



# School District of Horicon

## Course Outline

### Learning Targets

#### Large Animal Science

##### UNIT: Health and Disease

- Describe what it means for an animal to be 'healthy'.
- Determine the difference between an infectious and a noninfectious disease.
- Determine the difference between a contagious and a non-contagious disease.
- Define: disease, pathogen, host, vector, virulence, environment.
- Summarize how a host's defense mechanisms prevent a disease from occurring and why these mechanisms sometimes break down.
- Identify and explain the parts of a disease triangle and how they affect disease transmission.
- Summarize the difference between resistance and immunity.
- Summarize the difference between active and passive immunity as well as natural and artificial active immunity.
- Explain how antigens and antibodies interact in order to create immunity in an organism.
- Summarize how herd immunity works and how it affects the health of a group of organisms.
- Define and explain the differences between each of the following:
  - a. Pandemic
  - b. Endemic
  - c. Epidemic
  - d. Zoonotic

##### UNIT: Pathogens

- Explain the most likely method by which a pathogen gains entrance into its host.
- Explain how a pathogen can become established by focusing on a specific kind of tissue.
- Summarize the main causes of bodily damage from an infection by a pathogen.
- Identify and categorize each of the following by the unique characteristics and identifying traits: a. Bacteria b. Viruses c. Fungi d. Protozoa e. Helminth
- Define a prion and explain the characteristics that make this class of pathogens unique.
- Compare and contrast prokaryotic and eukaryotic organisms.
- Summarize how to classify bacteria, including by shape, aerobic/anaerobic, and by gram stain.
- Compare and contrast the differences between gram negative and gram positive bacteria, particularly in regards to cell membranes and cell walls, susceptibility to antibiotics, and endotoxins vs. exotoxins.
- Compare and contrast the properties of endotoxins vs. those of exotoxins.
- Summarize the properties of peptidoglycan and relate how these properties affect the susceptibility of some bacteria to antibiotics.
- Summarize the properties and characteristics of the membrane outside of the cell wall of some bacteria in regards to susceptibility to antibiotics, infection of a host, and resistance to host defenses.
- Summarize how a bacterial infection can lead to the death of a host via sepsis and septic

shock.

- Explain why a virus is not considered to be a living species.
- Summarize how viral reproduction occurs.
- Compare and contrast a retrovirus to a standard virus.
- Identify the kingdom of life in which fungi are classified.
- Summarize the key traits of protozoa.
- Explain how the symptoms of diseases caused by helminths differ from many other pathogens.
- Outline the method by which a prion causes a disease and identify practices that increase the likelihood of a prion infection.
- Describe the existing treatments and/or cures for a prion disease.

### **UNIT: Vaccines and Antibiotics**

- Summarize the mechanisms and strategies that comprise each of the following: a. continual forms of nonspecific immunity; b. selective forms of nonspecific immunity; c. specific immunity.
- Compare and contrast the properties of the three kinds of continual nonspecific immunity, including: a. mechanical; b. physical; c. chemical.
- Summarize the identifying characteristics of all forms of selective nonspecific immunity, including: a. Phagocytosis b. Inflammation c. Pyrexia d. Protective proteins e. NK Cells
- Summarize the function of interferons and complement proteins.
- Summarize how specific immunity differs from all forms of nonspecific immunity.
- Explain how the body uses antigens and antibodies to fight a disease.
- Identify the key traits that comprise each of the following: a. Genetic specific immunity b. Acquired specific immunity c. Nonspecific immunity
- Summarize the difference between active acquired immunity and passive acquired immunity.
- Explain how a vaccination works to reduce the rate of contraction of a disease.
- Identify the key characteristics of each of the following kinds of vaccinations:
  - a. Live b. Killed/Inactivated c. Toxoid d. Biosynthetic
- Define colostrum, and explain why it is a valuable part of a production animal operation.
- Summarize why adult vaccination is necessary for herd health using examples.
- Define VCPR and explain why it is necessary for an animal operation.
- Compare and contrast the function and properties of antibiotics and vaccines.
- Describe the most common methods by which an antibiotic destroys bacteria.
- Describe the most common bacterial mechanisms of antibiotic resistance.
- Summarize the difference between Inherent (natural) Bacterial Resistance and Acquired Resistance.

### **UNIT: Reproductive Anatomy**

- Identify the following from both images of the reproductive tract as well as by their descriptions: uterus, vulva, oviduct, cervix, and vagina.
- List the causes of reproductive inefficiency in livestock.
- Compare and contrast natural and artificial insemination.
- Explain how each of the following change during estrus: vulva; oviduct; vagina; ovary.
- Identify and explain the purpose (if any) of each of the following cervical structures:

- a. Fornix b. Annular Rings c. Mucus Plug
- Identify and explain the purpose (if any) of each of the following uterine tissues:
  - a. Perimetrium b. Myometrium c. Endometrium d. Caruncles
- Identify and explain the purpose (if any) of each of the following regions in the oviduct:
  - a. UTJ b. Isthmus c. Ampulla d. Infundibulum
- Identify and explain the purpose (if any) of each of the following ovarian structures:
  - a. Ova b. Follicles c. Corpus Luteum
- List and describe the signs of estrus in a cow.
- Summarize the causes, symptoms, and implications of each of the following disorders:
  - a. Ovarian Cyst b. Anestrus c. Freemartin d. Blind/Closed Cervix e. Dystocia f. Metritis g. Retained Placenta h. Anestrus i. Uterine Prolapse j. Vaginal Prolapse k. Repeat Breeding

### **UNIT: Reproductive Hormones**

- Define and describe each of the following: a. Estrous Cycle b. Endocrine Gland c. Target Tissue d. Estrus e. Endocrine System
- Summarize how a hormone “knows” which tissues and organs to activate.
- Explain why two messenger systems are needed in the bodies of animals.
- Identify, describe, and explain the function of GnRH, FSH, LH, Estradiol, Progesterone, and PGF2 $\alpha$ .
- Identify GnRH, FSH, LH, Estradiol, Progesterone, and PGF2 $\alpha$  based on when they reach their peak levels in the estrous cycle.
- Explain the purpose, mechanism, and hormonal components of Lutalyse, Ovsynch, CIDR, and MGA.
- Summarize and explain each of the following stages of the estrous cycle: a. Estrus b. Metestrus c. Diestrus d. Proestrus
- Explain the difference between a paracrine and endocrine hormone

### **UNIT: Insemination and Calving**

- Explain the difference between insemination and conception.
- Identify the window of time in which a cow should be bred after calving.
- Determine when it is appropriate to breed a cow by recognizing the signs of a cow in heat.
- Summarize the function of each of the following heat detection aids: heat expectancy chart, mount detection aid, tailhead markings, heat detector animals, and pedometers.
- Identify when insemination should occur based on when a cow is seen in heat.
- Summarize the purpose, function, use, and limitations of the following pregnancy detection methods: rectal palpation, ultrasounds, and blood testing.
- Compare and contrast the benefits and drawbacks of twinning in cattle.
- Summarize and define each of the following terms: dry period, lactation, gestation, and mastitis.
- Summarize the steps necessary to dry off a cow and prevent mastitis during or after the dry period.
- Diagnose a case of mastitis based on its symptoms.
- Diagnose whether or not a cow is about to calve based on her symptoms.
- Summarize the signs of normal calving vs. abnormal calving and diagnose whether or not

human intervention is necessary.

- Summarize and explain the steps required to conduct a physical exam on a cow while she is calving.
- List the situations in which human intervention during calving will always be necessary.
- Explain the proper intervention methods during the following scenarios: upside down calf, backwards calf, calf with a head/leg bent backwards, calf that is positioned correctly but has not made any progress in at least 30 minutes.
- Summarize how to manually dilate the cervix of a cow to aid in calving.
- Demonstrate how to properly utilize and apply calving chains in order to assist with cases of dystocia.
- Demonstrate how to properly care for the cow and the calf after calving in order to ensure maximal health and prevent disease and infection.

### **UNIT: Dairy Herd Management**

- Calculate how much milk a calf should be fed each day based on its birth weight.
- Summarize the steps involved in proper animal management of fresh cows.
- List the symptoms of mastitis and describe ways in which a cow could become infected with this disease.
- Summarize the method(s) of prevention and treatment for an animal with mastitis.
- Summarize the processes and factors involved with the Milk Letdown Reflex and describe the importance of oxytocin and cortisol in regards to this process.
- Describe how milk should be properly handled and stored once it is collected from the cow.
- Define Somatic Cell Count (SCC) and explain its importance to producing a high quality food product.
- Define each of the following: heritability; PTA; STA; EBV; sire summary; genetic base.
- Summarize how a PTA, STA, and EBV are similar and dissimilar.
- Explain how STA scores are calculated and summarize what they mean.
- Use given PTA & STA scores for various traits to summarize the genetic value of bulls.
- Use a sire summary to analyze the genetic potential value of a bull.
- Summarize how the information in a sire summary is generated by describing the process of conducting genetic evaluations.
- Define each of the following: a. In Vitro Fertilization b. Embryo Transfer c. Genomics

### **UNIT: Nutrition and Ruminant Anatomy**

- Summarize the extent of the universality of nutrient requirements among living species in regards to the six kinds of nutrients.
- Identify the nutrient most important for living species and summarize the roles it plays in the bodies of animals.
- List key characteristics and identify the roles played by each of the following nutrients: water, carbohydrates, fats, proteins, vitamins, and minerals.
- List key characteristics and identify the roles played by each of the following fat soluble vitamins: A, D, E, K.
- List key characteristics and identify the roles played by each of the following water soluble

vitamins: a. B12 b. Choline c. Thiamin (B1)/Niacin (B3)

- Explain why vitamin C is not needed in the diets of most animals.
- List key characteristics and identify the roles played by each of the following macrominerals:  
a. Potassium b. Sodium/Chlorine c. Sulfur d. Calcium/Phosphorus e. Magnesium
- List key characteristics and identify the roles played by each of the following microminerals:  
a. Iron b. Copper c. Zinc d. Fluorine e. Manganese
- Summarize the identifying characteristics of each of the following classes of digestive tracts:  
a. Ruminant b. Avian c. Post-gastric fermenters d. Monogastrics
- Explain the function and characteristics of each of the following organs: a. Gizzard b. Cecum  
c. Rumen
- Summarize the advantages and disadvantages of being a ruminant.
- Identify the function of each of the following stomach chambers: a. Rumen b. Reticulum c.  
Omasum d. Abomasum.
- Describe the path of food starting at the mouth and proceeding through each stomach  
chamber and type of intestine.
- Define “VFA” and summarize its importance to a ruminant.
- Identify and explain the roles of saliva in digestion for a ruminant.
- Explain the meaning and importance of each of the following for a ruminant: a. Rumination b.  
Eructation c. Peristalsis d. Papillae e. Villi
- Explain the rate at which forage is fermented in the rumen and how it changes inside the  
rumen during this time.
- Summarize the four key benefits provided to a ruminant by its rumen microbes.
- Explain how a calf becomes a ruminant by incorporating the role and purpose of the  
esophageal groove in a newborn calf and by identifying its source of the rumen microbes.
- Compare and contrast the abomasum of a ruminant to the stomach of a human.
- Summarize the processes that occur in the small and large intestine that enable digestion  
and other critical processes.
- Diagnose the most likely outcomes for a ruminant for each of the following scenarios:  
Iron Or Copper Deficiency  
Manganese Deficiency  
Swollen Large Intestine  
Inability To Perform Eructation  
Absent Or Swollen Villi  
Swollen Papillae/Inability To Absorb VFAs  
Reduced Saliva Production  
Decrease In Rumen Microbe Populations

### **UNIT: Feeding Rations**

- Define each of the following: a. Feeding Ration b. Balanced Ration c. Nutrient Composition  
d. Total Digestible Nutrients
- Describe how nutrients in a ration are measured.
- Summarize how crude protein is measured in a ration.
- Explain the roles and purposes of each of the following kinds of protein/nitrogen in a ration:  
a. Crude Protein b. DIP c. UIP d. NPN e. All of the above
- Identify the source of most of the fiber in a cattle ration and summarize the roles played by  
fiber in a ruminant.

- Define scratch factor and explain its importance to a ration and to ruminant health.
- Explain how minerals are measured in a ration.
- Identify concerns related to meeting vitamin requirements of a ration.
- Summarize how to ensure that an animal is receiving an adequate amount of water and identify its importance to the ratio of a ruminant.
- Determine the minimum amount of water needed for a given animal per day.
- Summarize the unique nutritional needs and demands of each of the following groups of cattle: a. Growing weaned calves b. First-calf heifers c. Mature Cows d. Mature bulls e. Newborn Calves
- Summarize how the nutrient needs of an animal are best determined.
- Summarize the options available for determining the nutrient content of a feeding ration.
- Explain the significance and role played by land grant universities and extension offices in regards to animal nutrition.
- Summarize the role played by ionophores and implants in cattle rations.
- Explain how and why acidosis occurs and how it can be prevented.
- Use a Pearson Square in order to balance a ration for a variety of groups of cattle and for different rations.
- Show how a Pearson Square can be used to determine both TDN ratios as well as Crude Protein ratios of ration ingredients.
- Use a Pearson Square to determine if the minimum requirements of an animal are met for a ration in regards to crude protein and determine how much, if any, additional protein is needed for a ration.

### **UNIT: Digestive Disorders**

- Diagnose the following based on their symptoms: Bloat, DA, Acidosis, Ketosis (Primary & Secondary), Hardware, Excess Fiber, Milk Fever/Hypocalcemia, Grass Tetany, Laminitis, Johnnes, Hypomagnesemia.
- State how magnet can be effective when treating hardware disease.
- Define slug feeding, explain what disorders it can lead to, and why.
- Identify the following diseases by their common-use names: milk fever, grass tetany, twisted stomach.
- State what problems could be prevented by increasing the amount of fiber and increasing the particle size of that forage.
- Summarize the disorders for which propylene glycol is an effective treatment.
- Summarize how to diagnose a twisted stomach.
- Summarize how acidosis can lead to laminitis and why laminitis results in an inability of the animal to move easily.
- State what problems could be prevented by increasing the amount of calcium in a cow.
- State what problems could be prevented by increasing the amount of magnesium in a cow.
- Diagnose a disorder using a description of the manure from an animal afflicted by that problem.

### **UNIT: Meat Science**

- Calculate ADG and WDA and summarize the significance of these calculations.

- Summarize the differences between prenatal and postnatal growth in meat animals.
- Interpret a sigmoid growth curve and identify the point of birth, point of inflection, point of maturation, and puberty.
- Determine which animal will be more profitable and valuable based on differences in the sigmoid growth curves.
- Plot changes that occur due to castration using a sigmoid growth curve.
- Interpret the changes in the rate of growth of muscle, bone, and fat in a meat animal between birth and maturation; utilize these differences in rates of tissue growth to justify when an animal should be harvested for maximal meat quality and profitability.
- Summarize the benefits and drawbacks of castration in meat animals.
- Describe use of anabolic implants & beta-antagonists in meat animals, and support your stance on this issue with evidence.
- Calculate dressing percentage of a given meat animal if provided with the live weight and carcass weight.
- Calculate the cutting losses and cutting yields of a carcass.
- Summarize the impact of Upton Sinclair's *The Jungle* on regulation in the meat industry and provide a summary of changes that have occurred in the regulation of the meat industry since the early 1900s.
- Summarize the purpose and role of each of the following pieces of legislation: a. Pure Food & Drug Act b. Meat Inspection Act c. Wholesome Meat Act d. Humane Slaughter Act/Humane Methods of Slaughter Act
- Define "adulterated meat" and provide examples of actions that would cause a cut of meat to be considered adulterated meat.
- Determine whether not federal inspection is required for a given meat processing facility and what this inspection would entail.
- Summarize the stipulations that are required by a facility in order to fully comply with HMSA.
- Compare and contrast what occurs during antemortem and postmortem federal inspection of meat facilities.
- Grade a cut of beef, pork, or poultry based on a picture or written description.
- Define "complete protein" and explain the difference between an essential amino acid and a nonessential amino acid.
- Define "marbling" and summarize the importance of this concept in regards to the quality and value of a cut of meat.
- Summarize how meat changes as a result of the Maillard Reaction and as a result of fermentation.
- Identify the key factors that affect the flavor and quality of a cut of meat.
- Summarize all of the factors that are necessary for muscle to be converted into meat.
- Summarize the importance of tenderness in regards to the value of a cut of meat and describe the factors that affect the tenderness of meat.
- Summarize the role that each of the following play in the sliding filament model: a. Myosin b. Actin c. Troponin/Tropomyosin d. ATP e. Calcium
- Identify the components of the sliding filament model in a given image.
- Explain how the sliding filament model, rigor mortis, tenderness, and meat quality are all related.

- Summarize the role of physical exams in cattle health and how to perform them.
- State the order in which the steps of a physical exam should be performed.
- State the symptoms of the ears, eyes, nose, and mouth that would lead you to be concerned and what they mean.
- Explain what a cow chewing her cud or teeth grinding tells the person performing the exam.
- Summarize what the CRT test is, what it indicates, and what the different results mean.
- Summarize what the following symptoms indicate: swollen jaw; swollen lymph nodes; slow pinch test.
- State how you know if a cow is dehydrated.
- State the appropriate heart and respiratory rate of a cow.
- Define heart murmur and dyspnea.
- Explain what a displaced abomasum is and how to detect it.
- Summarize the importance of rumen contractions and how to measure them.
- Explain what a person should look for when checking the udder of a cow.
- Define ketones and explain their importance to the physical exam.
- Summarize the different symptoms that can be found in manure and explain what they mean.
- Explain what should be checked on the right side of the cow.
- Summarize the importance of the withers pinch and dorsiflex.
- Perform a physical exam on actual cattle and come to a determination of their health and well-being.

*Students will be able to meet the learning targets above as evidenced by formative and summative classroom assessments.*