

Innate Immunity

Invertebrates and vertebrates

Responses in minutes and
Hours

Non-clonal pattern recognition
Receptors

Limited diversity and specificity

No Memory

Adaptive Immunity

Vertebrates

Responses in days and
weeks

Clonal antigen receptors

Mind-boggling diversity
and specificity

Memory

"Non-Specific Protection"

- E p i t h e l i a l s u r f a c e s

- M u c u s

- L y s o z y m e

- D e f e n s i n s / o t h e r a n t i m i c r o b i a l p e p t i d e s

- A c i d i n s t o m a c h

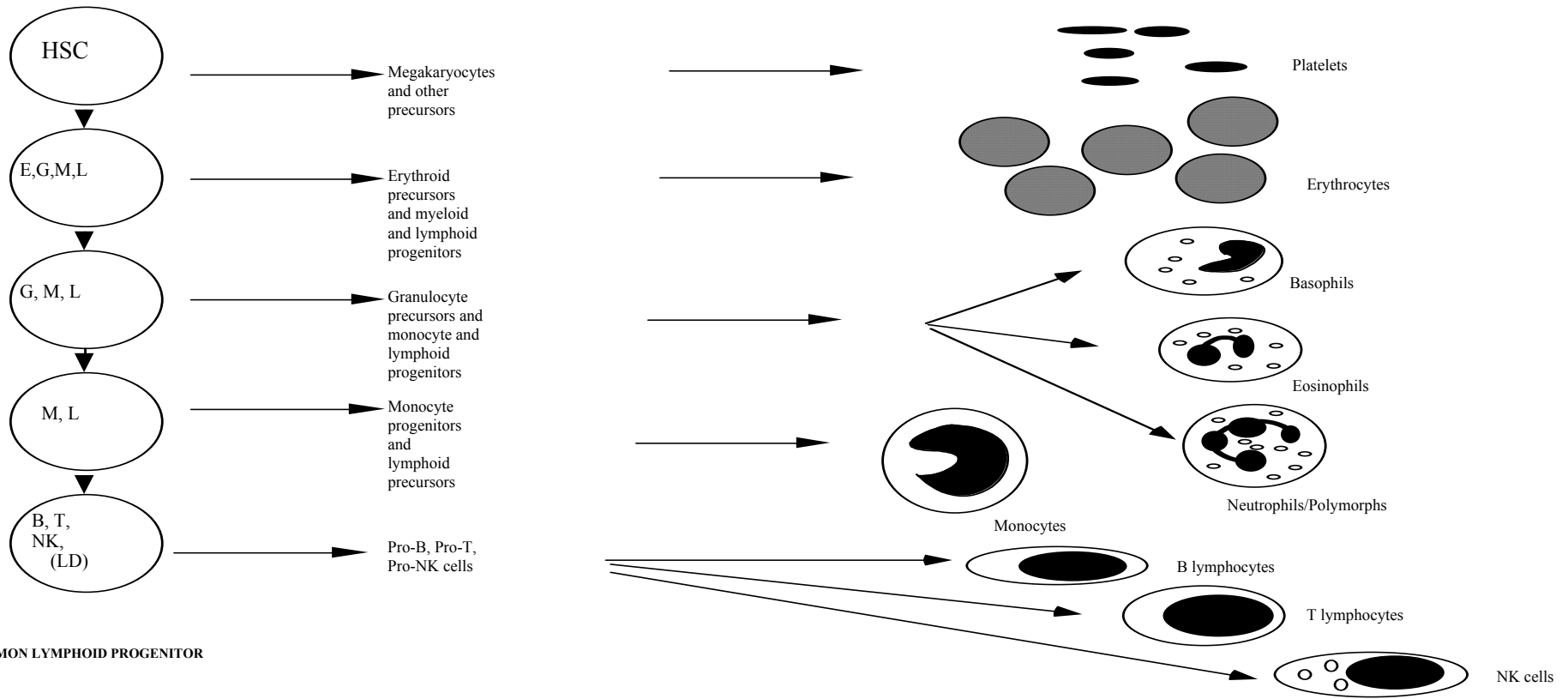
- C o m m e n s a l o r g a n i s m s

Innate Immunity

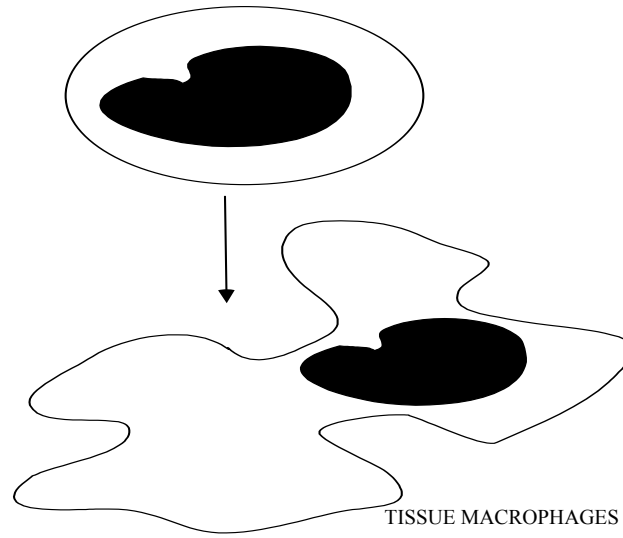
- Secretions: mucus, lysozyme, defensins
- Cells: macrophages, granulocytes, Natural Killer cells; (also dendritic cells, B-1 and MZ B cells, and $\gamma\delta$ T lymphocytes)
- Agglutinins: mannose binding lectin, C-reactive protein (and natural IgM antibodies)
- Complement: Alternative pathway, lectin pathway (and classical pathway for IgM)

Cells that mediate innate immune responses

- CELLS OF MYELOID ORIGIN
 - Macrophages
 - Granulocytes
 - Neutrophils (aka polymorphonuclear leukocytes)
 - Eosinophils
 - Basophils
 - Mast Cells
 - Dendritic cells
- CELLS OF LYMPHOID ORIGIN
 - Natural Killer (NK) Cells
 - $\gamma\delta$ T cells
 - B-1 B cells
 - Marginal Zone (MZ) B cells



MONOCYTES



TISSUE MACROPHAGES

MAJOR CLASSES OF PATHOGENS

Viruses

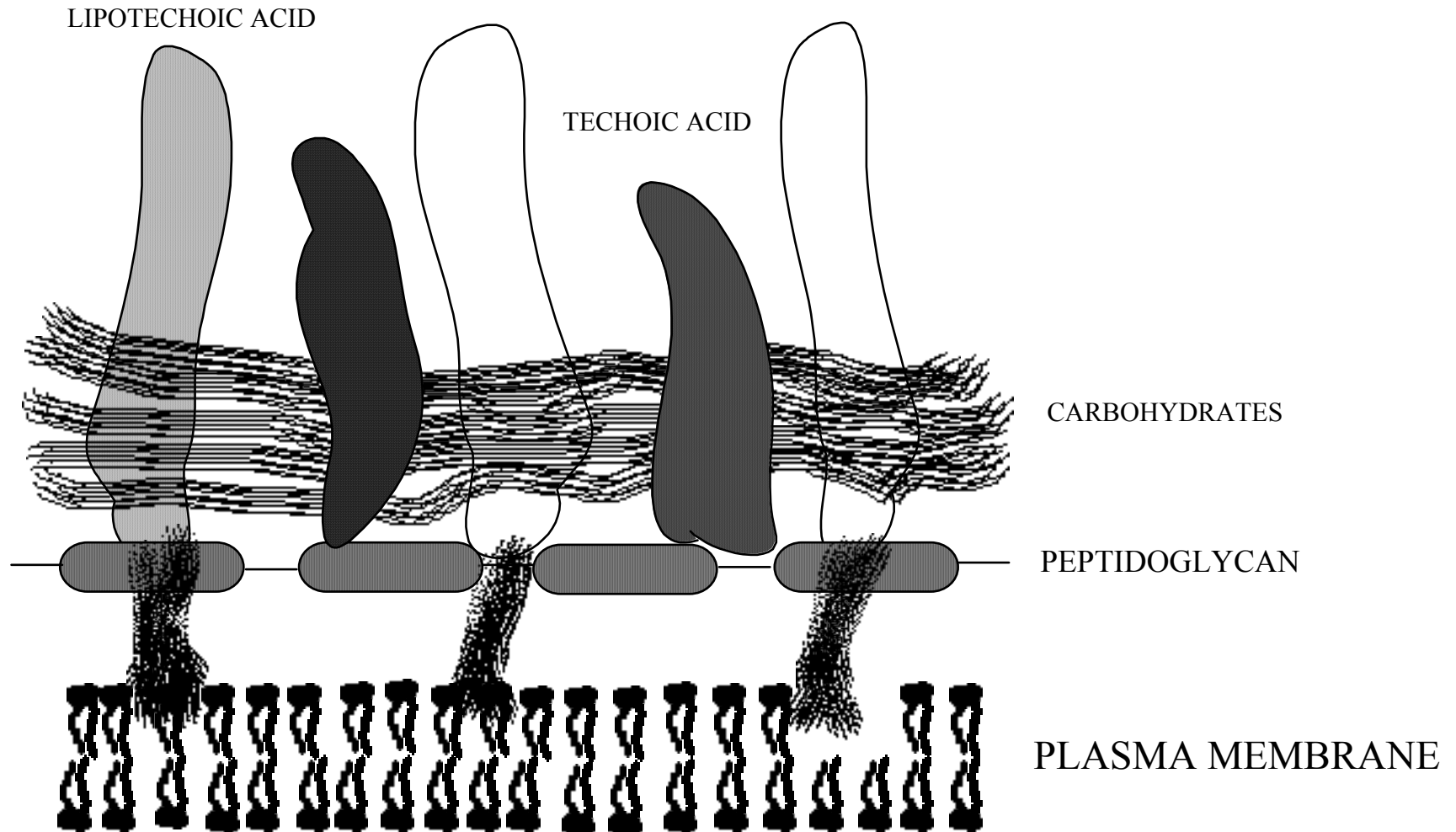
Bacteria

Protozoa

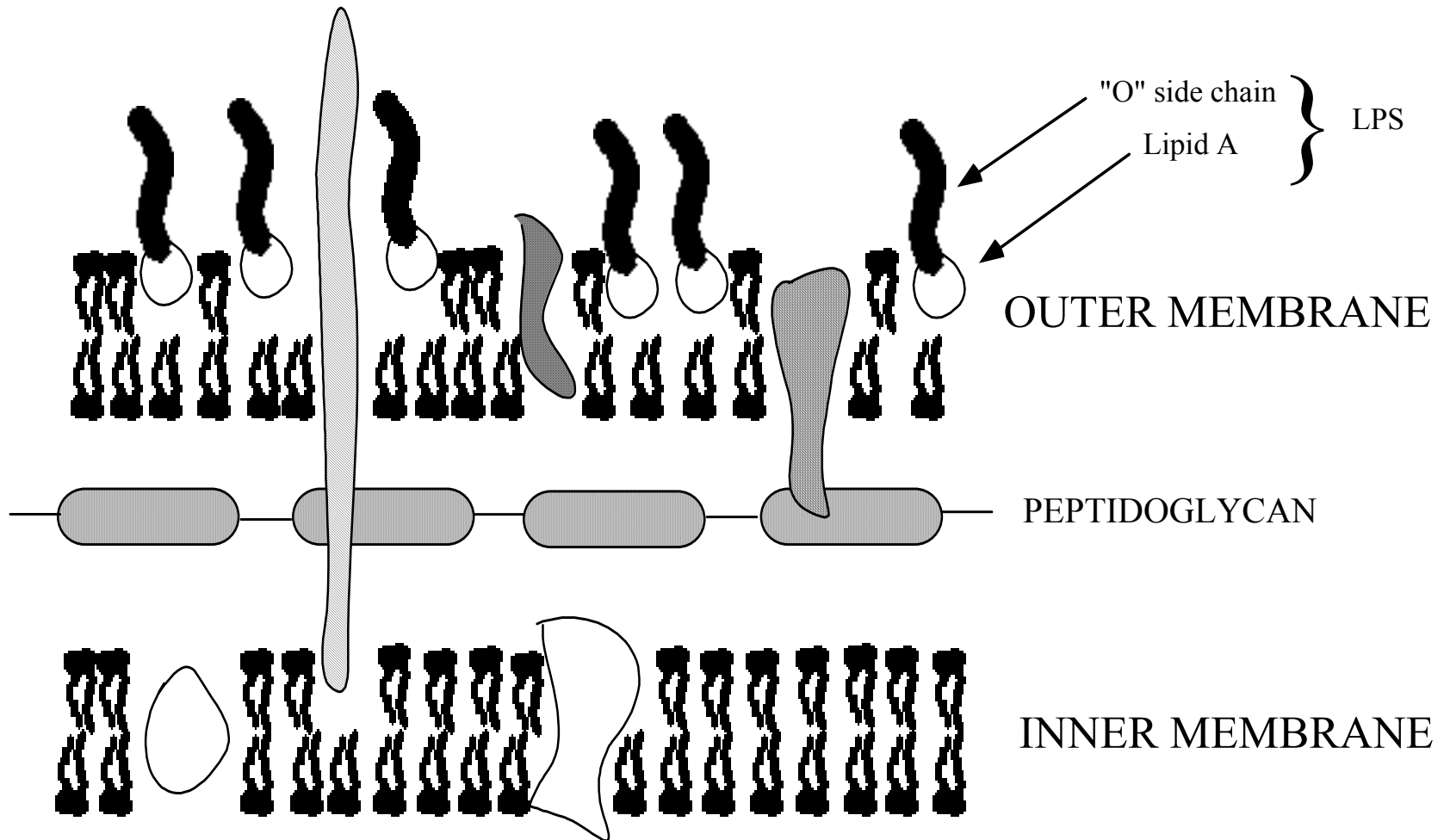
Fungi

Worms

SURFACE STRUCTURES OF GRAM POSITIVE BACTERIA



SURFACE STRUCTURES OF GRAM NEGATIVE BACTERIA

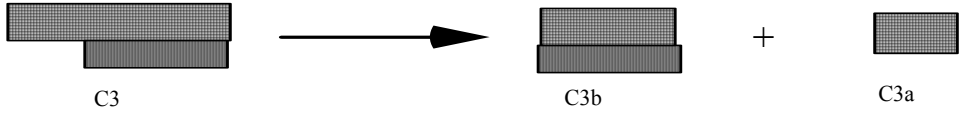


For whom theTolls

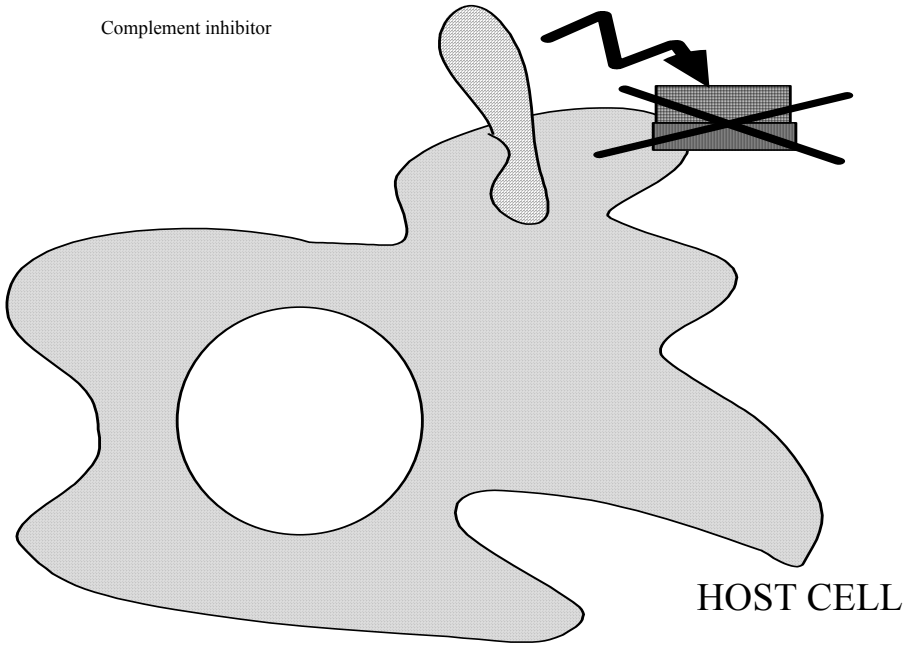
- TLR2 peptidoglycans and bacterial lipoproteins (N-acyl S-diacylglyceryl cysteine)
- TLR4 Lipopolysaccharide (endotoxin)
- TLR5 Flagellin
- TLR9 Unmethylated CpG DNA

Other PRRs

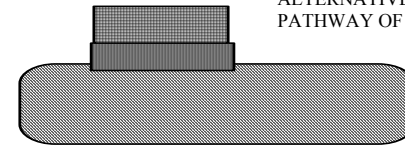
- F-Met-Leu -Phe receptor
– (a serpentine GPCR) f-Met peptides
- Mannose receptor Mannans
- Receptor for Lipotechoic acid
– (scavenger receptor family) Lipotechoic acid



Complement inhibitor

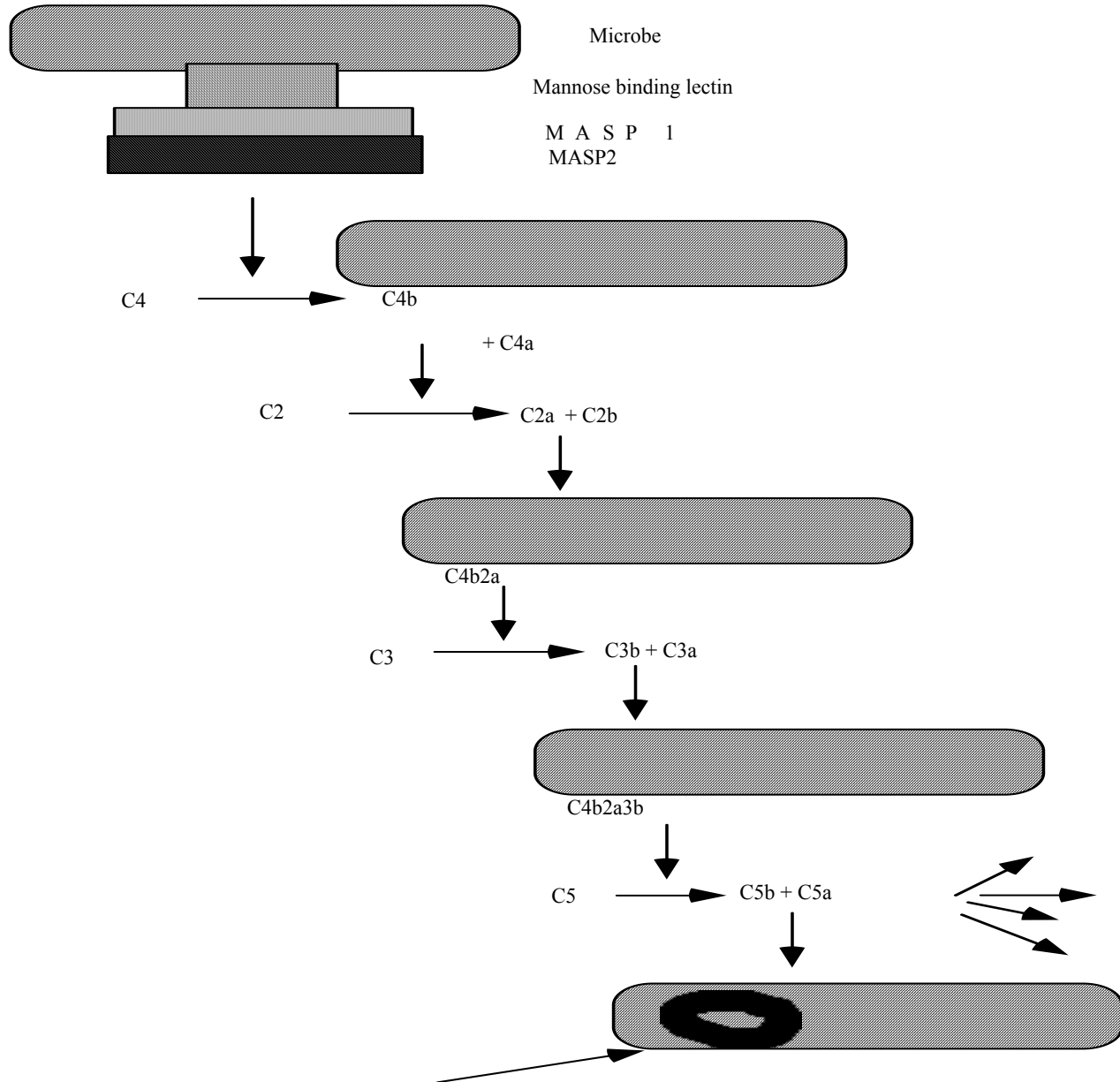


C3b COVALENTLY
ATTACHED TO MICROBES
ACTIVATES
ALTERNATIVE
PATHWAY OF COMPLEMENT

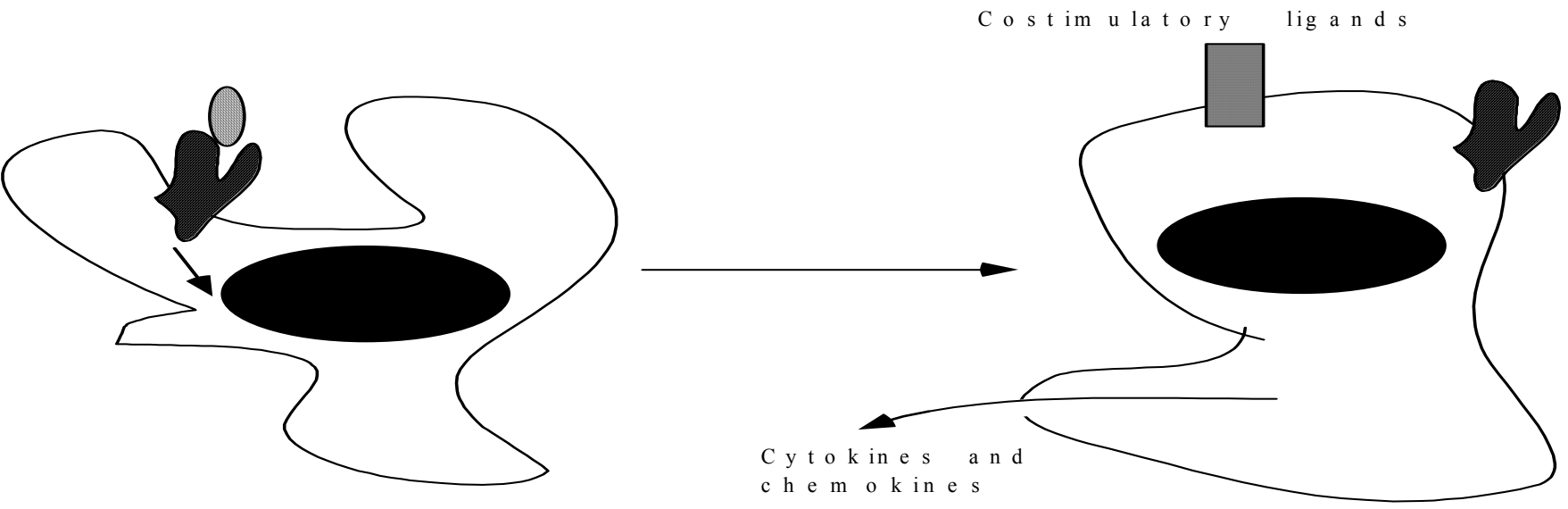


MICROBE

**MBL BOUND TO MANNANS INITIATES THE LECTIN PATHWAY
OF COMPLEMENT ACTIVATION**

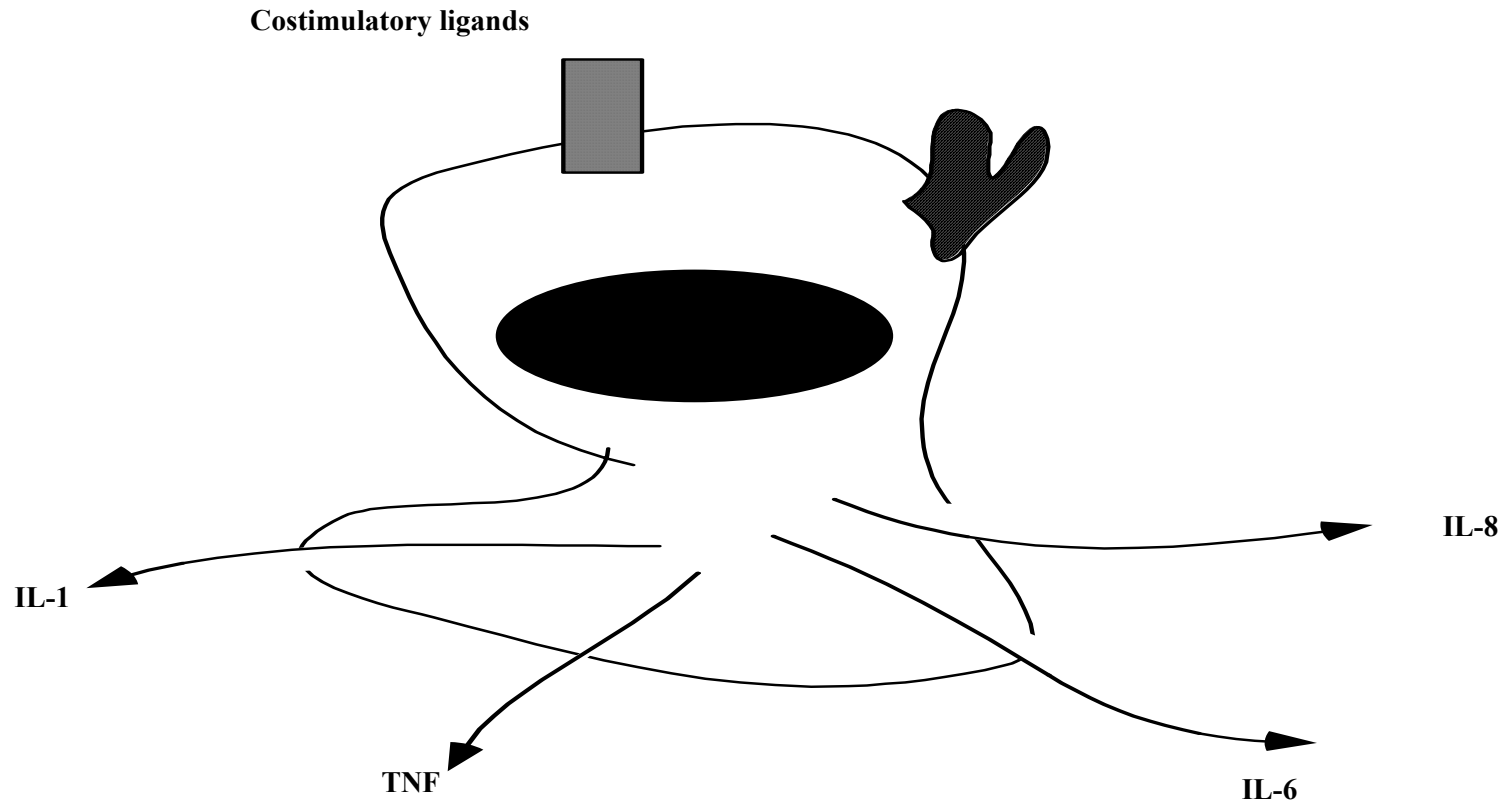


C5b-9 Membrane Attack Complex



PHAGOCYTE ACTIVATION

- 1 . INCREASED KILLING ABILITY
- 2 . SECRETION OF CYTOKINES AND CHEMOKINES
- 3 . EXPRESSION OF COSTIMULATORY LIGANDS



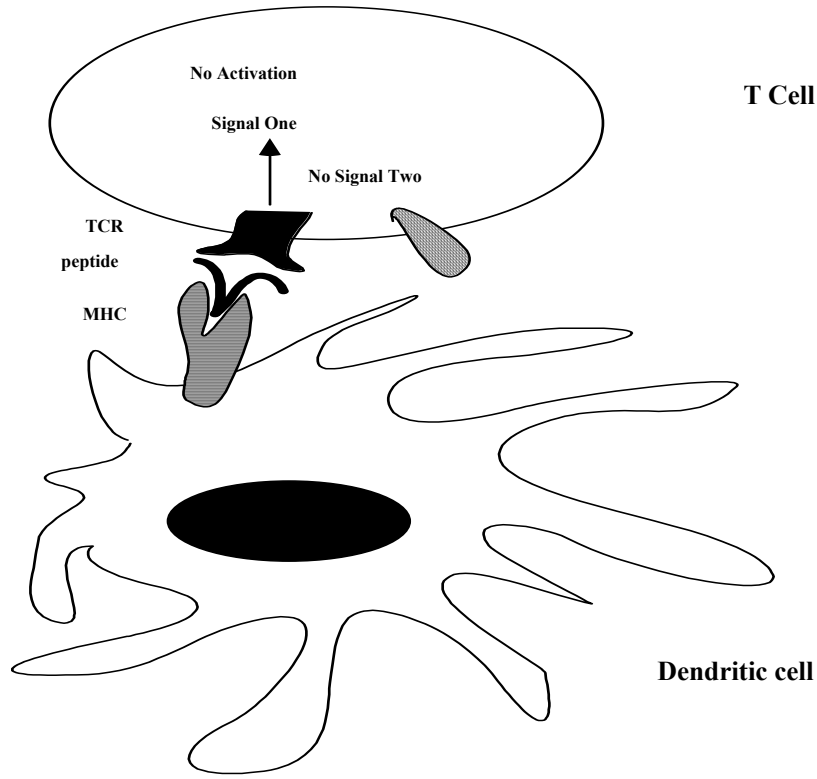
1. TNF, IL-1, IL-6 and IL-8 contribute to inflammation
 -increased vascular permeability, influx of phagocytes

2. "Acute Phase" response induced via hepatocytes by IL-6
 Transcriptional induction of:

- Fibrinogen
- α -2 macroglobulin
- Complement proteins
- C-reactive protein

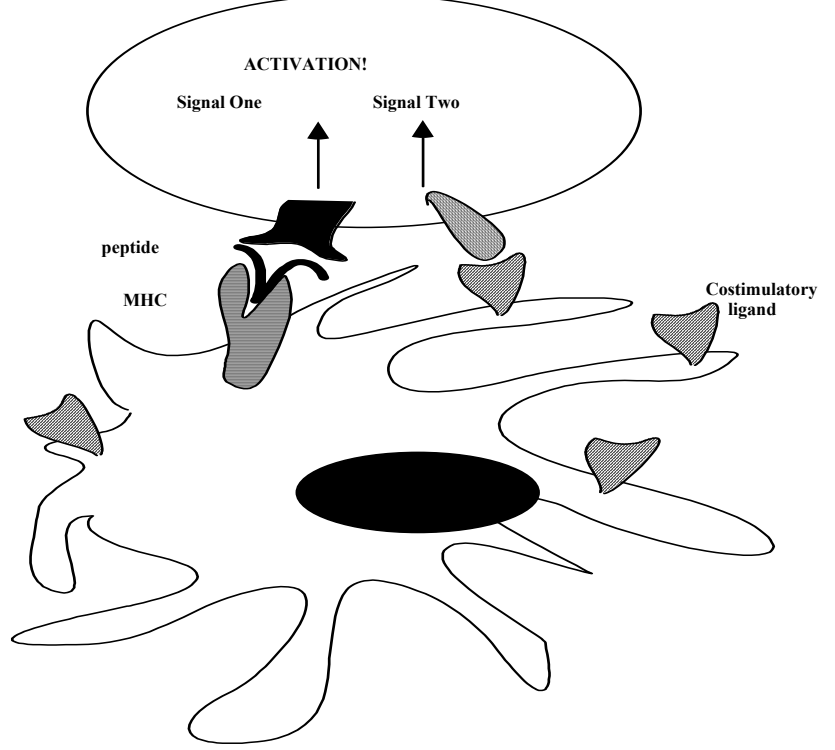
3. TNF and IL-1 can also reset the hypothalamic thermostat and contribute to an increase in body temperature

NO "DANGER"



T Cell

"DANGER !!!"



For more information and examples, see Immunobiology, by Janeway, C., Travers, P., Walport, M. and Capra, J., Garland Publishing, 5th edition, 2001 & Cellular and Molecular Immunology by Abbas, A., Pober, J., and Lichtman, A., W B Saunders; 4th edition,2000.