CHARLES LOUIS DAVIS DVM FOUNDATION

TOPICS IN LABORATORY ANIMAL MEDICINE
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SHEEP AND GOATS

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THANK YOU!

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Disclaimers

- This is not an ACLAM sanctioned presentation
- Every attempt to ensure information is reliable and correct (but I am not an expert)
  - Grain of salt?
- No information presented is known to be specifically included in ACLAM Board examinations
Ruminants

Sheep and goats
Genus and species: *Capra hircus*
Order: Artiodactyla
Family: Bovidae
Male: Buck (billy)
Castrated Male: Wether
Female: Doe (nanny)
Young: kid
Breed: toggenburg
Breed: Saanen

Location of scent glands: Behind horn bud
Breed: La Mancha

Polled trait:

Dominant allele, which is linked to the intersex trait

Other tidbits:

Goats have smallest RBC’s and lowest PCV
Model for which disease:

**Beta mannosidosis** -

- Autosomal recessive, lysosomal storage disease
- Accumulation of mannose (oligosaccharides) due to lack of lysosomal hydroxylase enzyme
- Results in a neurologic disorder, paucity of white matter, myelin and neuronal vacuolation

Breed: **Nubian**
Model for what disease:

**Myotonia congenita**

“Thomson’s Disease”
“Fainting Goats”

Autosomal dominant trait

Transient spasms of skeletal muscles brought about by visual, tactile or auditory stimuli

Caused by mutation in a gene responsible for down regulating electrical excitation in the muscles
Sheep

Genus and species: *Ovis aries*

Male: Ram
Castrated male: Wether
Female: Ewe
Young: Lamb

Location of Sebaceous Glands: Below eye and between toes
Breed: Suffolk

- Pruritis
- Nervous
- Excitable
- Tremors
Diagnosis: **Scrapie**

- Neuron - large cytoplasmic vacuoles (spongiform)
- Medulla oblongata, pons and midbrain
- Prion disease
- Transmissible spongiform encephalopathy
- Genetic component
  - Suffolk are susceptible
  - Targetes are resistant
- Specific codon genes identified
  - 171- genes Q, R or H
  - 136- genes A or V
- R and A confer resistance
What procedure is being performed?

Collection of the third eyelid lymphoid tissue to detect Scrapie

- Immunohistochemical detection of PrP which accumulates in the lymphatic tissue of the inner eyelid of sheep

- Test is positive one year before clinical signs develop (Vet Forum; June 1998; April 1998, New Scientist)
Other Spongiform Encephalopathies

Scrapie – sheep and goats

Bovine Spongiforme Encephalopathy - bovine

Transmissible Mink Encephalopathy - mink

Chronic Wasting Disease of deer and elk

Feline spongiform encephalopathy

Kuru - human

Cruetzfeld-Jakob Disease - human

Gerstmann-Straussler – human
Submandibular edema, with abscesses, draining tracts and granulomas

Diagnosis:

“Wooden tongue”
*Actinobacillus lignieresii*
Gram negative rod
Goats - not affected
Sheep – lip
Cattle – tongue

Rule out:

“Lumpy Jaw”
*Arcanobacterium pyogenes, A. bovis*
Gram positive rod/coccobacillis
Affects bone
Rare in sheep and goats
Diagnosis: **Contagious eczema (Orf, sore mouth)**
- Parapoxvirus
- Primary lesions on lips and mouth
- Usually seen in animals < 1yr
- High morbidity/Low mortality

Rule outs:

**Blue tongue**
- orbivirus
- cyanosis, ulcers of the dental pad, gingiva and tongue, chorioretinitis, conjunctivitis, coronitis

**Ulcerative dermatosis**
- poxvirus
- ulcers of face, genitals and feet

**Foot and Mouth Disease**
- picornavirus
- vesicles around the mouth, hooves and teats

**Vesicular Stomatitis**
- rhabdovirus
- vesicles on the oral mucus membranes, teats, interdigital spaces
Contagious ecthyma

- Zoonotic disease
- Human-to-human transmission can occur
- Handlers should wear PPE
- Disinfect clippers, ear taggers etc between infected animals
- Commercial vaccine available, but should be used with caution, may induce lesions in handlers
- Do not vaccinate herds that are already free of the disease
Diagnosis:

Haemonchus  Haemonchus  Haemonchus

*Haemonchus contortus*

-barbor pole worm
Clinical signs:
- Pallor, severe anemia
- Submandibular edema ("bottlejaw") - hypoproteinemia
- Weight loss, diarrhea
- Unthriftiness, decreased milk production, poor wool coat
Pathogenesis

- Direct life cycle
  - Ingestion of larvae to eggs passed in feces occurs in 3wks

- Hypobiotic (arrested) larvae may exist in host
- “spring rise”- large number of larvae passed from peripartuient ewes onto pasture
- Blood meals from mucosa of abomasum

Treatment Control

- Antihelminthics
  - Severe resistance has developed!
  - Facility sanitation and pasture management and rotation
  - Susceptible to freezing and dry conditions
Tissue from a sheep

Diagnosis:

Nodule worm

*Oesophagostomum columbianum*

*Oesophagostomum venulosum*
Tissue from a sheep
Diagnosis:

**Goiter**

- **Congenital Goiter**
  - Merino sheep

- **Nutritional Goiter**
  - due to iodine deficiency
  - consumption of goitrogenic plants (soybeans, rape, kale, cabbage and turnips)

[http://www.pipevet.com/photos/goiter.htm](http://www.pipevet.com/photos/goiter.htm)
Pipestone Vet Clinic
Clinical exam
Necropsy
Necropsy
Blood smear (Wright Geimsa)

Describe 3 morphologic changes:

- Polychromasia (Hb)
- Poikilocytosis (shape)
- Anisocytosis (size)

Describe arrows:

- Heinz body (curved arrow)
- Howell Jolly body (straight arrow)
Presumptive Diagnosis:

**Copper Toxicosis**

- Icterus/hemolysis
- Enlarged black/brown liver/spleen
- “Gun-barrel” black kidneys
- Hematuria/hemoglobinuria
**Copper toxicosis**

**Pathogenesis:**
- Sheep store Cu readily
- Single toxic dose range = 20-100 mg/kg ( vs 220-880 mg/kg in cattle)
- Cu released from liver is directly toxic to RBC membranes

**Cause:**
- Sheep fed improperly balanced rations or cattle diets
- Feed low in molybdenum, zinc or calcium
- Phytogenous sources- subterranean clover
  - Merino sheep may be more susceptible to this cause than other breeds

**Treatment:**
- D-penicillamine, Mb, thiosulfate, tetrathiomolybdate
Model for Wilson’s disease

- Human genetic defect in copper transporting p-type ATPase
- Northern Ronaldsay Sheep

Other well known animal model (rodent) for Wilson’s disease?

Long Evans Cinnamon (LEC) Rat
What are the nodules?

Normal caruncles

What are the nodules?

Uterus

Tissue from a sheep

Cotyledon: the fetal side of the placenta
Caruncle: the maternal side of the placenta
Placentome: a cotyledon and caruncle together

Describe seasonal estrous cycle for sheep/goats?

Seasonally polyestrous

Fall/Winter Breeders

Estrous: 14-19 d (shp), 18-24d (gt)
Estrus: 24-30hr (shp), 24-96 (gt)

Gestation length: 145-155 d (150d)

Syndesmochorial placenta

Cotyledon: the fetal side of the placenta
Caruncle: the maternal side of the placenta
Placentome: a cotyledon and caruncle together

Uterus

Tissue from a sheep

Cotyledon: the fetal side of the placenta
Caruncle: the maternal side of the placenta
Placentome: a cotyledon and caruncle together
Sheep – subcutaneous surface of the skin
Presumptive diagnosis?

Lymphosarcoma

Bovine Leukemia Virus

B lymphocyte associated retrovirus

Are leukemic (rare) as well as solid tumors (common)

Common sites – lymphoid tissue, abomasum, spinal canal, retrobulbar, uterus and other abdominal organs

Goats seroconvert but do not develop clinical disease
Clinical signs:
- Dyspnea, paresis, stiffness, inability to stand
- Other lambs found dead
- Creatinine Kinase (CK) and aspartate aminotransferase (AST) elevated

Presumptive diagnosis?

**White Muscle Disease**
(aka: stiff lamb disease, nutritional myodegeneration, nutritional muscular dystrophy)

Pathogenesis
- Vitamin E and/or Selenium deficiency
- Lack of one or both results in oxidative stress and loss of membrane integrity
- Cardiac form - neonates
- Skeletal form - young
White Muscle Disease

Diagnosis

- clinical signs
- whole blood levels of vitamin E
- plasma levels of selenium
- glutathione peroxidase levels in red blood cells

Treatment and Prevention

- Evaluation or awareness of regional soil content
- Supplementation of affected animals or late stage gestational ewes with Vitamin E or Selenium injections
- Properly balanced dietary rations

*be cautious of selenium “toxicity”
Tissue from a sheep

Presumptive Diagnosis?

Lungworms

*Dictyocaulus filaria*

Protostrongylus rufescens

Muellarius capillaris

Less common in goats
Tissue from a goat

- Abortion
- CNS signs

Cold enrichment (20°C) beneficial in culturing the organism

Diagnosis?

Listeria monocytogenes
Most likely diagnosis?

*Corynebacterium pseudotuberculosis*

- Disseminated superficial abscesses of lymph nodes
- Very common
- Gram + coccobacillus
- Thick caseous exudate
- ELISA available
Goat small intestine
Young animal with hemorrhagic diarrhea

Presumptive diagnosis?

Coccidiosis
(*Eimeria ninakohlyakimovae, E. arloingi, E. christensenii*)

Necropsy Findings:
GI may appear congested, hemorrhagic, or ulcerated and have scattered pale, yellow to white mucosal plaques

- common in young animals
- often associated with stress or intensive housing conditions, or weaning
- 11 Eimeria species in sheep, 9 in goats
Brain from a ruminant with CNS disease

Diagnosis?
Rabies
(Lyssavirus-genus)
(Rhabdovirus-family)

Histology
- Negri bodies in the cytoplasm of the neuron
- Confirmation made by fluorescent antibody stain of the brain

Zoonotic!
Reportable!
Frontal sinus of a sheep
Name the Parasite

*Oestrus ovis*
Nasal bot fly - larva
Clinical Exam – fetlock of a goat

Pruritus, scales, crusts and hyperkeratosis
**Diagnosis?**

*Chorioptes bovis*
- Affects lower legs and scrotum -
- Usually occurs in cooler months

**Rule outs?**

*Psoroptes cuniculi* (ears – rare)

*Sarcoptes scabiei* (head scabies)

-Ruminant mites have been eradicated or are very rare in the US

-Sarcoptes and *Psorergates* infections are reportable!

**Scabies in sheep:**
*Psoroptes ovis, Sarcoptes scabiei, Psorergates ovis, Chorioptes ovis*
Parasite found on sheep with pruritis, and chronic dermatitis of the neck, sides, abdomen and rump

**Diagnosis?**

**Sheep keds**

*(Melophagus ovinus)*

wingless, flat, brown, bloodsucking fly

Can transmit which virus?

**Bluetongue**
Brain from aborted goat fetus

Moderate gliosis, non-suppurative encephalitis, perivascular mononuclear infiltrates

www.k-state.edu/.../625tutorials/FIGbrain2.jpg
**Diagnosis?**

*Neospora caninum*

- Widespread worldwide
- Abortion is the only clinical sign in adults
- Young may show weakness or CNS signs
- More common in bovine, but may be seen in sheep and goats
- Immunohistochemical staining specific for the organism (immunoperoxidase)

**Definitive host?**

Dog

**Rule outs?**

*Toxoplasma sp.* (smaller)
Tissue from a sheep

unthriftiness, weight loss and intermittent diarrhea
**Diagnosis?**

*Mycobacterium paratuberculosis*  
“Johne’s Disease”

- Non-spore forming, fastidious, acid-fast, gram-positive rod

**Diagnostic tests?**

- Fecal culture: 8-12 weeks
- Serology: ELISA (most reliable), AGID or CF
- Acid-fast organisms on rectal biopsy smears

- Chronic carriers exist
- Most likely route of infection via ingestion
- Vertical transmission reported
- Organisms inhabit macrophages of host
Name three potentially zoonotic organisms associated with abortion and/or lambing in sheep:

- *Coxiella burnetii* - Q fever
- *Brucella* ____?____  *melitensis*
- *Campylobacter fetus* subspecies *intestinalis*
Q fever

- **Coxiella burnetii**
- Gram-negative coccobacillus-like bacteria, similar to rickettsial organisms
- Found in milk, urine and feces of infected animals
- **Placenta and fetus are particularly dangerous source of infection for people**
- Transmission via inhalation of aerosolized particles
- Likely to be asymptomatic in sheep
- Causes flu-like symptoms in people
- Can be treated with appropriate antibiotics
Name the vesicular/ulcerative diseases of sheep and goats?

- Bluetongue (Reovirus)
- Ulcerative dermatosis (Poxvirus)
- Contagious ecthyma (Parapoxvirus)
- FMD (Picornavirus)
- VS (Rhabdovirus)
Name three respiratory viruses of sheep and goats

- OPPV (Maedi/Visna – Retrovirus)
- Pulmonary Adenomatosis (Jaggsiekte – Type D retrovirus)
- CAEV (older animals – Retrovirus)
- Parainfluenza-3 (Paramyxovirus)
- RSV (Paramyxovirus)
- Adenovirus +/-?
Diseases of sheep and goats that are zoonotic?

- Q fever
- Contagious ecthyma
- Anthrax
- Brucellosis
- Leptospirosis
- Listeriosis
- Mycobacterium
- Tularemia
- Yersinia
- Rabies
- Cryptosporidium
- Toxoplasmosis
- Dermatophytes
Next Presentation...