



Department	Pharmacy
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Course Name	Immunology	Course No.	0201336
Prerequisite	Pharmaceutical Microbiology (0201331)	Credit Hours	2
Number & date of course plan approval	2016/2017	Brief Description	See form QF02/0409

Course Objectives	<p>(1) This course is intended to cover different aspects of immunology, starting with historical perspective and covering innate and adaptive immunity, immunogenicity, antibodies, humoral and cellular immune responses, immune regulation, immunopathology such as hypersensitivity, immunological tolerance and autoimmunity, and transplantation. The course also deals with immunization, tumor immunology as well as the diagnostic immunological techniques.</p> <p>(2) Moreover, the course will explain in detail the immunotherapy for various immunological diseases.</p>
Intended Learning Outcomes	<p>Upon completion of this course, the student should be familiarized with:</p> <ol style="list-style-type: none"> 1. The principle and excitement of immunology. 2. The important areas of immunology 3. The impact of modern medical practice in pharmacy, especially hypersensitivity and autoimmune diseases. 4. The humoral and cellular immune responses and their regulations. 5. The immunotherapy for various immunological disorders. 6. The various methods of wider current uses in serology (ELISA, RIA, FAB, etc...) 7. The immune system that will make the student better pharmacist.
Course Topics	<ol style="list-style-type: none"> 1. Overview of the immune system 2. Cells and organs of the immune system 3. Antigens 4. Complement system 5. Antibodies 6. B-Cell activation, differentiation and humoral response 7. Major histocompatibility complex (MHC) 8. Antigen processing and presentation 9. Cell-Mediated effector responses 10. Hypersensitivity reaction 11. Vaccination 12. Immunology tolerance and autoimmunity 13. Transplantation immunology

Text Books	<p>1. Goldsby RA, Kindt TJ, and Osborne BA (2011): Kuby Immunology, 6th Ed, W.H. Freeman and Company, New York, USA.</p> <p>2. Nairn R and Helbert M (2008): Immunology for Medical Students, 2nd Ed, Mosby Elsevier Ltd, Philadelphia, USA.</p>			
References	<p>1. Murphy K, Travers P, and Walport M (2008): Janeway's Immunobiology, 7th Ed, Garland Science, New York, USA.</p> <p>2. Delves PJ, Martin SJ, Burton DR, and Roitt IM (2006) Roitt's Essential Immunology, 11th, Blackwell Publishing Ltd, Oxford, UK.</p> <p>3. Rosen FS and Geha RS (2004) Case Studies in Immunology, A Clinical companion, 4th Ed, Gerlad Publishing New York, USA</p> <p>4. Playfair JHL and Chain BM (2005); Immunology at Glance, 8th Ed, Gower Medical Publishing Ltd, London, UK.</p> <p>5. Parham P (2005): The Immune System, 2nd Ed, Gerland Science, New York, USA.</p> <p>6. Playfair JL and Lydyard PM (2000): Medical Immunology, 2nd. Ed, Churchill Livingstone, London.</p>			
Grade Determination	<p>1st Exam = 25%</p> <p>2nd Exam = 25%</p> <p>Final Exam = 50%</p>			
Course Outline				
Week	Hours	Subjects	Chapters in Textbook	Notes
1	2	<p>1. Historical Perspective and terminology (immune, immunity, susceptibility, immunology, immune system, non-specific immunity, specific immunity)</p> <p>2. Factors of the innate (nonspecific) immunity</p> <p style="padding-left: 20px;">a. anatomic (physical) barriers (skin and mucous membrane, etc..)</p> <hr/> <p style="padding-left: 20px;">b. physiological (chemical) barriers (secretions, low pH, and other chemical mediators)</p> <p style="padding-left: 20px;">c. Cellular defenses (phagocytic cell)</p> <p style="padding-left: 20px;">d. Inflammatory barriers, fever, molecular defenses (complement, interferon)</p> <p style="padding-left: 20px;">e. Acute phase proteins (IL-6, CRP, lectins)</p> <p style="padding-left: 20px;">f. Adaptive (specific, acquired) immunity.</p>	1 ST	
2	3	<p>1. The Lymphoid system and hematopoiesis</p> <p>2. primary lymphoid organs (bone marrow, thymus)</p> <p>3. Secondary lymphoid organs (lymph nodes, spleen, MALT, GALT, SALT)</p> <hr/> <p>4. Lymphocyte traffic (circulation)</p> <p>5. Cells of the immune system (granulocytes, agranulocytes, NK cells, etc).</p>	2 nd	

3	2	<p>1. Antigens</p> <p>2. Immunogenicity (immunogens) versus antigenicity (antigens)</p> <p>3. Factors influencing immunogenicity (foreignness, molecular size weight, chemical composition or complexity, susceptibility to antigen processing and presentation)</p> <hr/> <p>4. Contribution of the biological system to immunogenicity (genotype of the recipient animal, immunogen dosage and route of administration, adjuvants)</p> <p>5. Epitopes</p> <p>6. Haptens and the study of antigenicity.</p>	3 th	
4	4	<p>1. Antibodies (definition)</p> <p>2. Basic structure of immunoglobulin (fine structure, immunoglobulin domains, variable-region domains, hypervariable regions, constant-region domains, hinge region)</p> <p>3. Deducing antibody structure (papain, pepsin, mercaptoethanol reduction and alkylation)</p> <hr/> <p>4. Antibody classes (IgM, IgG, IgA, IgE, IgD) and biological activities</p> <p>5. Immunoglobulin mediated effector functions or consequences (opsonization, activation of complement, ADCC, transecytosis)</p> <p>6. Antigenic determinants on immunoglobulin (isotypes, allotypes, idiotypes)</p> <p>7. Monoclonal antibodies (production and clinical uses of monoclonal antibodies).</p>	4 th	
5	2	<p>1. The complement system (definition)</p> <p>2. Functions of complement</p> <p>3. The components of complement</p> <p>4. Complement activation pathways (classical, alternative, and lectins)</p> <p>5. Regulation of the complement system (C1 inhibitor, C4b-binding protein, Factor H, CR1, MCP, DAF, Factor I, S protein HRF, MIRL, AI)</p> <hr/> <p>6. Biological consequences of complement activation (cell lysis, inflammatory response, opsonization of antigen, viral neutralization, solubilization of immune complexes)</p> <p>7. Complement components deficiencies.</p> <p>8. Phagocytosis (definition)</p> <p>9. Cells involved in phagocytosis (monocytes,</p>	13 th	



		neutrophils, macrophages, dendritic cells) 10. Stages of phagocytosis (chemotaxis, adherence and ingestion, digestion and killing, disposal) 11. Extracellular killing 12. Outcome of phagocytosis (killing of antigen only, killing of phagocytic cell, killing of antigen and phagocytic cell, killing neither of them).		
6	3	1. Major Histocompatibility Complex (MHC)(definition) 2. General organization and inheritance of the MHC 3. Location and function of MHC regions: Class I MHC genes, Class II MHC genes, Class III MHC genes 4. MHC haplotypes. 5. Congenic MHC mouse strains. 6. MHC molecules and genes. 7. Organization of Class I and Class II genes. 8. Regulation of MHC expression and cellular distribution of MHC molecules (Class-I restriction and Class-II restriction) 9. MHC and immune responsiveness 10. MHC and disease susceptibility 11. Self-MHC-restriction of T-cells.	7 th	
7	2	1. Humoral Immune Response (definition) 2. Primary and secondary immune responses (definition and differences) 3. Types of responses according to types of antigens (T-independent and T-dependent) 4. Cell cooperation in the antibody response (role of B-cells, T-cells, and, APC) 5. Regulation of the response.	11 th	
8	2	1. Cellular Immune Response (definition) 2. Types of T-cells (T _{H1} , T _{H2} , T _C , T _S , T _{DTH}) 3. Cellular interaction required for the generation of the response 4. The role of MHC. 5. Differences between humoral and cellular immune responses	14 th	
9	2	1. Immunopathology (Hypersensitivity, definition) 2. Immediate (Type-I, allergy) hypersensitivity (allergen, mechanism of	16 th	

		reaction, localized and generalized anaphylaxis, genetic factors in allergy, treatment of allergies, chemotherapy and immunotherapy)		
10	2	<p>3. Cytotoxic (Type-II) hypersensitivity (mechanism, examples such as transfusion reaction, hemolytic diseases of the newborn, and drug-induced type-II hypersensitivity, immunotherapy of type-II)</p> <hr/> <p>4. Immune Complex (Type-III) hypersensitivity (mechanism, examples such as serum sickness and Arthus reaction)</p> <p>5. Cell-Mediated (Type-VI) hypersensitivity (mechanism, examples such as contact dermatitis and granulomatous hypersensitivity)</p> <p>6. Mixed (Type-V) hypersensitivity (mechanism, example such as ADCC)</p>	16 th	
11	3	<p>1. Immunopathology (Tolerance and autoimmunity)</p> <p>2. Proposed mechanisms for induction of autoimmunity (release of sequestered antigens, molecular mimicry, mimicry between MBP and viral peptides, inappropriate expression of Class-II MHC molecules, polyclonal B-cell activation)</p> <hr/> <p>3. Organ-specific autoimmune diseases (direct cell damage, stimulating or blocking auto-antibodies)</p> <p>4. Systemic autoimmune diseases (direct cell damage or blocking auto-antibodies)</p> <p>5. treatment of autoimmune diseases (current therapies and therapeutic approaches)</p>	20 th	
12	2	<p>1. Immunopathology (Transplantation immunology)</p> <p>2. Immunologic basis of graft rejection</p> <p>3. Specificity and memory of the rejection response (autograft acceptance, first-set and second-set rejection)</p> <p>4. Role of cell-mediated response</p> <p>5. Transplantation antigens and tissue typing</p> <hr/> <p>6. Mechanisms involved in graft- versus-host (HVG) rejection</p> <p>7. Clinical manifestation of graft rejection (hyperacute, acute, chronic)</p> <p>8. Graft-versus -host rejection (GVH).</p>	21 th	



		<p>9. General immunosuppressive therapy (mitotic inhibitors, corticosteroids, cyclosporine A, FK506, and Rapamycin, total lymphoid irradiation)</p> <p>10. Specific immunosuppressive therapy (Immunotherapy by using immunotherapeutic agents)</p>		
13	2	<p>1. Immunopathology (Immunodeficiency, definition):</p> <p>2. Types of immunodeficiency (primary-congenital and secondary-acquired immunodeficiency diseases), (nonspecific, specific, and combined immunodeficiency diseases)</p> <hr/> <p>3. Acquired Immune Deficiency Syndrome (AIDS)</p> <p>4. Progression of HIV diseases and AIDS. Who gets AIDS, and how?</p>	19 th	
14	2	<p>1. Immunization and Vaccination (definitions)</p> <p>2. Passive (natural, artificial) and active (natural and artificial) immunizations</p> <p>3. Vaccines and immunization procedures (killed and attenuated antigens, toxoid, subunit vaccine, peptide vaccine, etc)</p> <hr/> <p>4. The use of adjuvants</p> <p>5. Current progresses in vaccinations and usage of the recent approaches.</p>	18 th	
15	2	<p>1. Antigen-Antibody Interactions</p> <p>2. Application of immunological testing</p> <hr/> <p>3. Antibody affinity, antibody avidity, cross-reactivity</p> <p>4. Immunological tests (skin test, LTT, precipitation test, agglutination test, immunofluorescent test, Western blotting, ELISA, immunoprecipitation, radioimmunoassay,</p>	23 th	

Approved by Dept. Chair

Date of Approval

Extra Information: (Updated every semester and filled by course instructor)

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