Course Number and Title: MLT 261 Blood Banking

Campus Location:
Georgetown

Effective Date:
2020-51

Prerequisite:
MLT 260

Co-Requisites:
None

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

Course Description:
This course introduces immunohematology and covers the theory and practice of a wide variety of procedures used in donor selection, component preparation and use, and techniques used to detect antigen/antibody reactions during transfusions.

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 antigen antibody reactions, the immune process, heredity, and Mendelian genetics as they relate to immunohematology. (CCC 1, 2, 5; PGC 2)
2. Describe ABO and Rh blood groups as well as other blood group systems of significance. (CCC 1, 2, 5, 6; PGC 2, 6)
3. Describe various diseases and conditions related to blood banking and how laboratory tests correlate with these diseases. (CCC1, 2, 5, 6; PGC 1, 2, 6)
4. Identify and describe the methodology used in blood bank and variables that can adversely affect laboratory results. (CCC 2, 5, 6; PGC 2, 4, 6)
5. Collect, process, and analyze blood bank specimens using a variety of methods. (CCC 1, 2, 3, 4, 6; PGC 1, 2, 3, 4, 5, 6)
6. Describe process of donor collection and processing as it applies to blood banking. (CCC 1, 3, 4, 5, 6; PGC 1, 2, 3, 5)
7. Evaluate laboratory data for quality control purposes, and describe the role of quality assurance in a blood bank laboratory. (CCC 2, 5, 6; PGC 1, 2, 3)
8. Describe safety awareness for the immunohematology laboratory personnel to include bloodborne pathogens and the use of personal protective equipment for the laboratorian and for instrumentation. (CCC 2, 5, 6; PGC 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 antigen antibody reactions, the immune process, heredity, and Mendelian genetics as they relate to immunohematology.
    1. Describe the physical and chemical characteristics of antigens.
    2. Describe the characteristics of immunoglobulins in relation to structure, significance for blood banking, variations, and Fc receptors on effector cells.
    3. Explain primary and secondary immune response, and distinguish between humoral and cellular immuni
    4. Differentiate the naturally occurring and immune forms of antibodies as to their cause or source, immunoglobulin type, optimum temperature, and medium for reactivity.
    5. Explain the difference between phenotype and genotype.
    6. Explain dominant, co-dominant, and recessive traits.

7. Discuss Mendel's laws of independent segregation and of dominance.
8. Correlate Mendel's law of dominance with specific examples of the inheritance of blood group antigens.

2. Describe ABO and Rh blood groups as well as other blood group systems of significance.
    1. Describe the ABO system in terms of the antigens and antibodies found in each of the types, its history, and the incidence of each type in the population.
    2. Describe the reactions in ABO typing for the following subgroups: A1, A2, A3, and Ax.
    3. Discuss ABO antigen changes which may occur during disease, including acquired B.
    4. Categorize the various blood types according to the amount of H antigen present.
    5. List the terminology systems for the Rh blood group.
    6. State the frequency of Rh antigens.
    7. Discuss the basis of weak D and its significance.
    8. Describe the characteristics of Rh antibodies.
    9. Discuss the clinical importance of this blood group system.
    10. Given the results of antigen typing and using probability charts, identify the most likely genotype.
    11. Discuss the effect of a positive direct Coombs test on the interpretation of Rh (D) typing.
    12. Name the antigens and antibodies of the Lewis system.
    13. Discuss the importance of the Lewis systems.
    14. Determine which antigens are present on the red cells and in the saliva given the ABO, secretor, and Lewis genes.
    15. Name the most important antigenic determinants for each of the following blood groups: MNSs, Kidd, P, Kell, Diego, Lewis, Xga, Duffy, and Lutheran.
    16. Name the corresponding antibodies in each of the above systems.
    17. Discuss reactivity, thermal range, incidence, inheritance, and clinical importance of each of the above systems.
3. Describe various diseases and conditions related to blood banking and how laboratory tests correlate with these diseases.
    1. Explain the following aspects of hemolytic disease of the newborn: causes and clinical aspects, risk to the fetus, detection, prevention, selection of blood/products for exchange transfusion, and ABO versus Rh hemolytic disease of the newborn.
    2. Define *massive feto-maternal bleed,* and identify both screening and definitive procedures for detection.
    3. Calculate an appropriate RhoGam dose given the results of Kleihauer-Betke stain.
    4. Describe RhoGam and its use in preventing hemolytic disease of the newborn.
    5. Recommend which patients are RhoGam candidates given case histories.
    6. Explain the significance of certain immune-mediated diseases for blood bank testing.
    7. Define *autoantibody* and compare the types of immune hemolytic anemias with respect to thermal amplitude, red cell destruction, and the type of protein (antibody or complement) coating the cells.
    8. Discuss problems encountered in laboratory testing of specimens containing cold autoagglutinins, and outline testing procedures that can differentiate between specificities.
    9. Discuss pathologic cold autoagglutinins, including laboratory testing and treatment.
    10. Differentiate between idiopathic warm autoimmune hemolytic anemia and drug-induced immune hemolytic anemia.
    11. Compare and contrast the four classic mechanisms for drug hemolysis, and give examples of medications causing each type.
    12. Describe the nature of various hepatitis viruses and the diseases they cause.
    13. Discuss the current theories regarding transfusion-associated hepatitis.
    14. Discuss the nature of the acquired immunodeficiency syndrome and its relation to blood products.
    15. Name and describe the laboratory tests performed on donor blood to detect human immunodeficiency virus infection.
    16. Describe the dangers of Epstein Barr virus and cytomegalovirus contamination of blood components.
4. Identify and describe the methodology used in blood bank and variables that can adversely affect laboratory results.
    1. Explain the composition and purpose of reagents used in blood bank testing.
    2. Define *forward*, *reverse*, *serum*, and *cell typing*.
    3. Discuss the use of microtiter and gel card techniques.
    4. Describe the preparation and use of check cells.
    5. Identify sources of error in antiglobulin testing.
    6. Describe the major crossmatch procedure and determination of compatibility or incompatibility.
    7. Describe the concept of zeta potential and how it relates to immunohematology.
    8. Identify techniques that may be used to aid in the identification of antibodies.
    9. List the antibodies most likely to react in each media or at each stage of the panel.
    10. Define dosage effect and absorption/elution techniques.
    11. Explain the principle of direct and indirect Coombs testing and clinical uses.
    12. Discuss elution and absorption techniques and their use.
    13. Prepare cell suspensions of appropriate concentration.
    14. Perform cell washing techniques correctly.
    15. Grade and interpret antibody-antigen reactions according to the established criteria.
    16. Determine the correct blood group and Rh using the tube technique, plus reverse grouping, recording, and correctly interpreting the results with 100 percent accuracy given samples of blood.
    17. Perform direct and indirect Coombs testing on appropriate specimens, grading, and recording the results appropriately.
    18. Properly identify an antibody from antibody panels or elution with 95 percent accuracy.
    19. Select the most appropriate blood for transfusion and perform a compatibility testing with 100 percent accuracy given blood samples.
    20. Perform antibody screen testing correctly and determine immunoglobulin class, reactivity, and optimum temperature.
    21. Use a cell panel to perform antibody identification procedures, and correctly interpret the results.
    22. Perform an elution to determine cause of hemolytic disease of the newborn or an autoimmune or a transfusion reaction.

5. Collect, process, and analyze blood bank specimens using a variety of 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. Identify blood components, the technique for obtaining, processing, storage, advantages and disadvantages, and evaluate which components may benefit a particular patient.
    3. Describe the types of anticoagulants used in blood banking.
    4. Explain the aspects of donor selection and processing.
    5. Perform ABO/Rh testing, forward, and reverse typing.
    6. Perform fluorescent/colorimetric antinuclear antibody testing.
    7. Perform antibody screening.
    8. Identify antibodies by serological techniques, and explain how timing of specimen collection is critical.
    9. Perform antigen typing.
6. Describe process of donor collection and processing as it applies to blood banking.
    1. List the criteria for donor selection.
    2. List the tests performed on donor blood.
7. Evaluate laboratory data for quality control purposes, and describe the role of quality assurance in a blood bank laboratory.
    1. Define *quality assurance*.
    2. Describe the role of quality assurance in a blood center or transfusion service.
    3. Identify and define key words of a successful quality assurance process.
    4. Discuss the relationship of quality assurance to quality control and continuous quality improvement.
    5. Perform quality control for the blood bank lab.
    6. Analyze data to determine if testing data is acceptable.
    7. Design a parameter to include in a quality assurance program of a blood bank laboratory.
8. Describe safety awareness for the immunohematology laboratory personnel to include bloodborne pathogens and the use of personal protective equipment for the laboratorian and for instrumentation.
    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 blood bank.
    4. Define the elements of a biosafety program.
    5. Demonstrate proper use of personal protective equipment in the laboratory.
    6. Demonstrate proper use of standard precautions in the laboratory.

Evaluation Criteria/Policies:
Students must demonstrate proficiency on all CCPOs at a minimal 75 percent level to successfully complete the course. The grade will be determined using the Delaware Tech grading system:

92	**–**	**100**	**=**	**A**
83	**–**	**91**	**=**	**B**
75	**–**	**82**	**=**	**C**
0	**–**	**74**	**=**	**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

Evaluation Measure	Percentage of final grade
Summative: Case Studies (8) (equally weighted)	6.5%
Summative: Tests (5-6) (equally weighted)	52%
Formative: Assignments (equally weighted)	6.5%
Summative: Lab exercises (equally weighted)	17.5%
Summative: Practical (15-20) (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):
AHTAASMLT

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.