

BI385 – Immunology
 Semester II 2011-2012
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Contact Information

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 OH: Tr 12noon -1:30pm; F 8:30am-10:00am

Text

Immunobiology 8th ed. Murphy ISBN: 978-0815342434
 (Available at BU Bookstore)

Course Website

<http://Blackboard.bu.edu>

BI 385 Immunology: Prereq: BI 203, BI 206, Junior standing. Recommended BI 315. The constituents and regulation of mammalian immune systems are described at the levels of the gene, protein, and cell. Topics include innate immunity; T cell, B cell, and MHC genetics, development, recognition and responses; signaling pathways; tolerance; memory; hypersensitivities; autoimmunity; transplantation; evolution and manipulation of defense systems. Three hours lecture, one hour discussion.

Date

Lecture Topics

Text Chapters

January 17	Introduction: The Self vs the Nonself Innate Immunity Anatomical/Physiological Barriers Players in Innate & Adaptive Immunity Cells, Tissues, and Organs	1
January 19	Complement (C') System Safeguards for Host from C' Damage Innate Immunity including Inflammatory Response	2, 3
January 24	Cell Adhesion Molecules Toll-like Receptors (TLRs) Cytokines: TNF- α , Interferons Natural Killer Cells Lymphocyte Subpopulations	3
January 26	Adaptive Immunity: The Large Picture Response to a Viral Antigen Response to a Bacterium/Toxin/Toxoid Clonal Selection Immunogens; Antigens; Superantigens	Handouts pp. 13-14 pp. 718-721 pp. 226-227

January 31	Exam 1	
February 2	Major Histocompatibility Complexes (MHCs) Antigen Processing for and Presentation in MHC class I MHC class II MHC Functions and Genetics	4: 142-143 6
February 7	Antigen Recognition by T, NKT, and T _{reg} Cell Receptors Antigen Recognition by B Cell Receptors Immunoglobulin Structure: Light & Heavy Chains; Variable/Constant Ends	4
February 9	Genetics of Lymphocyte Antigen Receptors: B cell Receptors (Immunoglobulins) Somatic Recombination: V,D &J gene segments Generation of Diversity: Combinatorial, Junctional, H & L Chain Combination, Somatic Hypermutation, Isotype Switching, T Cell Receptors	5
February 14	Continue Genetics Begin Signal Transduction in T Cells and B Cells Antigen Receptor Structures; ITAM Motifs	5 7
February 16	Activation of Transcription Factors Signal Inhibition Other Signal Receptors/Systems: Toll-like pathways, Chemokines, Cytokines Mechanisms of Apoptosis	7
February 21	No Class due to Monday Schedule	
February 23	Exam 2	
February 28	B Cell Development: Pro, Pre, Premature, Naïve Stages; Gene Rearrangements H and L chains, Allelic Exclusion; Cell Surface Proteins; Tolerance to Self	8

March 1	T Cell Development: Double Negatives, Double Positives, Single Positives, Naïve CD4 and CD8 T cell T Cell Gene rearrangements, Cell Surface Proteins Differences between T & B Cell Development Tolerance to Self B/T Cell Survival in Peripheral Lymphoid Tissues	8
March 6	T Cell Mediated Effector Responses Production of Armed Effector T Cells Properties of Armed Effector T Cells T Cell-Mediated Cytotoxicity Macrophage Activation by T _H 1 Cells	9
March 8	The Mechanism of HIV Infection Professor Thomas Gilmore	pp. 543-562
March 10-18	Spring Break	
March 20	Role of the Innate Immune System in pathogen- Induced Chronic Inflammation Dr Caroline Genco	3
March 22	Exam 3	
March 27	Humoral Immune Response: B Cell Activation by Armed T _H Cells; Reactions to Thymus Independent Antigens Immunoglobulin Functions: Toxin Neutralization, Viral/Bacterial Inhibition, Complement Fixation, Fc Receptor Function	10
March 29	Immunological Memory The Mucosal Immune System	pp. 448-460 12

April 3	Immune Manipulation vs Pathogens: Vaccines Factors to Consider: Safety (attenuation, acellular), Immunogenicity (adjuvants, conjugates), Memory, Rte of Immunogen Immune Manipulation vs.Tumors	pp.34 16: 693-711
April 5	Host Defenses in Time & Space: Infectious Agents and How They Cause Disease Pathogens Elude Host Defenses Immunodeficiency Diseases	13
April 10	Exam IV	
April 12	Immune System Pathology Hypersensitivities: Effector Cells & Molecules Type I (Anaphylactic) IgE Production; Types II & III; Type IV (Delayed) T cell Response	14
April 17	Cont. Hypersensitivities: Type IV (Delayed) T cell Response Immune System Pathology: Autoimmunity Genetic Factors & Environmental/ Disease Causes T & B Cell Contributions to Autoimmunity Control of AutoimmunityMonday Schedule	14 15:611-652
April 18	Monday Schedule	
April 19	Cont. Immune System Pathology: Autoimmunity Control of Autoimmunity	15
April 24	Responses to Alloantigens: Direct, Indirect, Hyperacute, Chronic, GVH Reactions; Fetal Tolerance Manipulation to prevent Rejection	15:652-664 16: 689=682
April 26	Evolution of the Immune System	pp.186-197
May 1		
May ?	Final Exam in Registrar's Schedule	

Grading

Exams (5)	90% (Exam 1: 16%, Exam 2: 18%, Exam 3: 18%, Exam 4: 19%, Exam V: 19%)
Discussion	10%
	100%

CAS Academic Code: The CAS *Academic Conduct Code* is strictly followed. Academic misconduct involves not only direct cheating on tests, but some more subtle acts as well. All work handed in for credit must be your own, with the exception that you may refer to other sources if you cite the references using the guide below. It is not permissible to use another student's work. You may discuss items with other students but your written work must be your own. If you have any questions you should consult Professor Godrick or the Teaching Fellow before the deadline. We are required to report cases of suspected academic misconduct to the Dean's Office. **Penalties for violations of the Academic conduct code may include suspension or expulsion from the University.**

Examples of References:

Hartwell, et al 2000. *Genetics from Genes to Genomes*. Chap. 24. McGraw Hill, NY
Hall, Stephen, 1997. *A Commotion in the Blood, Life and Death of the Immune System*. Henry Holt & Co. NY. 544 pp.
Shedlock DJ and Shen H Apr 11, 2003. Requirement for CD4 T cell help in generating functional CD8 T cell memory *Sci* 00:337- 339
Zinkernagel RM and Hengartner H. Jul 13, 2001 Regulation of the immune response by antigen *Sci* 293: 251-253
Special Section Jul 9,2004 Immunotherapy *Sci*:193-216
Special Section: Jul 13, 2001 Vaccines and Immunity *Sci* 293:228-236

Discussion Sections

The objective of the session is to look at current immunological techniques.

Students will select a protocol(s) upon which to report to the group examining a paper published within the last three years which uses a selected immunological technique. Students can choose from but are not limited to the repertoire of immunological techniques listed below.

Discussion will center about (1) problems with the technique - accuracy, false negatives/positives etc, (2) alternative protocols experimenters might have considered, and (3) future work. It is estimated three students will present per session depending on size of discussion section(s).

Administration:

Each student will give instructor 1st, 2nd, and 3rd choices for topic and then be assigned for presentation throughout semester. The sessions will be organized so each meeting discusses a different protocol. Prior to talk, students will submit 1-2 page abstract of their talk for class distribution. Difficulty of protocol will be taken into consideration of presentation/abstract.

Grading:

Abstract	=	%
Presentation	=	%
Attendance/Participation	=	%
Discussion Section	=	10% of total grade.

You are expected to be punctual. **Attendance is not taken after the first five minutes.**

Possible Protocols (but not limited to) to Discuss

General

Adjuvant use

Enzyme-Linked Immunosorbent assay (ELISA); Capture/Sandwich ELISA

ELISPOT assays for T cells

Radioimmunoassay (RIA)

Competitive Inhibition Assay

Affinity Chromatography

Hemagglutination and Precipitin Reactions

Equilibrium Dialysis (Measurement of Antibody Affinity and Avidity)

Coombs Tests and Detection of Rhesus Incompatibility
Assays/Staining Techniques for Cytokines & Cytokine-Secreting Cells
Monoclonal Antibodies
Phage Display Libraries for Antibody V-region Production
Immunofluorescence Microscopy & Immunoelectron Microscopy
Immunohistochemistry
Immunoprecipitation and co-Immunoprecipitation
Western Blotting/Immunoblotting
Reverse Genetics Applications in gene product isolation/identification
Production of Antibodies by Genetic Engineering

Cellular Applications

Lymphocyte Isolation Procedures from Tissues/Blood
Flow cytometry- using fluorescence-activated cell sorter
Generation of B or T Cell Clones
Generation of B Cell or T Cell Hybrids from Hybridomas
Intracellular Cytokine Staining/Cytokine Capture
Spectratyping -Assay of Diversity of T-Cell Response
Biosensor Assays to Measure Disassociation of Antigen Receptors & Antigen
TUNEL Assay
Assay for Different Cell Types: CD8 T Cells; CD4 T Cells
Microarrays for Gene Expression in Different Lymphocytes

Manipulation of Immune System

Assessment/Transfer of Protective Immunity
Hematopoietic Stem-Cell Transfers
In vivo Depletion of T or B cells
Small RNAs (RNAi or μ RNAs)
Transgenic Mice
Knockout Genes in Lymphoid Cells
Limiting Dilution Cultures
T-Cell Receptor Identification

Possible Journal Sources:

Adv Immunol	Inflammat
Annu. Rev. Immunol	Infect. Immun.
Bioassays	J. Infect. Dis.
J. Clin. Invest.	Nature
Curr. Opinions in Immunol	New Engl. J. Med.
Cur. Top. Microbiol. Immunol.	Proc. Nat Acad. Sci
Eur. J. Immunol	Science
Hum. Immunol.	Sem. Immunol.
J. Immunol	Trends in Microbiol
Immunobiology	
J. Immuno. Meth	
Immunopharmacology	
Immunol. Rev.	
Immunol. Today	
Immunotech.	