Two Sides of the Adaptive Immune System

**Humoral** = Immediate sensitivity
Antibodies (Type I, II, III)
Two Sides of the Adaptive Immune System

**Cellular** = Delayed sensitivity (Type IV)

24 - 48 hours after exposure

CONTACT DERMATITIS
**HUMORAL (ANTIBODY-MEDIATED) IMMUNE SYSTEM**
Control of freely circulating pathogens

1. A B cell binds to the antigen for which it is specific. Usually requires cooperation from helper T cell.

2. The B cell, often with stimulation from a helper T cell, differentiates into a plasma cell.

3. Plasma cells proliferate and produce antibodies against the antigen.

**CELL-MEDIATED IMMUNE SYSTEM**
Control of intracellular pathogens

1. A T cell binds to MHC-antigen complexes on the surface of the infected cell, activating the T cell (with its cytokine receptors).

2. A helper T cell produces cytokines that cause the activated T cell to differentiate into a cytotoxic T cell. These cytokines also influence the formation of plasma cells and activated macrophages.

3. The infected target cell is lysed by the cytotoxic T cell.

Intracellular antigens expressed on the surface of a cell infected by a virus, bacterium, or parasite. (Also may be expressed on surface of an APC.)
GALT = Gut Associated Lymphoid Tissue

- Peyer's Patch
- villi
- lymph follicle
- germinal center
- muscularis externa
BALT = Bronchial Associated Lymphoid Tissue
GENITAL TRACT

• **no** associated lymphoid tissue
• **no** clear site of immunologic priming
Why Doesn’t the Genital Tract have Lymphoid Tissue?

Self or non-self for the woman?

Pelvic Inflammatory Disease

STD
Exposure to Pathogens

Antigens

- Foreign proteins
- Viruses
- Bacteria
- Parasites
- Fungi
Antigen Processing

Macrophage

T cell

B cell

Bacteria
Remember the 5 Classes of Antibodies

- Ig = Immunoglobulin
  - IgG = “Good” major antibody class
  - IgA = “Appetite” to “A” hole, orifices
  - IgM = Macroglubulin, first one out
  - IgE = “Evil”, causes allergies
  - IgD = “Dumb class”, does nothing
Antibody Structure

- **Two Heavy Chains**
  - IgA = $\alpha$ Alpha
  - IgD = $\delta$ Delta
  - IgM = $\mu$ Mu
  - IgE = $\varepsilon$ Epsilon
  - IgG = $\gamma$ Gamma

- **Two Light Chains**
  - Kappa $\kappa$
  - Lambda $\lambda$
Antibody Drawing
BACTERIAL CAPSULE: The slippery capsule of *Streptococcus pneumoniae* enables these bacteria to avoid being eaten by neutrophils.
Antibodies Working for YOU!
Putting It All Together…

- APC
- T helper cell
- Activated T helper cell
- Cytotoxic T cell (T\textsubscript{c})
- Antibodies
- Memory B cell
- Plasma cell
- Memory T\textsubscript{c}
- Effector T\textsubscript{c}
- Lysis
HIV

An infection of T Helper or CD4 Cells

Figure 4
Virus attaches to healthy T-cell

Figure 6
The viral RNA and the reverse transcriptase change the T-cell, giving it a new set of codes/info
CD4 CELLS with HIV
ALLERGIES?

(c) www.ohmygoodness.com
Phase 1: Sensitization

- Allergens
- Antigen-presenting cell
- Processed allergens
- CD4 T cell
- B cell
- Plasma cell
- IgE antibodies
Phase 2: Clinical Disease

Early Inflammation

- Allergens
- IgE antibodies
- Mast cell
- Mediator release
- Blood vessels
- Nerves
- Glands
- Sneezing
- Rhinorrhea
- Congestion

Late Inflammation

- Cellular infiltration
  - Eosinophils
  - Basophils
  - Monocytes
  - Lymphocytes

Late-phase reaction

- Hyper-responsiveness
  - Priming

Resolution

Complications

Irreversible disease (?)
Allergic Rhinitis
The Eyes Have It!
In the midst of final exams, Noreen developed an allergic reaction to algebra.
ST DOB: 04-09-1995
Skin Tests 12-28-2001 Weeds, Trees, Mixed Grass, Cat Pelt
Three Legged Stool of Allergy Treatment

1. Avoidance
2. Medications
3. Immunotherapy
Avoidance
Medications
Immunotherapy
Normal Endoscopy
Endoscopy - Sinusitis
Vocal Cord Dysfunction

Ray Davis, Susan Brugman, Gary Larsen, JACI, 118, 6, 1329-31
June, 2007
Vocal Cord Dysfunction (VCD)
Exercise Induced Laryngeal Dysfunction (EILD)

1. VCD
2. Exercise laryngeal prolapse
3. Exercise laryngomalacia
Type IV Hypersensitivity - A Delayed Reaction

CONTACT DERMATITIS

Antigen (red dots) are processed by local APCs

T cells (blue cells) that recognize antigen are activated and release cytokines

Inflammatory response causes tissue injury

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Antigen is presented by APC’s to antigen-specific memory T cells.

They become activated and produce chemicals that cause inflammatory cells to move into the area, leading to tissue injury.

Inflammation by 2 - 6 hours with peak in 24 - 48 hours.
ALLERGIC CONTACT DERMATITIS

Sensitization

Allergen

Stratum Corneum

Epidermis

95% Keratinocytes

Dermis

Elicitation

Langerhans Cells

Inflammation

IL-18

activated T-Cells

draining Lymphnode

naïve T-Cells