

VT-2402: VETERINARY PATHOLOGY III

Cuyahoga Community College

Viewing: VT-2402 : Veterinary Pathology III

Board of Trustees:

1/30/2025

Academic Term:

Fall 2025

Subject Code

VT - Veterinary Technology

Course Number:

2402

Title:

Veterinary Pathology III

Catalog Description:

Veterinary hematology and chemistry laboratory procedures including complete blood counts (CBC) and clinical chemistries performed commonly in veterinary practices.

Credit Hour(s):

2

Lecture Hour(s):

1

Lab Hour(s):

3

Requisites

Prerequisite and Corequisite

BIO-1420 Anatomy and Physiology of Domestic Animals II, and VT-1521 Veterinary Pathology I.

Outcomes

Course Outcome(s):

Coordinate preparation and submission of blood samples for diagnostic analysis.

Objective(s):

1. Prepare, process, and preserve whole blood samples for hematologic testing in-house or by shipping to external laboratories.
2. Prepare and stain a quality blood smear for microscopic examination.
3. Prepare, process, and preserve blood samples for serum chemistry testing in-house or by shipping to external laboratories.
4. Describe factors such as hemolysis and lipemia that adversely influence blood sample quality.
5. Prepare, complete, and submit paper and electronic requisition forms.

Course Outcome(s):

Perform veterinary hematology and chemistry assays using a variety of technologies.

Objective(s):

1. Identify blood cell parasites and inclusions, and other cellular changes, such as lymphocyte activation and neutrophil toxicity, that indicate disease.
2. Differentiate artifacts from significant findings on blood smear examinations.
3. Perform calculations necessary to determine absolute leukocyte values and correction of the total white blood cell (WBC) count for nucleated red blood cells (RBC).
4. Perform a reticulocyte count and calculate reticulocyte numbers as a percentage, absolute number, and corrected percentage.

5. Calculate hematologic indices and explain their significance.
6. Set-up, operate and maintain chemistry analyzers, and other common types of equipment used to perform blood chemistry assays.
7. Perform chemistry assays using automated chemistry analyzers, point-of-care analyzers, and glucometers.
8. Set-up, operate, and maintain electronic cell counters and other equipment used to perform hematology tests.
9. Perform a CBC including determination of hemoglobin, packed cell volume, total protein, WBC count, RBC count, and platelet count.
10. Describe the function, structure, and appearance of each type of blood cell seen on a smear.
11. Perform a blood smear evaluation including determination of a differential cell count, evaluation of erythrocyte, leukocyte and platelet morphology and estimation of platelet and leukocyte numbers for a dog, cat, horse, or cow.

Course Outcome(s):

Produce and report hematology and chemistry results that are accurate, precise, and that provide the veterinarian with useful diagnostic information.

Objective(s):

1. Identify and carry out routine maintenance procedures on equipment used to perform hematology and chemistry assays.
2. Ensure accurate and precise diagnostic information through use of quality control procedures.
3. Differentiate normal and abnormal laboratory results and identify results that are indicative of emergency situations that need to be brought to the immediate attention of the attending veterinarian.

Methods of Evaluation:

1. Lecture and laboratory quizzes
2. Lecture and laboratory unit examinations
3. Comprehensive lecture and laboratory examinations
4. Sample collection and preparation
5. Homework assignments
6. Presentations

Course Content Outline:

1. Introduction to clinical pathology
 - a. In-house diagnostic laboratory vs. veterinary reference laboratory
 - b. Using a commercial laboratory effectively
 - c. Universal precautions and lab safety
 - d. The role of the technician in diagnostic testing
 - e. Laboratory equipment and instrumentation
 - i. Microscopes
 - ii. Centrifuges
 - iii. Refractometers
 - iv. Electronic cell counters
 - v. Chemistry analyzers
 - vi. Miscellaneous equipment and supplies
 - f. Quality Assurance
 - i. Accuracy, precision, and reliability
 - ii. Causes of laboratory errors
 - iii. Calibrators and controls
 - iv. Quality control procedures and records
 - g. Laboratory records
 - i. Standard Operating Procedures
 - ii. Requisition and report forms
 - iii. Maintenance records and logs
 - h. Proper disposal of laboratory samples and used supply items
2. Blood collection
 - a. Blood components
 - b. Tubes and tube selection

- c. Sample handling, storage, and shipping
- d. Blood smear preparation and staining
- 3. CBC
 - a. Methodologies
 - b. The automated CBC
 - c. Electronic cell counters
 - i. Impedance vs. laser-based analyzers
 - ii. Reading a CBC report form
 - iii. Machine maintenance and quality assurance
 - iv. Preparing and using reagents
 - d. Packed cell volume and plasma protein
 - e. Total white blood cell count
 - f. Blood smear examination
 - i. Estimation of cell counts
 - ii. Differential cell count
 - iii. Evaluation of cell morphology
 - iv. Examination for parasites, inclusions, and other changes
 - g. Platelet count
 - h. Reticulocyte count
 - i. Hemoglobin concentration
 - j. Calculated values
 - i. Hematocrit
 - ii. Correction of total WBC count for nucleated RBCs
 - iii. Calculation of erythrocyte indices
 - iv. Calculation of absolute leukocyte values
 - k. Reporting CBC results
 - i. Normal and abnormal values
 - ii. Values that should be reported to a veterinarian
- 4. Hematopoiesis
 - a. Formation of blood cells
 - b. Blood cell maturation
 - i. Erythroid cell line
 - ii. Granulocyte cell line
 - iii. Monocytic cell line
 - iv. Megakaryocytic cell line
 - v. Lymphoid cell line
- 5. Normal blood cell morphology in common domestic species
 - a. Erythrocytes
 - i. Normal shape, size, color, and distribution
 - ii. Species differences in erythrocyte morphology
 - b. Platelets
 - c. Leukocytes
 - i. Neutrophils, eosinophils, and basophils
 - ii. Lymphocytes
 - iii. Monocytes
 - iv. species differences in leukocyte morphology
- 6. Abnormal blood cell morphology in common domestic species
 - a. Leukocytes
 - i. Band neutrophils
 - ii. Activated lymphocytes
 - iii. Neutrophil toxicity
 - iv. Hypersegmentation of neutrophils
 - v. Degranulated eosinophils
 - vi. Pelger-Huet anomaly
 - vii. Atypical cells and neoplastic cells
 - b. Erythrocytes
 - i. Nucleated red blood cells
 - ii. Macrocytosis and microcytosis
 - iii. Regenerative response (polychromatophils)

- iv. Immune-mediated damage (spherocytes, agglutination, ghost cells)
 - v. Oxidative injury (Heinz bodies, eccentrocytes)
 - vi. Metabolic and membrane disorders (echinocytes, burr cells, acanthocytes, keratocytes, blister cells, stomatocytes, ovalocytes, target cells, bar cells)
 - vii. Mechanical fragmentation (schistocytes and dacryocytes)
- c. Platelets
 - i. Macroplatelets
 - ii. Clumping
- 7. Blood cell inclusions
 - a. Basophilic stippling
 - b. Howell-Jolly bodies
 - c. Distemper inclusions
 - d. Pappenheimer bodies
 - e. Clinical significance of cell inclusions
- 8. Blood cell parasites
 - a. Mycoplasma spp.
 - b. Anaplasma spp.
 - c. Babesia
 - d. Ehrlichia
 - e. Diseases associated with blood cell parasites
- 9. Blood cell artifacts
- 10. Anemias
 - a. Regenerative anemia
 - b. Non-regenerative anemia
 - c. Classification according to cell size and hemoglobin content
- 11. Avian and exotic animal hematology
- 12. Blood chemistry evaluation
 - a. Methodologies
 - i. Chemistry analyzers
 - ii. Point-of-care analyzers
 - iii. End-point assays vs. kinetic assays
 - b. Performing sample dilutions
 - c. Preparing and using reagents
 - d. Machine maintenance and quality assurance
 - e. Reading a report
 - f. Sample collection and preparation
 - g. Protein assays
 - i. Total protein
 - ii. Albumin
 - iii. Globulin
 - iv. Fibrinogen
 - h. Liver assays
 - i. Enzymes released from damaged hepatocytes (ALT, AST, SDH, GLDH)
 - ii. Enzymes associated with cholestasis (AP and GGT)
 - iii. Liver function assays (total bilirubin and bile acids)
 - i. Kidney assays
 - i. Blood urea nitrogen (BUN)
 - ii. Serum creatinine
 - iii. Symmetric dimethylarginine
 - iv. BUN/Creatinine ratio
 - v. Urine protein/creatinine ratio
 - vi. Uric acid
 - j. Pancreas assays
 - i. Exocrine assays (amylase, lipase, Serum TLI, Serum PLI)
 - ii. Endocrine assays (glucose, fructosamine, glycosylated hemoglobin)
 - k. Miscellaneous assays (cholesterol, creatine kinase, lactate)
 - l. Electrolyte assays

- i. Calcium and phosphorus
 - ii. Sodium, potassium, and magnesium
 - iii. Chloride and bicarbonate
- m. Endocrine organ assays
 - i. Thyroid assays (thyroxine, tri-iodothyronine, free T4 and T3)
 - ii. ACTH stimulation and dexamethasone suppression
- n. Factors influencing chemistry results
- o. Reporting chemistry results
 - i. Normal and abnormal values
 - ii. Values that should be reported to a veterinarian

Resources

Sirois, Margi. *Laboratory Procedures for Veterinary Technicians*. 7th ed. St. Louis: Elsevier, 2020.

Regan, William J., et al. *Veterinary Hematology: Atlas of Common Domestic Species*. 3rd ed. Hoboken, NJ: John Wiley & Sons, Inc., 2019.

Bassett, Joanna M., et al., editors. *McCurnin's Clinical Textbook for Veterinary Technicians and Nurses*. 10th ed. St. Louis: Elsevier, 2022.

Campbell, Terry. *Avian Hematology and Cytology*. 3rd ed. Ames: Wiley-Blackwell, 2015.

Thrall, Mary Anna, et al. *Veterinary Hematology and Clinical Chemistry*. 2nd ed. Ames: Wiley Blackwell, 2012.

Voigt, Gregg and Shannon L. Swist. *Hematology Techniques and Concepts for Veterinary Technicians*. 2nd ed. Ames: Wiley Blackwell, 2011.

Latimer, Kenneth S. *Duncan and Prasse's Veterinary Laboratory Medicine Clinical Pathology*. 5th ed. Ames: Wiley Blackwell, 2011.

Weiss, Douglas J. and K. Jane Wardrop. *Schalm's Veterinary Hematology*. 6th ed. Ames: Wiley Blackwell, 2010.

Rebar, Alan H., et al. *A Guide to Hematology in Dogs and Cats*. Jackson: Teton NewMedia, 2002.

Hawkey, C. M., and T. B. Dennett. *Color Atlas of Comparative Veterinary Hematology*. 1st ed. Ames: Iowa State University Press, 1989.

Resources Other

Today's Veterinary Practice, <https://todaysveterinarypractice.com/>
 Clinician's Brief, <http://www.cliniciansbrief.com/> (<http://www.cliniciansbrief.com/>)
 DVM360, <http://www.dvm360.com/>
<https://go.atdove.org/>, videos and lectures
<https://learn.idexx.com/>, (<https://learn.idexx.com/learn/>) videos and articles

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