

complement  
system :

MICROBIOLOGY  
AND  
IMMUNOLOGY

451MICRO

DR. NAGWA AREF

# Complement history :

Discovered in 1894 by Bordet

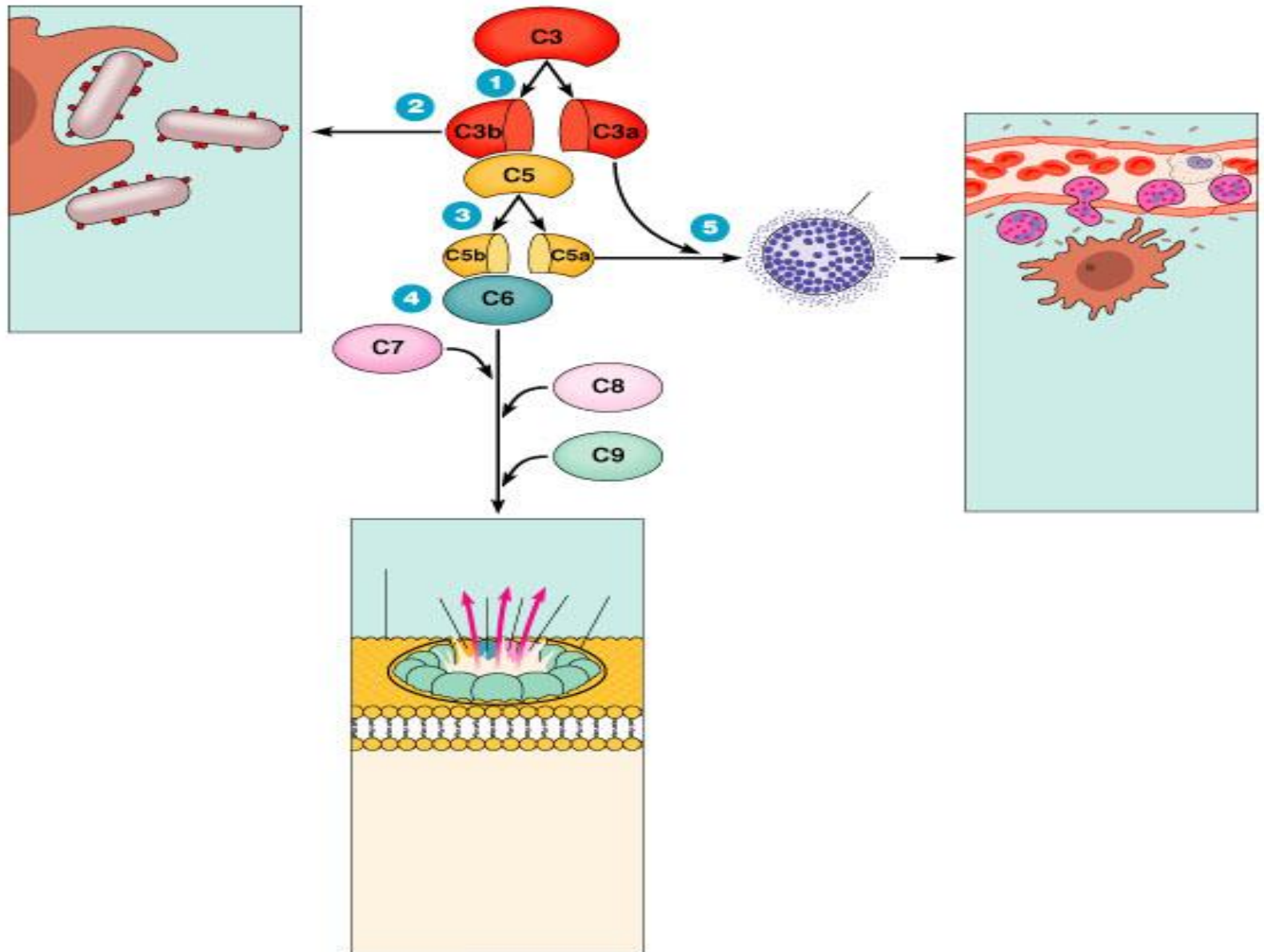
It represents lytic activity of fresh  
serum

Its lytic activity destroyed when  
heated at 56C for 30 min



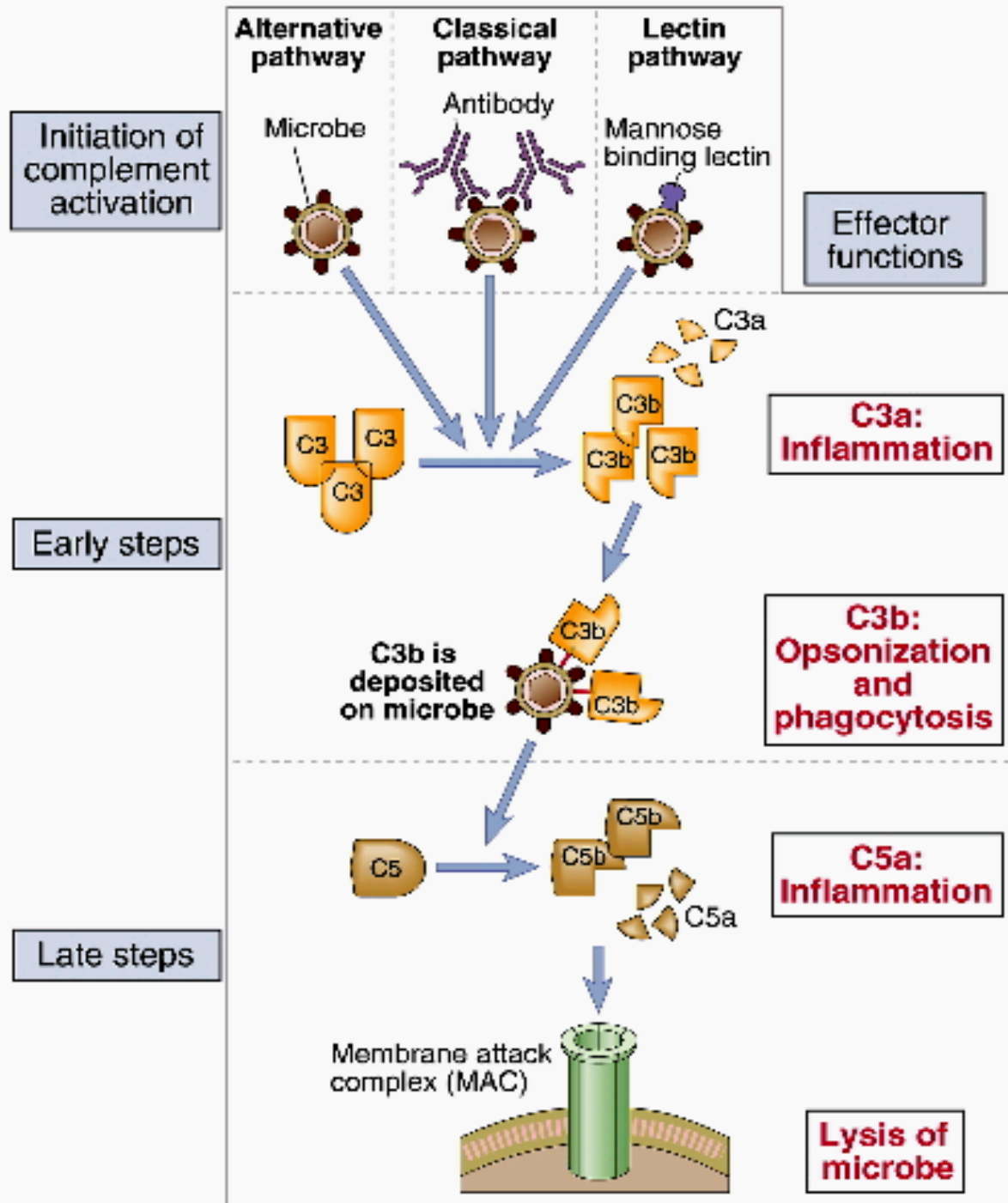
# Overview :

- ▶ The complement system is part of the innate immune system (vs adaptive) It is named “complement system” because it was first identified as a heat-labile component of serum that “complemented” antibodies in the killing of bacteria It is now known that it consists of over 30 proteins and contributes 3 g/L to overall serum protein quantities .



# Definitions :

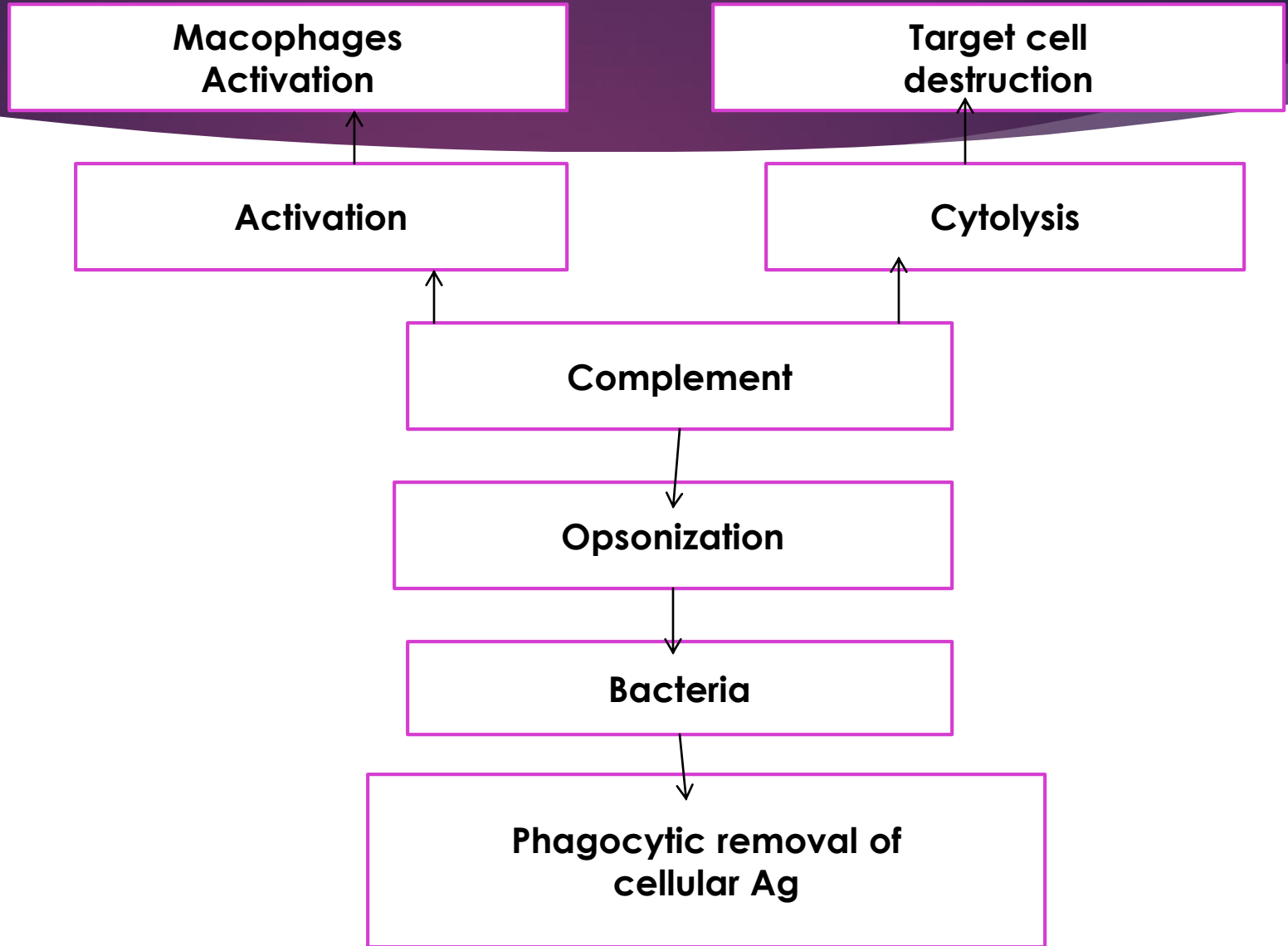
- ❁ C-activation: alteration of C proteins such that they interact with the next component
- ❁ C-fixation: utilization of C by Ag-Ab complexes
- ❁ Hemolytic units (CH50): dilution of serum which lyses 50% of Ab-coated r.b.c in a suspension
- ❁ C-inactivation: denaturation (usually by heat) of an early C-component resulting in loss of hemolytic activity
- ❁ Convertase/esterase: altered C-protein which acts as a proteolytic enzyme for another C-component



Complement (C')



# unction of Complement System :



# Complement functions :

## Host benefit:

- opsonization to enhance phagocytosis
- phagocyte attraction and activation
- lysis of bacteria and infected cells
- regulation of antibody responses
- clearance of immune complexes
- clearance of apoptotic cells

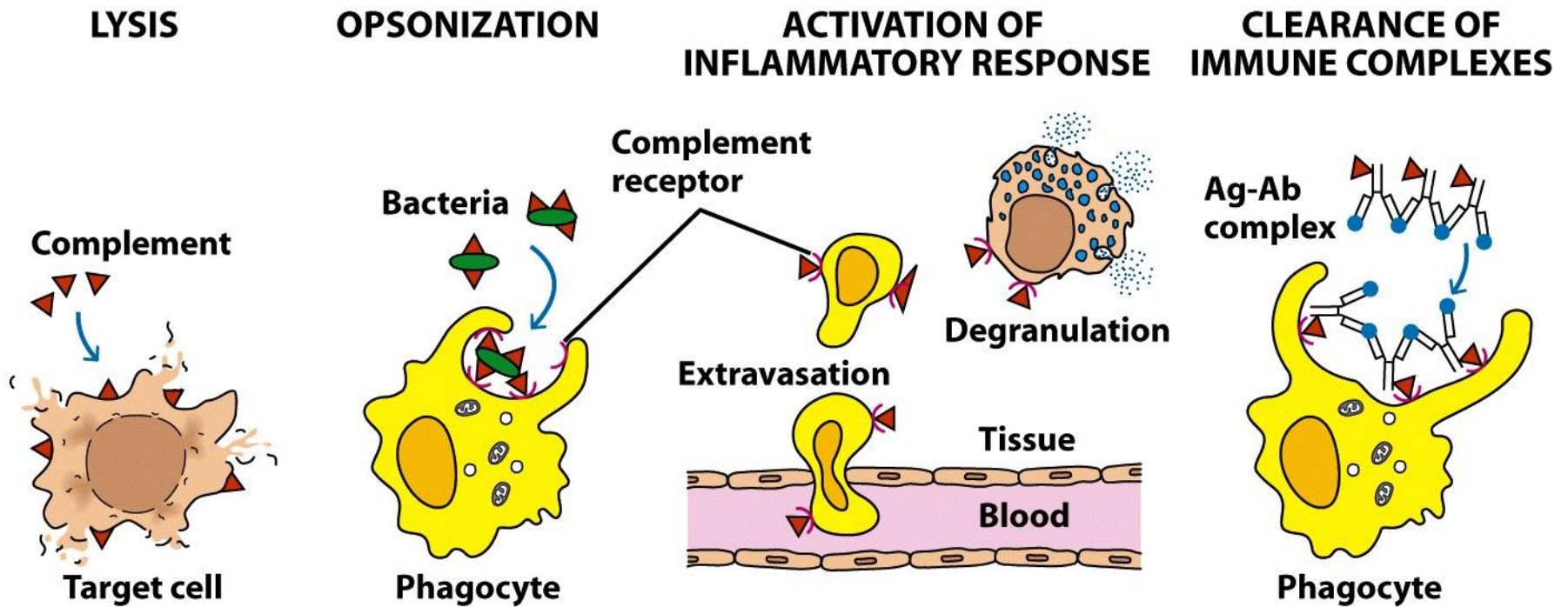
## Host detriment:

- Inflammation, anaphylaxis



# Four important functions :

- ▶ Lysis
- ▶ Opsonization
- ▶ Activation of inflammatory response
- ▶ Clearance of immune complexes



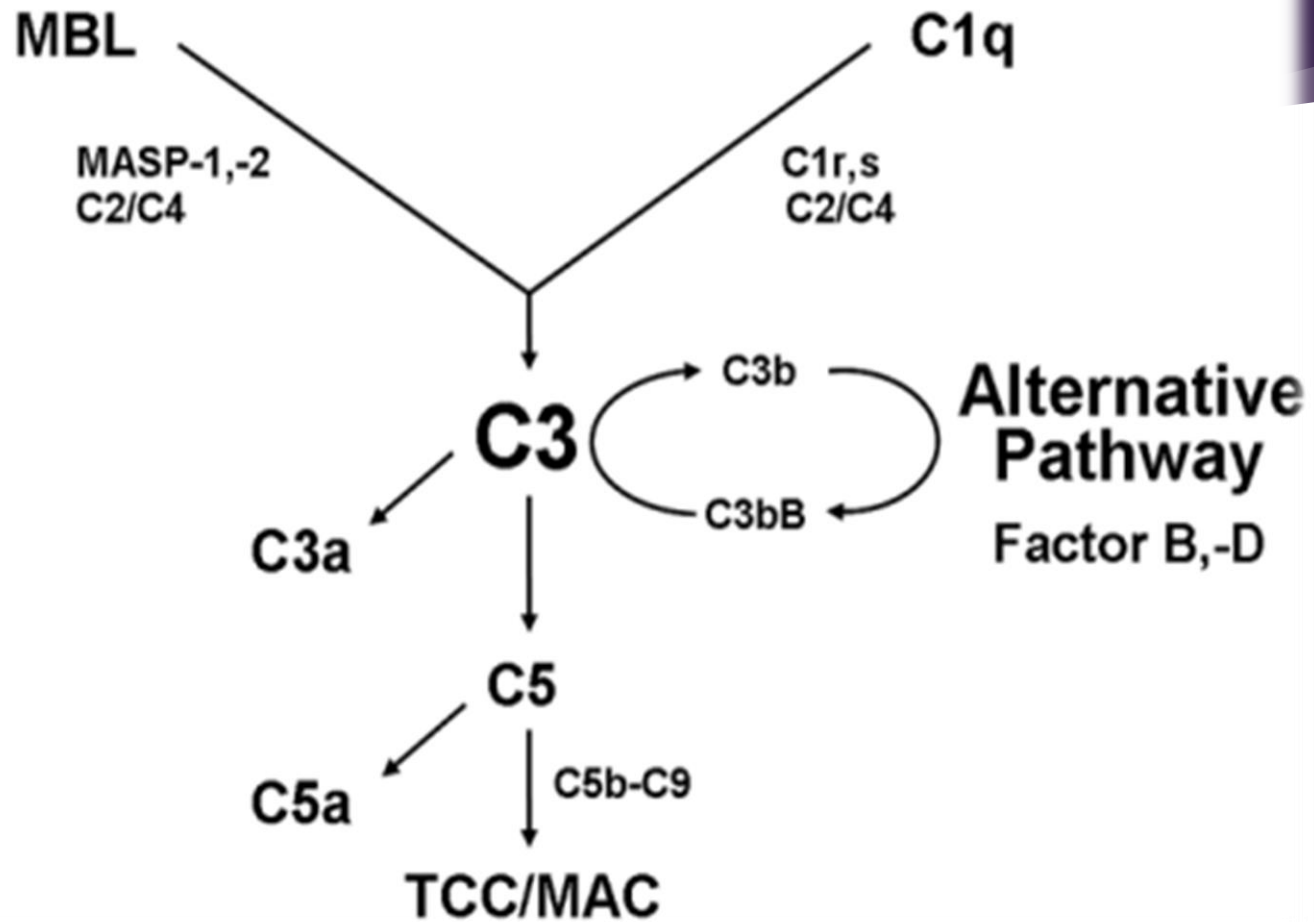
**Figure 7-1**  
*Kuby IMMUNOLOGY, Sixth Edition*  
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# Three pathways : classical, alternative, & lectin :

- ▶ Final steps identical in all 3 pathways :
- ▶ Classical - Initiated by formation of an Ag-Ab complex
- ▶ Alternative - Antibody-independent Part of innate immunity  
Initiated by foreign cell surfaces
- ▶ Lectin - Initiated by host proteins binding microbial surfaces

## Lectin Pathway

## Classical Pathway



# Summary :

- ▶ The complement system comprises a group of serum proteins which, when activated, plays an important role in antigen clearance.
- ▶ The classical, alternative and lectin pathways have been described.
- ▶ Elaborate regulatory mechanisms are required to prevent damage to normal cells.