

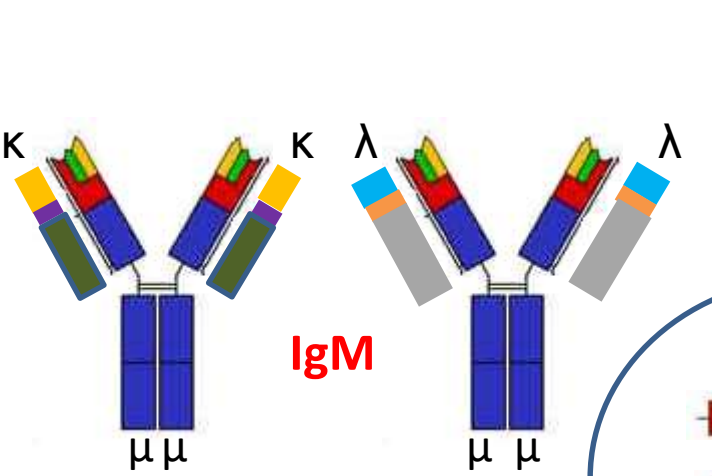
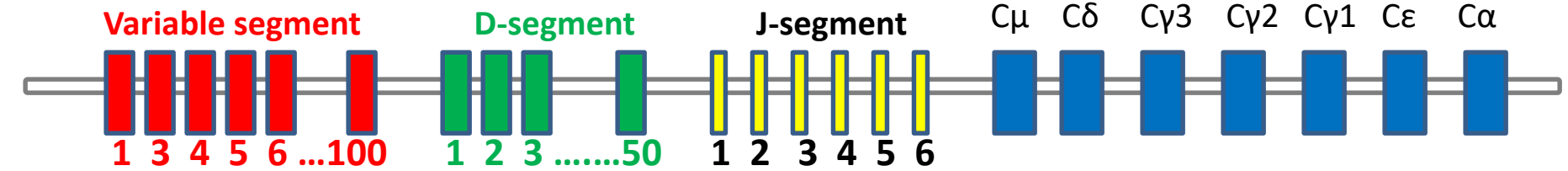


Immunology
Adaptive Immunity and Complement System
Lecture 6
2024-2025

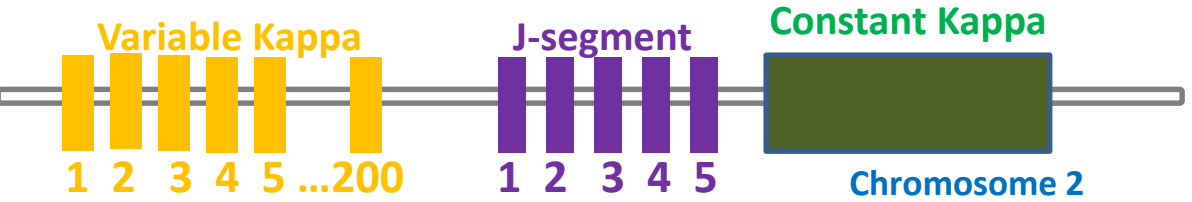
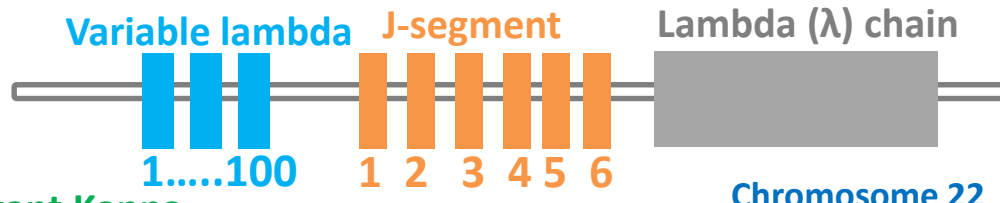
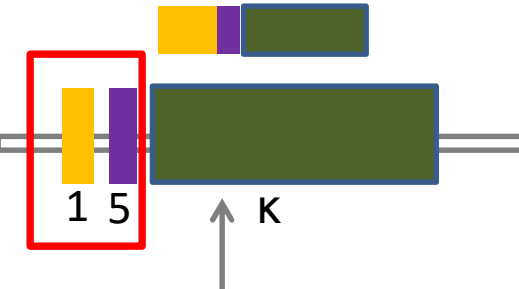
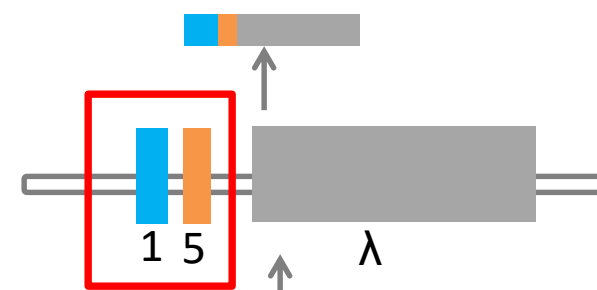
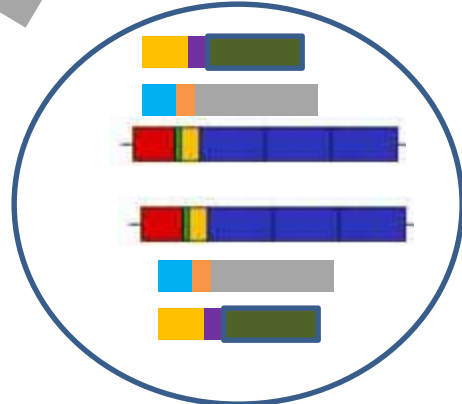
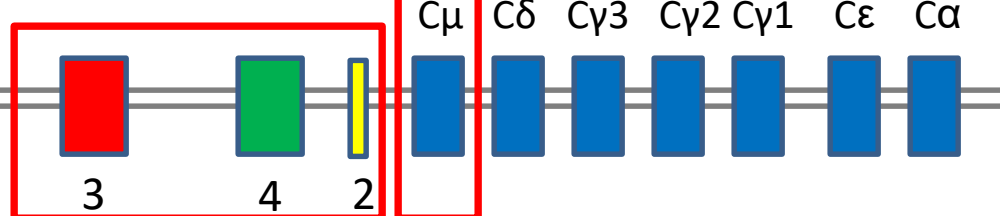
Dr. Mohammad Odaibat
Department of Microbiology and Pathology
Faculty of Medicine, Mutah University

Why do we have millions of different versions of Fab?

Chromosome 14



Recombinases



Chromosome 22
Light chains

Objectives

You should know the followings:

The **definition** of complement system

The **different pathways** associated with complement activation

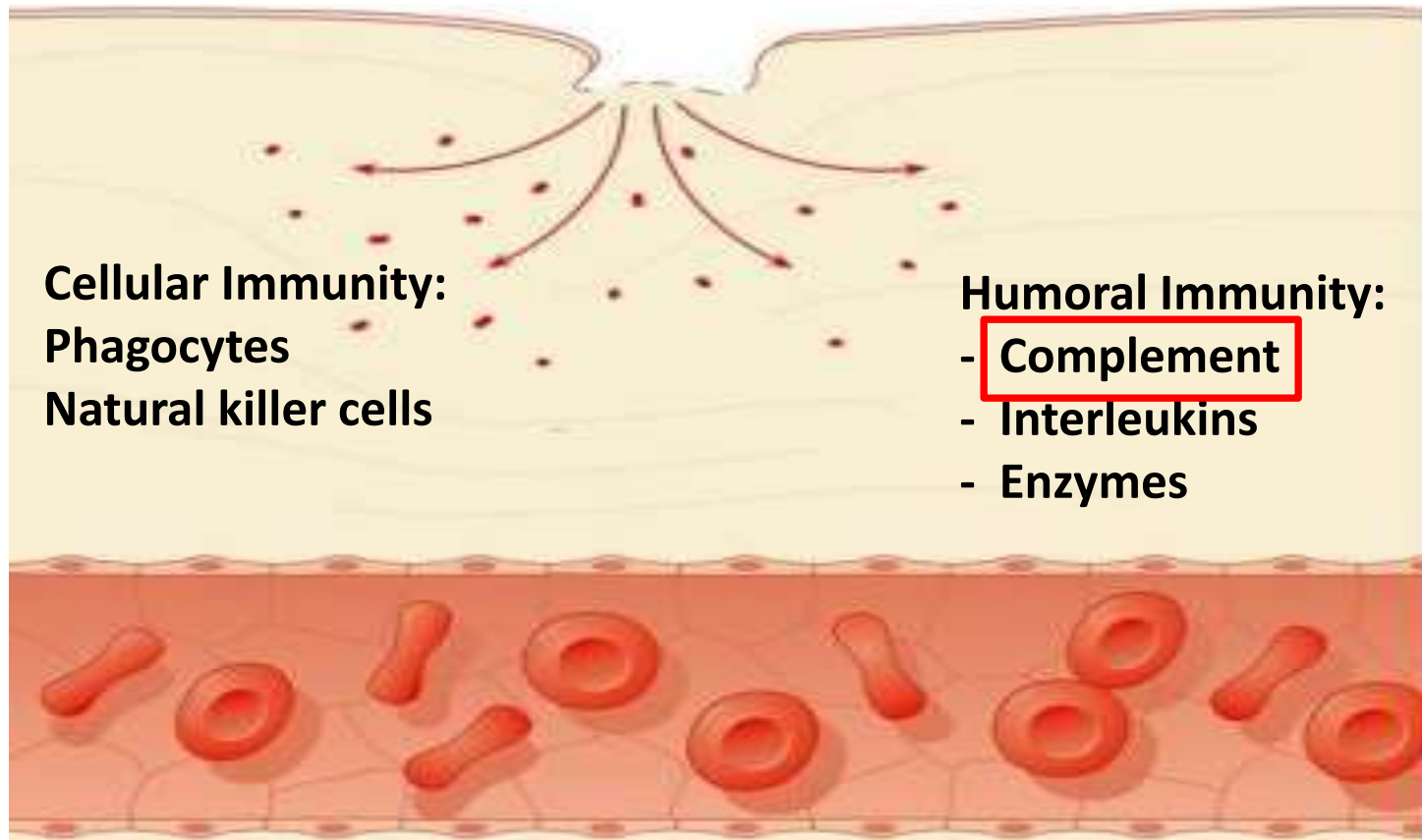
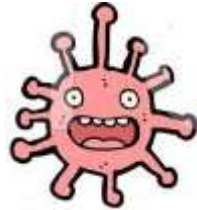
Why dose complement system is activated?

How dose complement system activate inflammatory response, lyses of foreign cells, and phagocytosis?

The **disorders** associated complement system

Innate immunity

Second line defense of the innate immune system



Cellular Immunity:
Phagocytes
Natural killer cells

Humoral Immunity:
- **Complement**
- Interleukins
- Enzymes

Innate immunity

Third line defense
Adaptive Immunity

Second line defense

First line defense

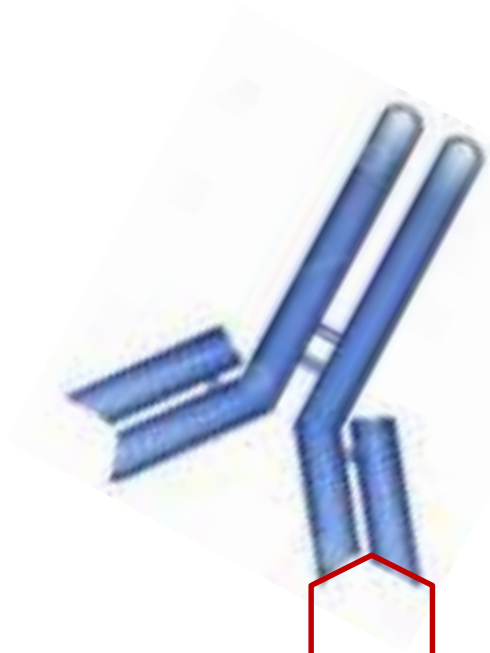
Target



3- Classical complement pathway

1- Alternative complement pathway

2- Mannan binding lectin



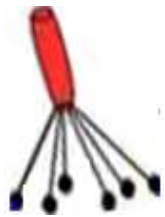
**Complement
Proteins**



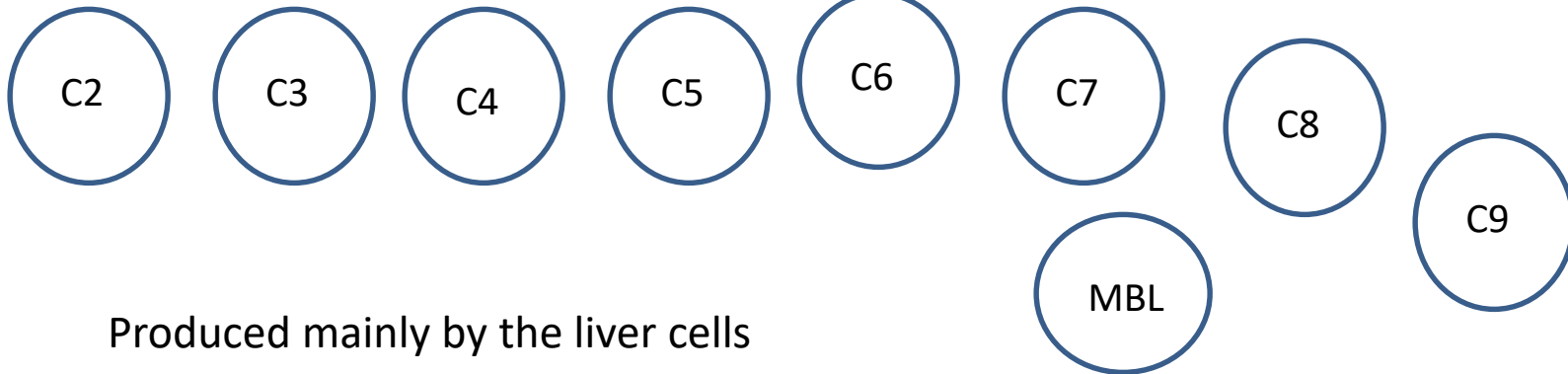
Bacterium

The definition of complement system?

A set of over 20 different protein molecules always found in the blood



C1



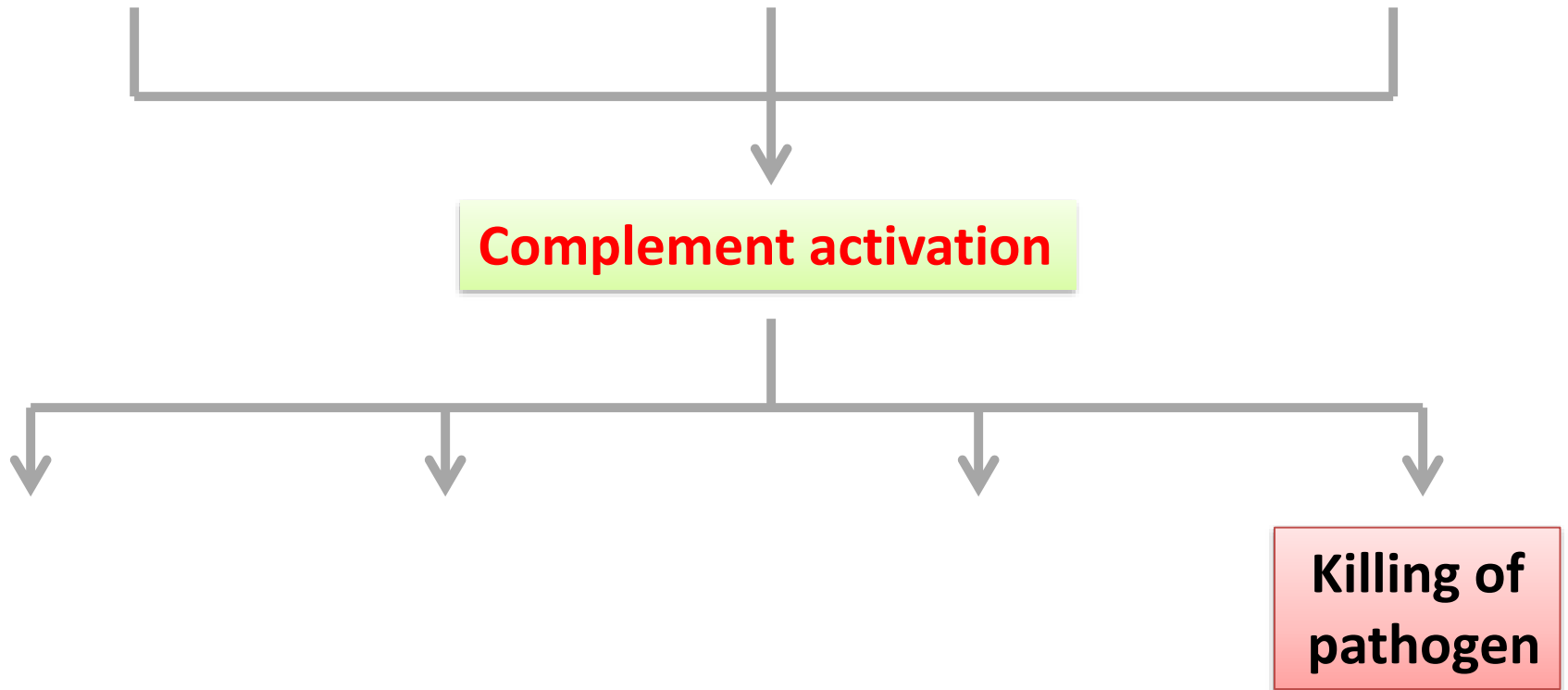
Produced mainly by the liver cells

Present in the blood as inactive enzymes called proenzymes

There are no cells in the system

Complement pathways activation

Classical Pathway



Complement pathways activation

2

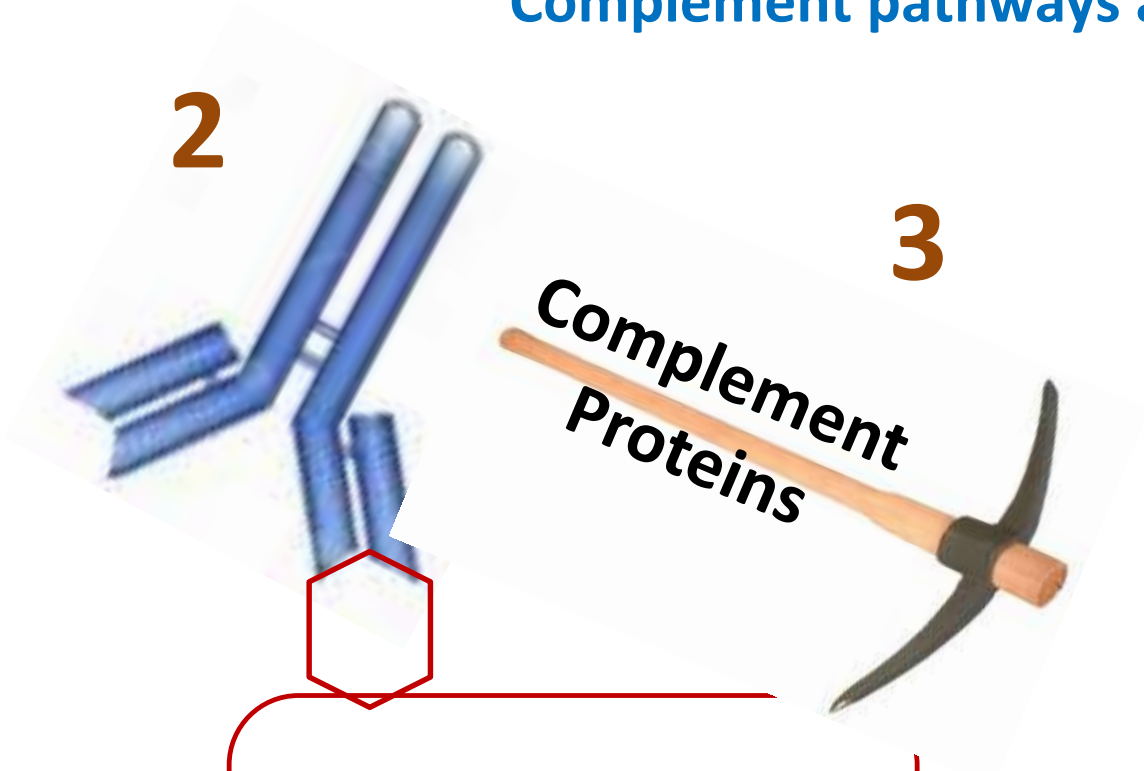
3

Complement
Proteins

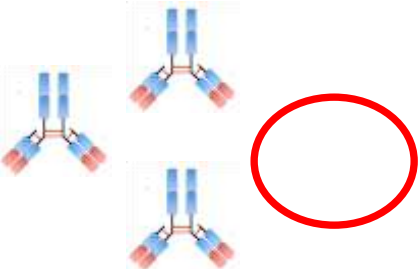
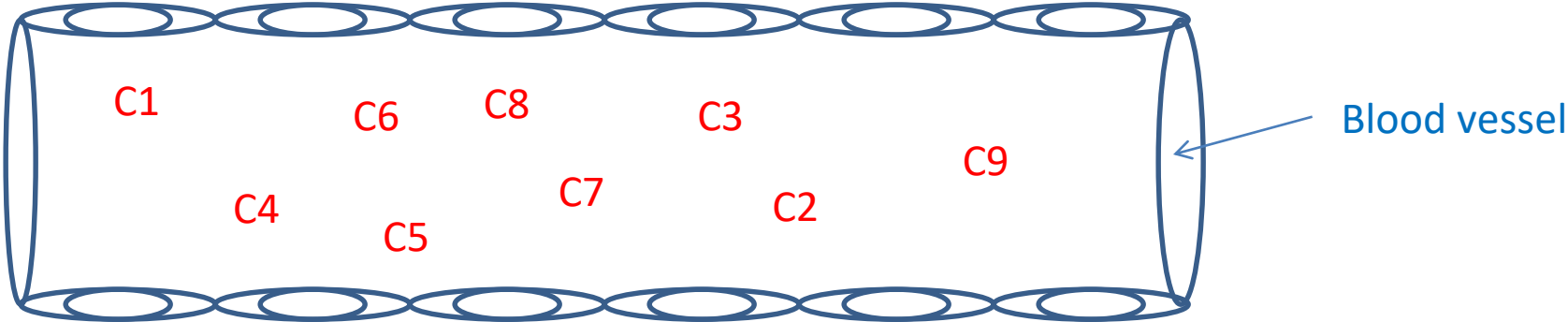
1

Bacterium

= Classical Complement Pathway

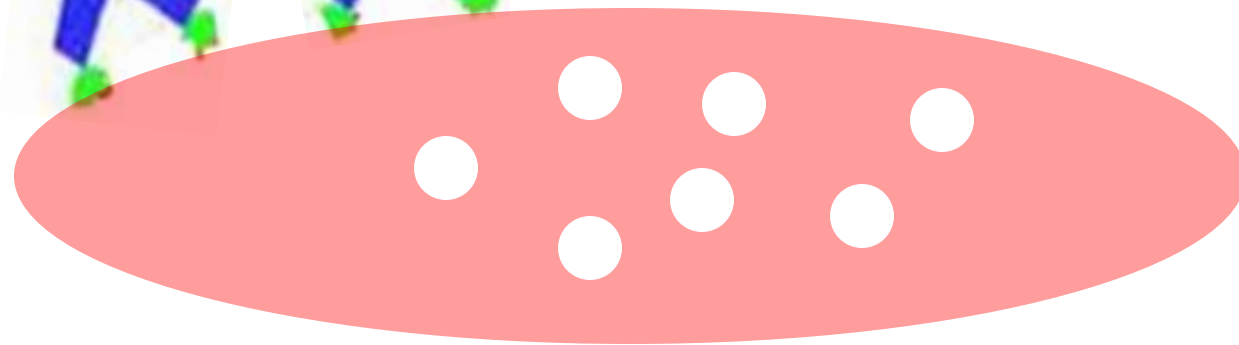
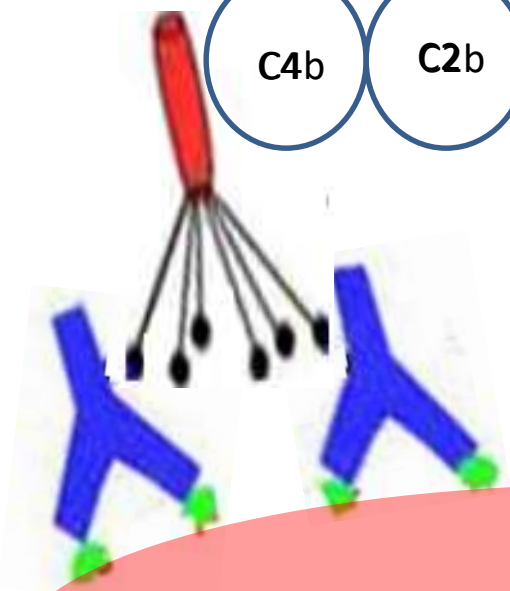
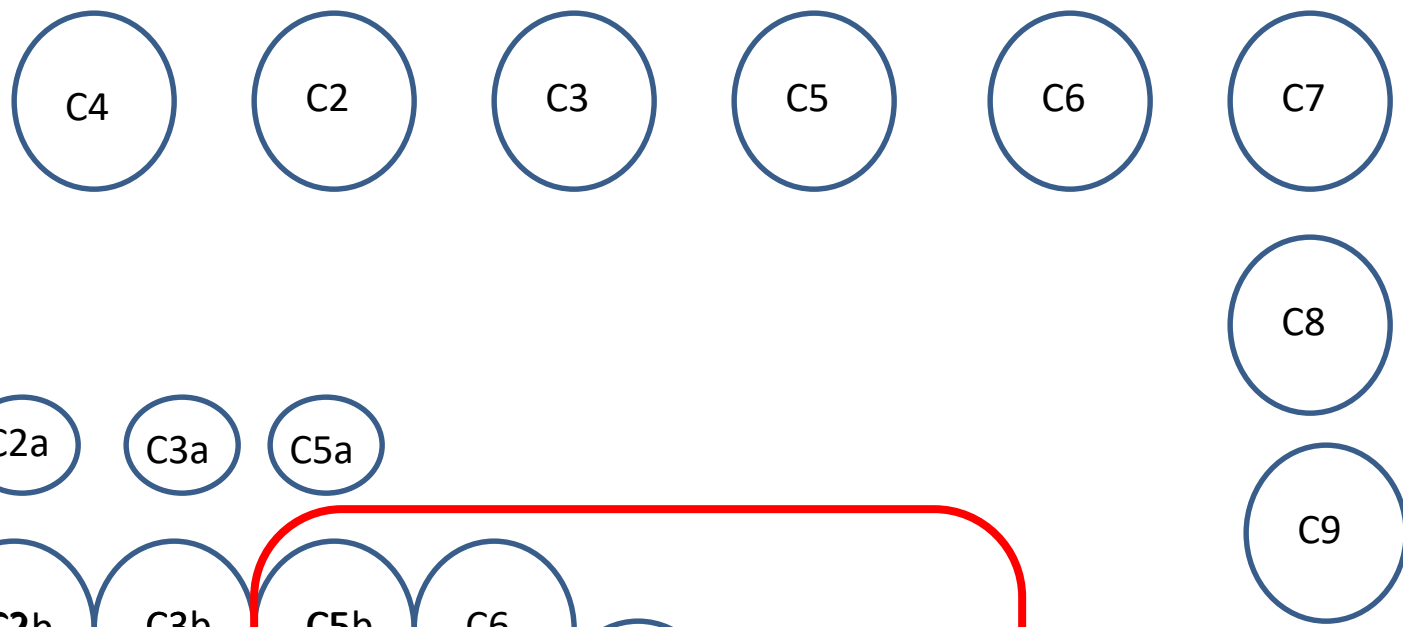
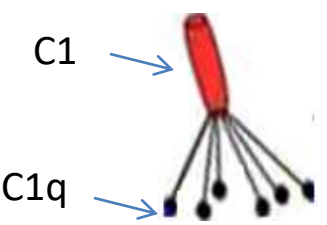


Classical Complement Pathway



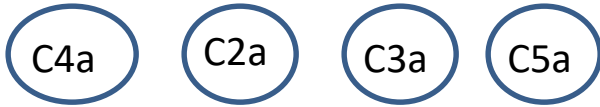
Infection





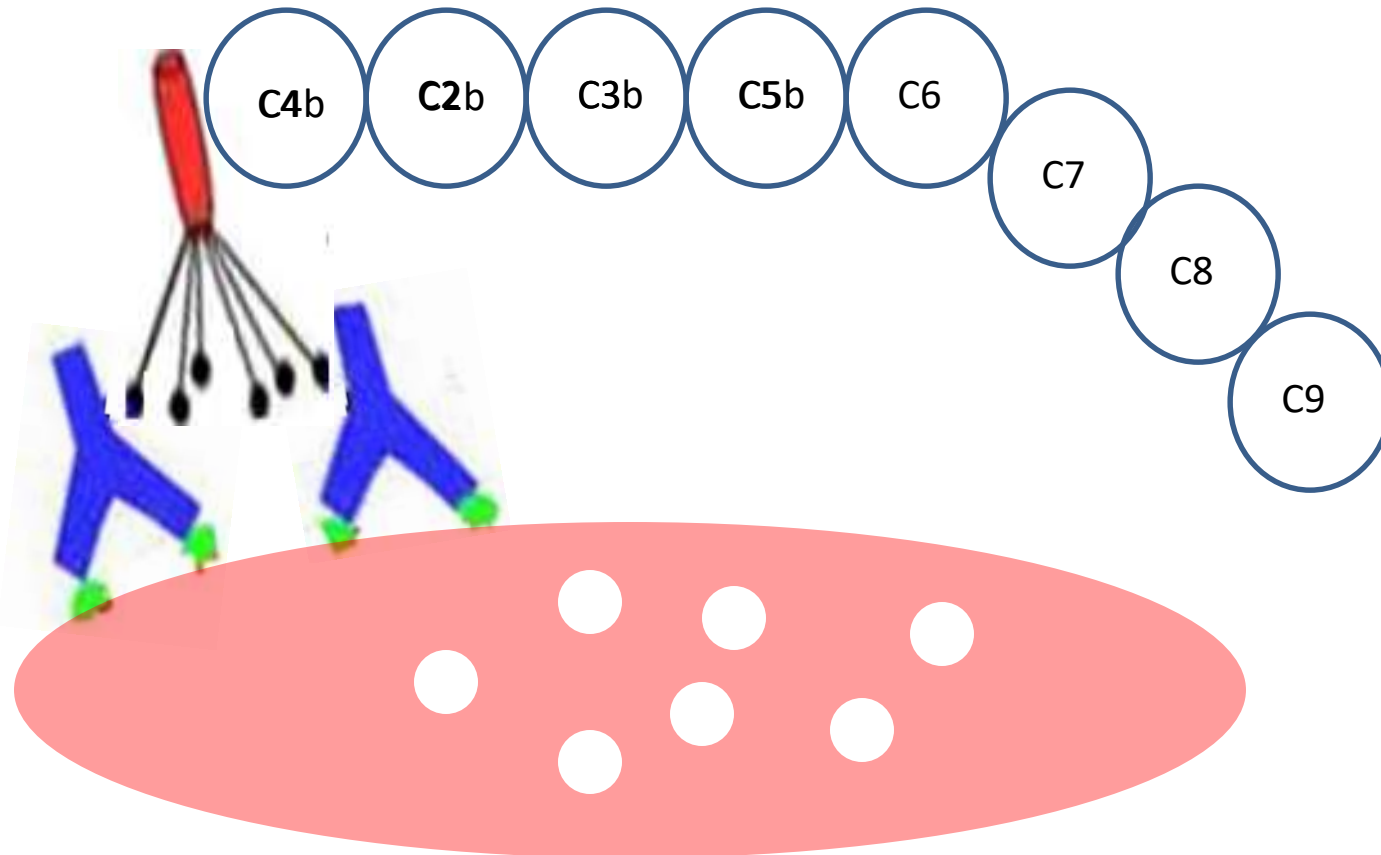
Membrane Attack Complex (MAC)

Classical Complement Pathway



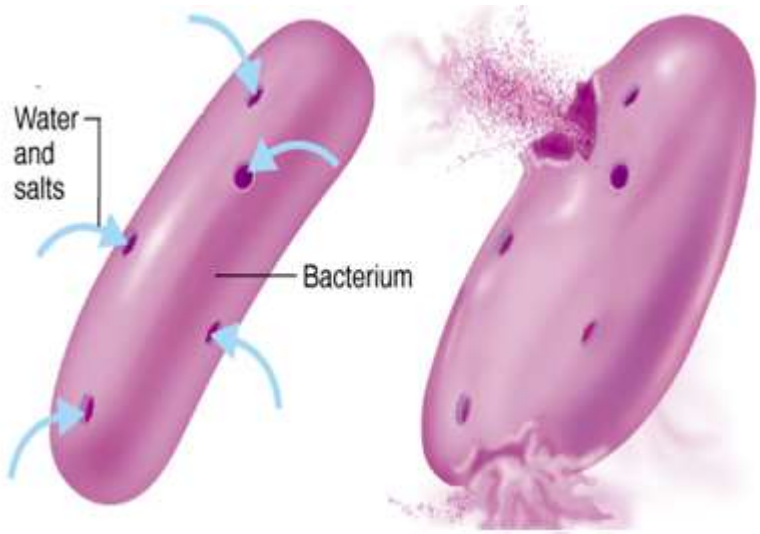
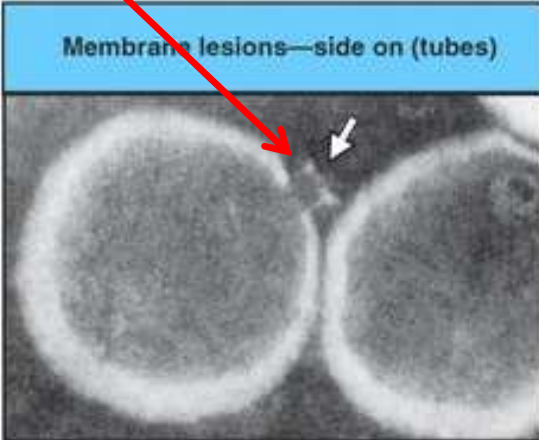
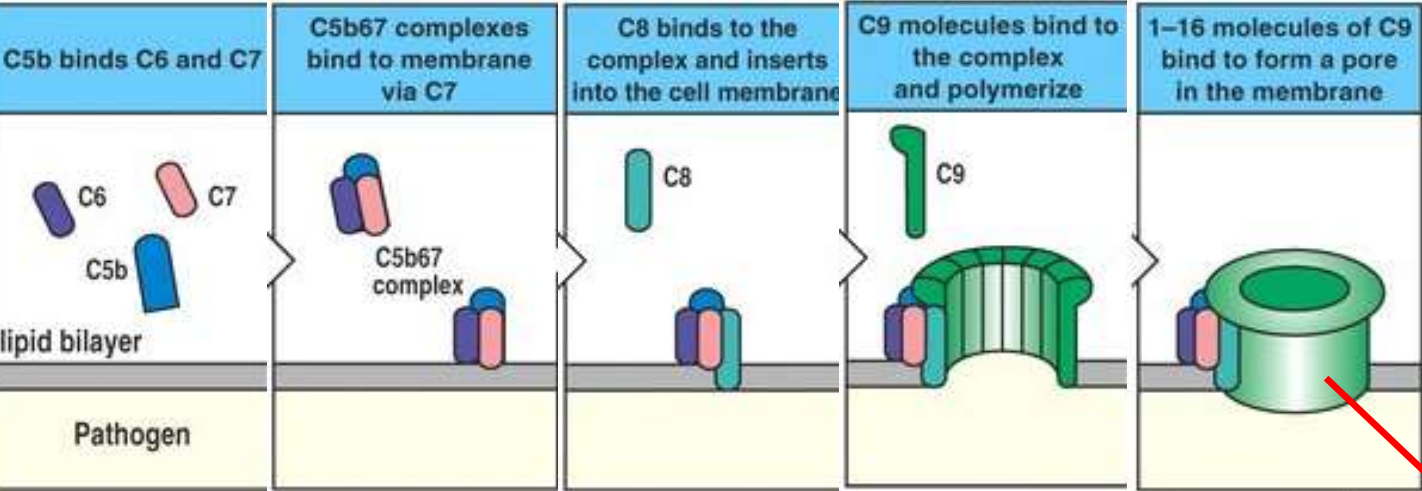
C5 convertase

C3 convertase

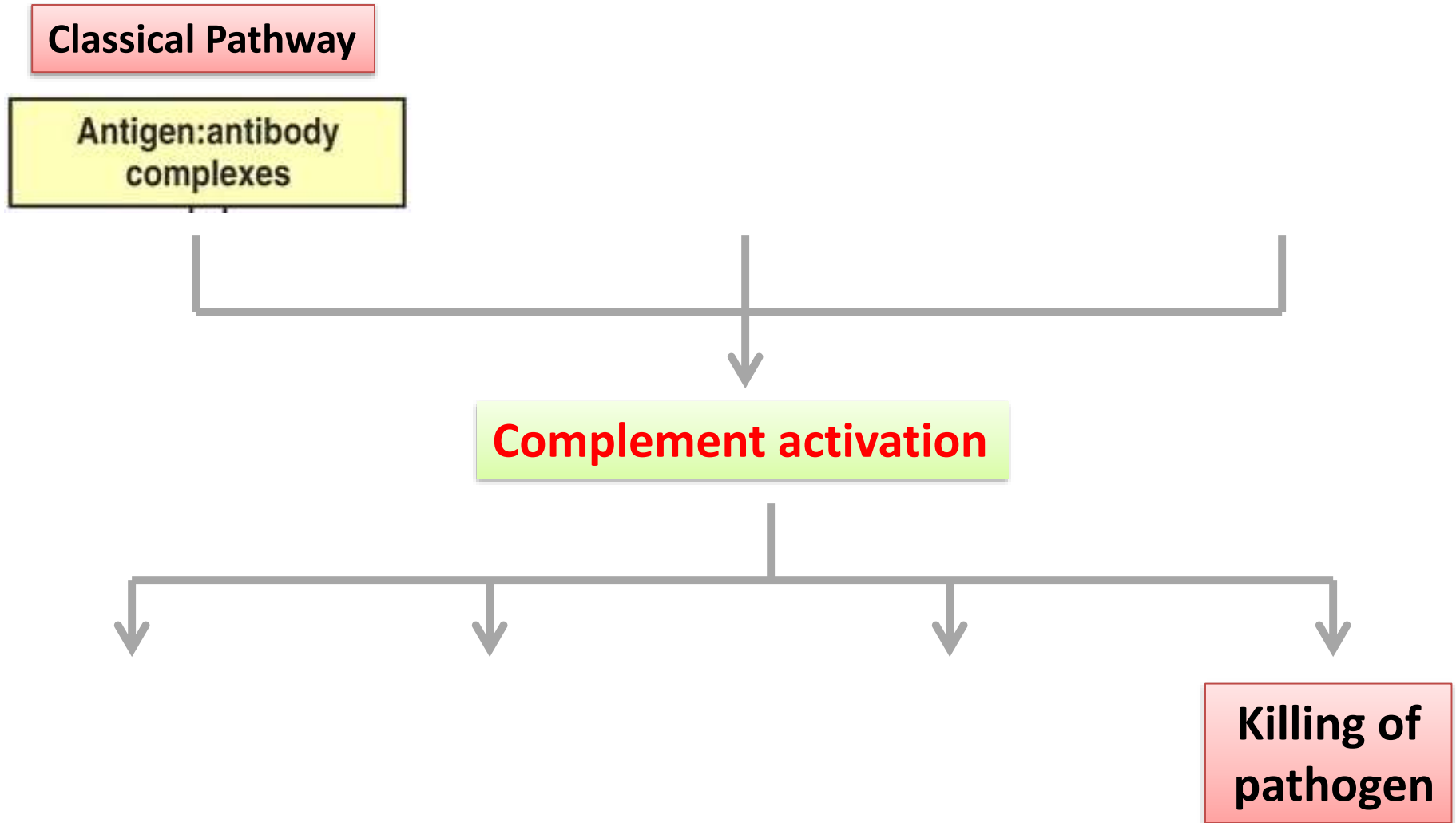


**Classical
Complement
Pathway**

Classical Complement Pathway



Complement pathways activation



Complement pathways activation

Infection



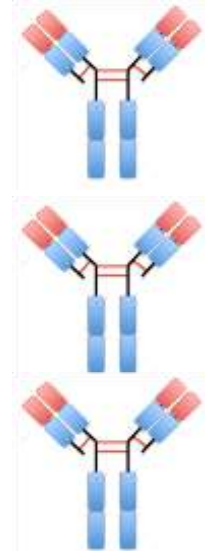
5-7 days



?

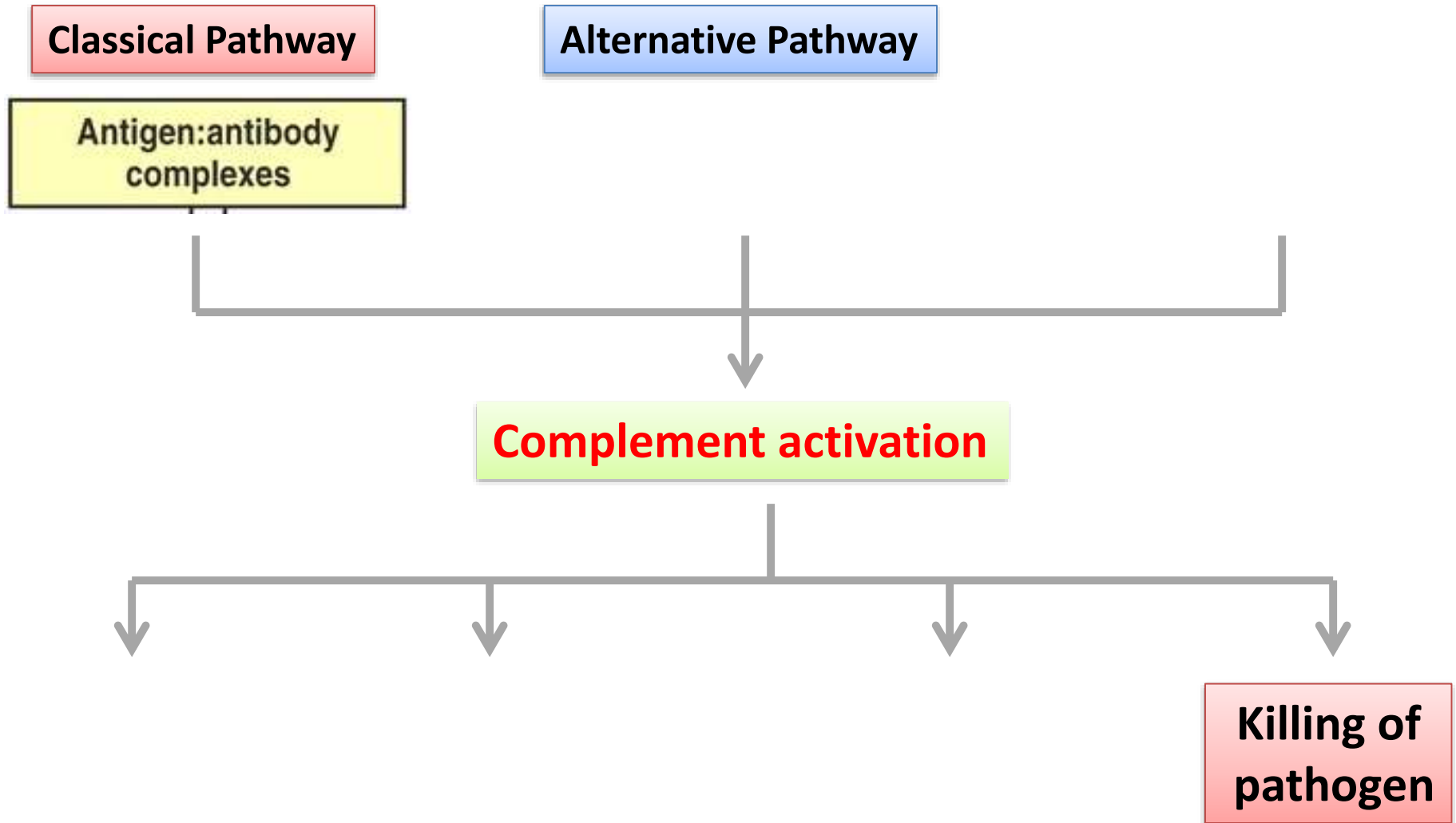
Alternative Pathways

Mannan Binding Lectin Pathway

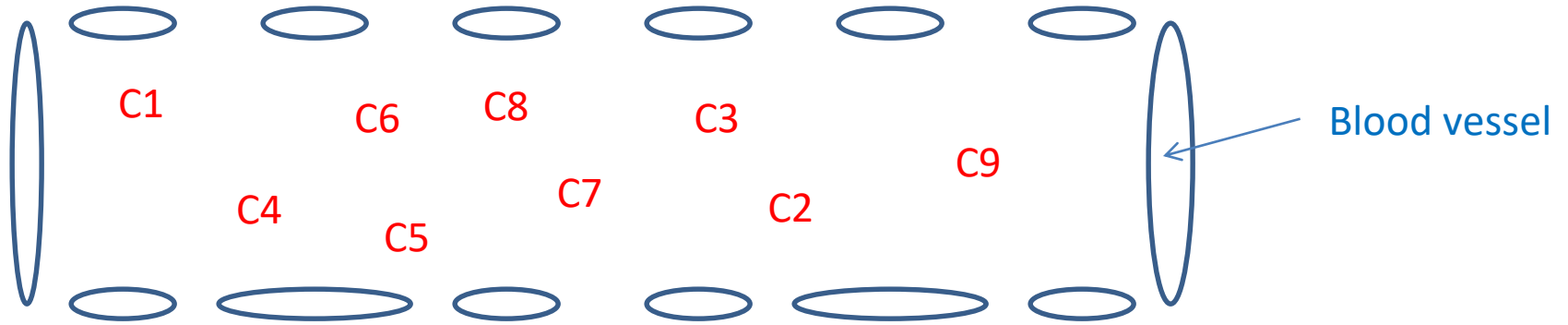


Classical pathway

Complement pathways activation



Alternative Complement Pathway



C1

C6

C8

C3

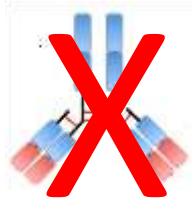
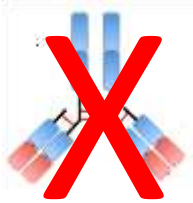
C9

C4

C5

C7

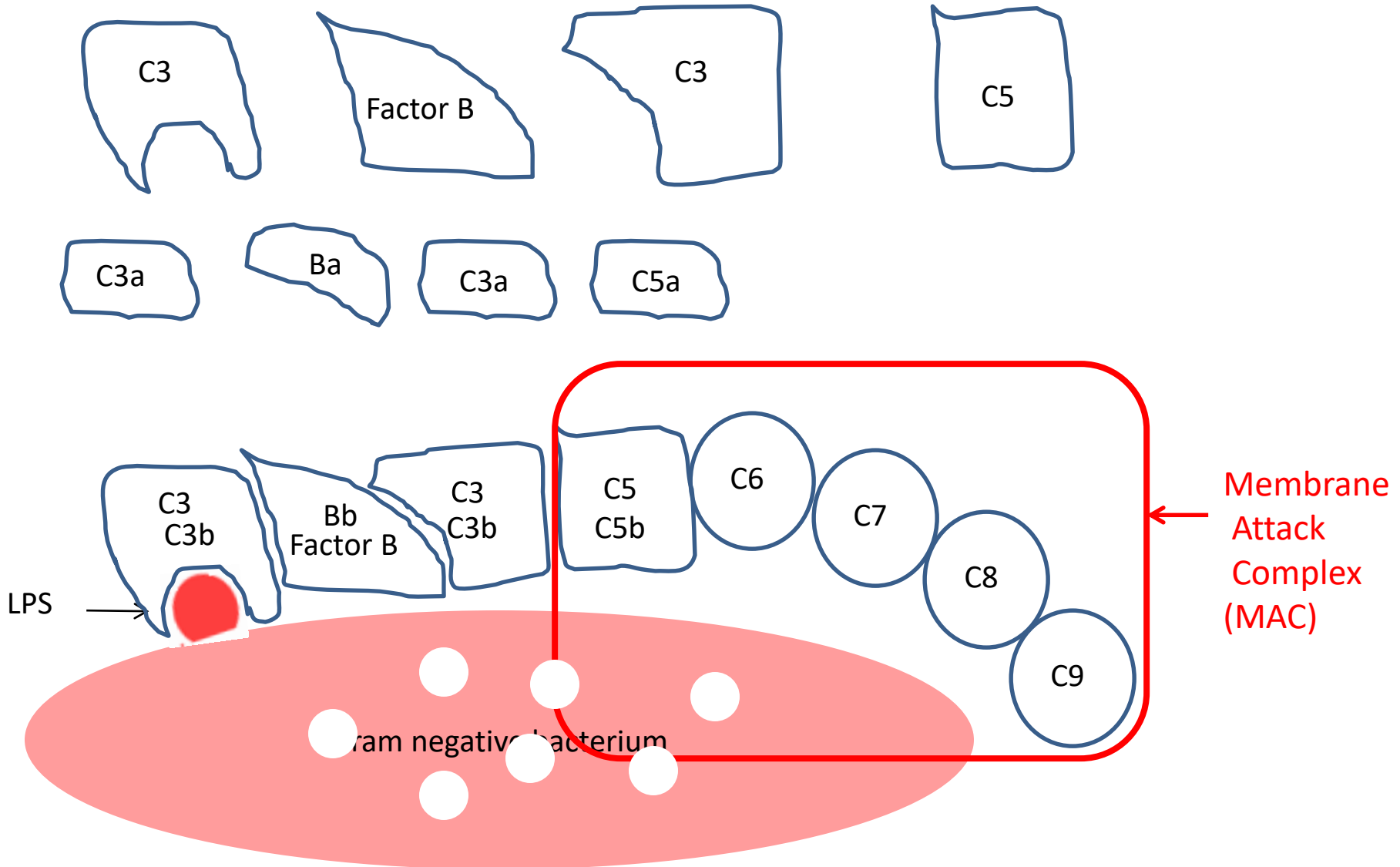
C2



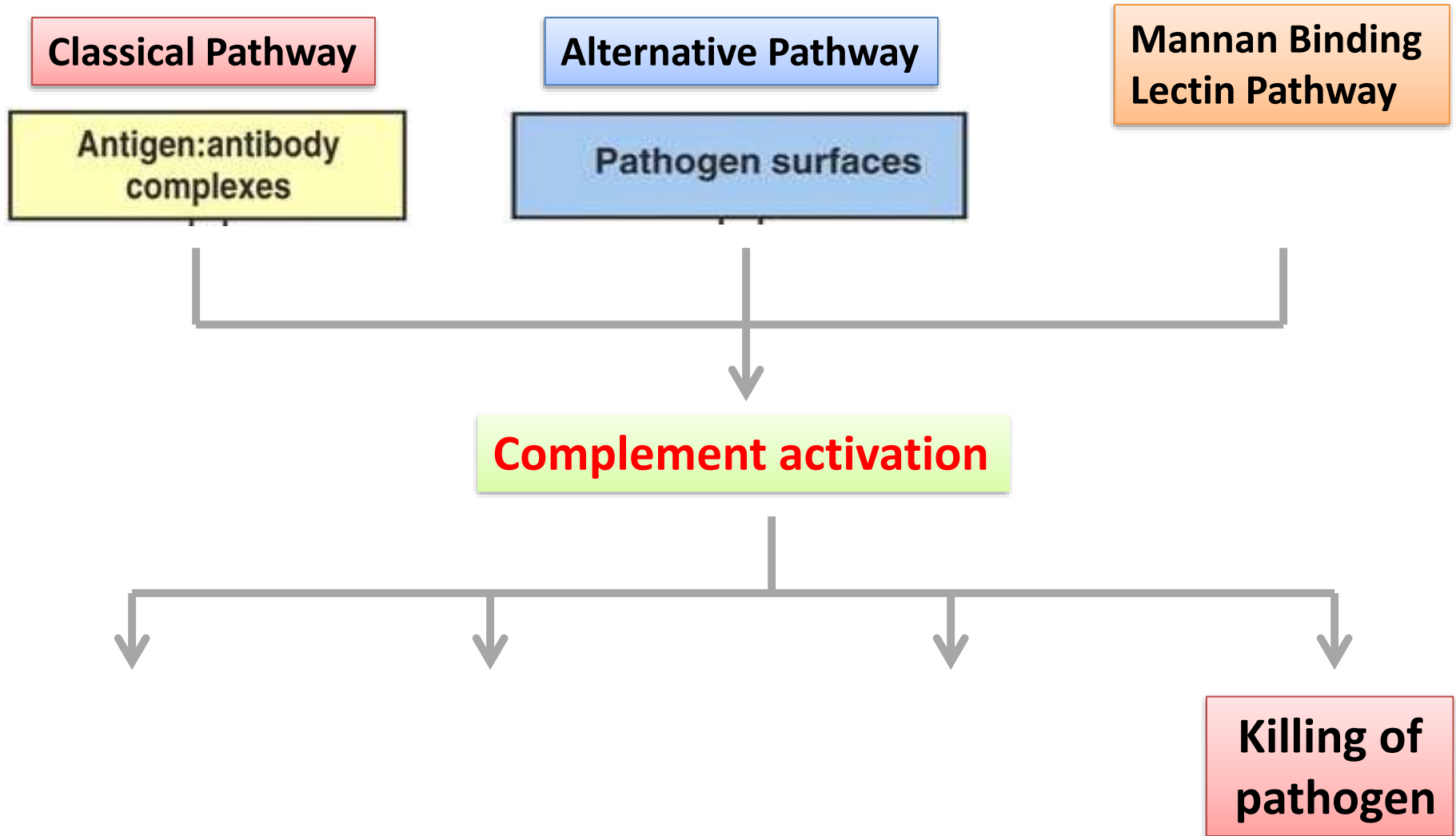
Inflammation



Alternative Complement Pathway



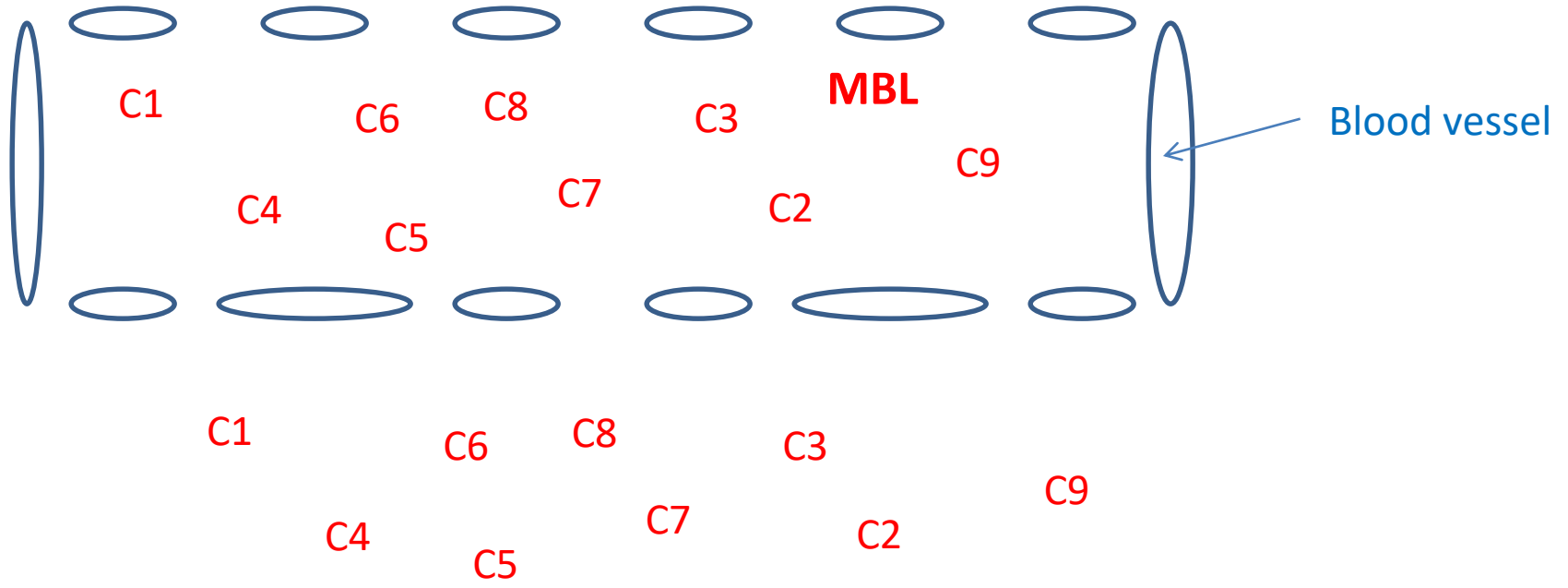
Complement pathways activation



Mannan Binding Lectin Pathway



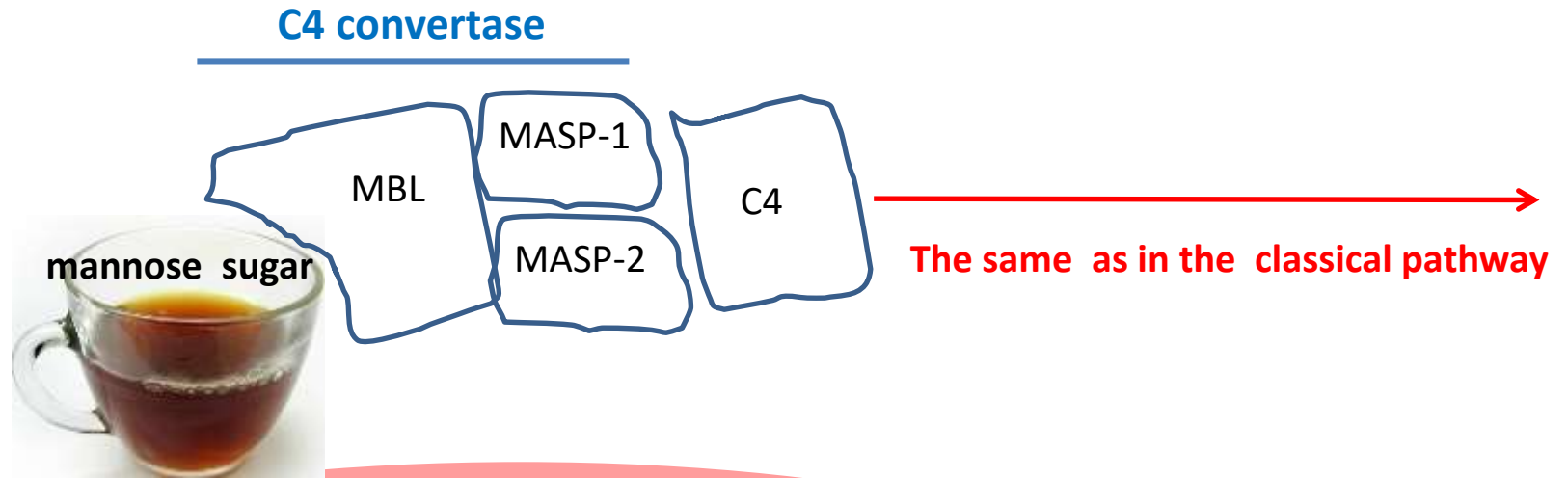
Mannan Binding Lectin Pathway



Inflammation



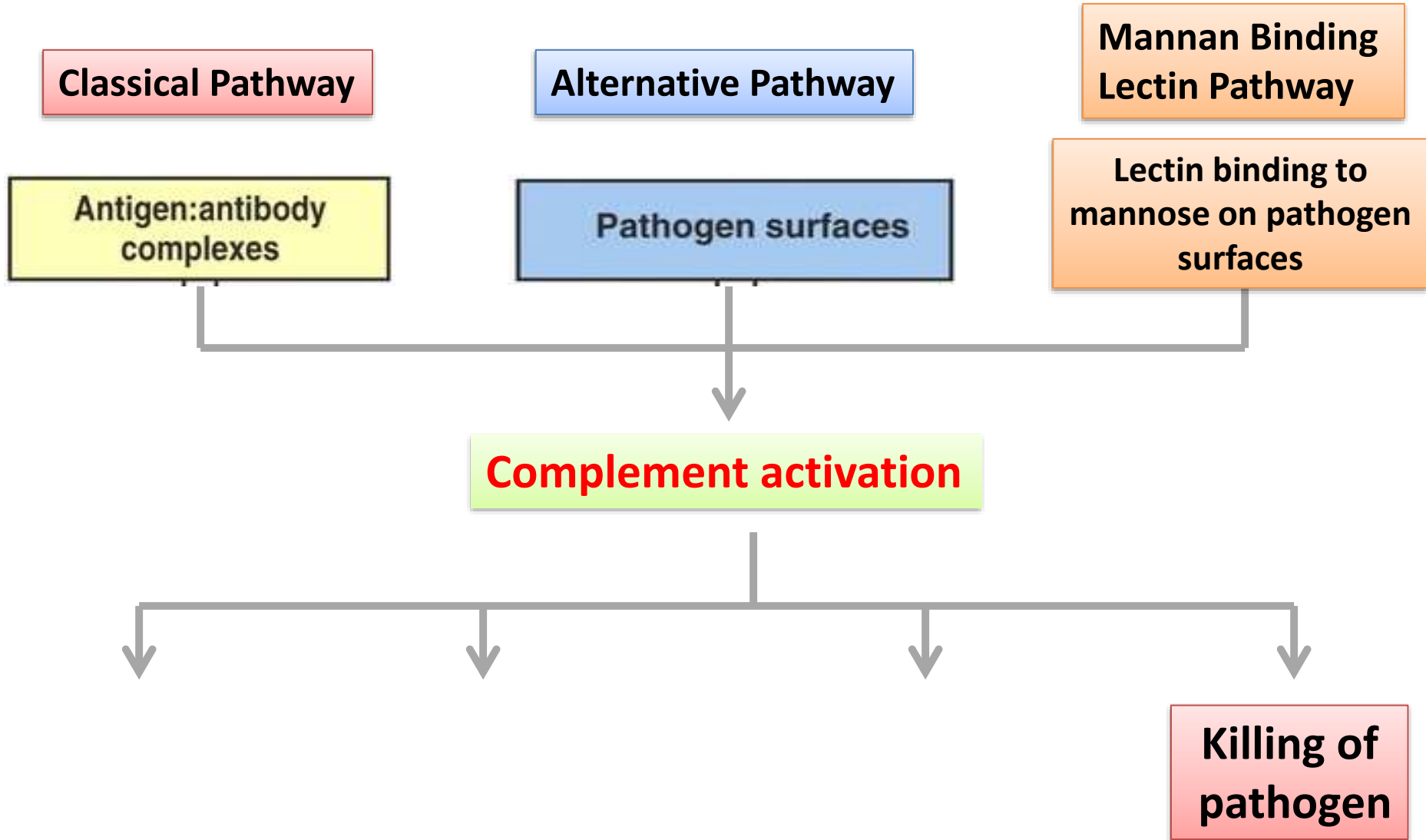
Mannan Binding Lectin Pathway



mannose residues on the surface of a large number of pathogens including bacteria, viruses, protozoa and fungi.

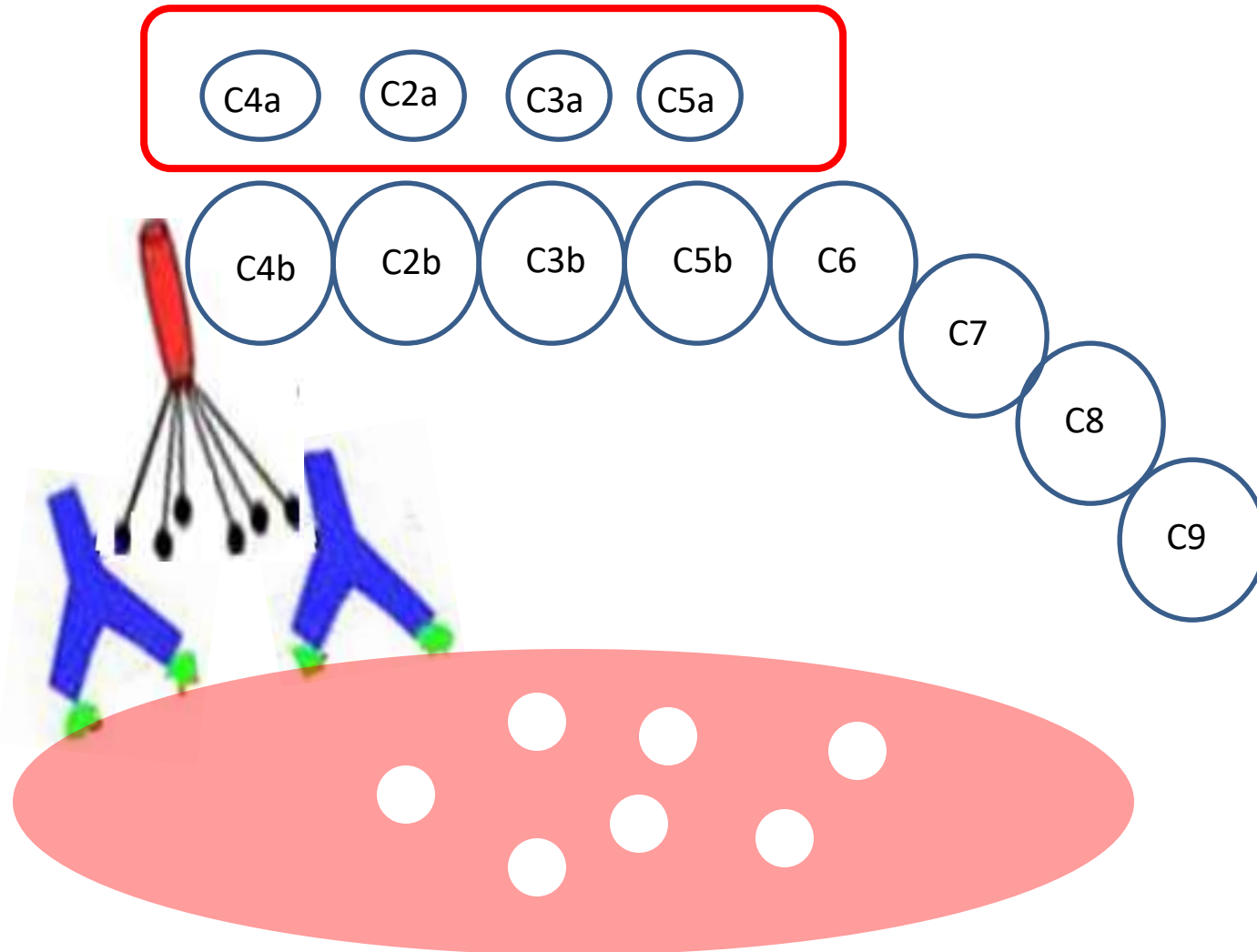
MASP: Mannan-binding lectin-associated serine protease

Complement pathways activation

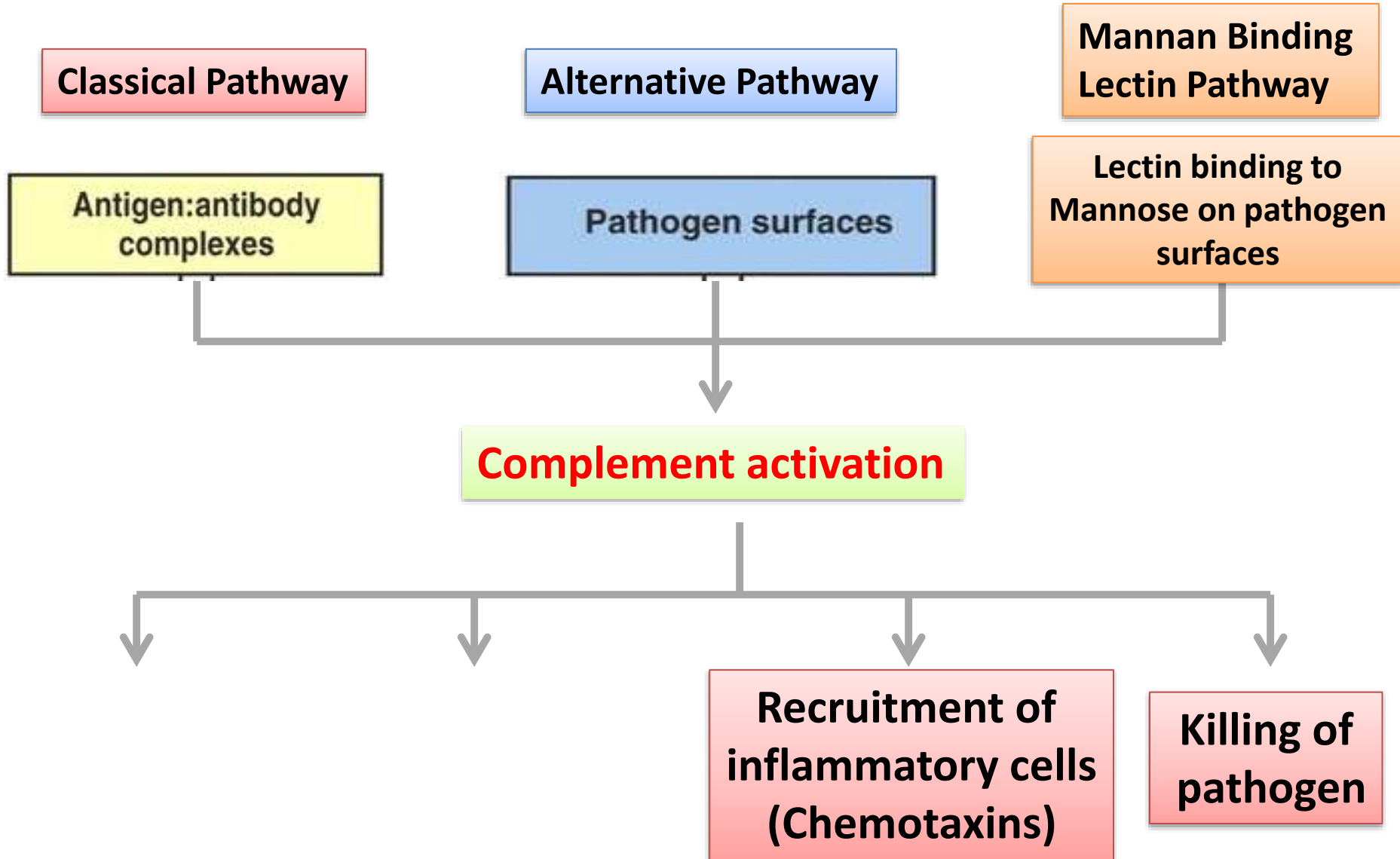


Biological activities of complement components

Biological activities of complement components



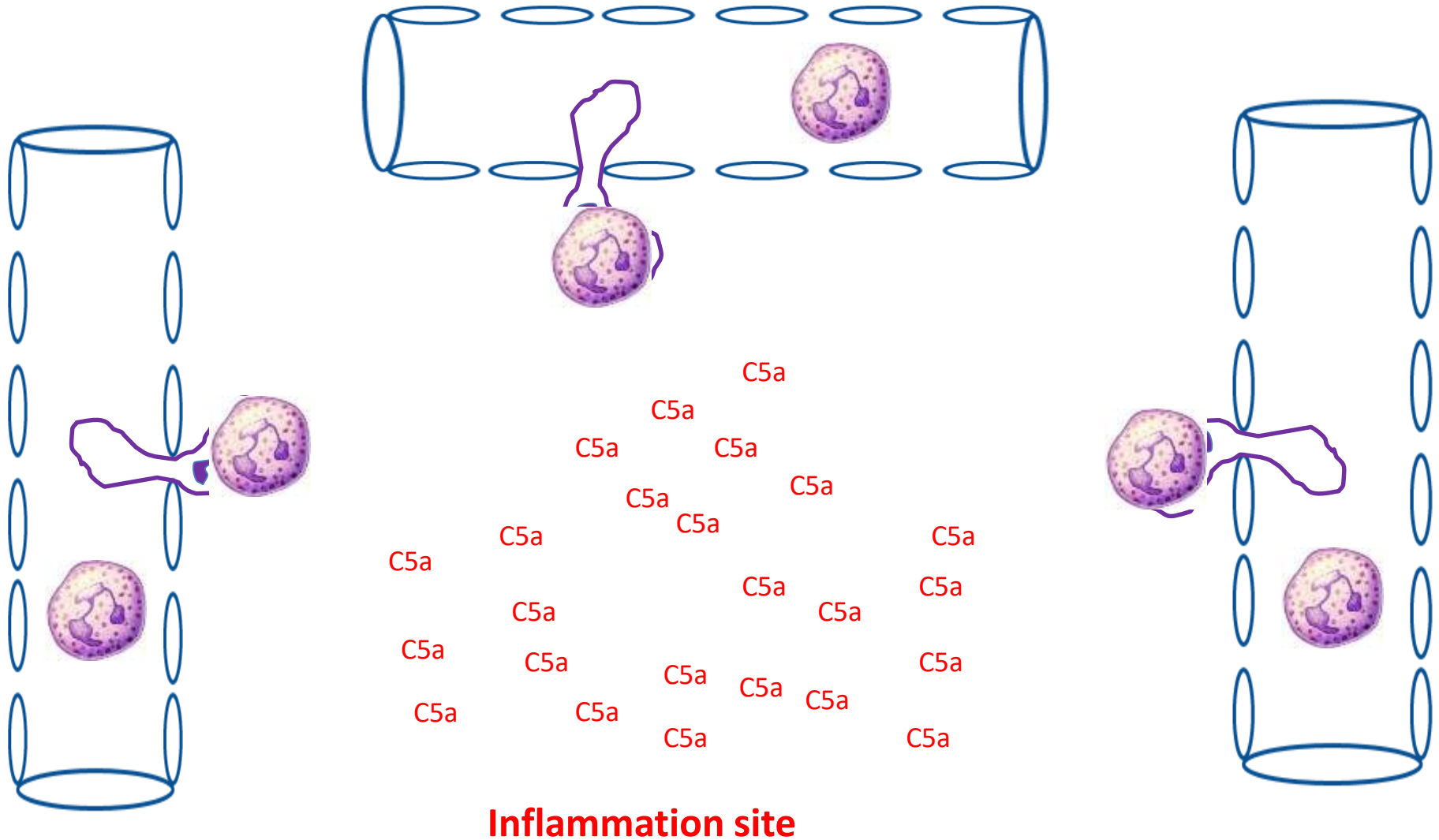
Complement pathways activation



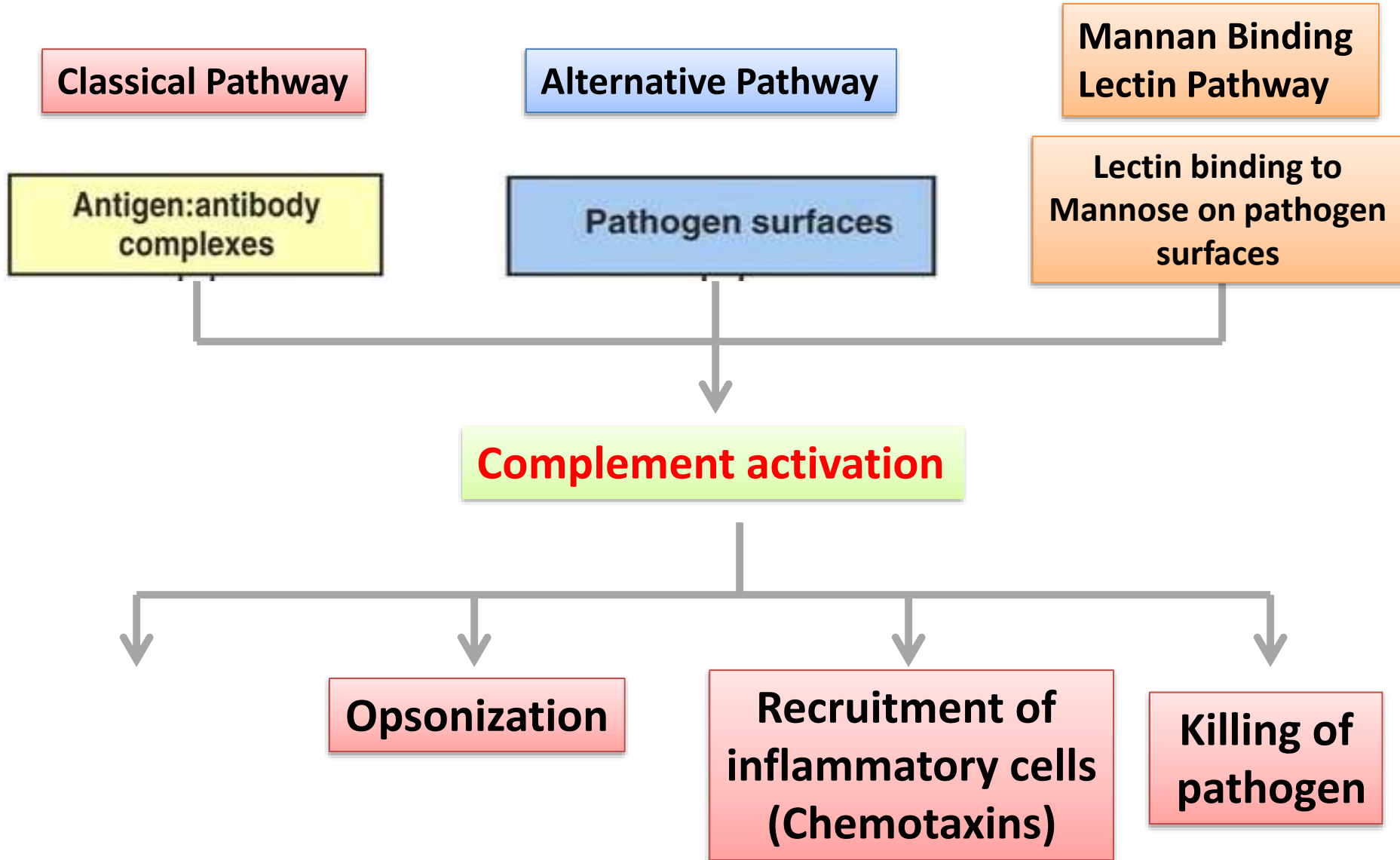
Biological activities of complement components

Recruitment of Inflammatory cells \longrightarrow Chemotaxis

C3a, C5a



Complement pathways activation

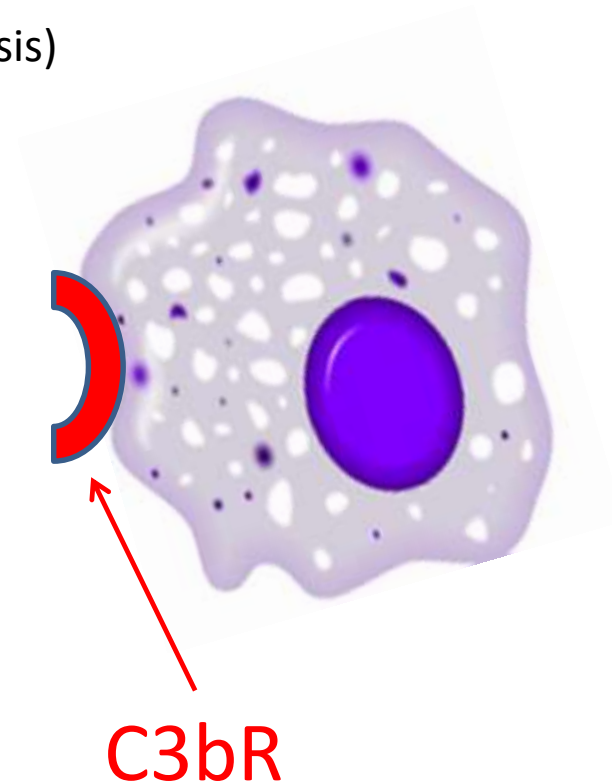
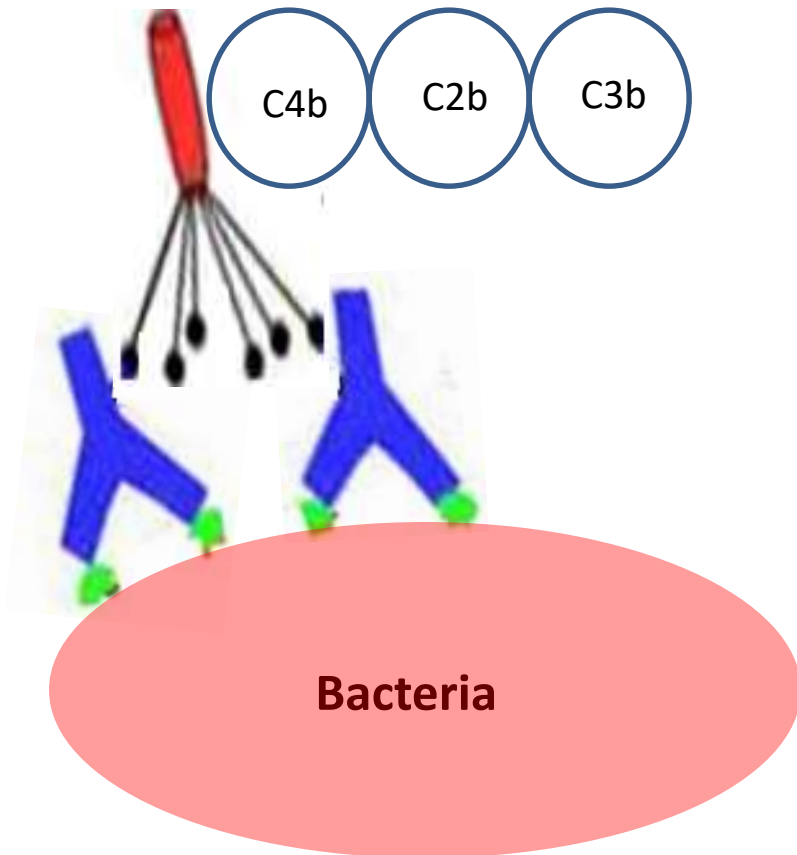


Biological activities of complement components

Opsonization

Opsonin: to prepare for eating (facilitate phagocytosis)

C3b



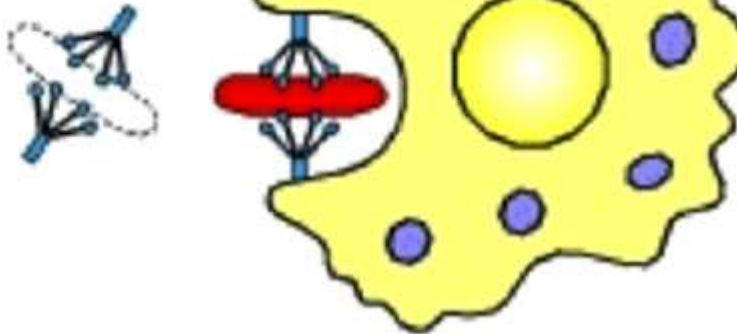
C3b act as opsonin which makes phagocytosis easier and faster

Biological activities of complement components

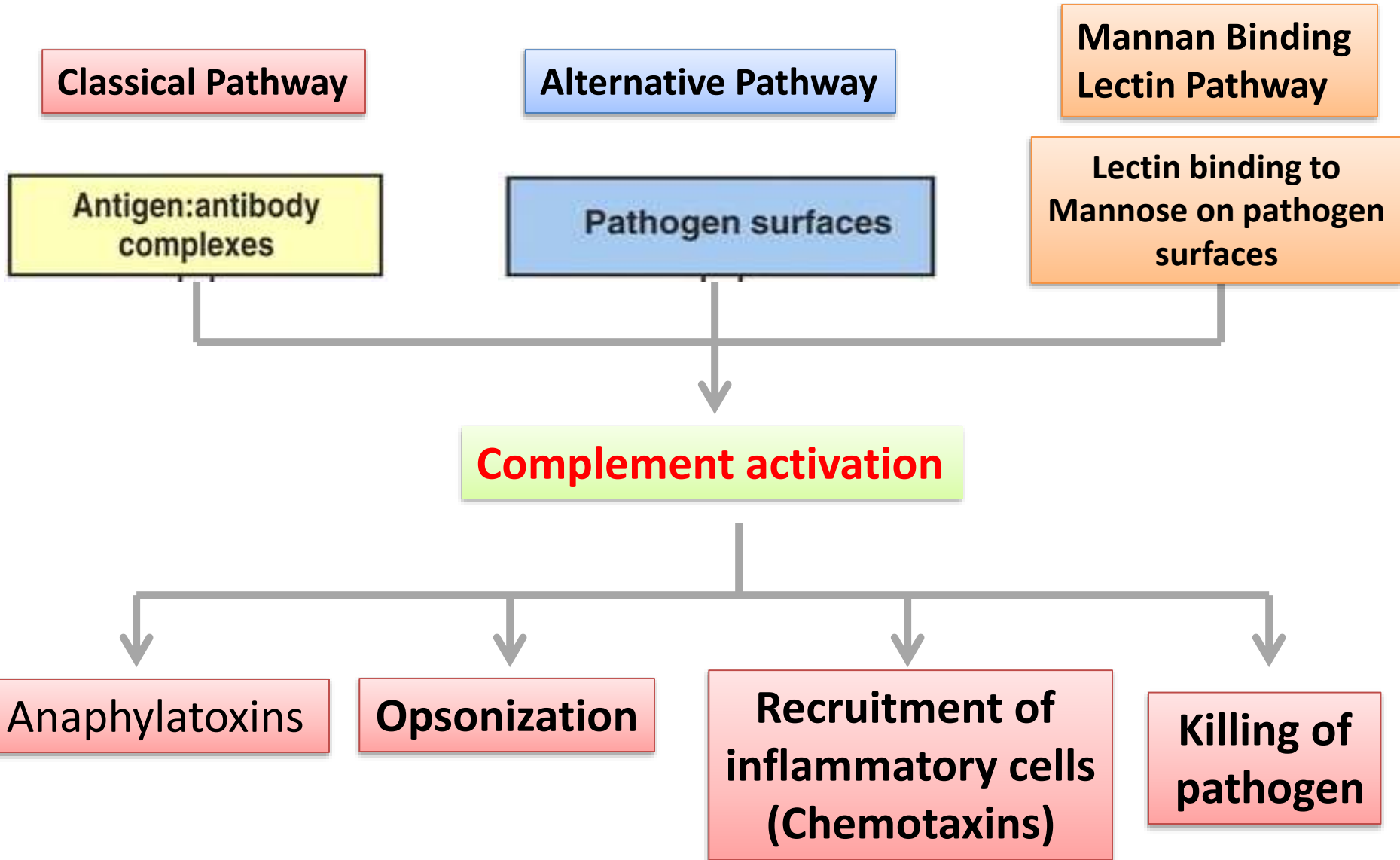
Opsonization

MBL

MBL act as opsonin



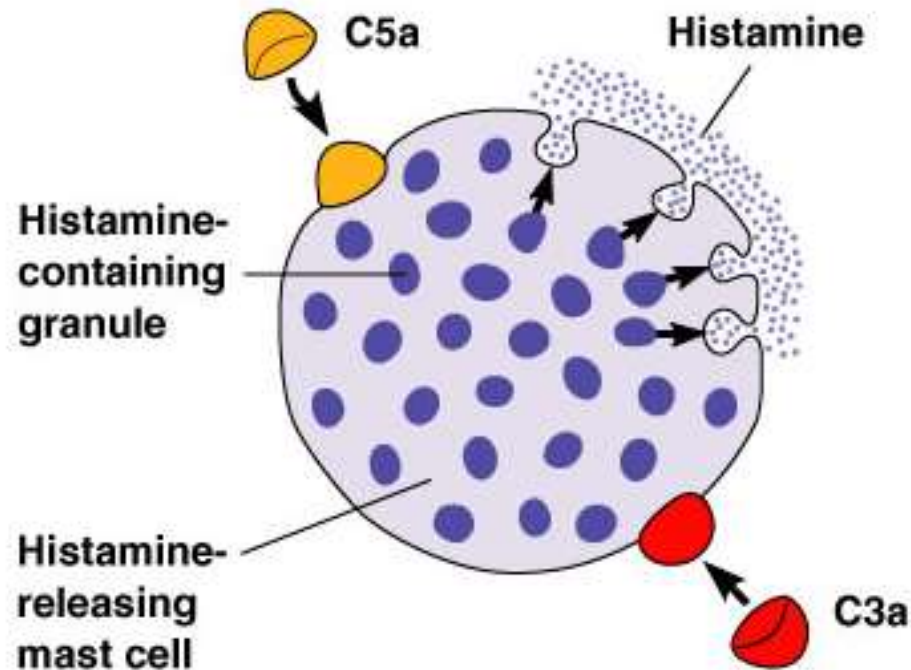
Complement pathways activation



Biological activities of complement components

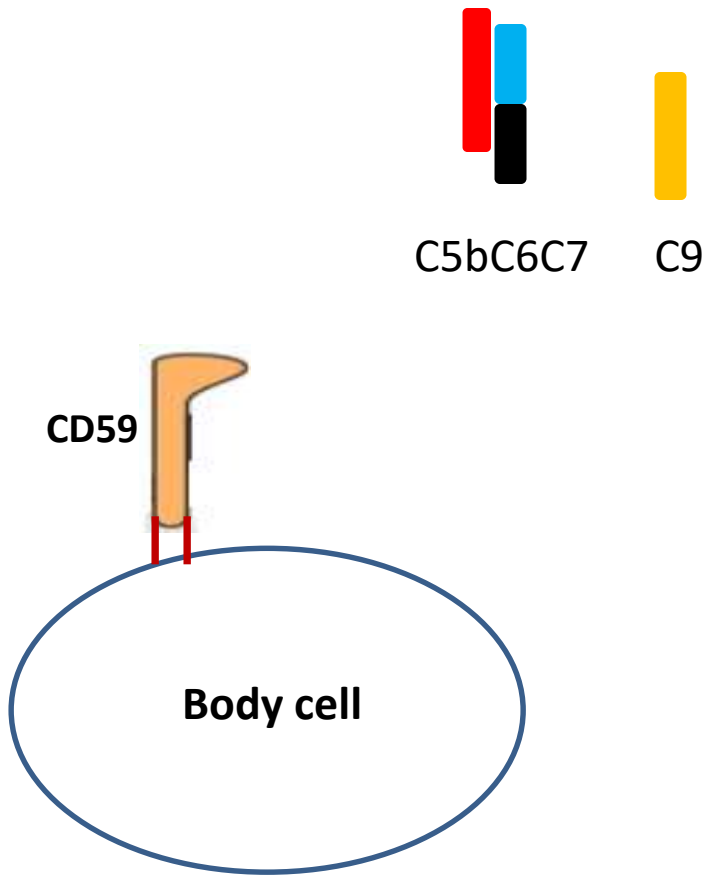
Anaphylatoxins

C3a, C4a, C5a



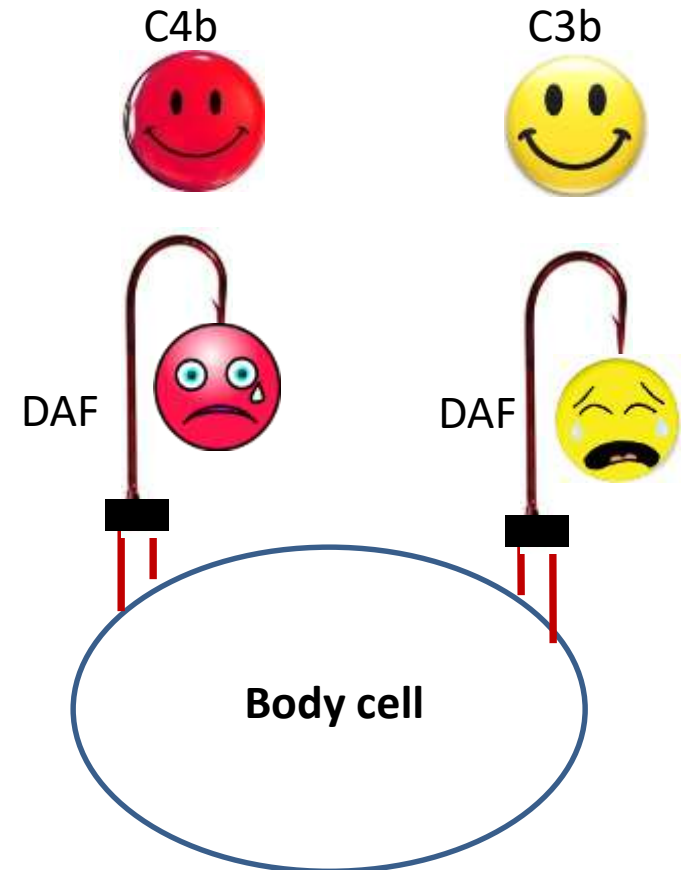
What protect our cells from complement system?

1. MAC-inhibitory protein (CD59)



CD59 inhibits the recruitment of C9 which inhibits the formation of MAC

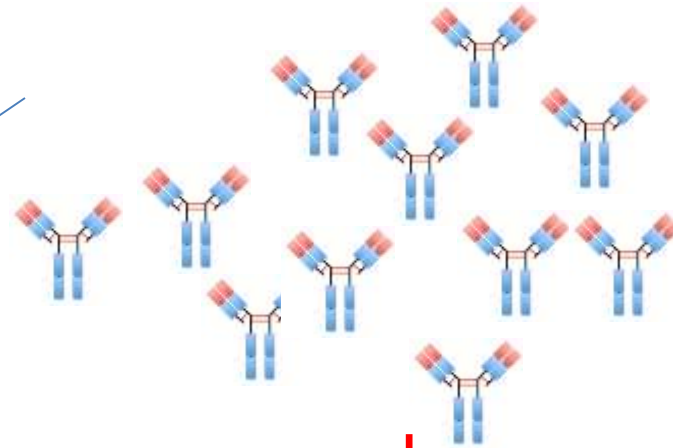
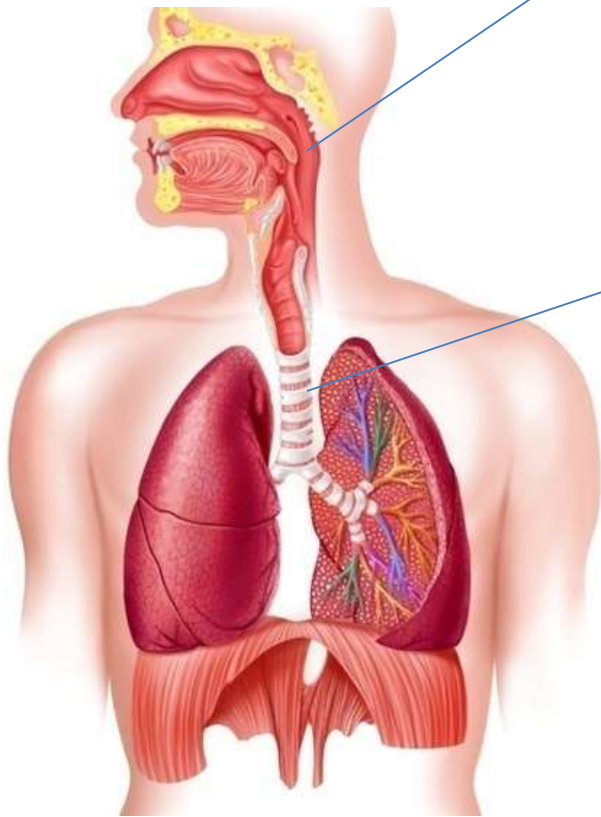
2. Decay-Accelerating Factor (DAF)



C4b and C3b interaction with DAF inhibits the stimulation of complement on the surface of body cells

Diseases associated with complement system

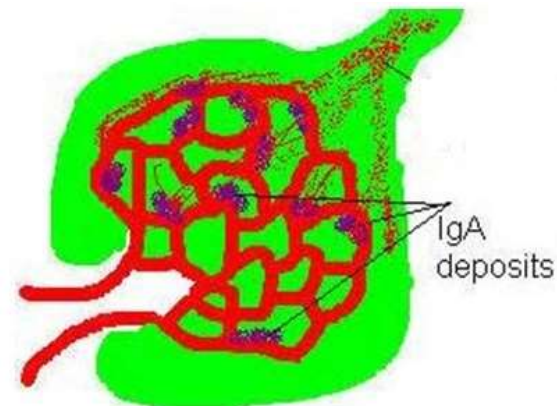
IgA nephropathy (Berger disease)



Polymerization



Deposition in the glomerular mesangium



Patient with respiratory tract infection

Diseases associated with complement system

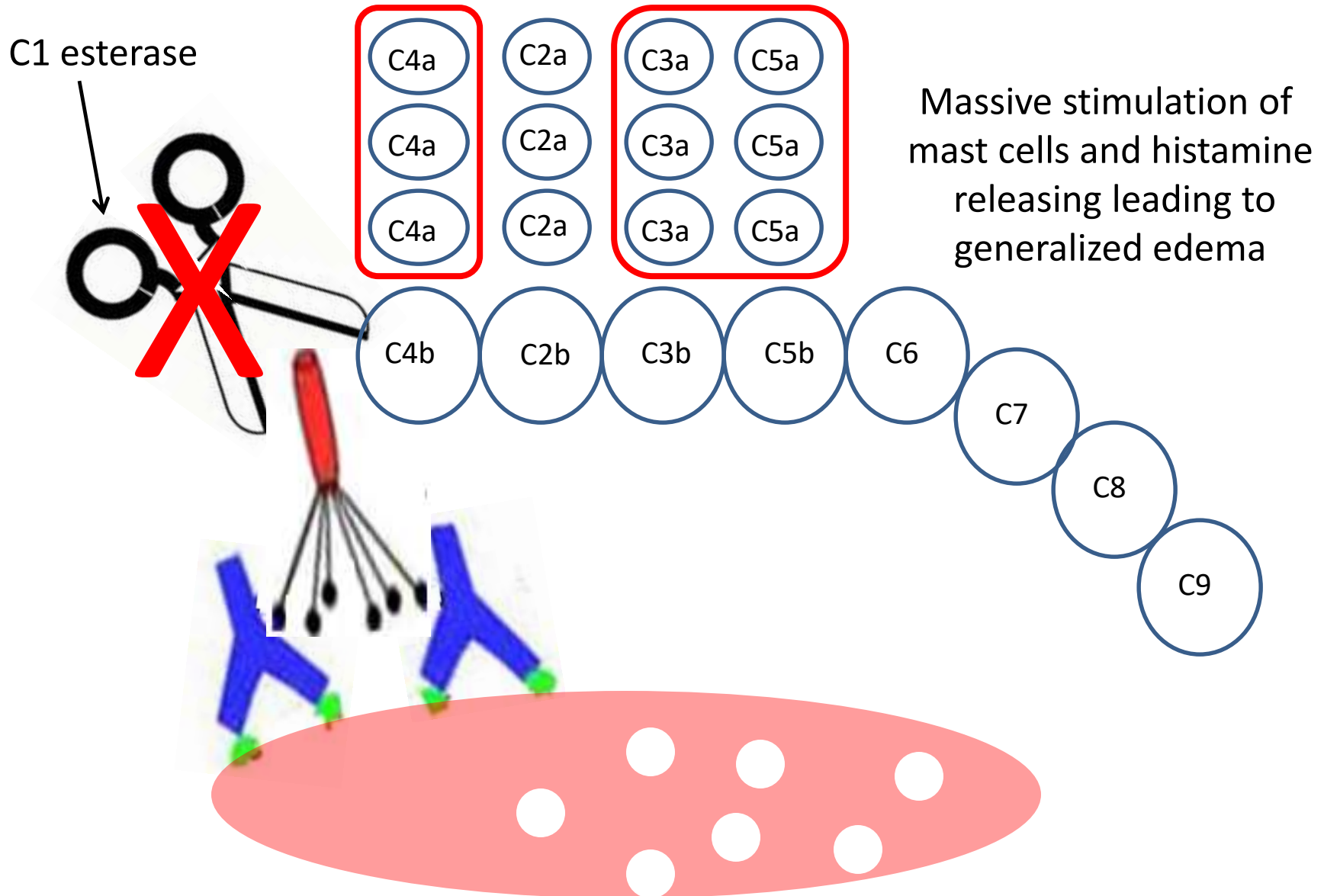
Henoch-Schönlein purpura (HSP) (IgA Vasculitis)



HSP is a small-vessel vasculitis in which complexes of IgA and complement component are deposited on arterioles, capillaries, and venules. HSP involves the skin and connective tissues, scrotum, joints, gastrointestinal tract and kidneys

Diseases associated with complement system

Angioedema



Diseases associated with complement system

Angioedema



Diseases associated with complement system

Paroxysmal Nocturnal Hemoglobinuria (PNH)

The disease is characterized by destruction of red blood cells, blood clots, and impaired bone marrow function. PNH is closely related to aplastic anemia.

