Micro 204

Flipped Classroom Session

Antibodies

IgE and IgA

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IgE Antibody Function

- IgE antibodies bind to FcεRI on mast cells or basophils.
- Upon crosslinking by allergens, IgE antibodies trigger mast cell or basophil degranulation.
- This leads to the release of mediators including histamine, chemokines, and cytokines.
- Mediators promote inflammation.

Parasitic worm
Normal Functions of Antibodies

Neutralization
- Viruses
- Toxins

Opsonization
- Bacteria

Complement activation
- Bacteria

Antibody-dependent cytotoxicity
- Toxic granules

Parasitic worm
- Mast cell
- Inflammation

Foreign/infected cell
- IgE

Macrophage
- IgA
- IgG
- IgM
- IgA
- IgM
- IgG

IgG

IgM
Differences in Fc Receptors

- Mast Cell: FcεRI
- Macrophage: FcγR
- IgE
- IgG

bacteria
Changes in Antibodies

- **Class switch recombination**

  - Membrane vs secreted
    - Transmembrane & Intracellular Domains

- **Affinity maturation**
  - Low affinity to high affinity
  - Mutation, selection

- **Variable region**
  - (antigen-binding)

- **Constant region**
  - (function)

**IgE**

**IgG**

**IgM**

**IgD**

**IgA**

**AID**

**B cell**

**Plasma cell**
B Cell Differentiation Pathways

- Activated B Cell
- Affinity Maturation
  - Hypermutation, Selection

  
  Germinal Center

  - Short-Lived Plasma Cell
  - Long-Lived Plasma Cell
  - Memory B Cell
Germinal Center Selection

Antigen

BCR signal

highest affinity

T cell help

highest affinity

Apoptosis

Proliferation

Differentiation

Memory B Cell

Plasma Cell

GC B Cells
Helminth parasite model: 
*Nippostrongylus brasiliensis* infection
Differences in Kinetics of Antibody Responses

Infection
*N. brasiliensis*
L3 larvae


Differences in IgG1 vs IgE Germinal Center B Cell Responses

\[ \text{IgG1}^+ \text{ Germinal Center B Cells} \quad \text{IgE}^+ \text{ Germinal Center B Cells} \]


Questions

- Why do IgE$^+$ B cells disappear from the germinal center?
- What are the implications for the IgE antibody response?
Why IgE B cell lifespan and affinity may be limited

- Parasitic worm
- Mast cell
- Inflammation

Neutralization
- Viruses
- Toxins

IgE
- Systemic IgE activation
  - Loss of consciousness
  - Hives
  - Swelling of tongue, inability to swallow
  - Rapid swelling of throat tissues

IgG

IgA

Anaphylaxis