

# BIO-1420: ANATOMY & PHYSIOLOGY OF DOMESTIC ANIMALS II

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## Cuyahoga Community College

**Viewing: BIO-1420 : Anatomy & Physiology of Domestic Animals II**

**Board of Trustees:**

January 2021

**Academic Term:**

Fall 2021

**Subject Code**

BIO - Biology

**Course Number:**

1420

**Title:**

Anatomy & Physiology of Domestic Animals II

**Catalog Description:**

Explores the comparative anatomy and physiology of the canine, feline, equine, bovine, ovine, avian and porcine species. Focuses on lymphatic, digestive, respiratory, urinary and reproductive systems. Immunology, pregnancy, lactation, blood and genetics considered. Laboratory includes preserved and fresh specimens, models, microscopic observations, demonstrations and audio/visual aids.

**Credit Hour(s):**

3

**Lecture Hour(s):**

2

**Lab Hour(s):**

2

**Other Hour(s):**

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## Requisites

**Prerequisite and Corequisite**

BIO-1410 Anatomy and Physiology of Domestic Animals I.

## Outcomes

**Course Outcome(s):**

Apply the fundamental knowledge of the digestive system of the canine, feline, equine, bovine, ovine, avian and porcine species when working in biomedical research, veterinary medicine, animal agriculture or other advanced scientific study.

**Objective(s):**

1. Explain the importance of microbes to digestion in the ruminants and equids.
2. Describe and identify the structural differences in the digestive tract between monogastrics and ruminants.
3. Identify the rumen compartments with their differing appearances and describe their individual functions.
4. Identify the regions of the monogastric digestive tract and explain their functions.
5. Describe the chemicals and compounds involved in the digestive process, including acids, enzymes, mucus and buffers.
6. Describe the digestive tract of a bird and explain the function of the various structures, including the differences from the digestive tract of a monogastric mammal.

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**Course Outcome(s):**

Apply the fundamental knowledge of the lymphatic system and blood composition of the canine, feline, equine, bovine, ovine, avian and porcine species when working in biomedical research, veterinary medicine, animal agriculture or other advanced scientific study.

**Objective(s):**

1. Identify the major blood cells and describe their functions.
  2. Identify the major components of the blood and describe the difference between serum and plasma.
  3. Describe the structure and function of lymphatic tissue.
  4. Describe the gross anatomy of lymphatic vessels and their organization
  5. Explain the formation and function of lymph.
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**Course Outcome(s):**

Apply the fundamental knowledge of the respiratory system of the canine, feline, equine, bovine, ovine, and porcine species when working in biomedical research, veterinary medicine, animal agriculture or other advanced scientific study.

**Objective(s):**

1. Recognize the general anatomic features of the mammalian respiratory system.
  2. Describe the mechanics of ventilation, including negative and positive pressure.
  3. Explain the control mechanisms for normal ventilation.
  4. Describe the physiology of internal and external respiration.
  5. Explain the principles of partial pressures, gas transport, blood gases, and acid/base balance.
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**Course Outcome(s):**

Apply the fundamental knowledge of the urinary system of the canine, feline, equine, bovine, ovine, and porcine species when working in biomedical research, veterinary medicine, animal agriculture or other advanced scientific study.

**Objective(s):**

1. Identify gross and microscopic anatomy of the mammalian urinary system.
  2. Explain the physiology of filtration, absorption, secretion, and renal thresholds.
  3. Describe the role of the kidneys in pH and electrolyte balance, fluid balance, and nitrogen balance.
  4. Describe the mechanisms of micturition.
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**Course Outcome(s):**

Apply the fundamental knowledge of the reproductive system and lactation in the canine, feline, equine, bovine, ovine, avian and porcine species (as applicable) when working in biomedical research, veterinary medicine, animal agriculture or other advanced scientific study.

**Objective(s):**

1. Describe the microscopic anatomy of the testes.
  2. Recognize the gross anatomical and functional aspects of the various components of the male reproductive system, including circulation, innervation, and the clinical significance of species variations.
  3. Explain the mechanisms of erection, intromission, and ejaculation, the components of semen, species variations, and clinical applications.
  4. Describe the anatomical and functional aspects of the various components of the female reproductive system and relate this to clinical applications.
  5. Recognize the microscopic anatomy of the ovary and relate this to clinical applications.
  6. Describe the components and processes of spermatogenesis, including hormonal control, and chromosome numbers for various species, and relate this to important clinical applications.
  7. Describe the components and processes of fertilization, oogenesis, including hormonal control, chromosome numbers, and estrous cycles for various species.
  8. Describe the different types of placentation.
  9. Describe normal parturition including the hormonal triggers for parturition, milk letdown, and milk production.
  10. Describe the process of egg formation and laying in birds.
  11. Identify the structures of the avian reproductive tract and explain the function of the cloaca.
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**Course Outcome(s):**

Apply the fundamental knowledge of genetics and immunology in the canine, feline, equine, bovine, ovine, and porcine species when working in biomedical research, veterinary medicine, animal agriculture or other advanced scientific study.

**Objective(s):**

1. Recognize dominant, codominant, incomplete dominant, and recessive inheritance patterns and be able to give examples of each from various species.
  2. Describe X-linked and sex-influenced inheritance.
  3. Recognize various inherited genetic traits within various species.
  4. Explain the difference between specific and non-specific immunity.
  5. Explain the role of B cells and T cells in immunologic reactions.
  6. Describe the process of antibody production and how this relates to vaccination.
  7. Describe passive and active immunity and relate this to important clinical applications.
  8. Explain the importance of colostrum to the immune function of neonates.
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**Methods of Evaluation:**

1. Objective lecture examinations
2. Practical laboratory examinations
3. Quizzes
4. Participation
5. Journal article summary

**Course Content Outline:**

1. Lymphatics
  - a. Lymph
  - b. Lymph vessels
    - i. Capillaries
    - ii. Thoracic duct
  - c. Lymph organs
  - d. Nodes
  - e. Spleen
  - f. Thymus
2. Immunity
  - a. Non-specific immunity
    - i. Complement cascade
    - ii. Inflammation
  - b. Specific immunity
    - i. B Cells
    - ii. Antibody protection
    - iii. Memory B cells
    - iv. T cells
    - v. Helper T cells
    - vi. Cytotoxic T cells
  - c. Passive vs. Active transfer
    - i. Colostrum
    - ii. Vaccination
3. Digestive system
  - a. Mechanical vs. chemical digestion
  - b. Monogastric digestion
    - i. Horse vs. carnivore/omnivore
    - ii. Anatomy
      1. Stomach
      2. Small intestine
      3. Cecum
      4. Large intestine
    - iii. Physiology of absorption
      1. Small intestine vs. large intestine
    - iv. Role of cecum in hindgut fermenters
  - c. Ruminant digestion
    - i. Anatomy
      1. Reticulum
        - a. Esophageal groove

2. Rumen
  3. Omasum
  4. Abomasum
  5. Small intestine
  6. Large intestine
  - ii. Physiology
    1. pH and chemical composition of each compartment
    2. Function of each compartment
  - iii. Role of microbes
    1. VFA as energy source
  - iv. Nutritional principles
    1. Carnivores
    2. Herbivores
    3. Omnivores
4. Respiratory system
- a. Organs of respiration
  - b. Gross anatomy
    - i. Nares
    - ii. Pharynx
    - iii. Larynx
    - iv. Trachea
    - v. Lungs
      1. Bronchi
      2. Bronchioles
      3. Alveoli
  - c. Microscopic anatomy
  - d. Physiology of ventilation
  - e. Mechanics of ventilation
    - i. Muscular movement
    - ii. Role of diaphragm
  - f. Negative vs. positive pressure ventilation
  - g. Control of ventilation
    - i. Neurogenic and muscular
  - h. Physiology of gas exchange
    - i. External respiration
    - ii. Internal respiration
    - iii. Partial pressures
    - iv. Transport of respiratory gases
      1. Oxygen
      2. Carbon dioxide
    - v. Acid/base balance
5. Urinary System
- a. Organs of the urinary system and gross anatomy
    - i. Kidneys
    - ii. Ureters
    - iii. Bladder
    - iv. Urethra
  - b. Microscopic anatomy
    - i. Nephron
    - ii. Collecting duct
    - iii. Ureter
    - iv. Urinary bladder
  - c. Physiology of the urinary system
    - i. Filtration
    - ii. Absorption
    - iii. Secretion
    - iv. Renal thresholds
    - v. Homeostatic mechanism
    - vi. pH

- vii. Electrolytes
  - viii. Fluid balance
  - ix. Nitrogen balance
  - x. Micturition
6. Male reproductive system
- a. Anatomy
    - i. Glans penis
    - ii. Penis
      - 1. Erectile tissue
      - 2. Os penis
    - iii. Prepuce
    - iv. Urethra
    - v. Bulbourethral glands
    - vi. Prostate gland
    - vii. Seminal vesicles
    - viii. Vas deferens
    - ix. Inguinal rings
    - x. Epididymis
    - xi. Testes
    - xii. Scrotum
    - xiii. Cryptorchidism
  - b. Microscopic anatomy of the testes
    - i. Seminiferous tubules
    - ii. Interstitial cells
    - iii. Sertoli cells
  - c. Hormonal influences
  - d. Physiology of ejaculation
    - i. Stimulation
    - ii. Erection
    - iii. Ejaculation
    - iv. Seminal fluid
7. Female reproductive system
- a. Anatomy
    - i. Vulva
    - ii. Vestibule
    - iii. Hymen
    - iv. Clitoris
    - v. Labia
    - vi. Vagina
    - vii. Accessory glands
    - viii. Cervix
    - ix. Uterine body
    - x. Uterine horns
    - xi. Oviduct
    - xii. Fimbria
    - xiii. Ovary
    - xiv. Broad ligament
    - xv. Round ligament
    - xvi. Vascular supply
  - b. Microscopic anatomy
    - i. Germ cells
    - ii. Developing follicles
    - iii. Graafian follicles
    - iv. Corpus luteum
    - v. Corpus albicans
  - c. Hormonal influences
    - i. Estrogen
    - ii. Progesterone

- iii. FSH
- iv. LH
- d. Estrous cycle
  - i. Proestrus
  - ii. Estrus
  - iii. Metestrus
  - iv. Diestrus
  - v. Anestrus
- e. Avian reproductive tract
  - i. Structure and function
  - ii. Egg formation
- f. Pregnancy
  - i. Embryonic membranes
  - ii. Placenta
  - iii. Gestation
  - iv. Parturition
  - v. Lactation
- g. Anatomy of the mammary gland
  - i. Hormonal control of milk production and letdown
- 8. Genetics
  - a. Overview of molecular genetics
  - b. Dominant/recessive patterns of inheritance
  - c. X-linked inheritance
  - d. Multiple alleles
  - e. Incomplete dominance
  - f. Codominance
  - g. Sex-influenced inheritance
- 9. Blood
  - a. Components
    - i. Liquid
    - ii. Protein
      - 1. Albumin
      - 2. Fibrinogen/fibrin
  - b. Cells/cellular components
    - i. Red blood cells
    - ii. White blood cells
      - 1. Lymphocyte
      - 2. Monocyte
      - 3. Eosinophil
      - 4. Basophil
      - 5. Neutrophil
    - iii. Platelets
  - c. Plasma vs. serum
  - d. Antigen/antibody reactions
  - e. Clotting mechanisms
    - i. Conversion of fibrinogen to fibrin
    - ii. Role of platelets
    - iii. Clotting factors

## Resources

Colville, Thomas and Bassert, Joanna M. *Clinical Anatomy and Physiology for Veterinary Technicians*. 3rd ed. St. Louis, MO: Elsevier, 2016.

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Evans, Howard E. *Miller's Anatomy of the Dog*. 5th ed. St. Louis, MO: Elsevier, 2020.

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Pasquini, Chris, Spurgeon, Tom and Pasquini, Susan. *Anatomy of Domestic Animals, Systemic and Regional Approach*. 11th ed. Pilot Point, TX: Sudz Publishing, 2007.

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Akers, R. Michael and Denbow, D. Michael. *Anatomy and Physiology of Domestic Animals*. 2nd ed. Ames, IA: Wiley-Blackwell, 2013.

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Reece, William O. *Dukes' Physiology of Domestic Animals*. 13th ed. Ames, IA: Wiley-Blackwell, 2015.

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Clayton, Hillary M., Flood, Peter F., and Rosenstein, Diana S. *Clinical Anatomy of the Horse*. 1st ed. St. Louis, MO: Mosby, 2005.

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Reece, W.O. and Rowe, E.W. *Functional Anatomy and Physiology of Domestic Animals*. 5th ed. Ames, Ia; Wiley Blackwell, 2017.

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## **Instructional Services**

### **OAN Number:**

Ohio Transfer 36 TMNS

Top of page

Key: 916