

# VT-2412: VETERINARY PATHOLOGY IV

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## Cuyahoga Community College

**Viewing: VT-2412 : Veterinary Pathology IV**

**Board of Trustees:**

October 2024

**Academic Term:**

Fall 2025

**Subject Code**

VT - Veterinary Technology

**Course Number:**

2412

**Title:**

Veterinary Pathology IV

**Catalog Description:**

Veterinary medical laboratory procedures performed commonly in veterinary practices including urinalysis, vaginal cytology, ear cytology, cytology of tissues and fluids, bone marrow evaluation, serology, coagulation tests and necropsy.

**Credit Hour(s):**

2

**Lecture Hour(s):**

1

**Lab Hour(s):**

3

## Requisites

**Prerequisite and Corequisite**

VT-2402 Veterinary Pathology II.

## Outcomes

**Course Outcome(s):**

Perform a complete urinalysis including evaluation of physical properties, specific gravity, chemical properties, and microscopic sediment examination.

**Objective(s):**

1. Explain the effects of various methods of urine collection on the results of a urinalysis.
2. Identify the normal physical and chemical properties of urine in each of the common domestic species.
3. Determine and report the physical properties of a urine sample including color, clarity, and odor and explain the significance of abnormal findings.
4. Determine and report the specific gravity of a urine sample and explain its significance.
5. Perform and report a biochemical exam using reagent strips and confirmatory tests and explain clinically important biochemical characteristics of urine.
6. Prepare and examine unstained and stained urinary sediment.
7. Identify, quantify, and report significant findings in urinary sediment including cells, casts, crystals, microorganisms, and miscellaneous sediment.
8. Differentiate normal and abnormal urinalysis results and identify results that are indicative of emergency situations that need to be brought to the immediate attention of the attending veterinarian.

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**Course Outcome(s):**

Perform serologic, coagulation, and other ancillary assays required to diagnose clinically important diseases in domestic animals.

**Objective(s):**

1. Collect and process blood for coagulation testing and perform in-house coagulation tests such as mucosal bleeding time, fibrinogen, activated clotting time, activated partial thromboplastin time (APTT)APTT, and prothrombin time (PT)PT.
2. Explain the indications for and methodology of commonly used serologic tests including enzyme-linked immunosorbent assay (ELISA)ELISA tests, slide or card agglutination tests, and antibody titers.
3. Explain the role of the polymerase chain reaction test in identification of disease-causing agents.

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**Course Outcome(s):**

Perform a necropsy dissection and tissue collection on a non-preserved animal.

**Objective(s):**

1. Explain the principles and procedures for performing a complete necropsy on a domestic or exotic animal.
2. Describe procedures for collection, storage, and shipment of samples for histopathology and toxicological examination.
3. Describe the special procedures including specimen preparation and submission used whenever an animal is suspected of dying of rabies or other zoonosis.

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**Course Outcome(s):**

Perform a complete diagnostic workup on a patient.

**Objective(s):**

1. Prepare, process, and store urine, cytology, fluid, tissue, and blood samples for both in-house testing and shipping to external laboratories.
2. Prepare, complete, and submit paper and electronic requisition forms.
3. Perform a complete laboratory evaluation including a complete blood count (CBC), profile, urinalysis, and clotting screen on a patient as ordered by the attending veterinarian.
4. Ensure accurate and precise diagnostic information through quality control procedures.
5. 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.

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**Course Outcome(s):**

Collect, prepare, and evaluate cytologic samples.

**Objective(s):**

1. Describe collection techniques for obtaining cytologic samples by abdominocentesis, thoracentesis, tracheal wash, arthrocentesis, and cerebrospinal fluid (CSF) tap.
2. Describe the properties of normal and abnormal body fluids including transudates and exudates.
3. Identify the necessary equipment for bone marrow biopsy and assist with sampling, preparation, and evaluation.
4. Obtain, prepare, and evaluate otic cytology samples and report results.
5. Obtain, prepare, and evaluate vaginal cytology samples and report results.
6. Prepare and evaluate tissue cytologic samples obtained by impression smear or needle aspirate.

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**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 the urinalysis
  - a. The four parts of the urinalysis
  - b. Urine specimen collection, handling, and storage
    - i. Timing of collection
    - ii. Containers and the volume needed
    - iii. Collection by midstream void, expression, cystocentesis, and catheterization
    - iv. Principles of sample handling
    - v. Changes in urine over time
    - vi. Specimen preservation
2. Quality assurance
  - a. Standardization of processing, equipment, and reporting procedures
  - b. Quality control strips
3. Urinalysis-Macroscopic examination
  - a. Normal and abnormal color
  - b. Normal and abnormal odor
  - c. Normal and abnormal clarity
  - d. Species idiosyncrasies
4. Urinalysis-Specific gravity (SG) determination
  - a. Using a refractometer to measure SG
  - b. Normal SG for the common domestic species
  - c. Causes of abnormal SG
  - d. The significance of isosthenuria
5. Urinalysis-Biochemical analysis
  - a. Chemical constituents of the urine
    - i. pH
    - ii. Protein
    - iii. Glucose
    - iv. Ketones
    - v. Blood/hemoglobin/myoglobin
    - vi. Bilirubin
    - vii. Urobilinogen
  - b. Normal values for each constituent
  - c. Causes of abnormal values for each constituent
  - d. Use of reagent strips
    - i. Factors that affect results
    - ii. False positive and false negative results
  - e. Confirmatory tests
    - i. Sulfosalicylic acid test
    - ii. Ictotest
    - iii. Acetest
6. Microscopic examination of the urine sediment
  - a. Preparation of the sediment
  - b. Setting up the microscope for wet preps
  - c. Evaluation for red blood cells RBCs, white blood cells WBCs, renal cells, transitional cells, and squamous cells
    - i. Reporting findings
    - ii. Differentiation of each cell type from similar objects
    - iii. Normal values for each cell type
    - iv. Recognition of each cell type
    - v. Evaluation for hyaline, granular, cellular, waxy, and fatty casts
      1. Origin of and significance of casts
      2. General appearance of casts and differentiation of types
      3. Normals for each cast type
      4. Differentiation of casts from similar objects
      5. Reporting findings
  - vi. Evaluation for crystals
    1. Significance of and behavior of urinary crystals
    2. General appearance of crystals and differentiation from other objects
    3. Magnesium ammonium phosphate (MAP or struvite) crystals

4. Amorphous crystals
      5. Calcium carbonate crystals
      6. Calcium oxalate dihydrate and monohydrate crystals
      7. Urate crystals
      8. Bilirubin crystals
      9. Other uncommon crystals
    10. Reporting findings
  - vii. Evaluation for Microorganisms
    1. Origin of and significance of bacteria, yeast, and fungi
    2. General appearance of bacteria, yeast, and fungi
    3. Differentiation of microorganisms from similar objects
    4. Reporting findings
  - viii. Evaluation for Miscellaneous Sediment
    1. Significance of miscellaneous sediment
    2. Fat droplets
    3. Parasites and parasite eggs
    4. Sperm
    5. Artifacts and contaminants
7. Tissue cytology
- a. Collection of cytology samples
    - i. Fine needle biopsy
    - ii. Imprint (impression smear)
  - iii. Scraping
  - iv. Preparation of cytology samples
    1. Compression preparation
    2. Modified compression preparation
    3. Starfish preparation
  - v. Submitting and staining cytology smears
8. Fluid cytology
- a. Collection of body fluids
    - i. Abdominal paracentesis
    - ii. Thoracentesis
    - iii. Transtracheal wash
    - iv. CSF and joint taps
  - b. Preparation of body cavity fluids
    - i. Wedge smear
    - ii. Line smear
    - iii. Combination smear
    - iv. Concentration by centrifugation
  - c. Submitting and staining fluid samples
  - d. Fluid sample evaluation
    - i. Normal body cavity fluids
    - ii. Transudates
    - iii. Modified transudates
    - iv. Chylous effusion
    - v. Exudates
9. Otic cytology
- a. Sample collection
  - b. Sample preparation
  - c. Microscopic examination
  - d. Significant findings
    - i. Bacteria
    - ii. Yeast
    - iii. Ear mites
    - iv. Inflammatory cells
    - v. Findings in a normal ear
    - vi. Findings in an abnormal ear
    - vii. Reporting results
10. Bone marrow biopsy

- a. Indications
  - b. Equipment
  - c. Site selection and preparation
  - d. Marrow collection
  - e. Preparation of the sample
  - f. Evaluation
11. Vaginal cytology
- a. Review of the estrus cycle
  - b. Sample collection
  - c. Preparation
  - d. Evaluation
    - i. Appearance of vaginal epithelial cells
    - ii. Interpretation of results
  - e. Reporting results
12. Tissue sample evaluation
- a. What a pathologist looks for
  - b. Microscopic characteristics of inflammatory lesions
    - i. Common inflammatory lesions
  - c. Microscopic characteristics of neoplastic lesions
    - i. Criteria of malignancy
  - d. Common malignancies
    - i. Epithelial cell tumors
    - ii. Mesenchymal cell tumors
    - iii. Round cell tumors
13. Necropsy
- a. Indications
  - b. Handling the body
  - c. Equipment
  - d. Necropsy procedure
  - e. Sample collection
    - i. Microbiologic samples
    - ii. Tissue samples
    - iii. Toxicologic samples
  - f. Sample preparation and tissue fixatives
  - g. Storing and shipping samples
  - h. Handling rabies suspects
14. Coagulation tests
- a. Blood coagulation
    - i. Mechanical phase
    - ii. Coagulation cascade
    - iii. Causes of coagulation defects
    - iv. Signs of a coagulation defect
    - v. Hereditary coagulation disorders
    - vi. Acquired coagulation disorders
  - b. Coagulation tests
    - i. Blood collection for coagulation testing
    - ii. Activated partial thromboplastin time (APTT)
    - iii. One-stage prothrombin time (PT)
    - iv. Protein induced by vitamin K absence or antagonist (PIVKA) test
    - v. Fibrin degradation products
    - vi. Activated clotting time
    - vii. Bleeding time
    - viii. Fibrinogen
    - ix. Degradation product of crosslinked fibrin (D-Dimer) and fibrin degradation products
15. Serology
- a. Antigens and antibodies
  - b. Sample collection and preparation
  - c. Common serologic tests

- i. ELISA antigen and antibody tests
- ii. Competitive-inhibition enzyme-linked immunospecific assay (CELISA) antigen test
- iii. Radioimmunoassay
- iv. Latex agglutination
- v. Immunodiffusion
- vi. Fluorescent antibody test
- vii. Antibody titers

## Resources

Sirois, Margi. *Laboratory Procedures for Veterinary Technicians*. 7th. St. Louis: Elsevier, 2019.

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Valenciano, Amy C. and Rick L. Cowell. *Cowell and Tyler's Diagnostic Cytology and Hematology of the Dog and Cat*. 5th ed. St. Louis: Elsevier, 2020.

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Bassett, Joanna M. Angela D. Beal, and Oreta M. Samples. *McCurnin's Clinical Textbook for Veterinary Technicians*. 10th. St. Louis: Elsevier, 2021.

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Raskin, Rose E. and Denny Meyer. *Canine and Feline Cytology: A Color Atlas and Interpretation Guide*. 3rd ed. St. Louis: Elsevier, 2016.

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Harvey, John. *Veterinary Hematology: A Diagnostic Guide and Color Atlas*. 1st ed. St. Louis: Elsevier, 2012.

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Sink, Carolyn, and Nicole M. Weinstein. *Practical Veterinary Urinalysis*. 1st ed. Ames: Wiley Blackwell, 2012.

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

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Osborne, Carl, and Jerry Stevens. *Urinalysis: A Clinical Guide to Compassionate Patient Care*. 1st ed. Leverkusen: Bayer Corporation and Bayer AG Leverkusen, 1999.

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Chew, Dennis, and Stephen DeBartola. *Interpretation of Canine and Feline Urinalysis*. 1st ed. Wilmington: The Gloyd Group, Inc., 1998.

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## 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

Top of page

Key: 4468