

SYLLABUS - SPRING 2008 – BCHB 525 CONCEPTS OF IMMUNOLOGY**PROFESSOR: Dr. Edward C. Kisailus****tel: 716-888-2558****Email: kisail@canisius.edu****COURSE DESCRIPTION**

This course will cover the biochemical recognition of chemical structures by antibody and cell receptors of the immune system; and analyze these interactions as related to the biological activity and function in the immune system. The role of antibody as the principal product of the humoral immune system will be discussed from a viewpoint of antibody specificity in recognizing and binding to structurally distinct antigens. Cell to cell interaction and subsequent signal transduction will be covered from the aspect that cells contain receptors that induce the immune system to recognize and respond to antigen. The cell mediated immune (cmi) system will be explored from the aspect that tumor cells contain chemical structures that cells of this arm of the immune system recognize and respond. All discussions will, where appropriate, connect these basic science principles to the applications of immunology to biotechnology.

OBJECTIVE:

Students will be able to:

1. Describe, define and identify chemical structures and their role in the immune system.
2. Comprehend, explain and distinguish cells of the innate and adaptive immune system and their function to recognize specific chemical structures.
3. Apply and demonstrate which biochemical mechanism(s) cells use to evoke the immune response
4. Analyze, compare and contrast methods used to study the humoral and cmi responses.
5. Compose, organize, write and present in-class a presentation encompassing the diverse elements of objectives 1 – 4 in monoclonal antibody and immunotoxin therapies.
6. Describe and evaluate methodologies to attain a successful therapeutic monoclonal antibody or immunotoxin

MAJOR TOPICS:

1. The immune systems: humoral and cmi
2. Immunoassays: the interaction of antibody and antigen.
3. Antigens: structure of protein, carbohydrate, and lipid
4. Antibodies: effectors of humoral immunity
5. Cells of the immune response: cell structures that recognize antigen.
6. Induction of the immune response: theories of antibody formation
7. Cell mediated immunity

REQUIRED TEXT: Murphy, K., Travers, P, and Walport, M.: *Immunobiology: The Immune System in Health and Disease*, Seventh Edition, 2008, Garland Publishing.

EVALUATION: There will be two examinations, and a student project.

Exam 1: 40% Exam 2: 40% Paper and Presentation: 20%

STUDENT PAPER:

The science of immunochemistry has become a part of biotechnology. I coined the term immunobiotechnology to reflect how the basic science and principles of immunochemistry have been adapted to a variety of technologies. Among these technologies one could identify monoclonal antibodies, over-the-counter immunoassays, immune-enhanced tumor killer cells, DNA-based vaccines, to name a few. Naturally with a new technology comes industry, the immunobiotechnology industry. My idea for this year's BCHB 525 Immunology student project is to have you research therapeutic monoclonal antibodies and therapeutic immunotoxins; and using our textbook, classroom discussions, and primary research papers thoroughly dissect:

1. How these molecules are developed
2. The nature of the disease to which the molecules are efficacious
3. How these molecules work as a therapy
4. The company and/or laboratory that markets and/or researched the therapeutic agent

FOR THE PAPER:

You will be responsible for reading current, original scientific articles in areas pertinent to your therapeutic molecule. These papers are to become your paper and will be a large part of your reference section for the paper. The company website is an excellent start to get information. The research papers are to be used to give the background to items 1 – 4 listed above.

The monoclonal antibodies are all on the market so should be relatively easy to find by googling. For the immunotoxins I found a very helpful reference from which I chose the targets for immunotoxins. The reference is Kreitman RJ. Immunotoxins for Targeted Cancer Therapy. *AAPS Journal*. 2006; 8(3): E532 - E551

Specifics

1. Wiki sites are not acceptable references since they are not edited for correctness of content
2. Paper length is at least fifteen pages double-spaced excluding references
3. Font is Arial
4. Font size is no larger than 11
5. Paper is due May 2, 2008

SPECIAL NOTE: Each student will present a five minute powerpoint presentation of their therapeutic monoclonal or immunotoxin. The number of slides is limited to 4. You should include a copy of the slides with your paper. The presentation is on Friday May 2, 2008. Be prepared to save your slides to the computer desktop. I will save the slides to an external hard drive.

Your slides and presentation should include:

1. Name of the monoclonal, therapeutic value and company marketing or researching
2. How the therapeutic was developed
3. Nature of the disease
4. How the molecule works as an efficacious treatment

LECTURE SEQUENCE: The following chapters will be covered in the order listed.

Chapter	Title (pages)	Chapter Pages
2	The Front Line of Host Defense Pattern recognition in the Innate Immune System Induced Innate Immune Responses to Infection	39 - 48 53 - 60 82 – 108
3	Antigen Recognition by B-cell and T-cell Receptors	111 – 142
4	Generation of Lymphocyte Antigen Receptors	143 – 179
5	Antigen Presentation to T Lymphocytes	181 – 217
6	Signaling through Immune System Receptors	219 – 256
7	The Development and Survival of T lymphocytes (The following sections related to T cell development will be discussed prior to chapter 8. The other sections relating to B cell development will be discussed prior to chapter 9)	273 -320
8	T-Cell Mediated Immunity	323 – 377
7	The Development and Survival of B lymphocytes (The following sections related to B cell development will be discussed prior to chapter 9)	259 – 273
9	The Humoral Immune Response	367 – 404

Powerpoint slides and lecture notes will be posted to BlackBoard.