MICR 6052 ADVANCED IMMUNOBIOLOGY

Spring 2018

CLASS DAYS and TIME: **Jan 8 – Feb 15, Mon, Tues, Thurs 9:00-10:00 am**
Feb 20 – Apr 5, Tues, Thurs, 9:45-11:45 am

CLASSROOM: **Jan 8 – Feb 15, 5.063V**
Feb 20 – Apr 5, ALTC 1.105

COURSE FACULTY:

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

COURSE DESCRIPTION AND OBJECTIVES

MICR6052 is composed of 2 separate Modules that are designed to build on the immunological concepts covered in IBMS 5000 given in the Fall semester and to put those concepts to use as we focus on understanding the world of the mammalian host response to infection. In addition, students will gain a more detailed understanding of the current concepts, approaches, and applications of research in the field of immunology.

Pre-requisite – IBMS 5000 or MICR 5051

Semester credit hours – 3.0

By the end of this course, each student should be able to define and discuss:

- how host defenses to infection are said to be composed of layers of protection.
- physical and physiological barriers provided to the host that interfere with initial phases of microbial infection.
- cells and soluble mediators produced by the host that are involved in non-adaptive (innate) immune responses, and how they interfere with early phases of microbial infection.
- why the antigenic complexity of a potential microbial pathogen and its products often requires multiple adaptive immune mechanisms to insure effective protection of the host.
- the principle hallmarks of the adaptive immune system (diversity, specificity, memory), and how these hallmarks differ from those of non-adaptive (innate) immunity.
- the cells and soluble mediators produced by the host that are involved in adaptive immunity, why this line of defense is considered "adaptive", and how humoral and cell-mediated adaptive immunity interferes with later phases of microbial infection.
- how host immune defenses have "co-evolved" with disease-causing characteristics of pathogenic microorganisms.
- how inappropriate immune responses can lead to pathologies associated with allergy, autoimmunity, immunodeficiency, and graft rejection.
- cutting-edge experimental strategies and approaches used to address critical questions in current immunological research.

COURSE ORGANIZATION

MICR6052 course is divided into two 6-week modules. Module 1 of MICR6052 is devoted entirely to understanding fundamental concepts in immunology primarily through lectures and including some in-class discussion. Module 2 is focused on applying fundamental immunological concepts to the understanding of current immunological research questions in a student-presentation and in-class discussion format.

Module 1 – Lecture format – 6 weeks

Reading Assignments – Required reading assignments are posted in the schedule of class meetings (shown below) and are never considered optional. Unless specifically noted by the instructor, anything in the required readings, whether emphasized in class or not, is considered testable on exams. Mandatory readings are primarily found in the required textbook (see below). However, occasionally a reading assignment will be given that is posted online or sent to you via email attachment. Students will be responsible for a significant amount of reading and preparation outside of the classroom so that class time can be most productively used for discussions and presentations of key concepts and of experimental results from the primary literature.

Lectures – In this first Module of the course all of the presentations are given in lecture format and are accompanied by the PowerPoint slide files or PDF-converted PowerPoint slide files. You are responsible for all information included in the lecture materials. However, you should not assume that all testable lecture material is found only in the posted materials. That is, lectures may be expanded and enhanced during in-class presentations. So, **take good notes because any information discussed in class is considered testable.**

Module 2 – student presentation/discussion format – 6 weeks

- Students will be randomly assigned to teams of 3-6 students each. These teams will stay together for the entire 6 weeks. Each week the teams will choose a different member to be leader for the week. This will insure that each student will serve as a team leader at least once.
- Each week will focus on a particular overarching immunological topic, theme or concept as shown on

the schedule below. The sup-topics and the assignments of those sub-topics to teams will be provided to the students the week before the beginning of Module 2.

- The leader of each team will be responsible for organizing the team's presentation in whatever manner the team decides, but the presentation must contain at a minimum the following components:
    - An oral introduction by the leader –(1-2 min) – include why the topic is significant and what the team's presentation will focus on if it is just a topic presentation or the rationale, and hypothesis being tested if it is a presentation of a specific paper
    - 10-15 min overall oral presentation about the topic – oral presentations can be divided among team members in any way the team decides
    - A **ONE-PAGE** handout for each member of the class and for the faculty involved
    - Two exam questions and answers covering the material presented by the team
- Any other creative presentation mechanism decided upon by the team to stimulate discussion and retention of the topic information is also encouraged
- The faculty may divide up the 4 contact hours during each week however they see fit and may include faculty lecture time in that 4 hours if deemed useful for the students.

Students will be responsible for a significant amount of reading and preparation outside of the classroom so that class time can be most productively used for the student presentations discussions.

Lectures – Some weeks may begin with a lecture by faculty to introduce the topic, theme or concept to be covered that week. Students will be provided copies of the PowerPoint slides presented during those lectures. Students are responsible for all information included in the lecture materials. However, students should not assume that all testable lecture material is found only in the posted materials. That is, lectures may be expanded and enhanced during in-class presentations. So, students should **take good notes because any information discussed in class is considered testable.**

Schedule

See class schedule on last page of syllabus

Attendance

In order to achieve the expected level of competency, students must be fully engaged. **Students are therefore expected to attend every lecture and to be on time.** It is recognized that a student may occasionally arrive late to class due to unexpected traffic problems or inclement weather. However, chronic lateness is considered an unprofessional behavior that disrupts the learning environment for everyone else in the classroom.

Textbooks

Required text book (assignments posted in the schedule of class meetings shown below):

Parham, P. (2014). ***The Immune System, 4th edition*****.** New York: Garland Science. Note that many of the slides used in class are derived from this book.

Grading Policies and Examination Procedures

Grading System –Final letter grades for the Spring semester will be based on performance on 2 exams during Module 1 and on the quality of student discussion and student presentations in Module 2. The two exams are each worth 25.0% of the final grade; the grade for Module 2 of the course will be worth 50.0% of the final grade.

Grading may be curved at the discretion of the course director and is based on the following scale:

A = 90-100% B = 80-89% C = 70-79% F = < 70%

Note: Fractions of grades are rounded to the nearest whole number for your final course grade. For example, 89.45 is an A, but 89.44 is a B.

The grading for Module 2 will be determined by the quality of oral presentations, and on the quantity and quality of discussion by all team members. Each week, the team leaders will be given a leadership grade, each oral presenter will be given an oral presentation grade, and all team members will be given a team grade by the faculty.

The class **may** be given a final exam, based in part on the team-generated questions (see above). Whether an exam is given will depend on the overall quality and quantity of discussion during the 6 weeks of these presentations. This exam, if given, would be worth 33.3% of your Module 2 grade.

Examination Protocol – Exams may be composed of multiple choice, short answer, and essay questions. The proportion represented by each question type will vary between the 2 exams. Certain questions may be accompanied by images, so it is imperative that you study images (particularly those presented in class).

No electronic devices, extra paper, books, backpacks, etc. are permitted in the testing area. Hats must be removed.

Grading Procedures – Exam results will be provided to students as quickly as possible. No "challenges" are allowed. However, a time will be scheduled outside of class so that students may review concepts of concern to them.

Make-up Presentations or Examinations – A student who must miss a presentation or a scheduled exam for a serious reason must request an excused absence from the Course Director. Acceptable "serious reasons" usually involve serious illness or injury to the student (doctor's excuse may be required) or the student's family member. Examples of unacceptable reasons include: Not prepared or incomplete studying, over-sleeping, hangover, heavy traffic or any travel delays, other appointments or scheduled professional or personal commitments.

If it is determined that missing an exam is justified, a make-up presentation or examination will be scheduled. The make-up will be scheduled as soon as possible at a time designated by the Course Director. Any student who misses a presentation or exam and does not receive an excused absence **will receive a grade of zero for that presentation or exam**.

Requests For Accommodations For Disabilities

Information regarding accommodations for disabilities is available in the UTHSCSA Catalog. A student who wishes to request accommodation for a disability should contact the Associate Dean for Students, Graduate School of Biomedical Sciences. The Student Request for Accommodations under Americans with Disabilities Act form and additional information may be obtained at http://www.uthscsa.edu/eeo/request.html.

Scientific Integrity / Professional Conduct

The expectation is that all students will exhibit the highest standards of scholastic and scientific integrity as elaborated on page 99 of the current UTHSCSA Student Catalog. Any student who commits an act of academic dishonesty is subject to discipline as prescribed by the UT System Rules and Regulations of the Board of Regents. Academic dishonesty includes, but is not limited to, cheating on exams, plagiarism, tampering with reference materials or files, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person (e.g. copying material from the web without proper attribution), and any act designed to give unfair advantage to a student or the attempt to commit such an act. Failure to abide by these rules of professional conduct will result in a grade of zero for the exam in question and, depending on the nature of the infraction, the consequences may include dismissal from the program.

If you suspect another student of professional misconduct, please bring your suspicions directly to the Course Director. Confidentiality will be maintained at every level during any ongoing investigation of suspected academic or scientific misconduct.

Email Policy

Every student is issued a University e-mail address and account at the time of enrollment. As a matter of University Policy, communications between students and faculty that occur using the student's University e-mail address are considered official business. Therefore, **students are expected to check their university email inboxes on a regular basis** so that any announcements, instructions, or information regarding this course will be received in a timely way. Missed communications due to inadequate monitoring of incoming emails on the University's email server will never be a valid excuse for unsatisfactory academic progress.

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). Texting, tweeting, emailing, web-surfing, gaming, or any use of electronic devices that is not directly connected with classroom activities is NOT permitted.

MICR6052 MODULE 1
ADVANCED IMMUNOLOGY
2018 CLASS SCHEDULE
Mon, Tues, Thurs 9:00-10:00 AM

Date	Time	Lecture topic	Faculty	Room	Reading Assignment
8-Jan	9-10 am	Early innate responses 1	Berton	5.063V	Ch1 and Ch2
9-Jan	9-10 am	Early innate responses 2	Berton	5.063V	Ch2 and Ch3.1-3.15
11-Jan	9-10 am	Cytokines, receptors and signaling	Berton	5.063V	Ch2 and Ch3.1-3.15
15-Jan		**HOLIDAY – NO CLASS**			
16-Jan*	9-10 am	Antigen receptors and generation of antigen receptor diversity 1	Berton	5.063V	Ch4.1-4.13; Ch5.1-5.5
17-Jan*	9-10 am	Antigen receptors and generation of antigen receptor diversity 2	Berton	5.063V	Ch4.1-4.13; Ch5.1-5.5
18-Jan	9-10 am	T cell development, antigen recognition and effector functions 1	Krolick	5.063V	Ch5.6-5.22
22-Jan	9-10 am	T cell development, antigen recognition and effector functions 2	Krolick	5.063V	Ch8; Ch12.1-12.5
23-Jan	9-10 am	T cell development, antigen recognition and effector functions 3	Krolick	5.063V	Ch7.1-7.1; Ch7.8-7.14
25-Jan	9-10 am	T cell development, antigen recognition and effector functions 4	Krolick	5.063V	Ch13.6
TBA	**TBA**	**EXAM 1**	Berton/Krolick		
29-Jan	9-10 am	B cell Development and selection	Berton	5.063V	Ch6
30-Jan	9-10 am	The germinal center	Berton	5.063V	Ch9; Ch11.1-11.8
1-Feb	9-10 am	Somatic hypermutation and class switch recombination	Berton	5.063V	Ch4.14-4.17

5-Feb	9-10 am	Immunity at mucosal surfaces	Berton	5.063V	Ch10
6-Feb	9-10 am	Hypersensitivity: types I and II	Krolick	5.063V	Ch14
8-Feb	9-10 am	Hypersensitivity: types III and IV	Krolick	5.063V	Ch14
12-Feb	9-10 am	Tolerance and Autoimmunity 1	Krolick	5.063V	Ch16
13-Feb	9-10 am	Tolerance and Autoimmunity 2	Krolick	5.063V	Ch16
15-Feb	9-10 am	Immune deficiency diseases	Krolick	5.063V	Ch13.8-13.16; 13.17-13.20; 13.24
TBA	**TBA**	**EXAM 2**	Berton/Krolick		

* **Note that lectures are on Tues, Wed, Thurs of this week because of a Monday holiday**

MICR6052 MODULE 2
MICR5027
TENTATIVE 2018 CLASS SCHEDULE
Tues 9:45-11:45 AM
Thurs 9:45-11:45 AM

Date	Time	Weekly Topic, Theme or Concept	Faculty	Room
20-Feb	9:00-11:00 AM	Pattern recognition signaling and innate immune responses	Li	ALTC 1.105
22-Feb	9:00-11:00 AM	Pattern recognition signaling and innate immune responses	Li	ALTC 1.105
27-Feb	9:00-11:00 AM	NKT cells in innate and adaptive immunity	Leadbetter	ALTC 1.105
1-Mar	9:00-11:00 AM	NKT cells in innate and adaptive immunity	Leadbetter	ALTC 1.105
6-Mar	9:00-11:00 AM	T cells, the thymus and aging	Griffith	ALTC 1.105
8-Mar	9:00-11:00 AM	T cells, the thymus and aging	Griffith	ALTC 1.105
12-Mar		**SPRING BREAK**		
20-Mar	9:00-11:00 AM	Effector and Memory T cells during Infections	Zhang	ALTC 1.105
22-Mar	9:00-11:00 AM	Effector and Memory T cells during Infections	Zhang	ALTC 1.105
27-Mar	9:00-11:00 AM	B cells in health and disease	Casali	ALTC 1.105
29-Mar	9:00-11:00 AM	B cells in health and disease	Casali	ALTC 1.105
3-Apr	9:00-11:00 AM	gut microbiota and health	Zhong/Dube	ALTC 1.105
5-Apr	9:00-11:00 AM	gut microbiota and health	Zhong/Dube	ALTC 1.105
TBA	**TBA**	**EXAM??**	Berton	

*** Academic Learning & Teaching Center – the new building by the Holly Auditorium**

Student Presentation Sub-topics and Team Assignments:

Week 1 - Pattern recognition signaling and innate immune responses

- Team 1 - RIG-I and regulation of type I interferons – seminal paper presentation - see attached paper - RNA Sensor_RIG-I_NI_Fujita2004.pdf
- Team 2 - cGAS as a cytosolic DNA sensor– seminal paper presentation – see attached paper - DNA Sensor_cGAS_Science_Sun-2013.pdf
- Team 3 - Nucleic acid sensors in systemic lupus erythematosus (SLE)
- Team 4 - regulation of type I interferons by TLRs
- Team 5 - TLRs, sepsis and therapeutic opportunities
- Team 6 - cryopyrin-associated periodic fever syndromes

Week 2 - NKT cells in innate and adaptive immunity

- Team 2 - harnessing NKT cells for cancer immunotherapy
- Team 3 - role of NKT cells in defense against infection
- Team 4 - NKT cell regulation of autoimmunity
- Team 5 - NKT cells role in adipose tissue/obesity
- Team 6 - harnessing NKT cells for vaccines against infectious disease
- Team 1 - NKT cell help for B cells

Week 3 - T cells, the thymus and aging

- Team 3 - How do we know that Aire expression in the thymus is important for self-tolerance?
- Team 4 - How do we know that some Tregs develop in the thymus?

- Team 5 - How do we know that some Tregs develop in the periphery?
- Team 6 - How do we know T cell production declines with age?
- Team 1 - How do we know that antigens made in medullary thymic epithelial cells can be presented by dendritic cells in the thymus?
- Team 2 - How do we know that antigen exposure changes the T cell receptor repertoire?

Week 4 - Effector and Memory T cells during Infections

- Team 4 - T cells during chronic infections (focus on the surface markers and functional indications of CD8+ T cell exhaustion)
- Team 5 - Effector CD8+ T cells (focus on the priming, expansion and effector functions of T cells)
- Team 6 - TEM and TCM (focus on the surface markers, migratory and functional differences between Effector Memory and Central Memory T cells)
- Team 1 - Transcriptional regulation of effector and memory T cells (focus on the transcription factors involved in effector/memory differentiation)
- Team 2 - TRM (focus on the surface markers, distribution and function of Tissue-Resident Memory T cells)
- Team 3 - CD4+ effector and memory T cells (focus on the differences between CD4+ and CD8+ T cells)

Week 5 - B cells in health and disease

- Team 5 - Transitional B cell differentiation/Ig gene editing
- Team 6 - Ig Somatic hypermutation
- Team 1 - Ig Class switching
- Team 2 - Plasma cell differentiation
- Team 3 - Memory B cell differentiation
- Team 4 - B cell development in bone marrow

Week 6 - gut microbiota and health

- Team 6 - Gut microbiota and colitis/cancer
- Team 1 - Gut microbiota and protective immunity to infection
- Team 2 - Gut microbiota and autoimmunity
- Team 3 - Gut microbiota and obesity
- Team 4 - Gut microbiota and diabetes
- Team 5 - Gut microbiota and fibrosis

	Team Members	Topic Assignments					
		Week 1	*Week 2*	*Week 3*	*Week 4*	*Week 5*	*Week 6*
Team 1		RIG-I and regulation of type I interferons	NKT cell help for B cells	How do we know that antigens made in medullary thymic epithelial cells can be presented by dendritic cells in the thymus?	Transcriptional regulation of effector and memory T cells (focus on the transcription factors involved in effector/memory differentiation)	Ig Class switching	Gut microbiota and protective immunity to infection
Team 2		cGAS as a cytosolic DNA sensor	harnessing NKT cells for cancer immunotherapy	How do we know that antigen exposure changes the T cell receptor repertoire?	TRM (focus on the surface markers, distribution and function of Tissue-Resident Memory T cells)	Plasma cell differentiation	Gut microbiota and autoimmunity
Team 3		Nucleic acid sensors in systemic lupus erythematosus (SLE)	role of NKT cells in defense against infection	How do we know that Aire expression in the thymus is important for self-tolerance?	CD4+ effector and memory T cells (focus on the differences between CD4+ and CD8+ T cells)	Memory B cell differentiation	Gut microbiota and obesity
Team 4		regulation of type I interferons by TLRs	NKT cell regulation of autoimmunity	How do we know that some Tregs develop in the thymus?	T cells during chronic infections (focus on the surface markers and functional indications of CD8+ T cell exhaustion)	B cell development in bone marrow	Gut microbiota and diabetes
Team 5		TLRs, sepsis and therapeutic opportunities	NKT cells role in adipose tissue/obesity	How do we know that some Tregs develop in the periphery?	Effector CD8+ T cells (focus on the priming, expansion and effector functions of T cells)	Transitional B cell differentiation/ Ig gene editing	Gut microbiota and fibrosis
Team 6		cryopyrin-associated periodic fever syndromes	harnessing NKT cells for vaccines against infectious disease	How do we know T cell production declines with age?	TEM and TCM (focus on the surface markers, migratory and functional differences between Effector Memory and Central Memory T cells)	Ig Somatic hypermutation	Gut microbiota and colitis/cancer

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