USC School of Pharmacy

Spring 2019: RXRS-408: Immunology and Immunotherapeutics

Instructors:

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Course Weight: 4 Units

Day/Time/Location: TUE/THU/9:30-10:50 am SOS37

Introduction

The immune system has the capacity to mount a counter attack in response to any antigenic intrusion. It has become clear that abnormal immune responses are key to the development of many common disorders not traditionally viewed as immunologic in nature, including autoimmune, genetic, neoplastic and neurodegenerative diseases. This integrative course will cover the critical role of the immune system in maintaining health, and the consequences of improper responses when pathogenic intrusion has occurred or upon pathogenic processes. Lectures will focus on immune responses to infections (bacterial, viral, fungal), xenobiotics (e.g. drugs and pollution), immune disturbances during autoimmune disease and organ transplantation. Additionally, this course will highlight the role of the immune system in development of neurological disorders. A large section of this course will be devoted to the immune-based treatment options and diagnostics including rapidly evolving immunotherapy, immunodiagnostics, drug-allergy, vaccines, infections and other immunological disorders.

Objectives

This course is designed for upper-level undergraduate and early graduate students who are interested in understanding disease and therapeutics to manage these conditions. USC students

who are pursuing a career in health or biological science majors, such as pharmacy or medical professions, would be most appropriate. In addition, this course would be of interest for early stage Master students in health/biological sciences.

Upon successful completion of this course, the student should be able to demonstrate a working knowledge of:

1. The basic principles of human immunity and immune response, involvement of specific organs and cells in immune responses.
2. The types of immune responses, i.e. innate and adaptive, their molecular and genetic determinants, including cellular immunity and antibody synthesis.
3. The immune system receptors, signaling, the functions of cytokines, chemokines and antigen-antibody relationships.
4. The complement system, including the complement network and their interactions.
5. The mechanisms and immunopathology of immunological-mediated human diseases including infections, allergic reaction, autoimmune diseases, immunodeficiency, disorders of the central nervous system.
6. The existing and evolving experimental and pharmacological therapeutic strategies targeting immune mechanisms.
7. The evolving diagnostic technologies including imaging and immune-based assays.

Assignments and Grading:

4 quizzes @ 10 pts each	40 pts (20%)
2 midterm exams @ 50 pts each:	100 pts (50%)
1 final exam	60 pts (30%)
Total:	200 pts (100%)

Attendance at all classes is expected and may be considered when assigning final grades.

Participation will include asking and answering questions and being actively involved in the discussion. It is expected that the students read the assigned papers prior to the lecture and be prepared to discuss background, current understanding, treatments, and gaps in knowledge for the topic in each lecture.

There will be 5 quizzes, two mid-term examinations and one final examination for this course. One of the quizzes with the lowest outcome will not be included in the grade. The questions for quizzes and exams will primarily be based on the lecture content and text books. The midterms (50 points each) and the final exam (60 points) will include fill-in the blank questions, multiple choice questions and true/false questions.

There are no make-up exams. If exceptional circumstances prevent you from attending an exam, your reason for missing it must be accompanied by a written statement from a third party (e.g. a note from a medical doctor).

Notes, books, calculators, electronic dictionaries, regular dictionaries, cell phones or any other aids are not allowed during exams.

Students will be asked to complete an anonymous critical evaluation of the course at its completion.

Required Readings and Supplementary Materials

Course Readings

All lecture material is posted on blackboard (www.blackboard.usc.edu). Quiz and final test scores will be inputted into grading section of the blackboard. Please note that quizzes may utilize "Turning Point" clickers and thus it is the student's responsibility to ensure that his/her clicker is registered and performing as needed.

Required Readings

- Janeway's Immunobiology 9th Edition. Kenneth Murphy and Casey Weaver. ISBN-13: 978-0815345053 https://www.amazon.com/Janeways-Immunobiology-Kenneth-Murphy/dp/081534550X/ref=dp_ob_image_bk
- Basic & Clinical Pharmacology 13th Edition. Bertram G. Katzung and Anthony J. Trevor. ISBN 978-0-07-182505-4 http://accessmedicine.mhmedical.com/book.aspx?bookid=1193
- Primary didactic materials will be distributed to students preceding each lecture, and posted on the learn.usc.edu *Website* (aka Blackboard). Supplemental information can be obtained from the recommended textbooks for those seeking clarification or additional reading. Manuscripts from the scientific literature or textbook sections may be assigned as required readings. Faculty in the course may be contacted at any time for clarification of any issues or information.

Recommended Readings

- Flaherty, DK. Immunology for Pharmacy, Springer Mosby, 2012 (available electronically from Norris Library)
- P. Parham: The Immune System (3rd Ed), Garland Science, 2009.
- Basic Neurochemistry: Principles of Molecular, Cellular and Medical Neurobiology. Scott T. Brad & George J. Siegel; ISBN: 978-0-12-374947-5

Course Outline

Date	Subject	Lecturer
Tue Jan 8 9:30 -10:50am	**Introduction to the Immune system & Cellular Immunity I** Brief introduction to the history of Immunology, overview of the host-pathogen interactions, organs, cells of the immune system. **Reading Material:** Janeway's Immunobiology, Chapter 1. Additional readings on the subject matter will be posted on Blackboard.	Astaryan
Thurs Jan 10 9:30 -10:50am	**Introduction to the Immune system & Cellular Immunity II** Brief introduction to the history of Immunology, overview of the host-pathogen interactions, organs, cells of the immune system. **Reading Material:**	Astaryan

	Janeway's Immunobiology, Chapter 1. Additional readings on the subject matter will be posted on Blackboard.	
Tue Jan 15 9:30 -10:50am	**Quiz 1** **Innate Immunity and Complement System I** Barriers to infection, inflammation, cells of innate immune responses. Molecular components - pattern recognition receptors. Complement factors. **Reading Material** Janeway's Immunobiology, Chapters 1,2,3	Astaryan
Thur Jan 17 9:30 -10:50am	**Innate Immunity and Complement System II** Barriers to infection, inflammation, cells of innate immune responses. Molecular components - pattern recognition receptors. Complement factors. **Reading Material** Janeway's Immunobiology, Chapters 1,2,3	Astaryan
Tues Jan 22 9:30 -10:50am	**Adaptive Immunity I** Adaptive immune responses: cellular - T-lymphocytes, receptors, antigen recognition, antigen presentation. Humoral immunity – B-lymphocytes, antibody production. Interaction with innate immune system. **Reading Material** Janeway's Immunobiology, Chapters 1,4-6. Additional readings on the subject matter will be posted on Blackboard.	Astaryan
Thurs Jan 24 9:30 -10:50am	**Adaptive Immunity I** Adaptive immune responses: cellular - T-lymphocytes, receptors, antigen recognition, antigen presentation. Humoral immunity – B-lymphocytes, antibody production. Interaction with innate immune system. **Reading Material** Janeway's Immunobiology, Chapters 1,4-6. Additional readings on the subject matter will be posted on Blackboard.	Astaryan
Tue Jan 29 9:30 -10:50am	**Quiz 2** **Immune System Receptors and Signaling I** T- and B-cell receptors, ligand binding and intracellular signaling pathways. Cytokines, chemokines, signaling. **Reading Material** Janeway's Immunobiology, Chapters 3,5,6	Astaryan
Thur Jan 31 9:30 -10:50am	**Immune System Receptors and Signaling II** T- and B-cell receptors, ligand binding and intracellular signaling pathways. Cytokines, chemokines, signaling. **Reading Material** Janeway's Immunobiology, Chapters 3,5,6	Astaryan
Tue Feb 5 9:30 -10:50am	**In Class Midterm 1**	Astaryan
Thur Feb 7 9:30 -10:50am	**Immunity to Cascade Overview** How the body responds to pathogenic, e.g. bacterial, viral and fungal stimuli. **Reading Material:** readings on the subject matter will be posted on Blackboard.	Louie
Tue Feb 12 9:30 -10:50am	**Immune Response Bacterial Infections** Immune based therapies for bacterial, viral infections, primary and secondary immunodeficiency disorders **Reading Material** Janeway's Immunobiology, Chapters 14,16 Katzung/Trevor, Basic & Clin. Pharmacol.,	Louie
Thur Feb 14 9:30 -10:50am	**Immune Response Viral Infections** Immune based therapies for bacterial, viral infections, primary and secondary immunodeficiency disorders **Reading Material**	Louie

	Janeway's Immunobiology, Chapters 14,16 Katzung/Trevor, Basic & Clin. Pharmacol.,	
Tue Feb 19 9:30 -10:50am	**Allergic Reactions** Overview of the immune system functioning during hypersensitivity reactions, allergies, asthma and chronic obstructive pulmonary disease. **Reading Material** Janeway's Immunobiology, Chapter 14.	Louie
Thur Feb 21 9:30 -10:50am	**Autoimmune Diseases** Mechanisms of autoimmunity, overview of autoimmune diseases, e.g. rheumatoid arthritis, inflammatory bowel syndrome, psoriasis. **Reading Material** Janeway's Immunobiology, Chapter 15	Louie
Tue Feb 26 9:30 -10:50am	**Quiz 3** **Therapeutic Treatments Allergies** Antihistamine, immunosuppressants **Reading Material** Janeway's Immunobiology, Chapters 14-16 Katzung/Trevor, Basic & Clin. Pharmacol., Chapters 36, 54, 55	Louie
Thur Feb 28 9:30 -10:50am	**Therapeutic Treatments of Autoimmune Diseases** Antibody therapeutics for allergies, rheumatoid arthritis, inflammatory bowel syndrome, psoriasis **Reading Material** Janeway's Immunobiology, Chapters 14-16 Katzung/Trevor, Basic & Clin. Pharmacol., Chapters 36, 54, 55	Louie
Tue Mar 5 9:30 -10:50am	**Genetic Immunodeficiency** Common variable immunodeficiency, severe combined immune deficiency, drug induced immunodeficiency. **Reading Material** Janeway's Immunobiology, Chapter 13. Additional readings on the subject matter will be posted on Blackboard	Louie
Thur Mar 7 9:30 -10:50am	**Acquired Immunodeficiency:** Virally induced immunodeficiencies **Reading Material** Janeway's Immunobiology, Chapters 14-16 Katzung/Trevor, Basic & Clin. Pharmacol., Chapters 36, 54, 55	Louie
Tue Mar 12	**Spring Break**	
Thur Mar 14	**Spring Break**	
Tue Mar 19 9:30 -10:50am	**In Class Midterm 2**	Louie
Thur Mar 21 9:30 -10:50am	**Oncogenesis and Tumor Proliferation** Overview of cancer mechanisms **Reading Material** Janeway's Immunobiology, Chapter 16 Additional readings on the subject matter will be posted on Blackboard.	Louie
Tue Mar 26 9:30 -10:50am	**Cellular Immunotherapies for Cancer** Immunotherapeutic options for patients with cancer **Reading Material** Janeway's Immunobiology, Chapter 16 Additional readings on the subject matter will be posted on Blackboard	Louie
Thur Mar 28 9:30 -10:50am	**Immunotherapies for Cancer** CART Therapy **Reading Material** Janeway's Immunobiology, Chapter 16 Additional readings on the subject matter will be posted on Blackboard	Louie
Tue April 2 9:30 -10:50am	**Quiz 4** **Immune Mediated Neurological Syndromes I**	Astaryan

	Neuro-immune interactions during neurological diseases - stroke, multiple sclerosis, Alzheimer's disease, Drug Induced Diseases **Reading Material** Pertinent reading material on the subject matter will be posted on Blackboard	
Thur April 4 9:30 -10:50am	**Immune Mediated Neurological Syndromes II** Neuro-immune interactions during neurological diseases - stroke, multiple sclerosis, Alzheimer's disease, Drug Induced Diseases **Reading Material** Pertinent reading material on the subject matter will be posted on Blackboard	Astaryan
Tue April 9 9:30 -10:50am	**Immune Mediated Neurological Syndromes III** Neuro-immune interactions during neurological diseases - stroke, multiple sclerosis, Alzheimer's disease, Drug Induced Diseases. **Reading Material:** Pertinent reading material on the subject matter will be posted on Blackboard.	Astaryan
Thur April 11 9:30 -10:50am	**Immunotherapy for CNS Disorders** Neuro-immune interactions during neurological diseases - stroke, multiple sclerosis, Alzheimer's disease, Drug Induced Diseases. (continued) **Reading Material:** Pertinent reading material on the subject matter will be posted on Blackboard.	Astaryan
Tue April 16 9:30 -10:50am	**Quiz 5** **Immunotherapy for CNS Disorders** Neuro-immune interactions during neurological diseases - stroke, multiple sclerosis, Alzheimer's disease, Drug Induced Diseases. **Reading Material:** Pertinent reading material on the subject matter will be posted on Blackboard.	Astaryan
Thur April 18 9:30 -10:50am	**Immunotherapy for CNS Disorders** Neuro-immune interactions during neurological diseases - stroke, multiple sclerosis, Alzheimer's disease, Drug Induced Diseases. **Reading Material:** Pertinent reading material on the subject matter will be posted on Blackboard.	Astaryan
Tue April 23 9:30 -10:50am	**Immunodiagnostics, Imaging** Overview of modern diagnostic technologies and tools of immune system disturbances – novel immune assays and imaging methods **Reading Material:** Pertinent reading material on the subject matter will be posted on Blackboard	Astaryan
Thur April 25 9:30 -10:50am	**Immunodiagnostics, Imaging** Overview of modern diagnostic technologies and tools of immune system disturbances – novel immune assays and imaging methods **Reading Material:** Pertinent reading material on the subject matter will be posted on Blackboard	Astaryan
May 7 8 – 10 am	**Final Examination**	

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems:
Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu
Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu
USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour

Additional Policies

Policy on Cell Phones, Pagers and Devices During ALL Classroom Activity

All cell phones, pagers, MP3 players or devices for communication MUST be turned off or vibrate mode during lectures, case conferences. Failure to comply will result in 5% deduction of the entire number of points accrued. In addition, no MP3 or electronic devices are allowed during examination. Devices are only permitted when written authorization by BOTH coordinators.

Extra Credits

There will be no extra credits that will be given for this course. This includes addition efforts that may improve the profession of pharmacy. Although these activities are encouraged, your participation in these activities improves the participants, professional.