Miami Dade College

Course Description

PCB4233C | Fundamentals of Immunology | 4.00 credits

Students will learn the immunological processes and concepts as they pertain to human health, disease prevention, development, and treatment. Its primary emphasis is on the cellular and non-cellular components of the immune system, and the ways in which these components interact to provide immunity. This is a combination lecture and lab course. Prerequisites: MCB3023, 3023L.

Course Competencies:

Competency 1: The student will demonstrate knowledge of the basic components and functions of the immune system by:

1. Describing the cells, tissues, and organs essential for immune function
2. Comparing the components of innate and adaptive immunity
3. Summarizing the functions of innate and adaptive immunity
4. Listing the differences between passive and active acquired immunity
5. Discussing the benefits the immune system provides over the reticuloendothelial system - specificity, amnestic response, surveillance of self
6. Describing the roles of B and T lymphocytes
7. Differentiating between the functions of humoral- and cell-mediated immunity

Competency 2: The student will demonstrate knowledge of immunoglobulin structure(s) and molecular genetics of antibody diversity by:

1. Explaining the genetic recombination and expression of immunoglobulin genes
2. Describing the basic structure of an immunoglobulin molecule
3. Discussing the significant features of the five classes of immunoglobulins
4. Explaining the diversity provided by the kappa and lambda light chains and gamma, alpha, mu, epsilon, and delta heavy chains

Competency 3: The student will demonstrate knowledge of the mechanisms of B-cell maturation, activation, and differentiation in antibody-mediated immune responses by:

1. Describing the steps by which a pre-B cell matures into a plasma cell
2. Discussing the protective roles of antibodies as opsonins in complement fixation, precipitin reactions, agglutinins, etc
3. Summarizing the immunological functions of complement proteins;, and the activation of these by antibody-antigen complexes
4. Explaining the classic and alternate pathways of complement fixation;, and the benefits of maintaining two complement fixation pathways
5. Analyzing the differences between a monoclonal and polyclonal response (s)
6. Explaining how monoclonal antibodies are generated and their use of in the laboratory and clinics

Competency 4: The student will demonstrate knowledge of the T-cell receptor structure and function by:

1. Describing the molecular structure of the T-cell receptor (TCR) and the organization of the TCR genes
2. Explaining the genetic mechanism for the generation of diversity in TCR genes
3. Comparing the analogies to immunoglobulin gene rearrangements
4. Discussing the role of Major Histocompatibility Complex (MHC) proteins in TCR function, antigen recognition/presentation, and signal transduction

Competency 5: The student will demonstrate knowledge of the mechanisms of T-Cell maturation, activation, and differentiation in cell-mediated immune responses by:

1. Explaining the steps of T cell maturation and development in the thymus and immune accessory organs

2. Describing how positive and negative selection generate self-restricted T cells
3. Contrasting the role of the different interleukins in T-cell maturation and cellular immune reactions
4. Describing T-cell commitment to the CD4 or CD8 lineages, and the generation of the different T-cell subpopulations (e.g., cytotoxic, helper)
5. Discussing the roles of T-cytotoxic, T-helper, T-DTH, T-suppressor, K, and NK cells in cellular immune reactions

Competency 6: The student will demonstrate knowledge of the role of the immune system in the maintenance of health and in the etiology of disease by:

1. Discussing the use of vaccines and toxoids in establishing acquired immunity
2. Comparing the risks and benefits of different vaccine preparations;, and of the role of adjuvants in vaccination
3. Discussing immune disorders related defects in tolerance, leading to hypersensitivity and autoimmunity;, and by providing examples of these.
4. Defining the terms primary and secondary immunodeficiencies
5. Discussing current global health issues, such as malnutrition and AIDS, and their relationship to immunity, disease prevention, and onset
6. Discussing the interactions between microorganisms and the immune system, including microbial/parasitic evasion strategies and immune system responses
7. Summarizing the role of the immune system in the etiology and treatment of oncogenic malignancies/cancer
8. Explaining the immune effector mechanisms mediating antigen recognition and graft rejection during transplantation
9. Discussing the influence of cultural and societal beliefs that impact vaccines, organ transplantation, and allergies

Competency 7: The student will demonstrate knowledge of basic laboratory methods and procedures by:

1. Performing calculations and appropriately measuring, preparing, and diluting reagents and serological components for use in an immunology laboratory
2. Demonstrating proper handling, use, and disposal of potentially infectious/hazardous materials
3. Safely performing all common forms of serological and immunological techniques and methods
4. Stating the importance of Quality Control procedures and documentation
5. Evaluating experimental results and conditions with critical thinking skills and by providing remediation for any deficiencies noted in experimental results and methods
6. Properly documenting laboratory procedures and record-keeping procedures
7. Communicating clearly and concisely in an appropriate scientific form

Competency 8: The student will demonstrate knowledge and practice of standard immunological laboratory procedures used to detect and measure the immune response by:

1. Performing and ABO typing of blood groups to illustrate antigen-antibody reactions
2. Conducting a C-reactive protein test and explaining its clinical significance
3. Conducting ELISA assays for the detection of [viral] antigens and antibodies
4. Evaluating Ouchterlony Gel Diffusion assays used to examine antigen-antibody reactions
5. Assessing radial immunodiffusion assays used to examine antigen-antibody reactions
6. Interpreting Western Blot analysis of antigenic determinants/proteins

Learning Outcomes:

- communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively