

# Innate and adaptive immunity

Innate	Adaptive
<b>Barriers ( <i>mechanical / chemical</i> ), enzymes peptides, complements cells ( monocytes macrophages neutrophils basophils eosinophil )</b>	<b>T cells &amp; b cells</b>
Non specific	Specific
<u>Monotonic ( always same response )</u>	<u>Increase magnitude &amp; speed in re-exposure</u>
Immediate ( minutes – hours )	Days
Better in recognizing self from non self	Less efficient in this type of recognition

## Regarding specificity & magnitude of speed

- Innate system**

The innate cells have **PRR** (receptors) for 1000 antigen (as an example); everyone has them we got them from our parents and will be giving them to or kids

- Adaptive system**

Depends on what antigens invade your body, BC each time a new antigen enters the body new T & B cells will be formed

Antigen	Immunogen	Hapten / tolerogen
Any particle that is <b>recognized</b> by the immune system	Antigen that stimulates an immune response	Antigen that doesn't stimulate an immune response
To get recognized need to be : <ol style="list-style-type: none"> <li>1. <b>in high MW</b></li> <li>2. <b>Complex ( proteins , carbs )</b></li> <li>3. <b>Foreign</b></li> </ol>	-	-

- Epitopes:** smallest part of antigen and it's the binding site with adaptive immunity or antibodies (antigenic determinants)
- Paratope:** the part that binds the antigen

Tolerogen	Haptens
<u>Things that induce tolerance</u>	<u>Very low molecular weight antigen need to conjugate to a carrier protein to induce the immune response</u>
Dust / it enters the body in small doses for a long time until no immune response	Like : penicillin Food additives , lipids

Receptors on innate cells are fixed (inherited) but in adaptive cells generated by somatic recombination

## Inflammation

Changes that happen	Signs of inflammation
Increased blood supply	Pain
Increased permeability	Heat
Expression of endothelial adhesion molecules	Redness & swelling
Activation of local innate cells to secrete chemotactic factors that recruit leukocytes	Loss of function

## PRRs

Toll like TRL	Scavenger	opsonin
Binding > signaling > phagocyte activation > cytokine secretion	Binding > signaling > phagocyte activation > internalization	<i>Indirect binding to microbe</i> :( coating the microbe to make it obvious) Act indirectly by binding to soluble molecules that engage the microbe The result is microbe internalization to the cell.

## Opsonization

*2 types*

<b>Complement receptors</b>	<b>Antibody receptors</b>
<u>C3b, c3bi, c4b</u>	<u>IGG, IGM</u>

*Antibody receptors*

<i>Direct</i>	<i>Indirect</i>
<u>IGG, IGA</u>	<u>IGM</u>

## Innate immune cells

Phagocytic	Non – phagocytic
- Neutrophil	- Basophils
- Mononuclear phagocytes	- Eosinophils
- Dendritic cells	- NK

## Functions of macrophages

“Please send crazy ants “

1) Phagocytosis of foreign particles the same as neutrophils (1) <u>Scavenger receptors</u> (2) <u>opsonin dependent phagocytosis</u> ; engulf antigen antibody complex as in viruses <i>via receptor for opsonizing IgG and complement C3b</i> , No receptors for IGM
2) Secretion of enzymes and oxidative metabolites if antigen is big, cause tissue damage (respiratory burst- oxygen radicals, NO, prostaglandins)
3) Cytokine production which recruit other inflammatory cells, as neutrophils ( <b>chemotaxis</b> ) by <i>TLR</i>
4) Antigen-Presentation to <i>T cells</i>

## The link between innate and adaptive immunity

*Its bidirectional, meaning that >> innate activates adaptive and the way around*

- 1) The innate stimulate the adaptive (*macrophage secret IL-12 and/ or IL-4 that activate T cells. C3d complement activate B cell. Antigen presentation to T cell by macrophages.*)
- 2) The adaptive immune response use some innate cells to eliminate the antigen (*T cells secret IFN gamma that activate macrophages*)