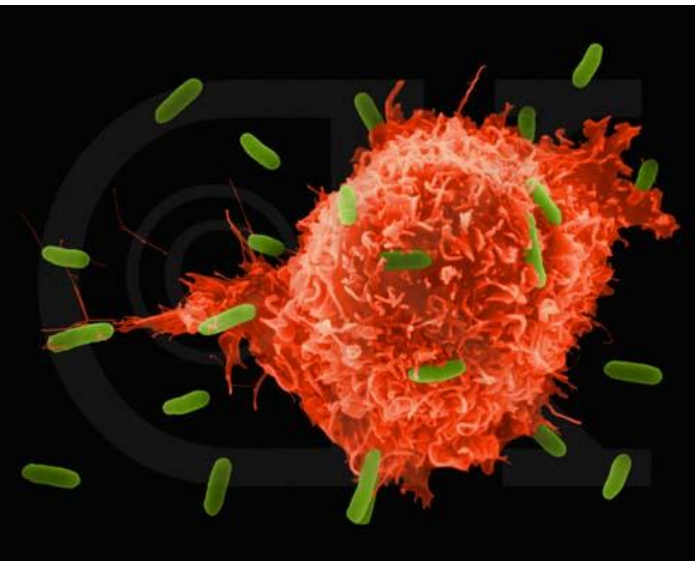


Innate Immune System

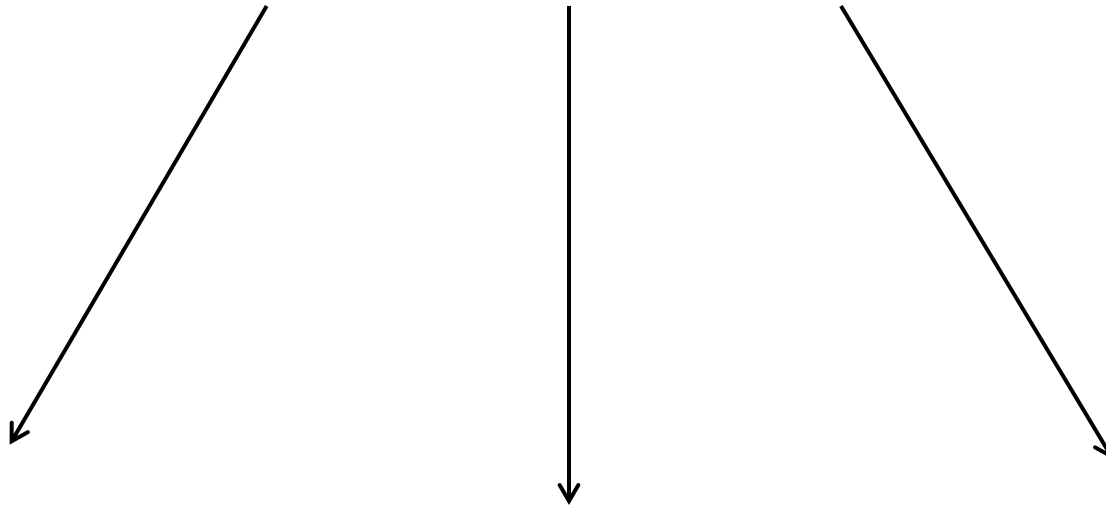


Dr. Issa Abu-Dayyeh



Why doesn't this happen in our tissues??

Innate Immune System



Complement system

Professional Phagocytes

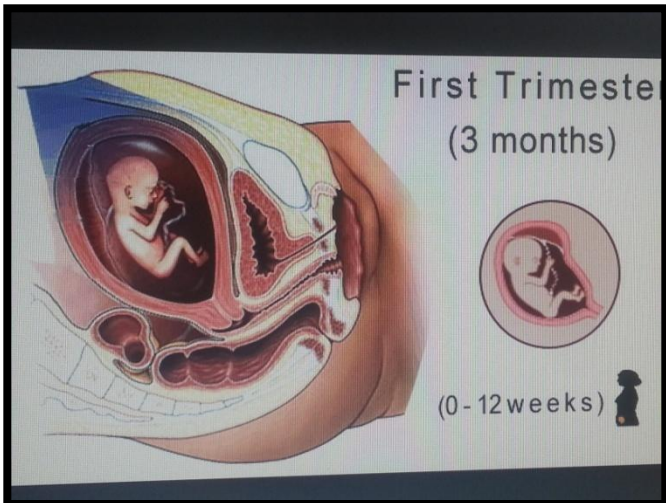
NK cells

Complement System

Composed of around 20 proteins that work together to destroy invaders and to signal other immune system players that the attack is ON!



Sea Urchins (Evolved around 600 Million years ago) possess a complement system

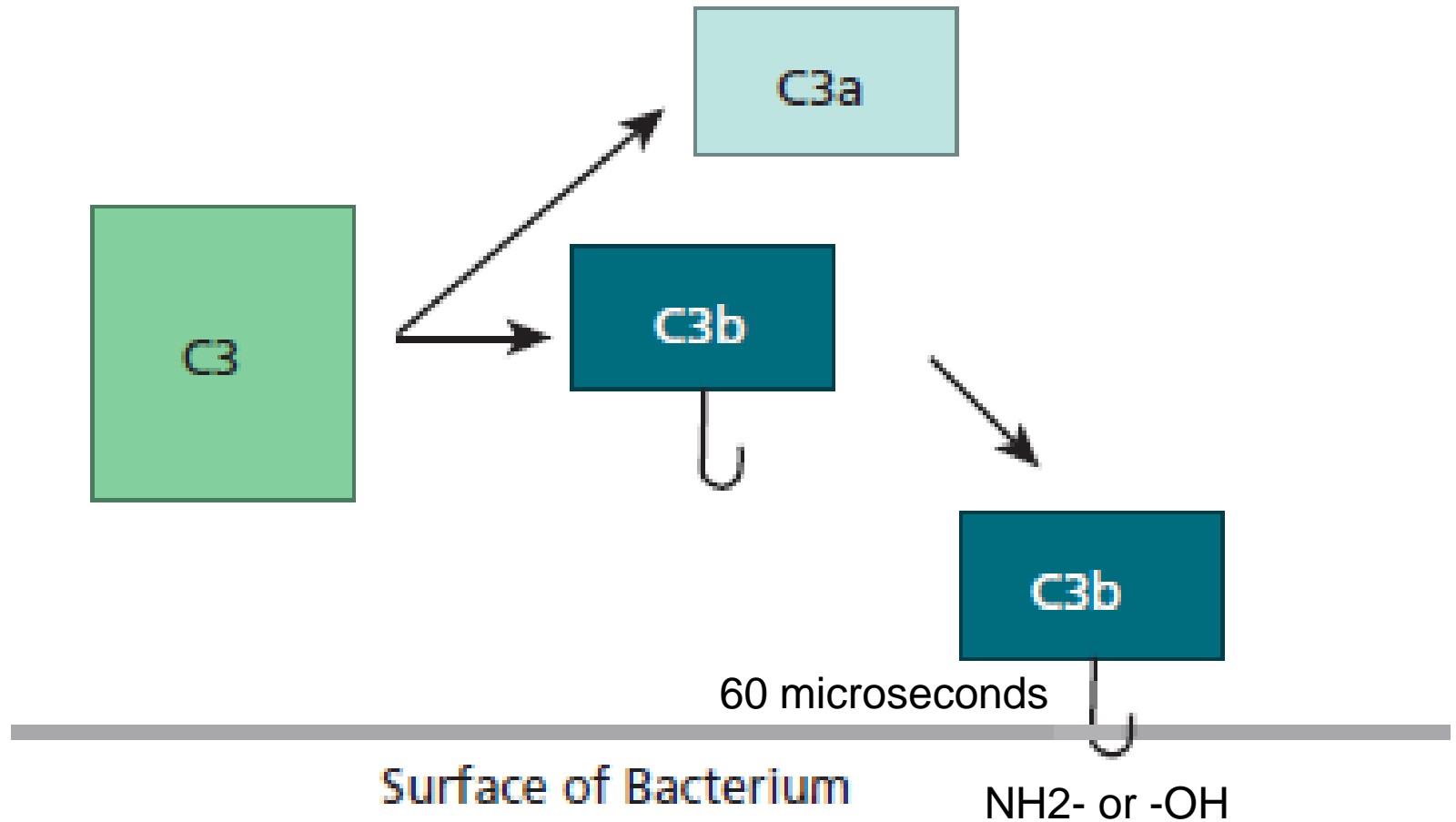


In humans, complement system develops In **FIRST TRIMESTER** of pregnancy.

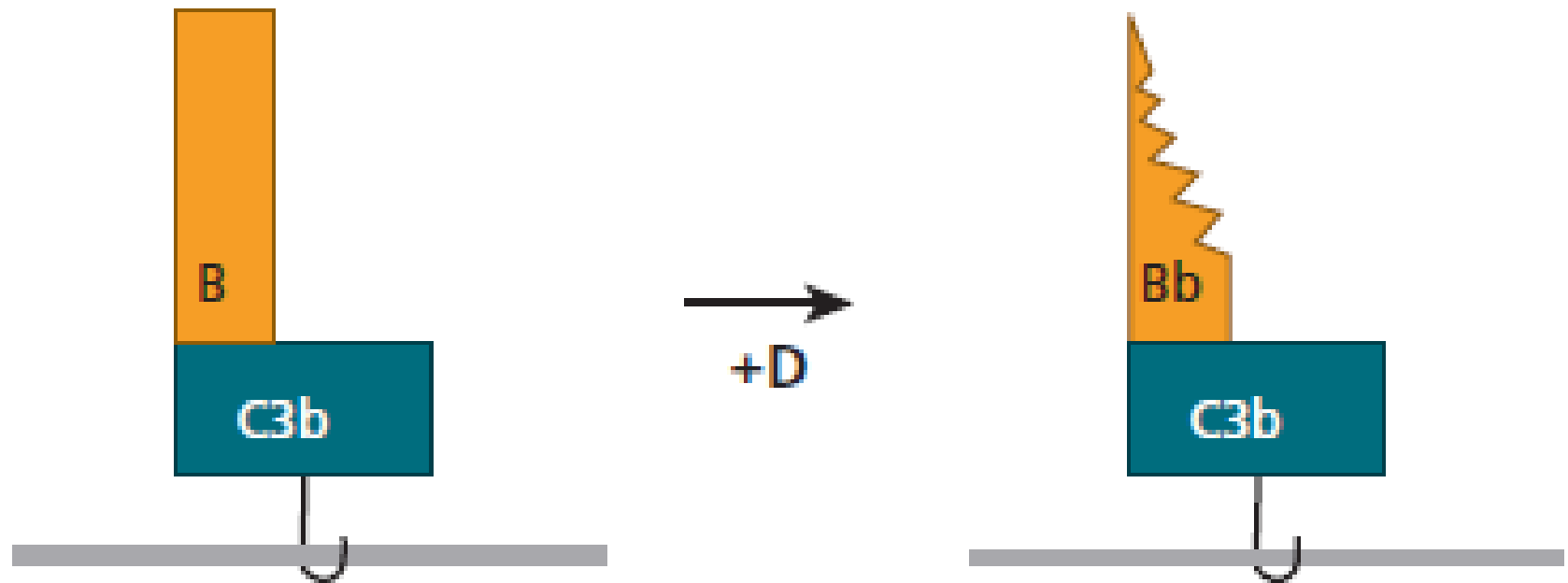
Methods of complement activation

- 1- Classical Pathway
- 2- Alternative Pathway
- 3- Lectin Activation Pathway

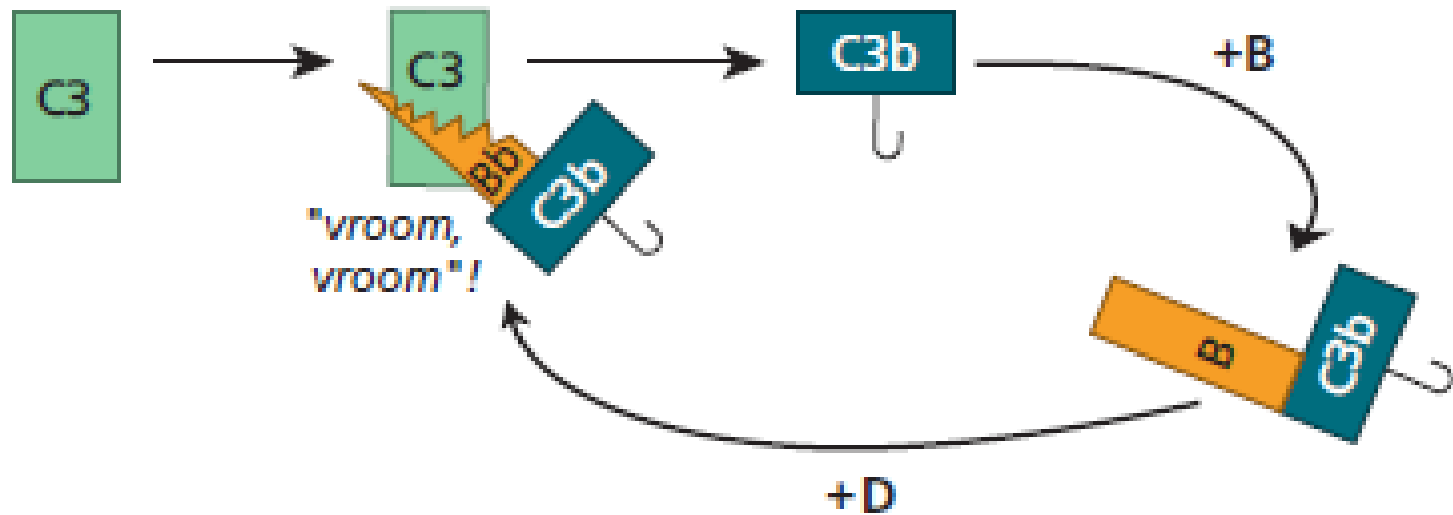
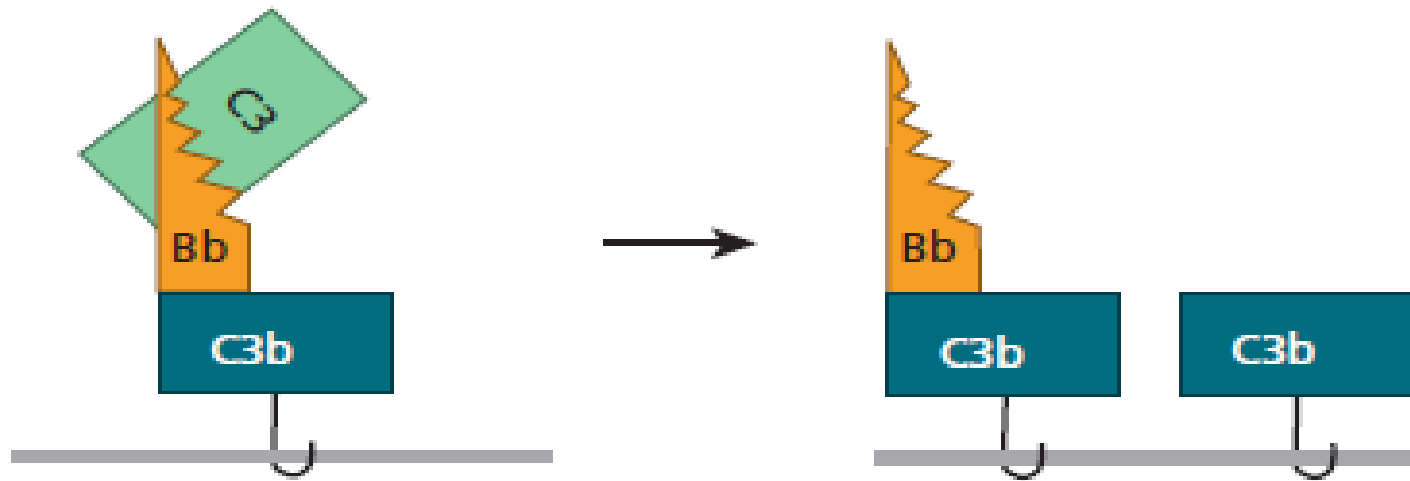
Alternative Pathway



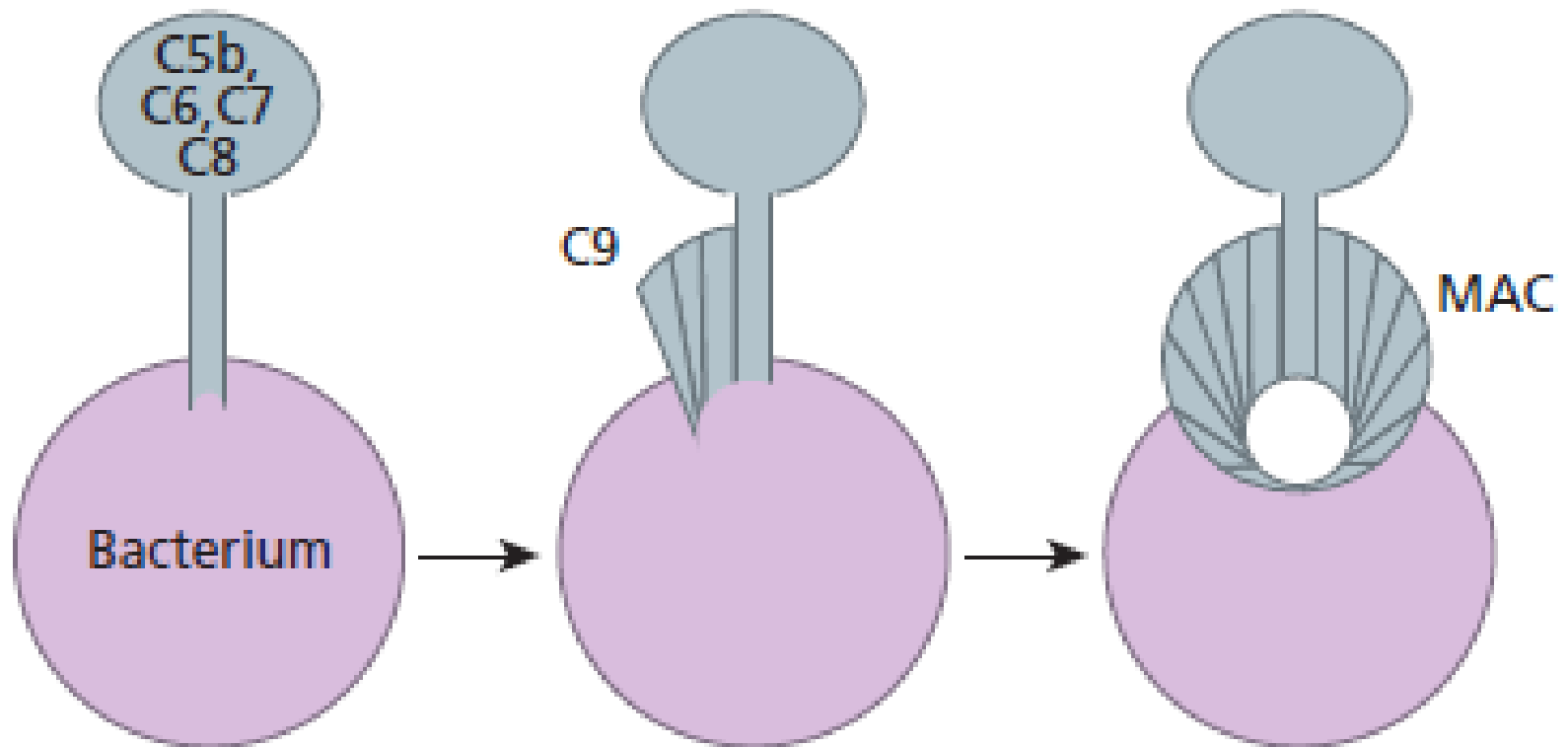
Generation of the chain saw C3bBb



Convertase



Generation of MACs



Why doesn't complement destroy our own cells??

Human cells possess surface enzymes that inactivate C3b

Decay Accelerating factor DAF (CD55) destroys C3bBb

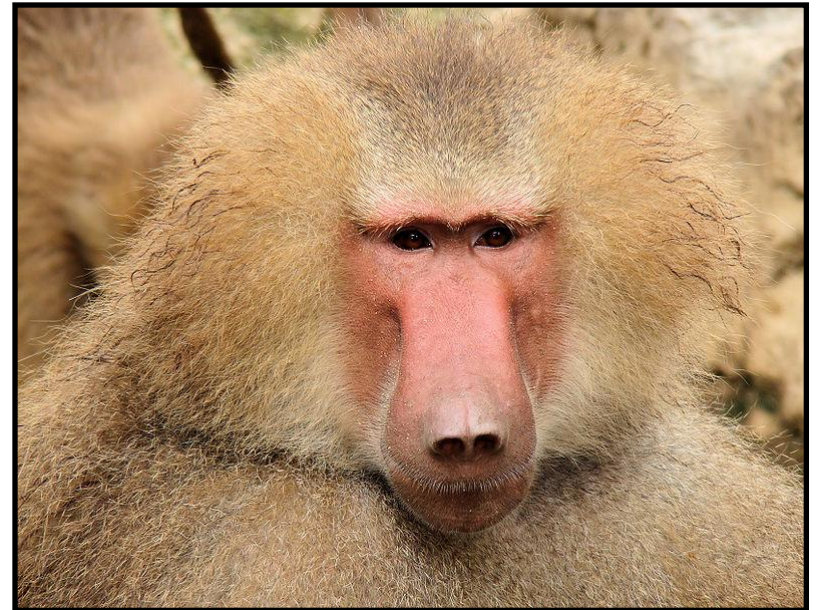
Protectin (CD59) Kicks almost finished MACs away

Failure of Heart Xenograft Experiments

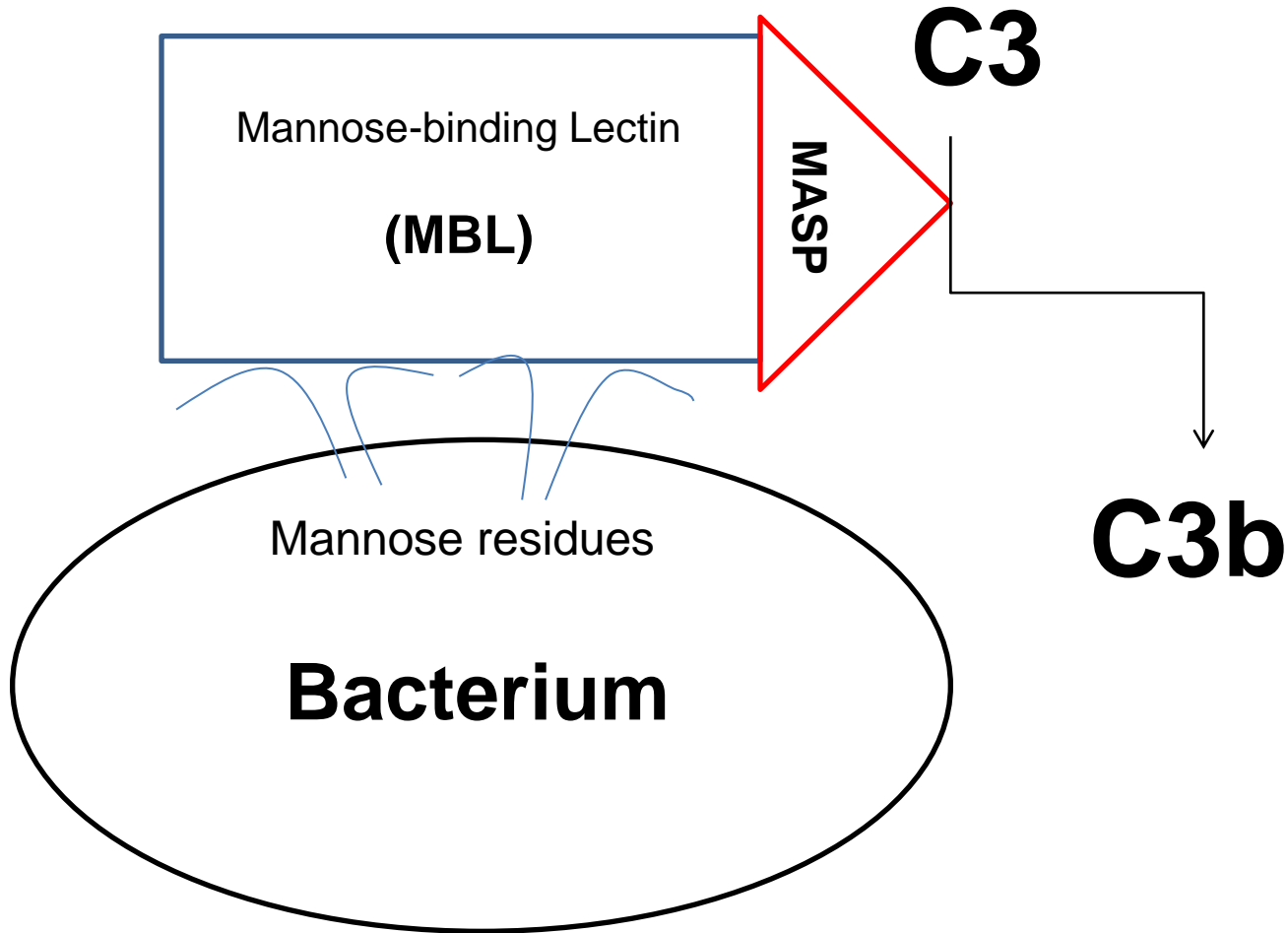


1- Complement is fast!!

2- Complement attacks any unprotected surface.



Lectin Activation Pathway



Alternative pathway: **Random Bombs**

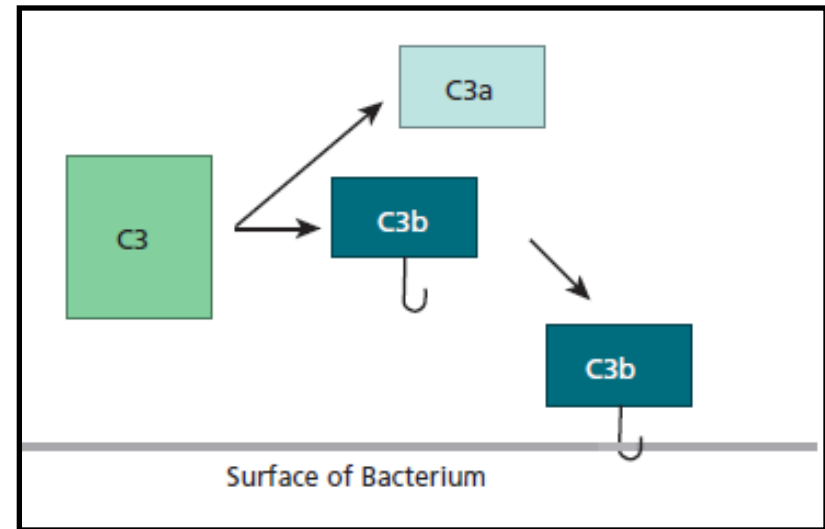
Lectin pathway: **Smart Bombs**

Functions of the complement system

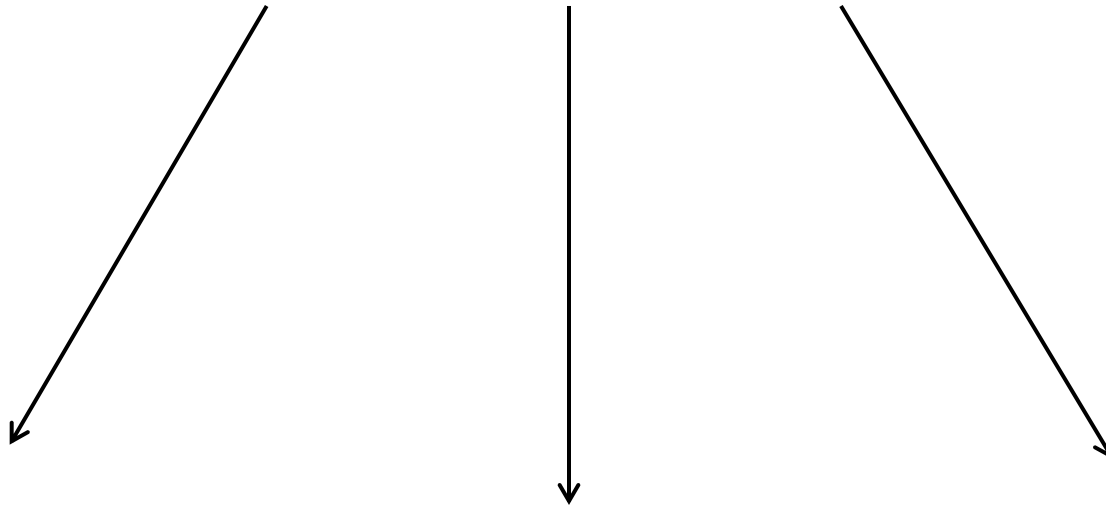
Building MACs

Opsonization by iC3b

Chemotaxis (C3a, C5a,
act as anaphylatoxins)



Innate Immune System



Complement system

Professional Phagocytes

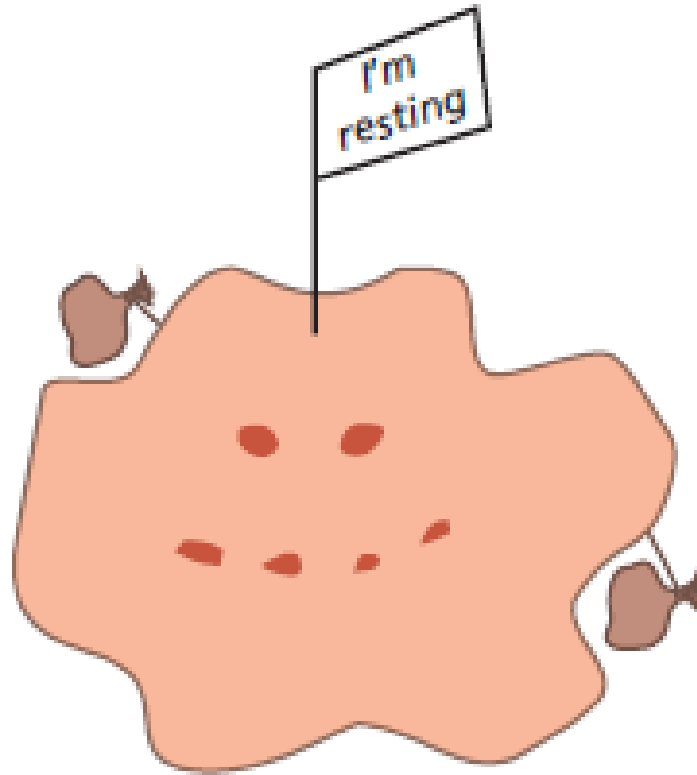
NK cells

Professional Phagocytes

Macrophages (APCs found below almost all areas of the body: skin, lungs, intestines).

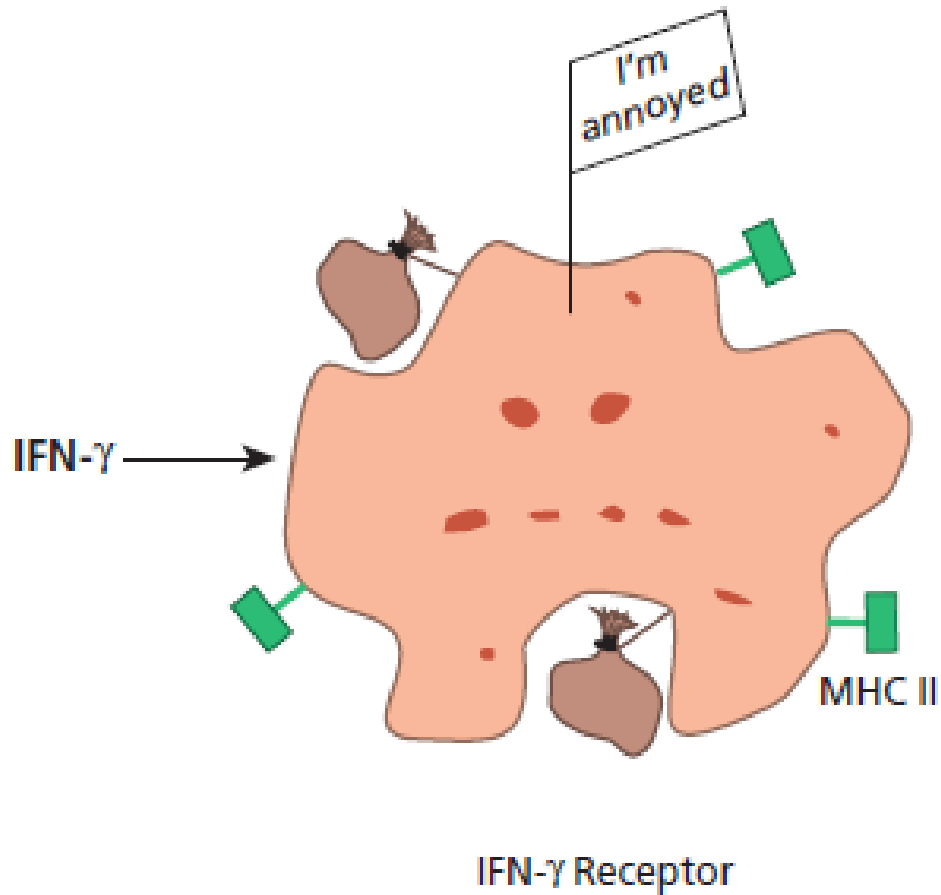
Neutrophils (NOT APCs, short-lived, and mostly involved in killing germs)

Macrophages exist in 3 states



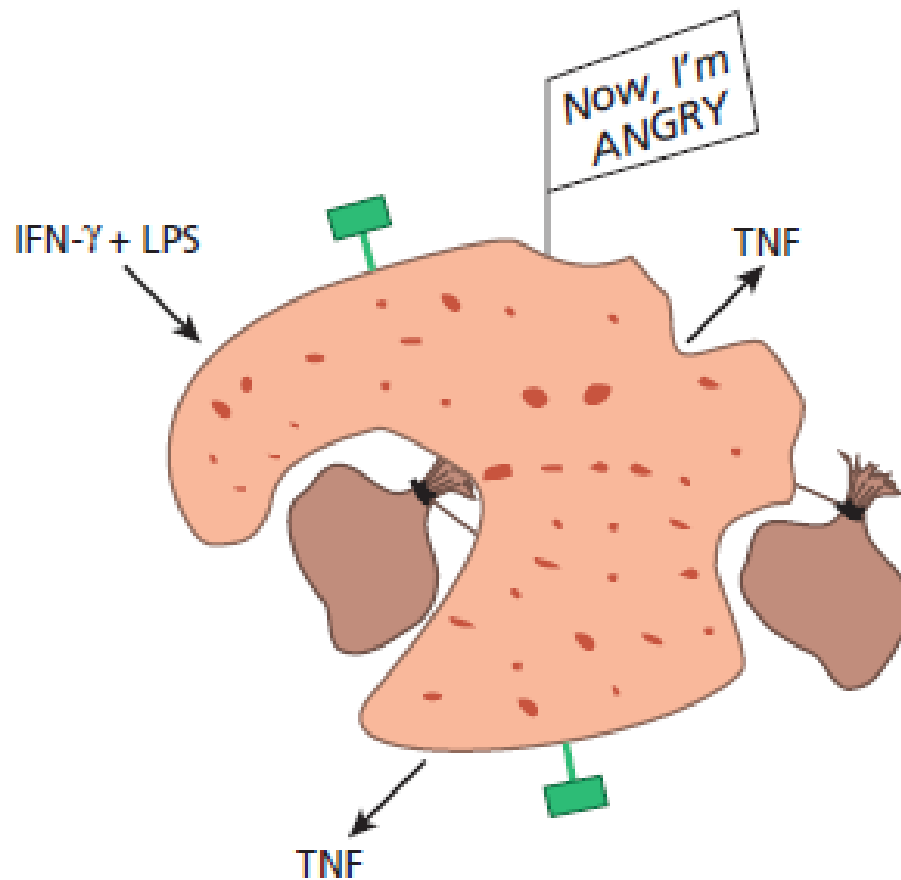
Resting Macrophage (Garbage collector)

(Low MHC II expression)



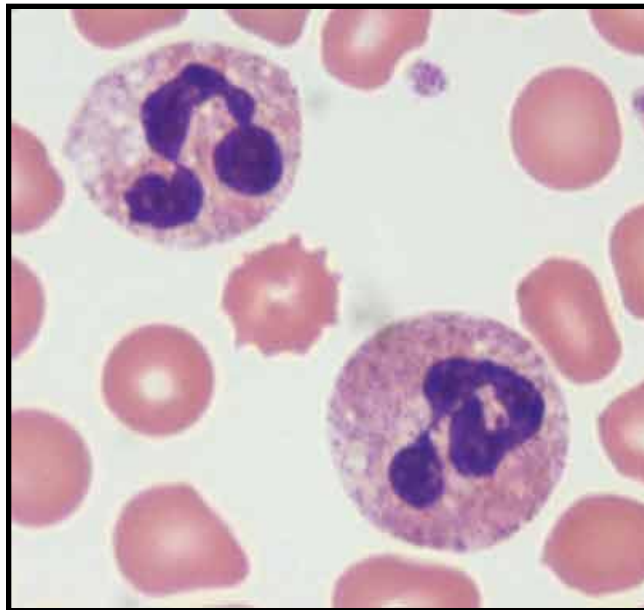
Primed Macrophage (Good APC, good killer)

(up-regulate MHC II expression)



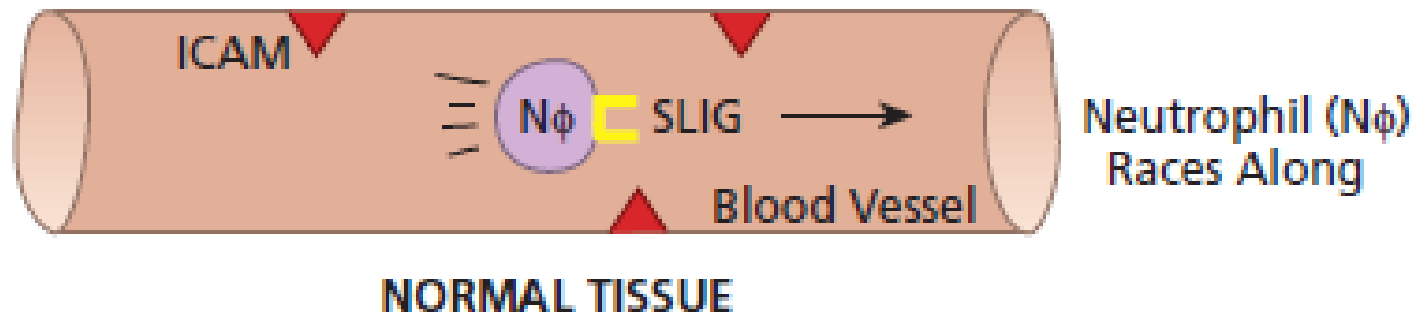
Hyperactivated Macrophage (Highly phagocytic, more lysosomes, ROI, NO)

If Macrophages are overwhelmed, who comes to the rescue??

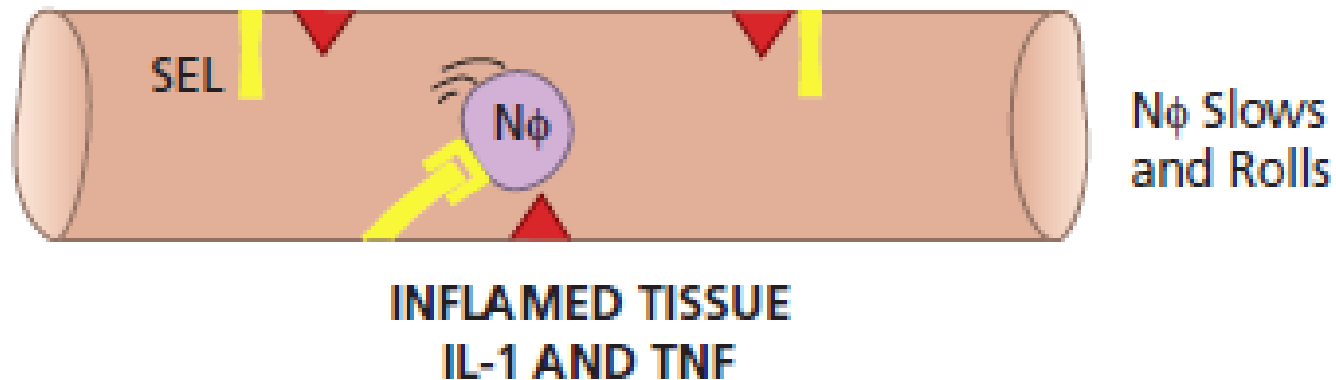


Neutrophils are NOT antigen-presenting cells but rather professional killers

How do neutrophils know when and where to exit blood stream?

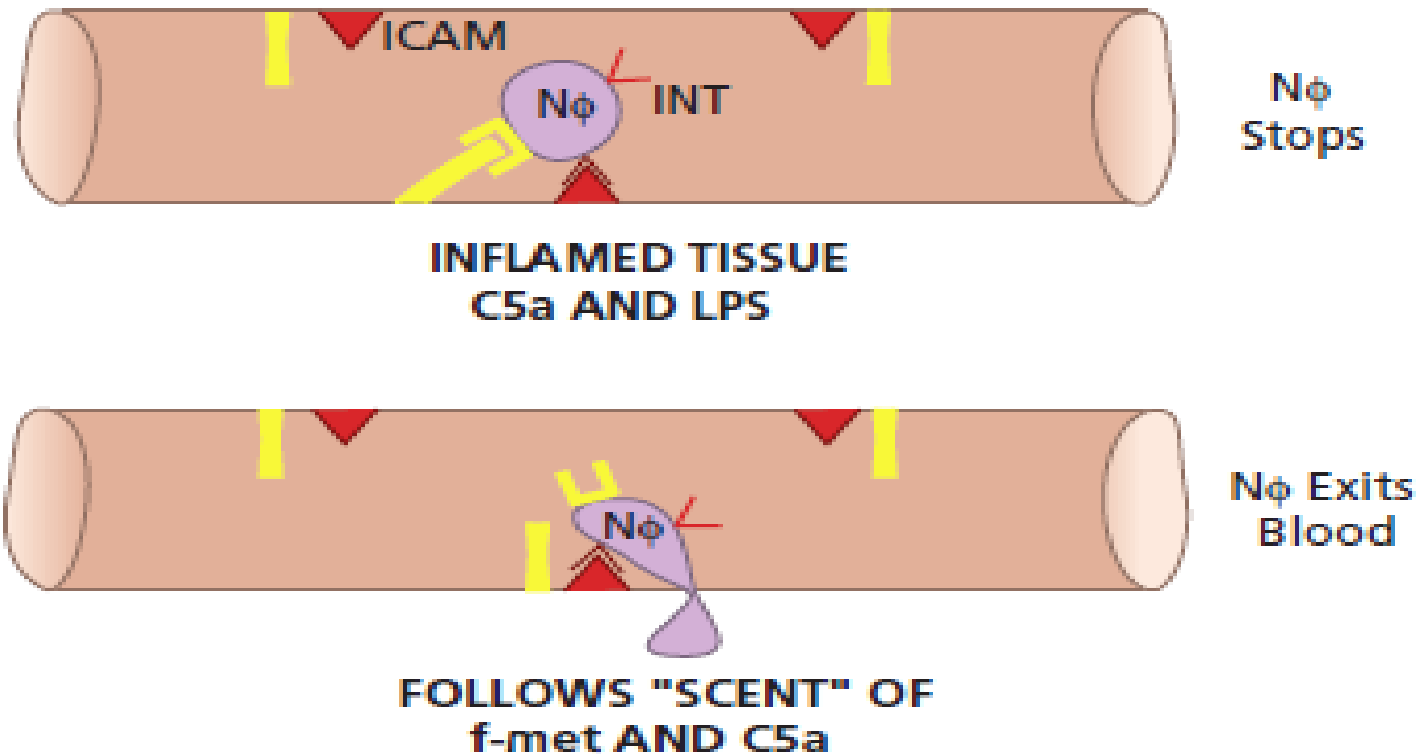


Neutrophils slow down at infection site



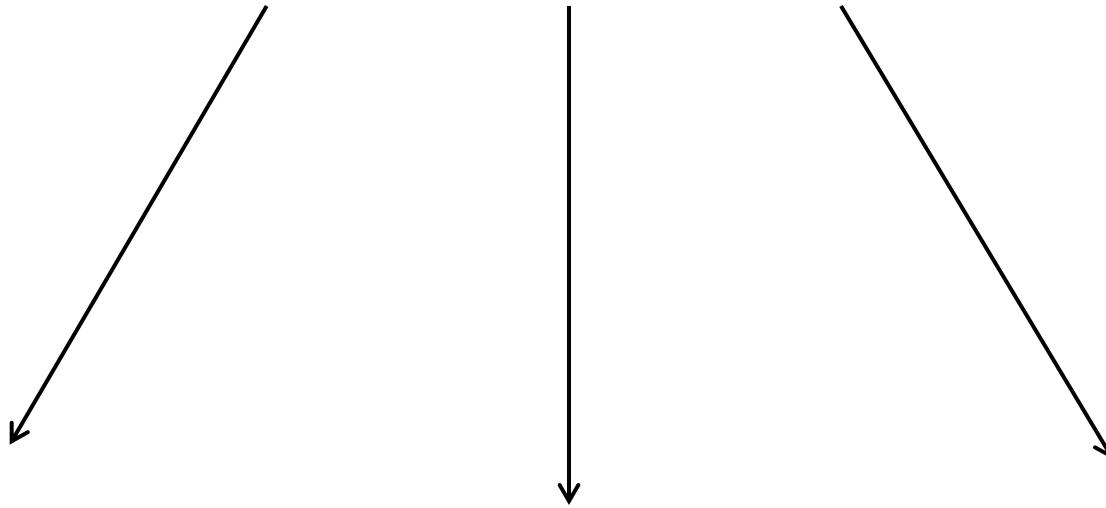
After ~6h post tissue insult, selectin is expressed on near-by endothelial cells.

Stopping and exiting circulation



Selectins, integrins, and their ligands constitute a postal system for immune cell delivery.

Innate Immune System



Complement system

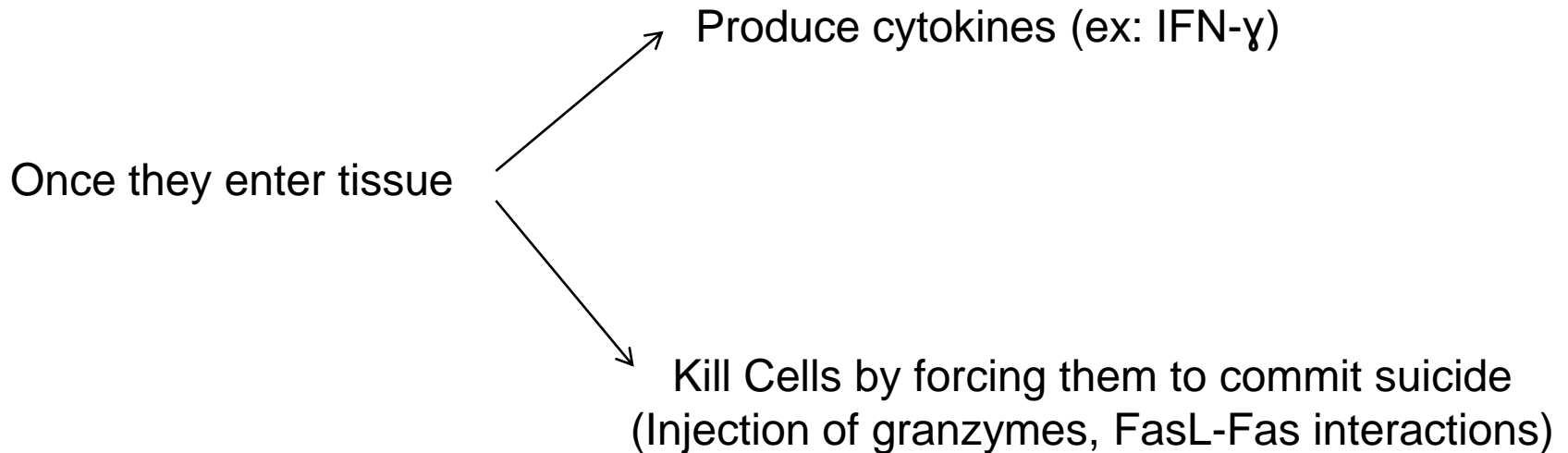
Professional Phagocytes

NK cells

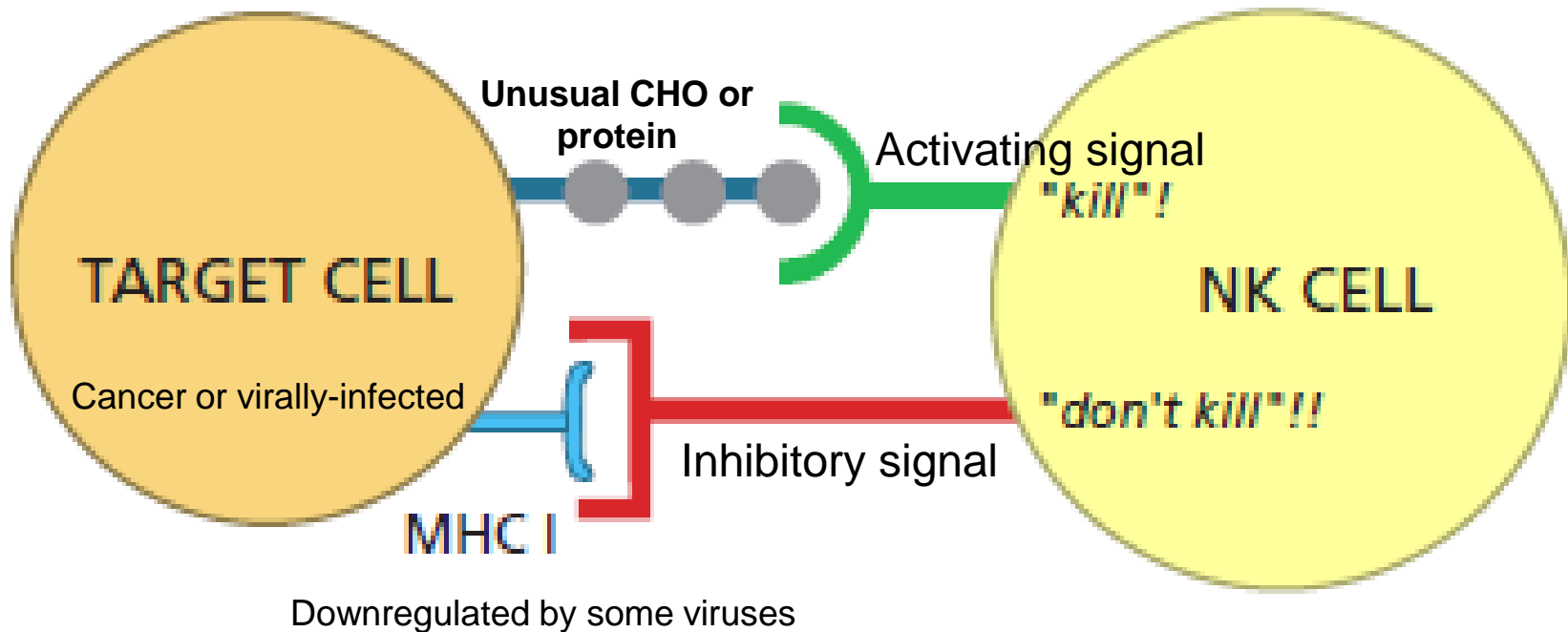
NK cells

Short-lived cells (1 week), no B or T cell receptors

On call- mostly found in blood, liver, and spleen (Not in tissue)



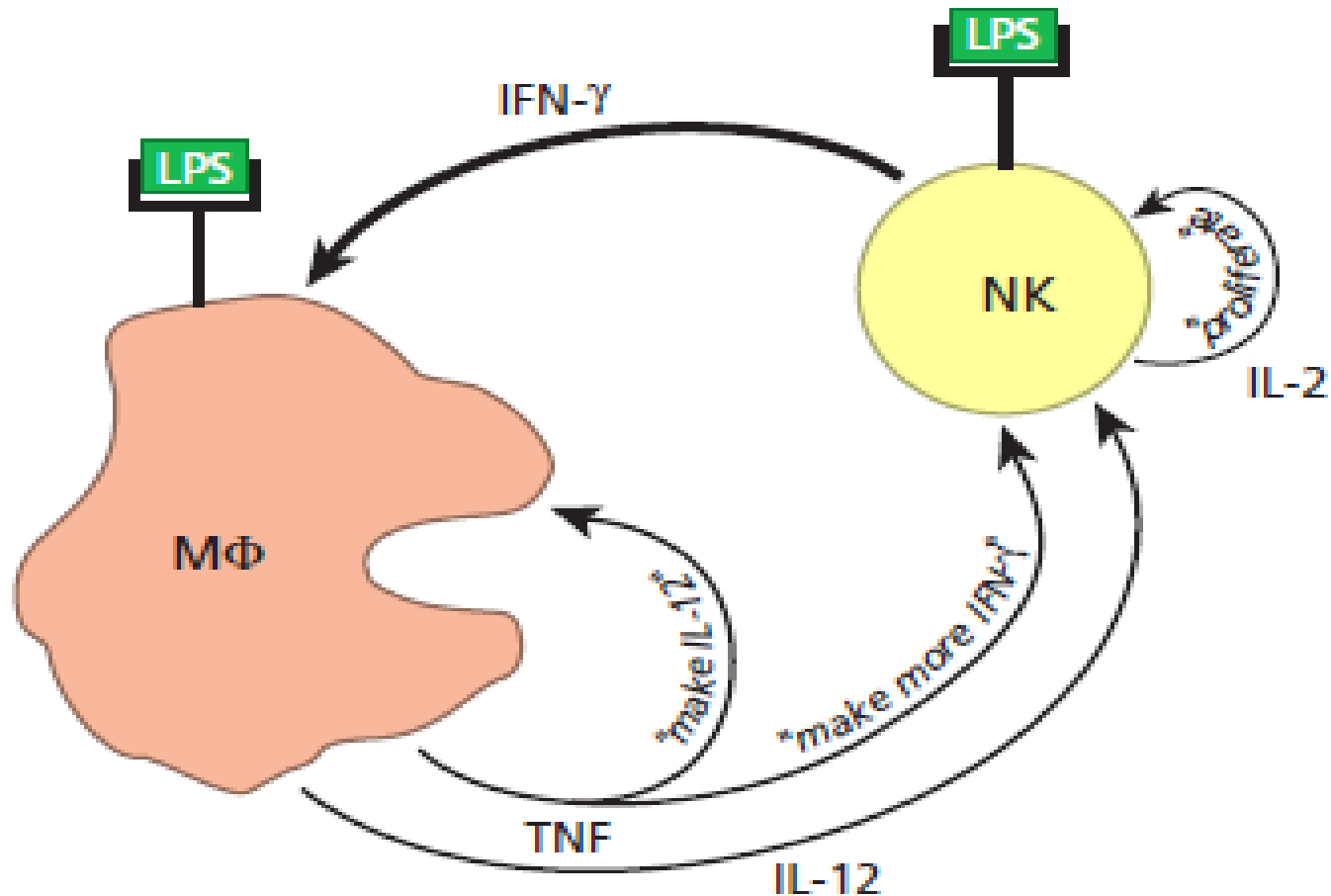
How do NK cells recognize their target??



NK cells become more active in the presence of LPS/type I interferons.

NK cells combine Tc and Th functions!!

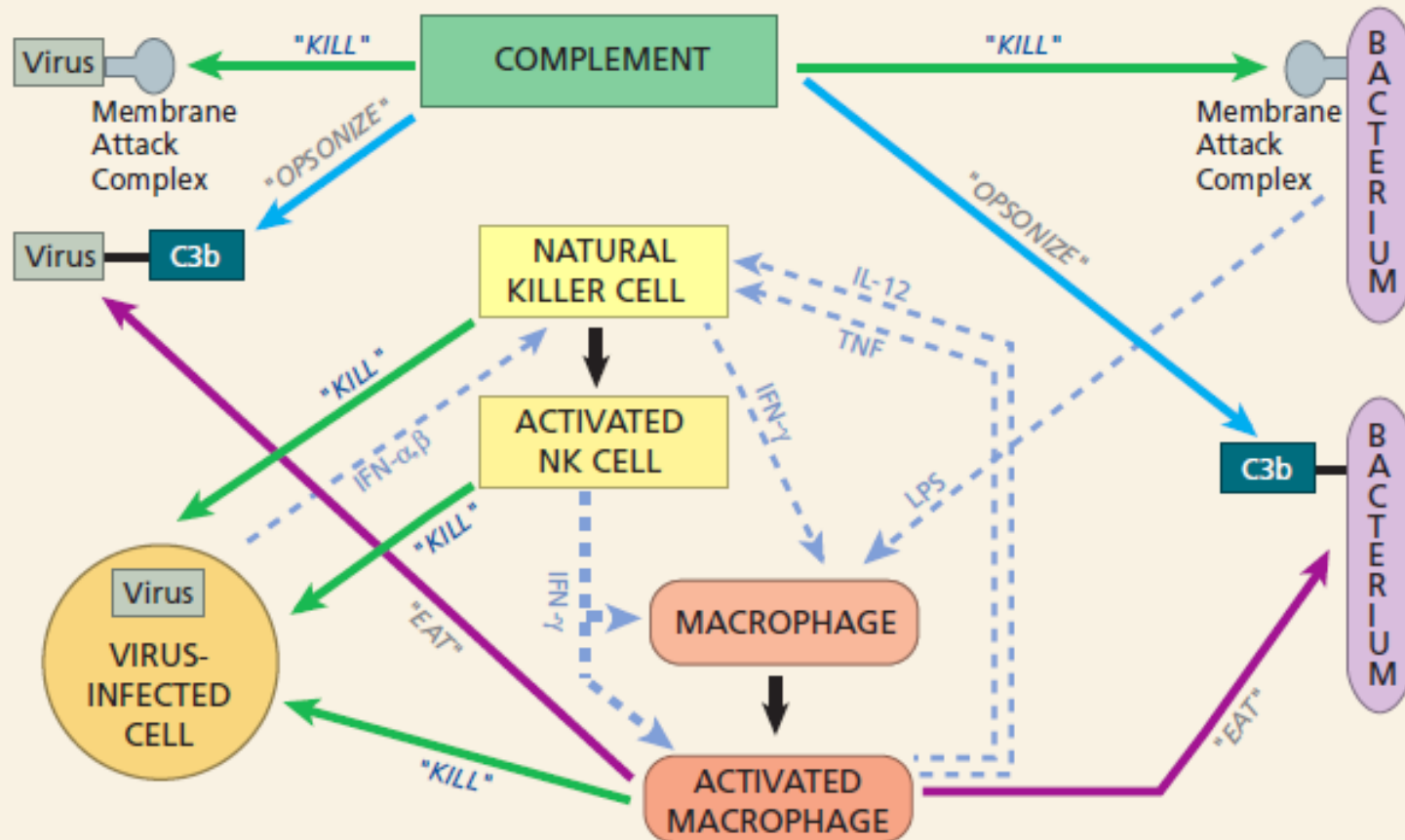
NK and M ϕ co-operate



Professional Phagocytes and complement co-operate

- Complement tags invaders and phagocytes eat them.
- Activated M ϕ can produce complement components (C3, factors B and D) and increase blood vessel permeability to recruit complement proteins from blood.

How the innate immune system deals with bacteria and viruses??



- Many viruses evolved defenses to protect them from the innate immune system.
- Innate system can help contain a viral infection in early stages, but more potent weapons are frequently required!

Adaptive Immune System

THANK YOU!

QUESTIONS??