Instructor:
Michael Lynes, Ph.D.
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Class meetings T, Th  BSP 131

Office hours: No scheduled hours. I am in my office by about 8AM, and usually stay until about 6. Drop by my office, phone, or email to make an appointment.

course website: http://lynes.mcb.uconn.edu/classes.shtml

Teaching Assistant:
Andrew Turkenkopf

Recommended approach to studying this material:
1. skim assigned chapter before class, look at figures in chapter
2. take notes in class; copy notes over that night after class to ensure you understand what you wrote
3. read assigned chapter for comprehension
4. be certain to read primary literature assignments before the assigned date!

Administrative notes:
1. please turn off your cell phone before class
2. exam seating will be designated at the beginning of each examination
3. no electronic device usage will be permitted during examinations

Additional Information:
1. Departmental seminars are usually held on Thursdays at 11 AM; BSP 130
2. Relevant topics will be announced in class, and posted in the main lobby

Bonnie Lyons, DVM of the Jackson Laboratory will speak about chronic inflammatory disease (the viable motheaten model) and retinopathy on 10/21/04. (see required additional reading # 3).
Grades
Examinations will focus on material presented in class, and from the supplemental assigned readings. The final grade calculation will be made based on two hour exams (30% each), and the final examination grade (40%).

Statement on Academic Integrity
“A fundamental tenet of all educational institutions is academic honesty; academic work depends upon respect for and acknowledgement of the research and ideas of others. Misrepresenting someone else's work as one's own is a serious offense in any academic setting and it will not be condoned.

Academic misconduct includes, but is not limited to, providing or receiving assistance in a manner not authorized by the instructor in the creation of work to be submitted for academic evaluation (e.g. papers, projects, and examinations); any attempt to influence improperly (e.g. bribery, threats) any member of the faculty, staff, or administration of the University in any matter pertaining to academics or research; presenting, as one's own, the ideas or words of another for academic evaluation; doing unauthorized academic work for which another person will receive credit or be evaluated; and presenting the same or substantially the same papers or projects in two or more courses without the explicit permission of the instructors involved.

A student who knowingly assists another student in committing an act of academic misconduct shall be equally accountable for the violation, and shall be subject to the sanctions and other remedies described in The Student Code.”

(taken from the UCONN student handbook: http://www.dosa.uconn.edu/Code2.html#Part%20VI:%20Academic%20Integrity%20in%20Undergraduate%20Education%20and%20Research)
Semester Schedule

Date       Topic                                                                                   Readings

8/31       Introduction, overview of course
A. Organization of the course
1. content: lecture with associated primary literature readings
   (references are noted in outline)
2. additional resource materials: assigned text readings/note additional textbook
   features, websites
3. course format: lectures and discussions during class: feel free to ask questions in class; you may tape the lectures if you wish.

B. Historical roots of the study of Immunology
1. Immunology is a relatively young science
   a. 1798 Jenner: cowpox immunization
   b. 1891 Koch: DTH vs tuberculin Ag
   c. 1895 Bordet: C’ + Ab + bacteria = lysis
   d. 1901 Landsteiner: ABO blood groups
   e. 1914 Little: genetic theory of tumor transplantation
   f. 1936 Gorer: identification of MHC antigens
   g. 1939 Kabat and Tselius: Antibodies as gamma globulins

C. Overview of immunological system activation
1. Signal molecule → receptor molecule → information processing →
   tolerance or response
2. signal molecule = antigen; smallest unit that is recognized as non-self
3. Characteristics of the immune response
   a. specificity
   b. memory

D. Current trends in immunological research
1. manipulation of the response to disease
   a. AIDS
   b. cancer
   c. autoimmunity
   d. tissue transplantation
2. antibodies as enzymes
3. antibodies as probes of biochemical/cellular structure
4. psychoneuroimmunology
5. cytokine immunotherapies
6. xenogeneic transplants of humanized tissues

E. Lynes laboratory research interests
1. mechanisms of immunotoxicity/role of metallothionein
2. automated measurements of chemotaxis
3. GCSPR protein microarray platform applications
   a. use of the GCSPR platform for immune function characterization in 1G
   and microgravity
   b. GCSPR pathogen biosensor
   c. Cytometer on a chip
Basic components of the Immune Response

Kuby, Chapter 2

A. Cells
   1. hematopoiesis
      a. lymphoid lineage
      b. other cells (erythroid and myeloid lineages)
   2. structure/function of cells
   3. organization of cells into tissues
   4. lymphocyte traffic

B. Soluble components of the immune system
   1. antibodies (structure/function)
   2. complement (structure/function)
   3. cytokines (structure/function)

The experimental system

Kuby, Chapter 23

A. The experimental animal
   1. phylogenetic studies
   2. commonly used mammalian systems
      a. mouse: mendelian inheritance and breeding manipulations
      b. other mammalian animal systems
   3. man

B. Artificial systems
   1. culture techniques: in vitro
   2. immunologically compromised animals (will discuss more fully on 11/27)
      a. immunological mutants
      b. radiation induced immunodeficiency
   3. transgenic animals

Antigenicity and Immunogenicity

Kuby, Chapter 3

A. Antigenicity vs. immunogenicity
B. Fundamental characteristics of antigens
C. Prototypical antigens
   1. mitogens as polyclonal activators
   2. T-dependent and T-independent antigens
   3. the MHC as an antigenic system

Antibodies: structure and function

Kuby, Chapter 4

A. Immunoglobulin structure
   1. subunit structure
   2. heavy and light chains
   3. Fc, Fab, and F(ab’)2
B. Antigenic determinants of immunoglobulins
   1. isotypes and subclasses
   2. idiotypes
   3. allotypes
C. Functions associated with antibody fragments

Antibody/antigen Interactions

Kuby, Chapter 6

A. Antibody-antigen binding
   1. parameters of binding
   2. structural contributions to binding
B. Assays of antibody binding
   1. Precipitation
   2. Agglutination
3. Radioimmunoassay
4. ELISA
5. Fluorescent immunoassay/Flow cytometry
6. Western immunoblot analysis
7. Immunohistochemistry/Immunoelectronmicroscopy

C. Monoclonal antibodies

9/21 Antibody/antigen Interactions (continued)

9/23 Sources of antibody diversity

Kuby, Chapter 5

A. Genetics of antibody synthesis (the B cell receptor)
B. Generation of antibody diversity
   1. germline vs. somatic mutation
   2. associational, junctional and combinatorial diversity

Sample questions for the first examination will be handed out today in class

9/28 Major Histocompatibility Complex (MHC)

Kuby, Chapter 7

A. Discovery as a transplantation antigen, and genetics
B. Cellular expression/tissue distribution
C. Contribution to cellular recognition (genetic restriction)
D. Structure/function

9/30 •••••••• FIRST EXAM •••••••••••• will cover material through 9/23•••••••••••••

10/5 Cell biology of the MHC/protein biology

Kuby, Chapter 7 (con't)
of the MHC; antigen processing and presentation

A. Mechanisms of antigen association with MHC molecules
   1. endocytic pathway (exogenous antigen)
   2. cytosolic pathway (endogenous antigen)
B. Interactions of antigen/MHC with the T cell antigen receptor

10/7 T cell/antigen interactions

Kuby, Chapter 9

A. structure of the TcR
B. genetics of TcR
C. Other molecular components of the TcR
D. Signal transduction following TcR engagement

10/12 Consequences of TcR engagement

Kuby, Chapter 10

A. T cell populations in the thymus and periphery
B. T cell maturation
C. Mechanisms of T cell activation
D. Products of T cell activation (see soluble mediators)

10/14 Cell mediated immunity (CMI)

Kuby, Chapter 14

A. Cytotoxicity
B. Delayed type hypersensitivity
C. Immunological protection conferred by CMI

10/19 Soluble mediators of immunity:

Kuby, Chapter 12, 13

A. Cytokines and lymphokines: structure and function
B. Lymphokine receptors
C. Complement

10/21  **Humoral immunity**  Kuby, Chapter 11
A. Characteristics of humoral immune response
B. Cells participating in humoral immune response
C. Steps in B cell activation
D. Affinity maturation and class switching

10/26  **Immune responses to infections agents**  Kuby, Chapter 17
ref #[2]
A. Viral
B. Bacterial
C. Protozoan
D. Invertebrate parasites

10/28  **Manipulation of the Immune Response**  Kuby, Chapter 18
A. Vaccines (live/attenuated/killed; protein;DNA)
B. Drugs
C. Irradiation

Inappropriate immune responses
Kuby, Chapter 16
A. hypersensitivities

11/2  **Inappropriate immune reactions:**  Kuby, Chapter 20
A. Autoimmune disease
   1. Animal models
   2. Human diseases
      b. treatment

11/4  Inappropriate immune reactions (autoimmunity, continued)

11/9  •••••••• EXAM •••••••• will focus on material from 9/28 through 11/4, and will depend on material from the first section of the course. Note that you are responsible for material in the required readings that are available from the reserve desk at the library, and as electronic documents.

11/11  **Immunodeficiencies**  Kuby, Chapter 19
A. Animal models for congenital syndromes
   1. nude
   2. SCID
   3. beige
B. Human congenital immunodeficiencies

11/16  **Immunodeficiencies (continued)**  Kuby, Chapter 19 (con't)
A. Acquired causes of immunodeficiencies
   1. Environmental
   2. Drug induced
   3. Viral
B. AIDS
   1. Etiology/viral replication cycle
   2. symptoms/immune effects
   3. epidemiology
   4. current and future therapies

11/18  B. AIDS (continued)
11/19-11/28  No class; Thanksgiving recess!

11/30  The immune response to cancer  Kuby, Chapter 22
       A. Mechanisms of carcinogenesis  reference #[5]
       B. Natural immune responses to neoplasia
       C. Immunological diagnosis of neoplastic disease
           1. tumor antigens
       D. Immunotherapies for neoplasia
           1. “magic bullets”: immune conjugates
               a. antibody/drug conjugates
               b. antibody/radionuclide conjugates
           2. anti-idiotypic antibodies
           3. irradiation and transplantation to reconstitute immunity
           4. TILs, LAKs
           5. Gene therapies

12/2  The immune response to cancer (continued)

12/7  Transplantation Biology  Kuby, Chapter 21
       A. Immunological mechanisms of histoincompatibility  reference #[6]
       B. Manipulation of histoincompatibility
           1. General
           2. Specific
       C. Clinical value of transplantation

12/9  Overview and final comments

12/13-12/18  EXAM PERIOD; the date for the MCB 211 final exam to be announced ********** the final exam will emphasize material from 11/11 through 12/9, and will cover material from the entire course. Note that you are responsible for material in the required reserve readings.
Required Textbook

Textbook website
http://bcs.whfreeman.com/immunology5e/

Required additional reading from the scientific literature:


   http://jvi.asm.org/cgi/content/full/75/18/8752?view=full&pmid=11507220

   http://www.bloodjournal.org/cgi/content/abstract/98/8/2526

   http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VJ0-42M793FD&_user=669286&_handle=B-WA-A-A-EWY-MsSAYWA-UUW-AUECWBWWVV-AUEWYABUVV-CDAZEBVZZ-EWY-U&_fmt=full&_coverDate=03%2F31%2F2001&_rdoc=348&_orig=browse&_src=%23toc%236080%232251%23999669998%2323238189!&_cdi=6080&view=c&acct=C000036298&_version=1&_urlVersion=0&_userid=669286&md5=70d12e41d850cda0a2e8e65145a42a90
Some website addresses of interest to immunologists:
Immunology techniques, biological materials, and instrumentation websites
1. http://flowcyt.cyto.purdue.edu/flowcyt/societes/index.htm {a list of worldwide flow cytometry associations}
3. http://www.bdfacs.com/home.htm {a home page for a flow cytometer manufacturer}
4. http://www.atcc.org/ {a homepage for the American Type Culture Collection; a source of cell lines and genetic resources}
5. http://www.jax.org {a resource of inbred mouse strains, transgenic and knockout mice}
7. http://flowcyt.cyto.purdue.edu/flowcyt/supplier/reagents.htm {a webpage listing of antibodies and other reagent suppliers}

Immunology databases
2. http://www.blacksci.co.uk/products/journals/jnltitle.htm {an HIV database hosted by Roche pharmaceutical}
2. http://cancernet.nci.nih.gov/ord/diseases.html {the office of rare diseases at NIH; for autoimmune diseases like Lupus, arthritis}

Genome databases
1. http://www.informatics.jax.org/userdocs/overview.shtml {mouse genome information}

Scientific journal websites
1. http://www.cell.com/ {the journal Cell}
3. http://www.jimmunol.org/ {The Journal of Immunology}
5. http://www.blacksci.co.uk/products/journals/jnltitle.htm {a host of journals from this publisher, including Immunology and Immunology and Cell Biology}

Scientific funding websites
1. gopher://gopher.nih.gov:70/77/gopherlib/indices/crisp/index? {a site from which to search for currently funded NIH grants}
2. http://www.nih.gov/grants/oer.htm {the National Institutes of Health website}

Scientific document search engines

Scientific reagent and instrumentation companies:
1. http://www.pharmingen.com/ {a supplier of monoclonal antibodies to human, mouse antigens; also a subsidiary of Becton Dickinson, a flow cytometry company}