Micr-6005, Current Concepts of Immunology  
(Rutgers course number: 16:681:543)

(3 Credits)

Spring 2009 Semester

Course Director: Yufang Shi  
(732-235-4501, shiyu@umdnj.edu)
Please note that this course is offered once every 2 years.

Lectures:
**Monday and Wednesday**
1:40 to 3:00pm  
Room V-10, RWJMS Research Tower.

The immune response is an evolutionarily-conserved defense mechanism involving a complex network of interacting molecules and cells that specifically recognize and respond to agents foreign to the body.

This course provides current concepts of immunology. It will emphasize the organization and evolution of the immune system, genetic basis of the generation of diversity, MHC gene structure and function, development and selection of lymphocytes, lymphocyte activation, and the regulation of immune tolerance. The effector mechanisms of immune reactions cover antigen-antibody reactions, cytokines, and the cell-mediated immune responses. Basic principles of immunity to microbes and cancer cells are introduced.

Slide Preview:  
http://www2.umdnj.edu/mgenmweb/courses/ccimmu/index.htm?=7

Text Book:  Janeway’s Immunobiology  7th Edition, 2007, by Murphy *(for reference only, not required)*

After registration, please send your contact info to administrative coordinator: shiyu@umdnj.edu
**Schedule**

**Yufang Shi**  
Robert Wood Johnson Med. School  
shiyu@umdnj.edu

- **Introduction and History of Immunology:**  
  - Course organization, reading assignments, grading systems and other logistics.  
  - Concepts of Immune responses. History and development of immunology  
  - Wednesday  
  - January 21

**Beverly Barton**  
New Jersey Medical School  
bartonbe@umdnj.edu

- **Cells and Tissue of the Immune System:**  
  - Lymphoid organs, cells of the immune system, structure of the spleen, thymus and lymph nodes, gut associated lymphoid tissues, and lymphocyte trafficking  
  - Monday  
  - January 26

**Arnold Rubin**  
Robert Wood Johnson Med. School  
rubinar@umdnj.edu

- **Hematopoiesis:**  
  - Hematopoietic stem cells, bone environment, lineage commitment, differentiation factors and cytokines, plasticity of the hematopoietic system  
  - Wednesday  
  - January 28

**Debra Laskin**  
Rutgers University  
laskin@eohsi.rutgers.edu

- **Innate Immunity/Toll-Like receptors:**  
  - Innate defense mechanisms, phagocytes, Toll-like receptors, inflammation factors and the links to adaptive immune response  
  - Monday  
  - February 2

**Beverly Barton**  
New Jersey Medical School  
bartonbe@umdnj.edu

- **Antibody structure and antibody diversity – B-cell and T-cell receptor:**  
  - Antibody structure, hunting for T cell antigen receptor, gene structure for antibodies and TCR, rearrangement mechanisms, and generation of diversity  
  - Wednesday  
  - February 4

**Alexander Izaguirre**  
Director of Information Technology  
Robert Wood Johnson Medical School  
izaguial@umdnj.edu

- **MHC Molecules:**  
  - TCR-antigen recognition properties, antigen presenting cells, transplantation and the discovery of MHC, structure of class I and class II molecules, gene structure of the mouse and human MHC luci, non-classical MHC class I molecules and biological functions.  
  - Monday  
  - February 9

**Alexander Izaguirre**  
Director of Information Technology  
Robert Wood Johnson Medical School  
izaguial@umdnj.edu

- **Antigen presentation/Dendritic Cells:**  
  - Antigen processing, antigen presentation for CD4 and CD8 T cells, B cells and T cells as APC, types of dendritic cells, immunogenecity and tolerance induced by dendritic cells  
  - Wednesday  
  - February 11

**Guy Werlen**  
Rutgers University  
werlen@biology.rutgers.edu

- **T-cell Development:**  
  - Thymic environment, T cell progenitors, pre- and immature T cells, positive and negative selection, thymic entry and export, and markers of newly generated T cells  
  - Monday  
  - February 16

**Arnold Rabson**  
Cancer Institute of New Jersey  
rabson@cabm.rutgers.edu, rabsonab@tmo.blackberry.net

- **Lymphocyte Signal Transduction:**  
  - B and T cell antigen recognition, coreceptors, co-stimulation molecules, antigen receptor mediated signal transduction process, common features of kinases and phosphatases, lymphocyte specific transcription factors, modulation and abnormalities of lymphocyte signal transduction and diseases.  
  - Wednesday  
  - February 18
<table>
<thead>
<tr>
<th>Lecturer</th>
<th>Institution</th>
<th>Topic</th>
<th>Date</th>
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<tbody>
<tr>
<td>Lorie Covey</td>
<td>Rutgers University</td>
<td>B-cell Development:</td>
<td>Monday</td>
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<td>Bone B cell development environment, IgD and IgM receptors, B cell development process, positive and negative selection, germinal centers, B cell differentiation and class switch and B cell memory</td>
<td>February 23</td>
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<tr>
<td>Wenchao Song</td>
<td>University of Pennsylvania</td>
<td>Complement:</td>
<td>Wednesday</td>
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<td>Complement properties, composition, classical and alternative activation pathways, by-products and biological functions, complement receptors and immune responses, regulatory function of complement and autoimmune disorders.</td>
<td>February 25</td>
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<tr>
<td>Sidney Pestka</td>
<td>Robert Wood Johnson Med. School</td>
<td>Interferons and Immune responses:</td>
<td>Monday</td>
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<td>Discovery of interferons, properties and classification of interferons, interferon receptors and signal transduction, effect of interferons on antigen presentation and immune activation, interferon and natural killer cells, anti-viral mechanisms.</td>
<td>March 2</td>
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<tr>
<td>Beverly Barton</td>
<td>New Jersey Medical School</td>
<td>Cytokines and Immune responses:</td>
<td>Wednesday</td>
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<td>Definition of cytokines, paracrine mechanisms, cytokine receptors, function of most common known cytokines, the cytokine network</td>
<td>March 4</td>
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<tr>
<td>Yufang Shi</td>
<td>Robert Wood Johnson Med. School</td>
<td>Type 1 and Typ2 T helper cells:</td>
<td>Monday</td>
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<td>Function of helper T cells, properties of Th1 and Th2 cells, cytokine patterns of Th1 and Th2 cells, generation and detection of Th1 and Th2 cells, Th1 and Th2 type immune responses and different disease. Other T cell populations</td>
<td>March 9</td>
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<tr>
<td>Guy Werlen</td>
<td>Rutgers University</td>
<td>NK, NKT and Innate-Like T cells :</td>
<td>Wednesday</td>
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<td>Property and distribution. Self and nonself recognition, inhibitory receptors. Immune Regulatory functions</td>
<td>March 11</td>
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<tr>
<td>Yufang Shi</td>
<td>Robert Wood Johnson Med. School</td>
<td>Mid-Term Exam</td>
<td>Monday</td>
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<td>March 23</td>
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<tr>
<td>Edmund Lattime</td>
<td>Cancer Institute of New Jersey</td>
<td>Tumor Immunology:</td>
<td>Wednesday</td>
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<td>Cancer and immune responses, the immune surveillance theory, tumor specific antigens, tumor antigen presentation, co-stimulation and tumor immunity, modulation of immunity to tumor, CTL and NK, immune suppression in the tumor environment</td>
<td>March 25</td>
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<tr>
<td>Yufang Shi</td>
<td>Robert Wood Johnson Med. School</td>
<td>Immune regulation and tolerance:</td>
<td>Monday</td>
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<td>Self and non-self, transplantation and immune tolerance, immunosuppression by antibodies, the idiotype network, T regulatory cells, and regulatory cytokines.</td>
<td>March 30</td>
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<td>Edmund Lattime</td>
<td>Cancer Institute of New Jersey</td>
<td>Vaccine development:</td>
<td>Wednesday</td>
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<td>Antigen presentation in vivo, co-stimulation and vaccine development, first and secondary immune response, immune response</td>
<td>April 1</td>
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Lorie Covey
Rutgers University
covey@biology.rutgers.edu

**Immunity in infectious diseases:**
Definition of pathogens, host and parasite interaction, host defense mechanisms, immunity to intracellular and extracellular parasites, superantigens, and immune tolerance induced by infections

Yufang Shi
Robert Wood Johnson Med. School
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**Phylogeny of the Immune System:**
Evolution perspective of immune response, Pattern Recognition Receptors, the Immunoglobulin Domain, the "Big Bang" of gene duplication, origin of MHC, Generation of Antigen Receptor Diversity in low vertebrates and a phylogenetic overview of the immune system

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**Mechanisms of Apoptosis and Cytotoxicity:**
Definition of cell death, comparison of cell death pathways, apoptosis in the immune system, molecular mechanisms of apoptosis, apoptosis detection methods, the bax-2 family proteins, caspases, death receptor and ligands, IAPs and cytotoxicity induced by CTL and NK cells

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Robert Wood Johnson Med. School
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**Immunosuppression and Transplantation:**
Overview of immune signal pathways, milestone of transplantation, immunophilins and mTOR, immune effect of steroids, clinical immunosuppression.

Leonard Sigal
Bristol-Myers Squibb
leonard.sigal@bms.com

**Autoimmunity:**
General classifications of autoimmune disorders, autoimmune mechanisms, overall pathogenesis processes, autoantigens, genetics of autoimmune diseases, environmental factors, examples of autoimmune diseases

Alexander Kusnecov
Rutgers Universityality
kusnecov@rci.rutgers.edu

**Psychoneuroimmunology**
Neuro-immune interactions, the Hypothalamic-Pituitary-Adrenal Axis, CNS reception of immune activity, acute stress and chronic stress on the immune system, mechanisms of psychoneuroimmunology.

Leonard Sigal
Bristol-Myers Squibb
leonard.sigal@bms.com

**Immunodeficiency:**
Genetic immunodeficiency, infection-induced immunodeficiency, drug-induced immunodeficiency.

Roger Strair
Cancer Institute of New Jersey
strairrk@umdnj.edu

**Transformation and Malignancy of the Immune System:**
Leukemia classification Transformation mechanisms, examples of genetic alterations, impact on the immune system, diagnosis and therapy, GVHD

Carol R. Gardner
Rutgers University
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**Inflammation and Hypersensitivity**
Definition of inflammation, cardinal signs of inflammation, inflammation mediators,
chemotaxis, allergic reactions and hypersensitivities.

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