Course Number and Title: MLT 260 Immunology

Campus Location:
Georgetown

Effective Date:
2022-51

Prerequisite:
BIO 121, MLT 121

Co-Requisites:
None

Course Credits and Hours:
4.00 credits
3.00 lecture hours/week
3.00 lab hours/week

Course Description:
This course covers theory and application of immunity and the immune response such as antibody structure and interactions, the complement system, hypersensitivity reactions, and disorders of the immune response. Topics include routine immunology/serology procedures and interpretation of test results in relation to disease states. Student laboratory experiments provide experiences in fundamental serology/immunology techniques.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
Lab coat

Schedule Type:
Classroom Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Describe the immune response, antigen antibody reactions, cellular, and humoral immunity. (CCC 1, 2, 5, 6; PCG 6)
2. Describe various diseases and conditions and how laboratory tests correlate with these diseases. (CCC 1, 2, 5, 6; PGC 6)
3. Identify and describe the methodology used in immunology/serology, and determine the variables that can adversely affect laboratory results. (CCC 2, 5, 6; PGC 1, 2, 3, 4, 6)
4. Collect, process, and analyze immunology/serology specimens using a variety of methods to include both manual and automated methods. (CCC 1, 2, 3, 4, 6; PGC 1, 2, 3, 4, 5, 6)
5. Evaluate laboratory data for quality control purposes, and describe the role of quality assurance in immunology. (CCC 3, 5, 6; PGC 1, 2, 3)
6. Describe safety awareness for the immunology laboratory personnel to include bloodborne pathogens and the use of personal protective equipment for the laboratorian. (CCC 2, 5, 6; PGC 1, 5)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Describe the immune response, antigen antibody reactions, cellular, and humoral immunity.
    1. Describe the physical and chemical characteristics of antigens.
    2. Describe the classes, chemical, and physical properties of immunoglobulins.
    3. List in sequence the components of the complement activation scheme.
    4. Discuss the role of calcium and magnesium in complement activation.
    5. Discuss the alternate complement pathway, and explain its significance.
    6. Identify activators of the classic complement pathway.
    7. Identify activators of the alternate complement pathway.
    8. Differentiate between primary and secondary immune responses.
    9. Name the two main components of a specific immune response.
    10. Differentiate between active and passive immunity.
    11. Differentiate between T and B cells.
    12. Describe cell mediated immunity and the factors involved in its expression.
    13. Describe humoral immunity and the factors involved in its expression.
    14. Explain the makeup of a cluster of differentiation.
    15. Discuss how Natural Killer cells differ from T lymphocytes.
    16. Discuss several biological properties of individuals that influence the nature of the immune response.

17. Describe the differences in the structure of class I and class II proteins.
18. Compare the transport of antigen to cellular surfaces by class I and class II proteins.
19. Discuss the differences in the source and types of antigen processed by class I and class II molecules.
20. Explain the clinical significance of the class I and class II molecules.
21. Describe innate immunity and the factors involved in its expression.
22. Explain acute phase reactants their significance and function.
23. Discuss the intracellular mechanism for destruction of foreign particles during the process of phagocytosis.
24. Describe cytokines and relate its medical importance.
25. Define, vaccine, toxoid, attenuation, adjuvant, and recombinant vaccine.

2. Describe various diseases and conditions and how laboratory tests correlate with these diseases.
    1. Name the causative agent for syphilis, list the four stages, and describe its symptoms.
    2. Name the three general types of laboratory tests useful in the diagnosis of syphilis, and describe the procedure for each.
    3. Compare the advantages and disadvantages for the above tests.
    4. Discuss the development and appearance of antibodies in syphilis and relate this information to laboratory testing.
    5. List five antibodies which may be seen following streptococcal infection.
    6. State the principle of the streptozyme test, and discuss the significance of test results.
    7. Name the causative agent of infectious mononucleosis.
    8. Discuss heterophile antibodies such as mono, serum sickness, and Forsman.
    9. Discuss Epstein-Barr virus markers.
    10. Define *cold agglutinin*, and discuss the principle of the cold agglutinin procedure.
    11. Identify sources of false positive and negative results.
    12. Discuss immobilization (I) antigen and the significance of an increased titer of cold agglutinins.
    13. Define *C-reactive protein* (CRP), and discuss the principles of the CRP test.
    14. Discuss the clinical significance of the CRP test, and compare the CRP and sedimentation rate in relation to clinical significance and sensitivity.
    15. Explain the rheumatoid arthritis (RA) factor.
    16. Give the principle of the RA test.
    17. Discuss the clinical significance of positive results of the RA test.
    18. Compare the relative specificity and sensitivity of latex particles and erythrocytes in RA testing.
    19. Give the principle of the hemagglutination test for rubella.
    20. Explain the timetable for pre-natal exposure for rubella and state the critical period.
    21. Explain how to differentiate immunoglobulin G (IgG) from immunoglobulin M (IgM) antibodies.
    22. Differentiate between rubella and rubeola.
    23. Given rubella titers discuss the clinical significance.
    24. Briefly discuss other methods available for the diagnosis of rubella.
    25. Define *toxoplasmosis*, *other agents*, *rubella*, *cytomegalovirus*, and *herpes simplex* (TORCH) *syndrome*.
    26. Describe the structure of the hepatitis B virus.
    27. Describe the results in various stages of disease for hepatitis B surface antigen (HBsAg), anti-*hepatitis B core* antigen (Anti-HBc), and anti-hepatitis B surface (Anti-HBS).
    28. Differentiate among hepatitis A, hepatitis B, and hepatitis C.
    29. Discuss the methods available for the diagnosis of hepatitis.
    30. Discuss the significance of the delta virus.
    31. Discuss the tests for hepatitis C virus (HCV), anti-HCV, and molecular tests.
    32. Define *autoimmunity*.
    33. Discuss the relationship of immunologic deficiency and autoimmunity.
    34. Describe the clinical uses and interpretation of the following: antinuclear antibody (ANA), anti-mitochondrial antibodies (AMA), rheumatoid factor (RF) factor, thyroid antibodies, anti-smooth muscle antibodies, and anti-deoxyribonucleic acid anti-DNA.
    35. Describe the fluorescent staining patterns for ANA in various disease states.
    36. Name three categories of autoimmune disorders, and give one example of each.
    37. Describe the four major types of hypersensitivity, and give at least one example for each.
    38. Give the major characteristics of the following immunologic deficiency states: Bruton's hypogammaglobulinemia, immunoglobulin A (IgA) deficiency, Nezelof's, Di George's, sex-linked agammaglobulinemia, Swiss type agammaglobulinemia, Wiskott Aldrich, Ataxia Telangiectasia, chronic granulomatous disease, and Chediak-Higashi.
    39. Differentiate between multiple myeloma and macroglobulinemia.
    40. Name at least two carcinofetal antigens, and discuss their use in medicine.
    41. Describe causes of alterations in immunoglobulins both normal and abnormal.
    42. Briefly discuss the role of the immune system in immunodeficiency, inflammatory, allergic, autoimmune, and lymphoproliferative diseases.
    43. Discuss the origin structure and effect of *human chorionic gonadotropin* (HCG).
    44. Briefly discuss the principle and advantages and/or disadvantages of bioassay tests for pregnancy.
    45. Describe the HCG in each of the following: normal pregnancy, ectopic pregnancy, hydatiform mole, and testicular tumors.
    46. Discuss the principle, sensitivity, and advantages/disadvantages for *enzyme-linked immuno-sorbent assay* (ELISA) and radioimmunoassay (RIA) methods.
    47. Describe the epidemiology of *acquired immune deficiency syndrome* (AIDS).
    48. Discuss the causative agent and clinical symptoms of AIDS.
    49. Identify the serological tests for infection with *human immunodeficiency virus* (HIV), and explain their significance.
    50. Discuss the impact of AIDS on laboratory practice.
    51. Explain the immunologic abnormalities associated with AIDS.
    52. Perform the following serologic procedures using appropriate written procedures and package inserts: mono test, *rapid plasma reagin* (RPR), streptozyme, lupus latex test, pregnancy test, CRP, RF test, and other card tests as available.
    53. Distinguish between an allograft, autograft, xenograft, and syngeneic graft (isograft).
    54. Compare the immunologic mechanisms involved in hyperacute, acute, and chronic graft rejection.
    55. Describe the characteristics that differentiate cancer cells from normal cells and the process by which malignant cells are thought to

develop.
56. Differentiate between tumor-specific antigens and different categories of tumor-associated antigens and recognize examples of each.
57. Describe some of the cellular properties and genetic changes that occur during malignant transformation of hematologic cells.
58. Differentiate between primary immunodeficiency diseases and secondary immunodeficiency diseases.
59. Indicate the general immunologic defects associated with each of the nine categories of primary immunodeficiency diseases.
60. Explain the immunologic defects and clinical manifestations associated with selected primary and secondary immunodeficiency diseases.

3. Identify and describe the methodology used in immunology/serology, and determine the variables that can adversely affect laboratory results.
    1. Differentiate between precipitation and agglutination.
    2. Discuss factors which influence the precipitation reaction, including causes of false positive and negative.
    3. Interpret Ouchterlony patterns.
    4. Differentiate between direct and indirect florescent techniques.
    5. Discuss toxin neutralization.
    6. Compare and contrast the varying sensitivity of serological procedures.
    7. Differentiate among prozone, postzone, and zone of equivalence, and describe the significance of these in the laboratory.
    8. Discuss the importance of monoclonal antibodies and how they are produced.
    9. Describe the complement fixation test, given the visible results of the final stages of this test, and determine whether it is positive or negative.
    10. Discuss affinity and avidity and their influence on antigen-antibody reactions.
    11. Differentiate between turbidmetry and nephelometry and discuss the role of each in measurement of precipitation reactions.
    12. Describe the difference between competitive and noncompetitive immunoassays.
    13. Distinguish between heterogeneous and homogenous immunoassays.
    14. Discuss the principles of the polymerase chain reaction.
    15. Discuss DNA and RNS amplification methods.
    16. Describe the function of each of the major components of a flow cytometer.
    17. Summarize the principle of hydrodynamic focusing within a flow cytometer.
    18. Explain the underlying principles of serum and urine protein electrophoresis, immunofixation electrophoresis, and serum free light chain analysis.
4. Collect, process, and analyze immunology/serology specimens using a variety of methods to include both manual and automated methods.
    1. Explain how different specimens can be used in the clinical laboratory: serum, plasma, whole blood and the importance of the quality of the specimen.
    2. Properly perform various immunological tests associated with disease states: ELISA, enzyme immunoassay (EIA), electrophoresis, immunoblots, western blots, agglutination tests, serologic kits, radial immunodiffusion, Ouchterlony, ANAs, chromatography, blood bank antibody screens, and Coombs tests, and molecular testing.
5. Evaluate laboratory data for quality control purposes, and describe the role of quality assurance in immunology.
    1. Define *quality assurance*.
    2. Identify and define key words of a successful quality assurance process.
    3. Discuss the relationship of quality assurance to quality control and continuous quality improvement.
    4. Perform quality control for the immunology laboratory.
    5. Analyze data to determine if testing data is acceptable.
6. Describe safety awareness for the immunology laboratory personnel to include bloodborne pathogens and the use of personal protective equipment for the laboratorian.
    1. Explain the basic techniques in the prevention of disease transmission.
    2. Name the components of the personal protective equipment standard.
    3. Explain the purpose and contents of a laboratory safety manual as it relates to immunology/serology.
    4. Define the elements of a biosafety program.

Evaluation Criteria/Policies:
The grade will be determined using the Delaware Tech grading system:

90	**–**	**100**	**=**	**A**
80	**–**	**89**	**=**	**B**
70	**–**	**79**	**=**	**C**
0	**–**	**69**	**=**	**F**

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:
Calculated using the following weighted average

Formative: Case studies – (6) (equally weighted)	6.5%
Summative: Tests – (5-6) (equally weighted)	52%
Formative: Assignments – (equally weighted)	6.5%
Formative: Lab exercises – (equally weighted)	17.5%
Summative: Practical – (5-10) (equally weighted)	17.5%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Collect, process, and analyze biological specimens and other related substances.
2. Recognize factors that affect procedures and results, and take appropriate actions within predetermined limits when corrections are indicated.
3. Perform and monitor quality control within predetermined limits.
4. Apply basic scientific principles for application in medical laboratory procedures and methodologies.
5. Employ safety principles according to health and environmental regulations.
6. Correlate laboratory results with common disease processes and treatments for diagnosis.
7. Demonstrate professional conduct and interpersonal communication skills with patients, laboratory personnel, other healthcare personnel, and the public.

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.