Topics

- Humoral Immune Response Part I
  - Antibody effector functions
  - Thymus dependent and independent antigens
  - Linked recognition
  - B cell Activation, proliferation and differentiation
  - Isotype switching, Affinity maturation
  - Distribution and function of Ab
  - Accessory cells

Extracellular Bacteria

- Destruction of extracellular bacteria
- Neutralize the toxins
- Prevents the spread of intracellular infections

Humoral Immune Response
Antibody effector functions

Thymus dependent antigens
- Proteins
- Require T cell help

Thymus independent antigens
- Bacterial Lipopolysaccharides (LPS)
- Do not require T cell
Fig 9.3

- Adhesion molecules interaction
- Stimulation via TCR
- CD40 / CD40 ligand stimulation (Accessory signal)

Fig 9.4 © 2001 Garland Science
Secretion of cytokines (IL4) by the Th2 cell

B cell proliferation and differentiation

- IL4, CD40 lead to B cell proliferation
- IL5 and IL6 lead to B cell differentiation into plasma cells

Isotype switching

- A variable region can be associated with the constant region of any isotype
- mRNA splicing
- IgM
- IgD
- IgA
- IgG
  - IgG1, IgG2a, IgG2b, IgG3
- IgE
Cytokines determine Isotype

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<th>IgM</th>
<th>IgG3</th>
<th>IgG1</th>
<th>IgG2b</th>
<th>IgG2a</th>
<th>IgE</th>
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Fig 9.7: Immunobiology, 4th ed., Garland Science 2001

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- B cell is activated
- Migrate to primary follicles of spleen and lymph nodes
- Proliferates and forms germinal center (follicular dendritic cells)
- Proliferating B cells are called centroblasts (random somatic hypermutation of V region)
- Produce centrocytes (positive selection by FDC)
- Differentiation into memory cells and Ab producing plasma cells (Th cells)

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Figure 9-9: Immunobiology, 4th ed., Garland Science 2001
Affinity maturation
Caused by:
- somatic hypermutation
- Selection cells with high affinity receptors

Centrocyte selection at the germinal center
Take up foreign Ag from FDC?
Yes
Interaction with T cells
↓
Differentiation
No
↓
Apoptosis
Distribution and function of Ab

- Pathogens are can grow in all the body
- Ab need to be available in all the body

- Route of entry of pathogens:
  - Epithelial barries:
    - Mucosa of the respiratory, digestive, urogenital tract, damaged skin
  - Directly to the blood
    - Insects, wounds, needles
IgM

- First to be produced
- Low affinity
- Forms pentameres (high avidity)
- Large, confined to the blood
- Activates complement

IgG

- Monomeric
- IgG forms dimers
- IgG is the most important in the blood
- IgG Opsonization, Complement activation, neutralization
- Transported through placenta
- IgG is the most important in the blood
- IgG Opsonization, Complement activation, neutralization
- Transported through placenta

IgA

- Forms dimers
- IgA is most important in secretions (epithelium of intestine and respiratory tract)
- Neutralizing antibodies
- Present in mother’s milk

IgE

- Monomeric
- Binds receptor in mast cells beneath skin and mucosa
- Acts as a receptor
- Binding causes degranulation of mast cells
Distribution of Igs

- IgG, IgM:
  - Plasma
  - IgG, IgA (monomeric):
  - Extracellular fluid
- IgG
- Fetus
  - IgA (dimeric):
  - Secretions, cross epithelia
- IgE
  - Mast cells beneath epithelia