

Day 8 (Immunology)

Natural Killer Cells (NK cells)

- larger, contain more cytoplasm, have dense granules
- produced in bone marrow
- Missing Self Hypothesis - recognises abnormal cells by presence of MHC class I
- Uses FcγR III to recognise antibody-coated microbes / tumor cells - recognise immunoglobulin
- Have FasL molecules - FasL binds to Fas on surface of virus infected cell, induces apoptosis

Steps of NK-mediated cytotoxicity:

- ① Target binding & recognition
- ② MTOC and granule migration to immune synapse
- ③ Granule exocytosis
- ④ Perforin creates pores → granzyme delivered
- ⑤ Release of CTL from apoptotic target cell.

Enzymes involved:

- Granzyme - induction of apoptosis in cell
- Perforin - creates pores in cell memb. to deliver granzyme
- Serglycin - packaging and stabilising of granule contents

② B cells

- name from Bursa of Fabricius in birds
- produced in adult bone marrow, activated by T_H cells
- produce IgA, IgE, IgG antibodies
- Antigenic peptide \rightarrow recognised by $T_H \rightarrow$ B cell activated \rightarrow differentiates into plasma cells \rightarrow soluble antibodies produced
- Plasma cells have extensive protein making machinery

Lymphocyte repertoire - the total no of antigenic specificities the body is responsive against

\hookrightarrow How are B cells so diverse and individually specific?

We shall be talking of 3 processes that are responsible for this generation of diversity.

- ① Affinity maturation: The lymphocyte repertoire is so diverse that it can bind to any possible antigen, albeit with low affinity. Repeated stimulation with antigen, can make B cells make antibodies with higher affinity.
- ② V(D)J recombination: Combinatorial joining of V, D & J gene segments necessary for assemblage of heavy chains & light chains generate diversity.

③ Somatic hypermutation: Affinity maturation is due to the accumulation of point mutations specifically in heavy and light chain coding sequences. This can happen when B cell is stimulated by antigen.

• B cells are monospecific - all antibodies produced by a single cell are identical.

| Surface molecules | Function |
|--|---|
| The B-cell receptor complex | |
| • Antibody (IgM and IgD on mature B cells) | B-cell receptor (BCR) for antigen |
| CD79a/CD79b (Ig α /Ig β) heterodimer | Mediates cellular activation on binding of BCR to antigen |
| Co-receptors | |
| • CD19 | All these molecules modulate B-cell activation |
| CD20 | Influences B-cell activation |
| CD21 (complement receptor CR2) | Ca ²⁺ channel |
| CD32 (Fc γ RII: Fc receptor for IgG) | Binds to C3d, C3bi |
| • CD40 | Binds to IgG complexed to antigen |
| | Signals B-cell activation and antibody class switching after engagement of CD40 ligand (CD154) on activated T cells |
| Molecules required for T-cell activation | |
| • MHC class II molecules | Present peptides to Th cells |
| • CD80/CD86 (also called B7.1, B7.2) | Bind to CD28 on T cells to trigger their activation |
| Adhesion molecules | |
| ICAM-1 | Binds to LFA-1 and facilitates interaction with T cells |
| LFA-3 | Binds to CD2 and facilitates interaction with T cells |