MICR 5051
Introduction to Immunology
FALL 2015

CLASS DAYS and TIME: Tuesday-Thursday 1:00-3:00 PM Classroom: Med. School Bldg. 5.063V

COURSE FACULTY: **Keith Krolick, Ph.D.**
Course Director

OFFICE HOURS: **By appointment; Office 423D**

EMAIL: **KROLICK@uthscsa.edu**

TELEPHONE: **567-3968**

READ THIS DOCUMENT CAREFULLY - YOU ARE RESPONSIBLE FOR ITS CONTENTS.

MASTER OF SCIENCE IN IMMUNOLOGY & INFECTION PROGRAM MISSION aNprovide classroom and laboratory experiences desig

CD

finished the exam and has departed the exam room, you will not be allowed to take the exam. If you miss an exam, you may be eligible for taking a make-up exam (see below).

Grading Procedures – Exam results will be provided to students as quickly as possible. No "challenges"

USE OF RECORDING DEVICES

Recording of lectures and other learning activities in this course by any means (*e.g.*, video, audio, etc.) is only permitted if approved by the instructor or required for compliance with Americans with Disabilities Act (ADA).

ELECTRONIC DEVICES

Cell phones must be turned off during all class meetings and exams. Computers and electronic tablets are allowed only for participating in classroom activities (*e.g.*, viewing slides presented in lecture or conference materials). No texting, tweeting, emailing, web-surfing, gaming, or any use of electronic devices that is not directly connected with classroom activities is permitted.

MICR 5051

INTRODUCTION TO IMMUNOLOGY

2015 CLASS SCHEDULE

Tuesday-Thursday 1:00-3:00 PM

MODULE 1

WEEK	DATE	TOPIC	Reading Assignment* and relevant Bb Reviews	Instructor and Format
Week 1	Aug 25	Overview of Host Defenses Against Infection 1 and2	PAR: Ch1-3 HIW: Ch1, Ch2, Ch15	Krolick (Lecture)
	Aug 27	Overview of Host Defenses Against Infection 3 and 4	[Bb REVIEWS 1-4]	Krolick (Lecture)
Week 2	Sept 1	Lymphocyte Receptors for Antigen 1 and 2	PAR: Ch4.1-4.12; Ch5.1-5.5	Krolick (Lecture)
	Sept 3	Lymphocyte Receptors for Antigen 3 *** T Cell Development, Antigen Recognition, and Effector Functions 1	PAR: Ch.5.6-5.22; Ch8; 12.1-12.5 HIW: Ch.4, Ch.5, Ch,6 [Bb REVIEWS 5-8]	Krolick (Lecture)
Week 3	Sept 8	T Cell Development, Antigen Recognition, and Effector Functions 2 and 3	PAR: Ch7.1-7.2; Ch7.8-7.14	Krolick (Lecture)
	Sept 10	T Cell Development, Antigen Recognition, and Effector Functions 4 and 5	PAR: Ch13.6 HIW: Ch.8, Ch.9	Krolick (Lecture)
Week 4	Sept 15	NO CLASS		
	Sept 17	Exam #1		

MODULE 2

WEEK	DATE	TOPIC	Reading Assignment* and relevant Bb Reviews	Instructor and Format
Week 5	Sept 22	Humoral Immunity 1 and 2	PAR: Ch4.13-4.17; Ch6.1-6.8; Ch6.11-6.15 HIW: Ch.3, Ch.7	Krolick (Lecture)
	Sept 24	Humoral Immunity 3 and 4	PAR: Ch9 HIW: Ch.10	Krolick (Lecture)
Week 6	Sept 29	Humoral Immunity 5 *** Mucosal Immunity 1	[Bb REVIEWS 9-12] PAR: Ch10	Krolick (Lecture)
	Oct 1	Mucosal Immunity 2 and 3	[Bb REVIEWS 13-14]	Krolick (Lecture)
Week 7	Oct 6	Flow Cytometry 1 and 2		Daniel (Lecture)
	Oct 8	Serologic Diagnosis 1 and 2	Bb HANDOUT	Krolick (Conference)
Week 8	Oct 13	NO CLASS		
	Oct 15	Exam #2		

MODULE 3				
	DATE	TOPIC	Reading Assignment* and relevant Bb Reviews	Instructor and Format
Week 9	Oct 20	NO CLASS		
[redacted]				Krolick (Conference)
				Krolick

NO

INTRODUCTION TO IMMUNOLOGY

Lesson Objectives for Individual Sessions

The Lesson Objectives listed below are to be used as a guide to the most essential questions that you should consider in your studies. However, do not view these lists as the "end-all" as you devise your study strategies. Anything covered in reading assignments, online activities, or discussed in class is to be considered "testable".

WEEK	TOPIC	Lesson Objectives

		10. Explain the importance of allelic exclusion in lymphocyte receptor expression. 11. Explain why B cells are "monospecific" for antigen. 12. Describe how inexact joining during VDJ rearrangements contributes to antigen-binding diversity and why there is greater diversity in CDR3 than in the rest of the variable region. 13. Describe how B cells co-express IgM and IgD. 14. Describe how the membrane form of antibody differs from the secreted form and how a B cell can makes both forms. 15. Describe T cell receptor structure and how it functions together with the CD3 complex. 16. Explain how the BCR and TCR are similar. Are different. 17. Explain how T cell receptor antigen-binding diversity is generated and how it resembles the generation of antibody diversity.
Weeks 2-3	**T Cell Development, Antigen Recognition, and Effector Functions**	There are 3 main types of infection, intracellular (cytoplasmic), intracellular (intravesicular), and extracellular. T lymphocytes must specialize in order to effectively contribute to host defenses by guaranteeing the activation of immune responses with effector functions that can reach

Development:

1. Correlate B cell developmental stages with the rearrangement and expression of immunoglobulin genes.
2. Describe how antibody expression is dependent on DNA recombination; and when antibody expression is dependent on alternative RNA processing.
3. Be able to explain how a B cell simultaneously expresses IgM and IgD.
4. Understand the roles of the membrane and secreted forms of antibody and the mechanisms by which they are expressed by the B cell.
5. Understand the difference between antigen-independent B cell development in the bone marrow and antigen-dependent differentiation after B cells leave the bone marrow.
6. Understand the process of negative selection of the B cell repertoire during B cell development.

Activation:

7. Know that B cell activation requires two independent signals and be able to describe them.
8. Describe the different fates of B cells following activation by antigen.
9. Understand why B cell activation in response to T-dependent antigens (most antigens) requires interaction with helper T cells, while activation in response to T-independent antigens does not.
10. Understand that the immune system is a circulatory one and that antigen-specific B cells and T cells find each other in the secondary lymphoid organs where antigen is concentrated.
11. Be able to describe the germinal center and the events that take place there with regard to B cell-T cell interactions, and B cell activation and function.

Effector functions:

12. Describe molecular mechanisms that result in isotype switching in B cells, including: *i)* the role played by helper T cells and how major cytokines regulate this process, *ii)* the effect on antibody binding specificity for antigen, and *iii)* the ultimate importance of being able to switch isotypes.
13. Describe how somatic hypermutation contributes to affinity maturation, a selective phenomenon that increases the ability to neutralize pathogens.

    Distinguish between affinity and avidity of antigen-antibody interactions and understand how structures of the molecules ar[illegible]eantigen

7. Difference between sensitivity vs. specificity in serological testing.

8, How false positive or false negative test results can be obtained.

9. Describe the principles and interpret the results of selected tests:

- Enzyme-Linked Immunosorbent Assay (ELISA or EIA)
- Western Blot (immunoblot)
- direct and indirect immunofluorescence
- RPR Card Test
- slide agglutination test
- tube agglutination test (what is the Prozone Effect?)
- complement fixation (CF) test
- neutralization (virus plaque inhibition) assay

Before class, in preparation for Conference Discussion, you must:

1) perform the assigned readings;
2) study and evaluate the patient case histories provided; and
3) prepare to discuss the cases in class.

Questions provided with the cases are intended to be used as a guide to the most important elements of the cases, but it should not be assumed

Week 11	**Immunodeficiency Diseases**	Immunodeficiency diseases are the result of missing or impaired components of the immune system. Your primary objectives for this lecture include being able to: 1. Explain how defects in various components of the immune system, or steps in immune developmental pathways, can lead to immunodeficiency diseases. 2. Explain how some immunodeficiency diseases are inherited, while others are transmitted as an infectious disease. 3. Explain how an immunodeficiency disease may be secondary (a sequela) to some other disease. 4. Describe the specific defects that lead to the specific immunodeficiency diseases presented in class. With regard to each disease, describe the expected functional/immunological consequence, predict what forms of infectious disease a patient carrying that defect would become most susceptible, and the phenotypic lymphocyte markers that would allow diagnosis. That is what lymphocyte markers could be used to test for deficient numbers of circulating B and T lymphocytes? How could you test for their ability to function?
Week 12	**Vaccine Development and Strategies**	Microbial pathogens have many specialized strategies to survive in the host, some that out-perform host defenses. In order to survive, the host may need outside help that enhances immune function. Thus, you are expected to demonstrate a mastery of issues regarding vaccination strategies by demonstrating your ability to: 1. Describe the desired results of vaccination. 2. Explain what is meant by herd immunity. 3. Distinguish between passive vs. active immunization 4. Understand that there are both advantages and disadvantages in choosing live attenuated microbes vs. killed microbes in designing vaccines. 5. Explain what a subunit vaccine

Week 13	**Transplant Rejection and Graft-versus-Host Disease**	Your objectives are to become familiar with mechanisms that lead to transplant rejection so as to be able to: 1. Describe the stages and various immune effectors that are associated with the rejection of tissue/organ transplants. 2. Describe the roles played by the MHC molecules acting as antigenic targets of donor transplant rejection, as well as antigen presenting molecules of the transplant recipient. 3. Describe histological signs of allograft rejection. 4. List factors that can influence the rate and intensity of graft rejection. 5. Explain why it is useful to perform <u>both</u> tissue typing and MLC testing prior to transplantation. How is each test performed? 6. Consider potentially detrimental side-effects accompanying immunosuppressive treatments designed to prevent graft rejection. 7. Describe clinical scenarios in which bone marrow/stem cell transplantation would be a useful therapeutic strategy. 8. Describe the process of hematopoiesis. 9. Define circumstances and general pathology are associated with graft-versus-host disease.