Chapter 19: Immunological disorders

Lecture

Hypersensitivities Autoimmune diseases Immunodeficiencies- HIV

<u>Lab</u>

Major unknown

Hypersensitivities





Figure 18-2a Microbiology, 6/e © 2005 John Wiley & Sons

Figure 18-2b Microbiology, 6/e © 2005 John Wiley & Sons

Type I: anaphylactic reactions



Figure 18-4a Microbiology, 6/e © 2005 John Wiley & Sons



<u>Sensitization</u>: B cell makes IgE to Ag; IgE binds to mast/basophil cells

<u>Secondary exposure</u>: immediate reaction due to crosslinking of > 1 IgE by Ag on mast/basophil cell \rightarrow degranulation

Reaction time: usually <30 minutes

Figure 19.1a

Type II: cytotoxic reactions ABO blood group system



Type II: cytotoxic reactions hemolytic disease of newborn



Type III: immune complex reactions



Immune reaction against soluble antigens

Ratio of antibody to antigen (slight excess of antigen) \rightarrow binding occurs \rightarrow complex sticks into basement membrane of cells \rightarrow triggers inflammation via neutrophils

Reaction time: 3-8 hours



Type IV: cell mediated reactions



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Sensitization: Ag phagocytized and presented by macrophage → stimulates T-cells

Secondary exposure: memory T cells activate T cells/ macrophage which migrate to site and release cytokines

Reaction time: 1-2 days ("delayed hypersensitivity reaction")

Autoimmune diseasescytotoxic reactions





Grave's disease



Myasthenia gravis

Autoimmune diseasesimmune complex reactions





Lupus Hardin Library for the Health Sciences, University of Iowa

Macrophage Lymphocyte

Rheumatoid Arthritis Joint

Inflamed

cause joint destruction and deformity.

Joint



Inflammatory

Cytokines



Rheumatoid arthritis

rumatory-arthritis.com

Autoimmune diseasescell mediated reactions



Hashimoto's thyroiditis

Multiple sclerosis

dr.marahimi.com

Immunodeficienciescongenital



Severe Combined Immunodeficiency Disorder (SCID)



IgA immunodeficiency

Immunodeficienciesacquired



HIV infection



HIV infection





Stages of HIV infection



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Diseases associated with HIV infection

Pathogen or Disease	Disease Description
Protozoa Cryptosporidium parvum	Persistent diarrhea
Toxoplasma gondii	Encephalitis
Isospora belli	Gastroenteritis
Viruses Cytomegalovirus	Fever, encephalitis, blindness
Herpes simplex virus	Vesicles of skin and mucous membranes
Varicella-zoster virus	Shingles
Bacteria Mycobacterium tuberculosis	Tuberculosis
M. avium-intracellulare	May infect many organs; gastroenteritis and other highly variable symptoms
Fungi Pneumocystis jiroveci	Life-threatening pneumonia
Histoplasma capsulatum	Disseminated infection
Cryptococcus neoformans	Disseminated, but especially meningitis
C. albicans	Overgrowth on oral and vaginal mucous membranes (category B stage of HIV infection)
C. albicans	Overgrowth in esophagus, lungs (category C stage of HIV infection)
Cancers or Precancerous Cond Kaposi's sarcoma	itions Cancer of skin and blood vessels (caused by human herpessirus 8)
Hairy leukoplakia	Whitish patches on mucous membranes; commonly considdeed precancerous
Cervical dysplasia	Abnormal cervical growth

Transplants- an induced disorder of the immune system



Stem cells- a way around tissue transplant rejection?

Totipotent stem cells: first few cells produced after fusion of sperm and egg; capable of generating all tissue types

<u>Pluripotent stem cells</u>: cells derived from totipotent cells; capable of generating multiple tissue types from the three germ layers

<u>Multipotent stem cells</u>: cells capable of generating cells of related type (e.g. Hematopoietic stem cells can form blood and lymphatic tissue)

<u>Unipotent stem cells</u>: cells can only form one cell type, but can regenerate

Stem cells



Stem cell sources

THE PRESENT Embryonic stem (ES) cells: pluripotent

Umbilical cord stem cells: multipotent and some pluripotent

Adult stem cells: rarely pluripotent, mostly unipotent

AND FUTURE

- Induced pluripotent stem cells (iPSC): insertion of 4 genes into fibroblast with retroviral vector (11/07)
- iPSCs from murine embryonic fibroblasts using recombinant cellpenetrating reprogramming proteins (4/09)
 - iPSCs using fibroblasts and microRNA (4/11)
 - iPSCs from exfoliated renal epithelial cells (11/12)

Independent study

Attendance is still counted at this point in the semester.
You must attend all classes for Case Study material.

2. Print out Case Study Handout, Glossary, and first Case Study: Skin and Eye Diseases and bring to class on Thursday

