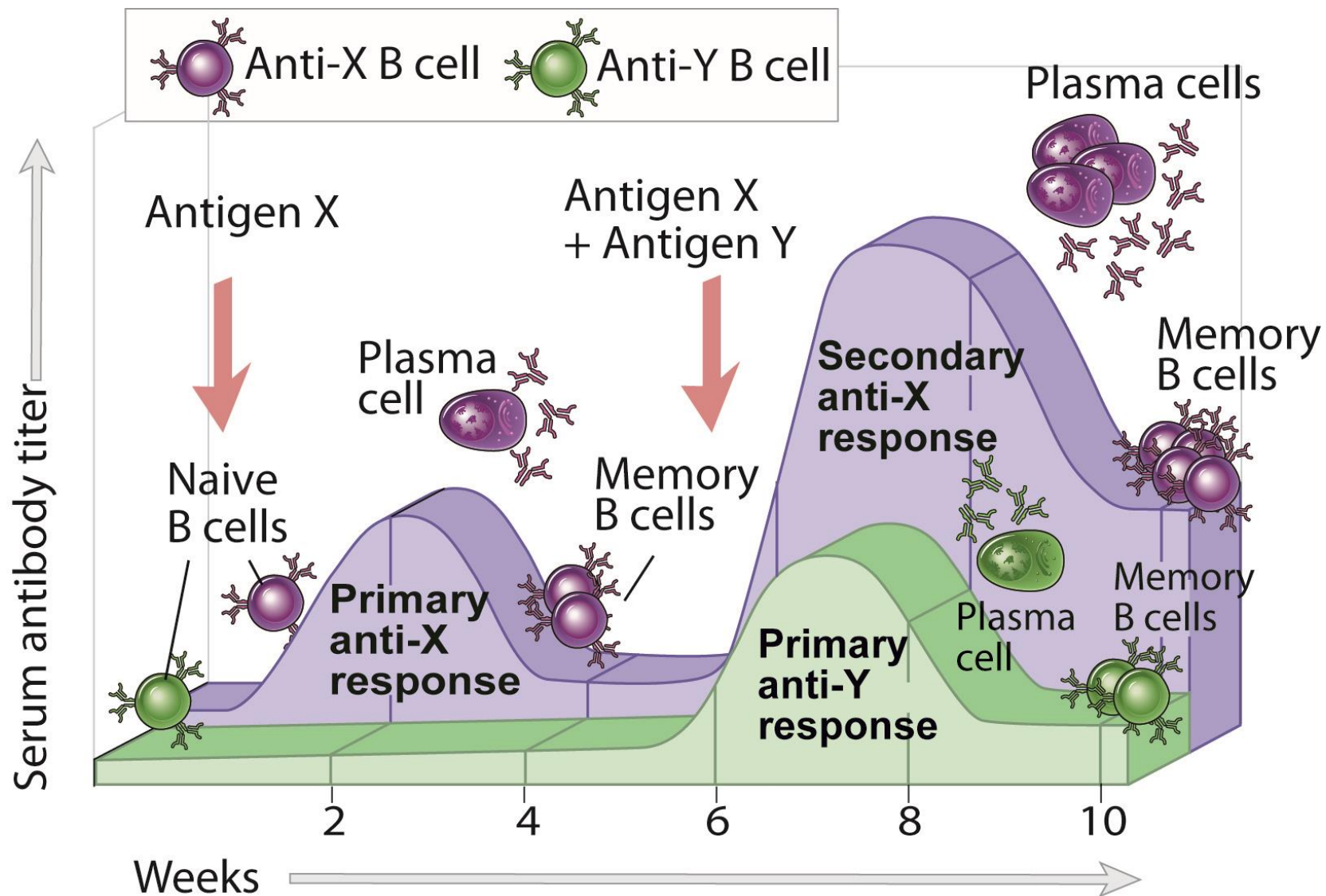
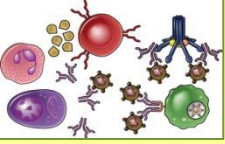
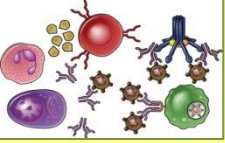


Fig. 1-4

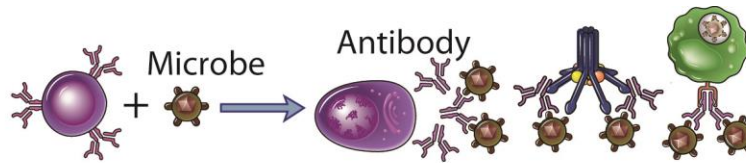


The **cluster of differentiation** (cluster of designation) (often abbreviated as CD) is a protocol used for the identification and investigation of cell surface molecules providing targets for immunophenotyping of cells



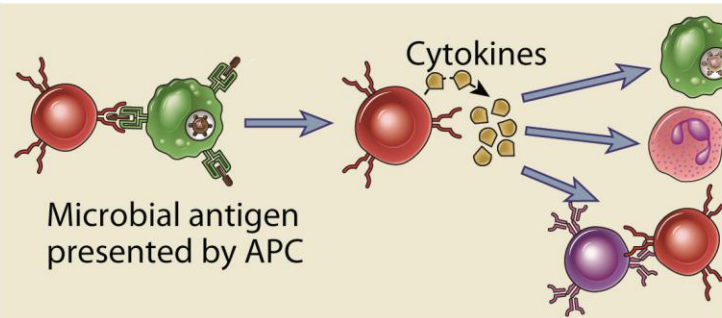
# Classes of Lymphocytes

**B lymphocyte**



Neutralization of microbe,  
phagocytosis,  
complement activation

**Helper T lymphocyte**

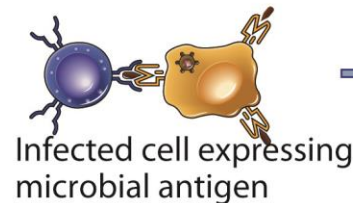


Activation of macrophages

Inflammation

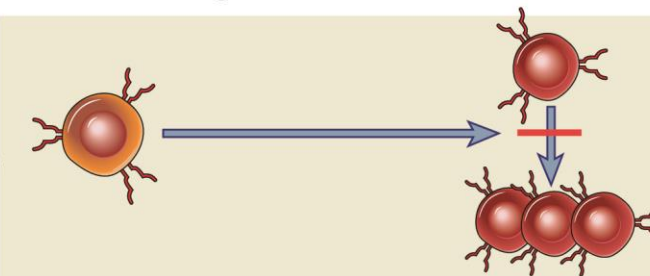
Activation of T and B lymphocytes

**Cytotoxic T lymphocyte (CTL)**



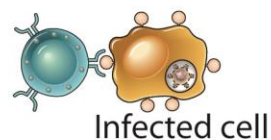
Killing of infected cell

**Regulatory T lymphocyte**



Suppression of other T cells

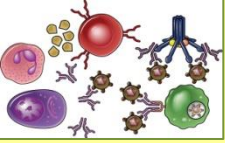
**Natural killer (NK) cell**



Killing of infected cell

Fig. 1-5





# Phases of Adaptive Immune Responses

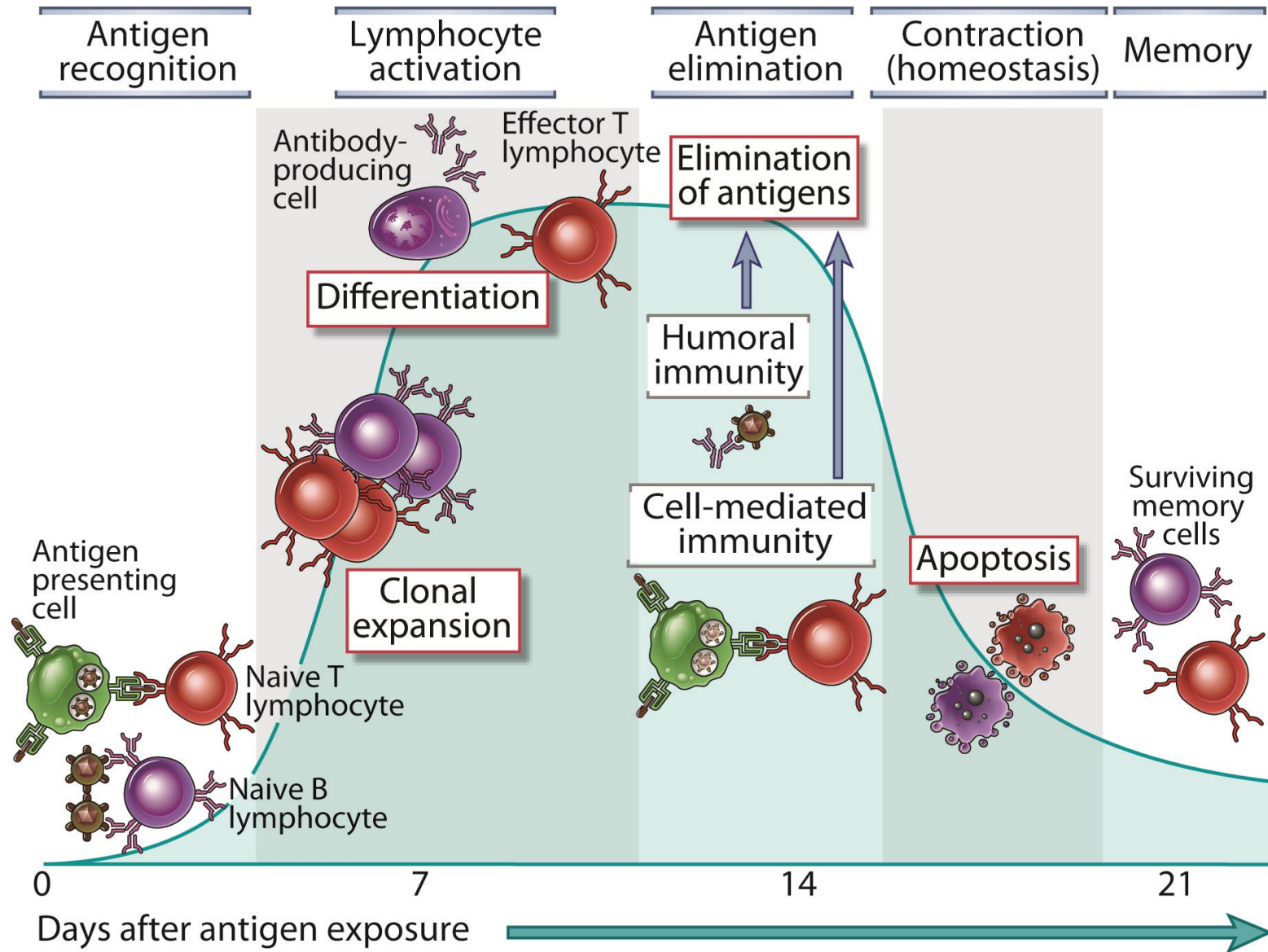
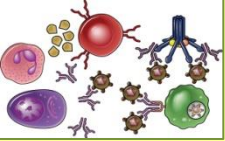


Fig. 1-6



# The Clonal Selection Hypothesis

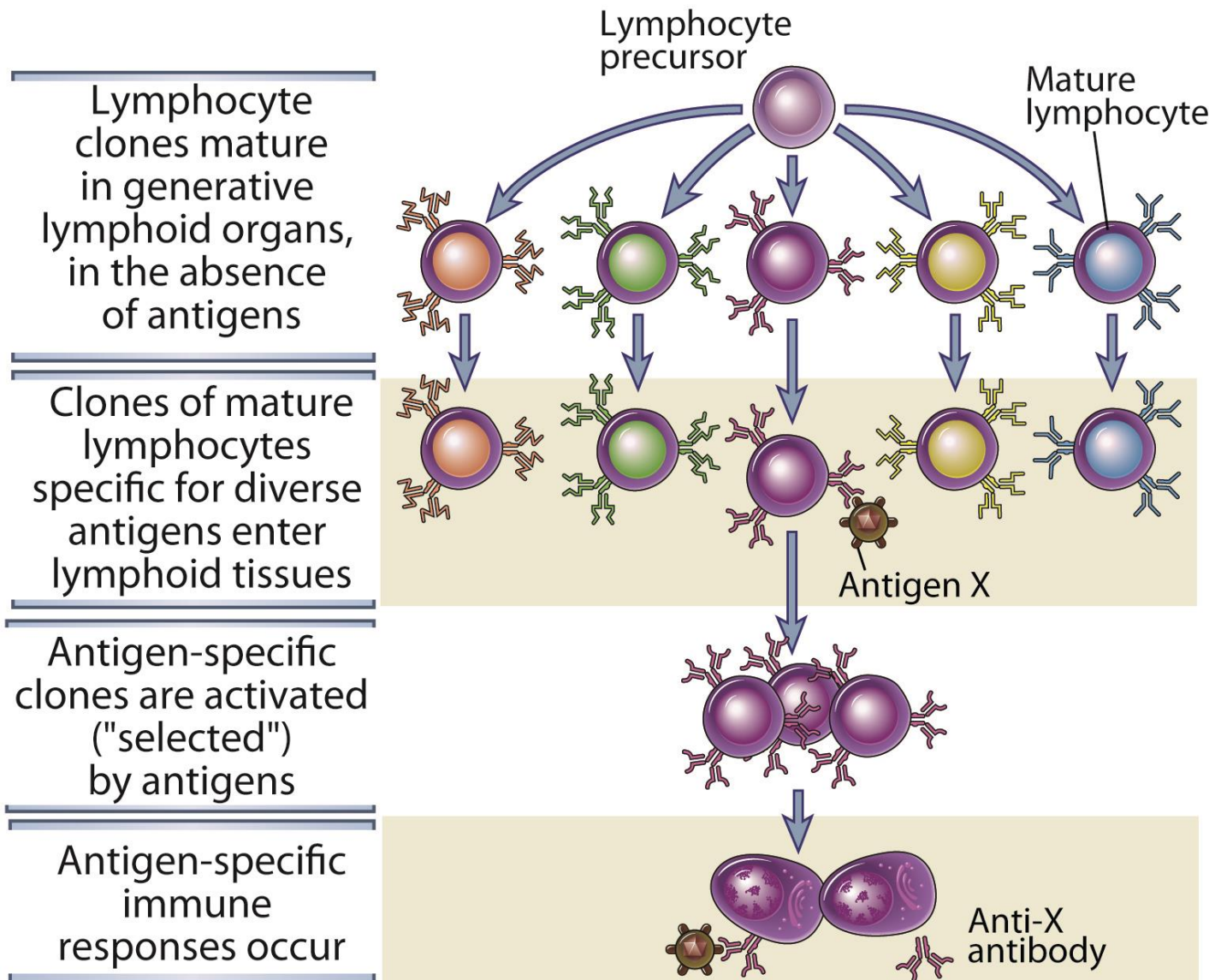
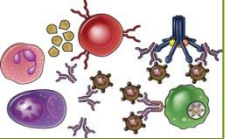


Fig. 1-6



## Question 1

A previously healthy 8-year-old boy is infected with an upper respiratory tract virus for the first time. During the first few hours of infection, which one of the following events occurs?

The adaptive immune system responds rapidly to the virus and keeps the viral infection under control.

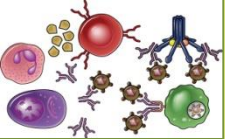
The innate immune system responds rapidly to the viral infection and keeps the viral infection under control.



Passive immunity mediated by maternal antibodies limits the spread of infection.

B and T lymphocytes recognize the virus and stimulate the innate immune response.

The virus causes malignant transformation of respiratory mucosal epithelial cells, and the malignant cells are recognized by the adaptive immune system.



## Question 2

A standard treatment of animal bite victims, when there is a possibility that the animal was infected with the rabies virus, is administration of human immunoglobulin preparations containing anti-rabies virus antibodies. Which type of immunity would be established by this treatment?

Active humoral immunity

Passive humoral immunity

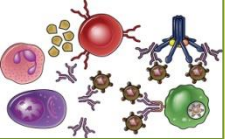
Active cell-mediated immunity

Passive cell-mediated immunity

Innate immunity



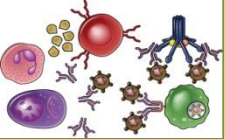




### Question 3

At 15 months of age, a child received a measles-mumps-rubella vaccine (MMR). At age 22, she is living with a family in Mexico that has not been vaccinated and she is exposed to measles. Despite the exposure, she does not become infected. Which of the following properties of the adaptive immune system is best illustrated by this scenario?

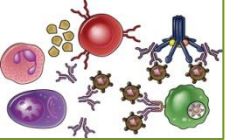
Specificity	
Diversity	
Specialization	
Memory	
Self tolerance	



#### Question 4

A vaccine administered in the autumn of one year may protect against the prevalent strain of influenza virus that originated in Hong Kong that same year, but it will not protect against another strain of influenza virus that originated in Russia. This phenomenon illustrates which property of the adaptive immune system?

Specificity	
Loss of memory	
Specialization	
Cultural diversity	
Self-tolerance	



### Question 5

Which of the following can be accurately called a cytokine?

A cell surface antigen receptor on lymphocyte

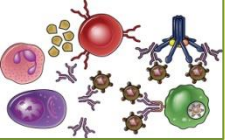
An antibody secreted by a B cell

A protein secreted by a T lymphocyte that activates a macrophage

A lipid secreted by a Natural Killer cell that activates a B cell

A nuclear protein that regulates lymphocyte gene expression





## Question 6

According to the clonal selection hypothesis, which of the following is correct?

Lymphocyte specificity is determined by exposure to an antigen

Clones of lymphocytes specific for antigens develop prior to exposure to the antigens



Antigen binding to a lymphocyte receptor selects that lymphocyte to die

Antigen binding to secreted antibody stimulates proliferation of the B cell that secreted the antibody

Each clone of lymphocytes express receptors for many different antigens