CHARLES LOUIS DAVIS DVM FOUNDATION

TOPICS IN LABORATORY ANIMAL MEDICINE
May 18, 2007

SHEEP AND GOATS

Melaney K. Gee, MS, DVM
Wake Forest University Health Sciences

THANK YOU!

- Slides and accompanying information provided by Diane Forsythe and Mary Grant of NIEHS/NIH, RTP, North Carolina and Sue Spray of the Scripps Research Institute

- We wish to extend appreciation to those who contributed to this collection. The contributors are many and without their assistance this collection would not be possible

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**

Location of scent glands:

Behind horn bud

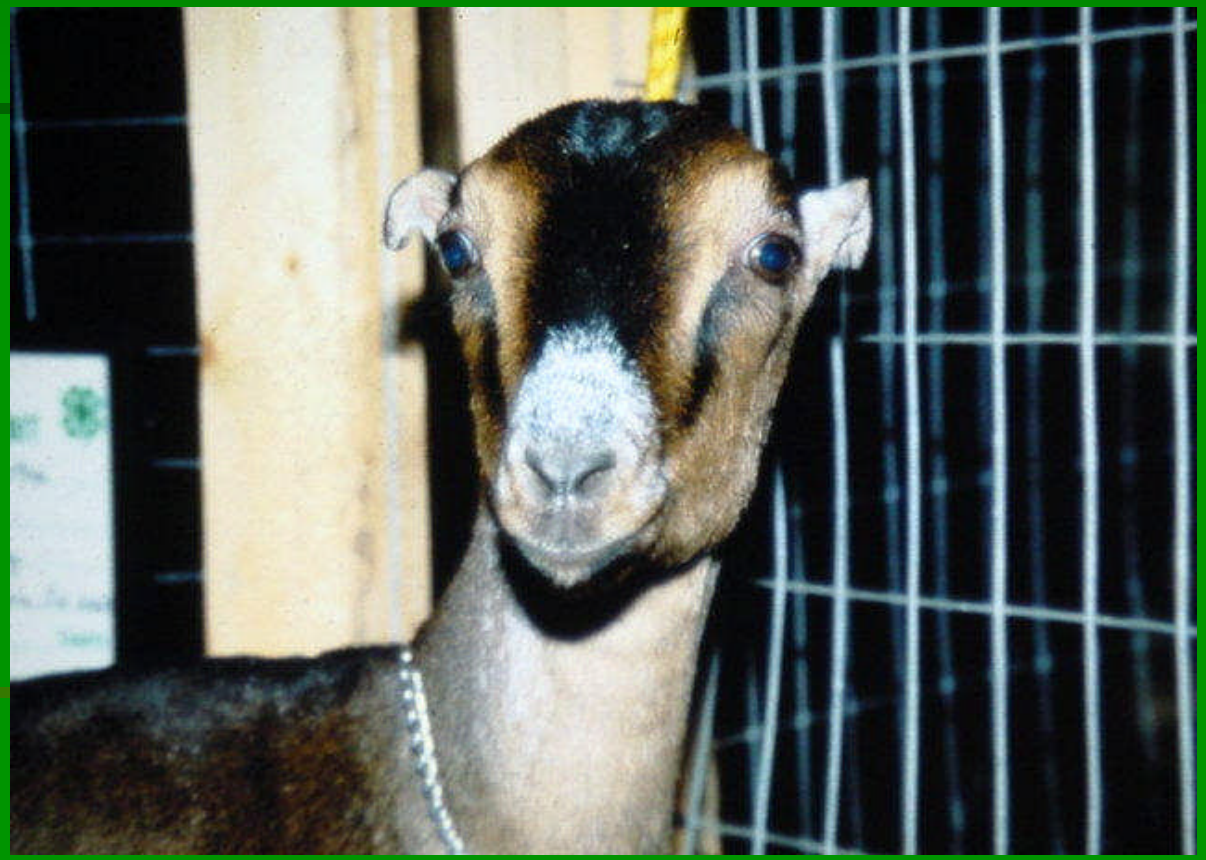
Breed: **Saanen**

Polled trait:

Dominant allele, which is linked to the intersex trait

Other tidbits:

Goats have smallest RBC's and lowest PCV



Breed: **La Mancha**

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**

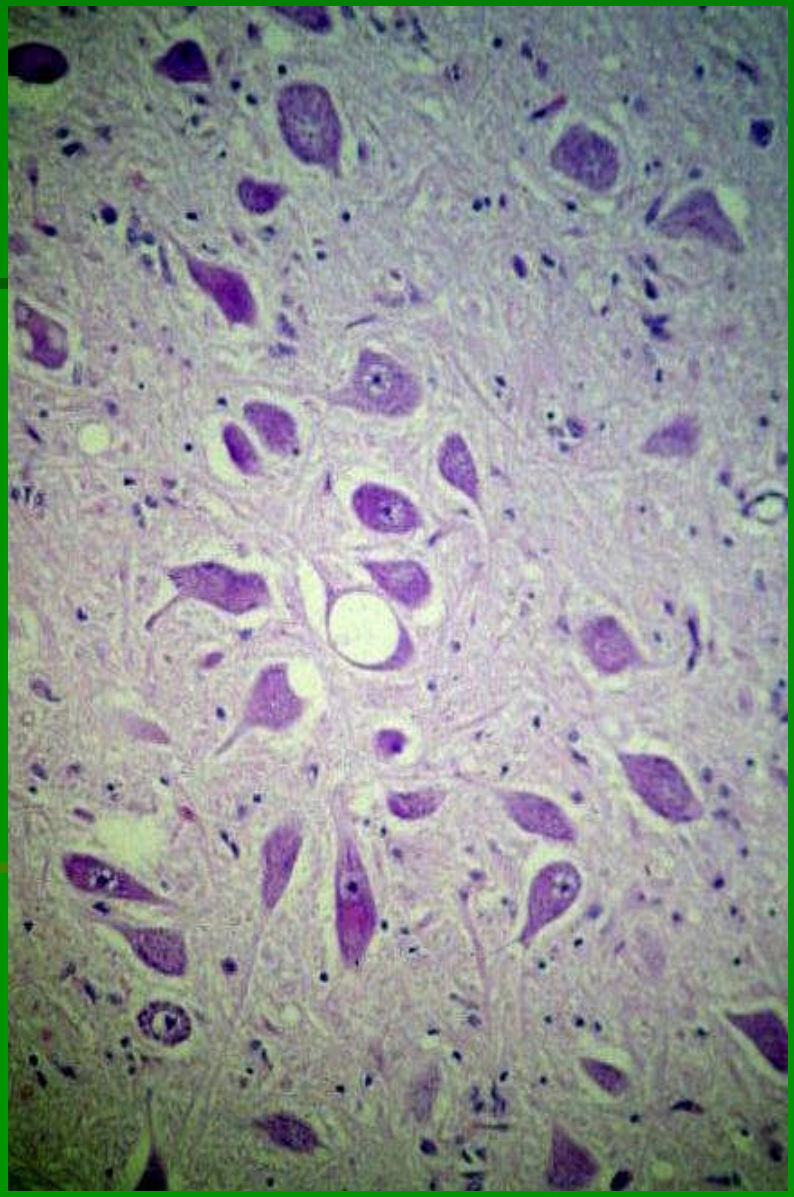
Location of Sebaceous Glands:
Below eye and between toes

Breed: **Suffolk**

- Pruritis
- Nervous
- Excitable
- Tremors

Diagnosis: **Scrapie**

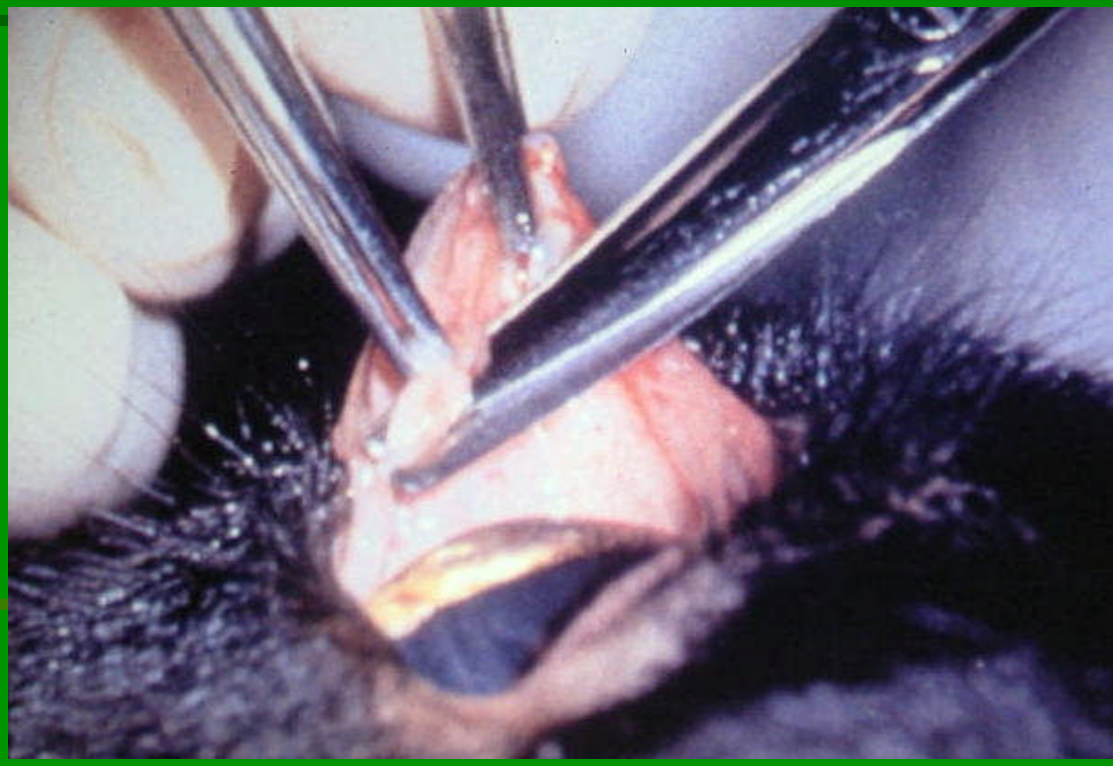
- **Neuron - large cytoplasmic vacuoles (spongiform)**
- **Medulla oblongata, pons and midbrain**
- **Prion disease**
- **Transmissable spongiform encephalopathy**
- **Gentetic component**
  - **•Suffolk are susceptble**
  - **•Targees are resistant**
- **Specific codon/genes identified**
  - **•171- 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;April98, 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

Cruetzfield-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 ecthyma (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

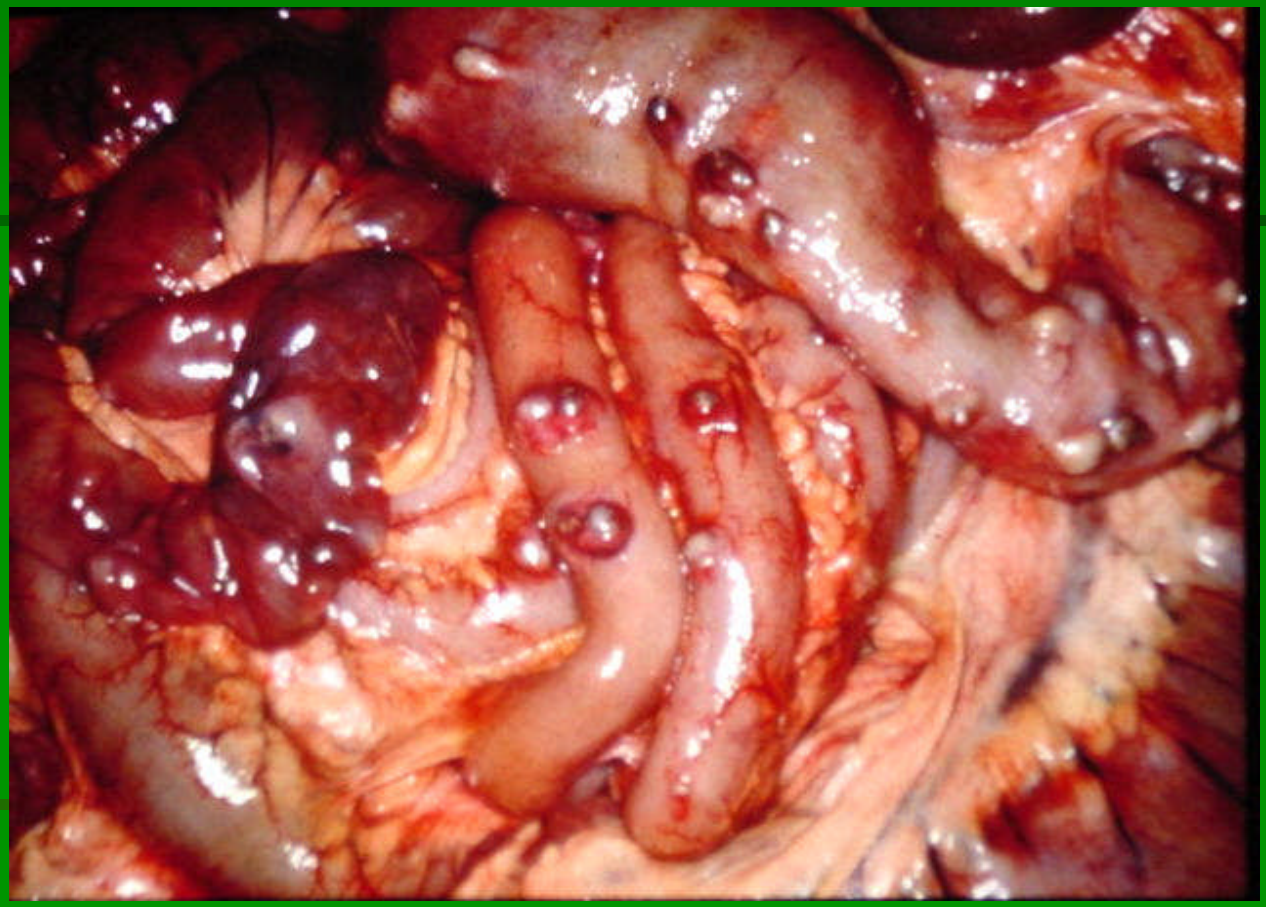
Haemonchus contortus

-barbor pole worm

- Clinical signs-
  - Pallor, severe anemia
  - Submandibular edema (“bottlejaw”)- hypoproteinemia
  - Weight loss, diarhhea
  - 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

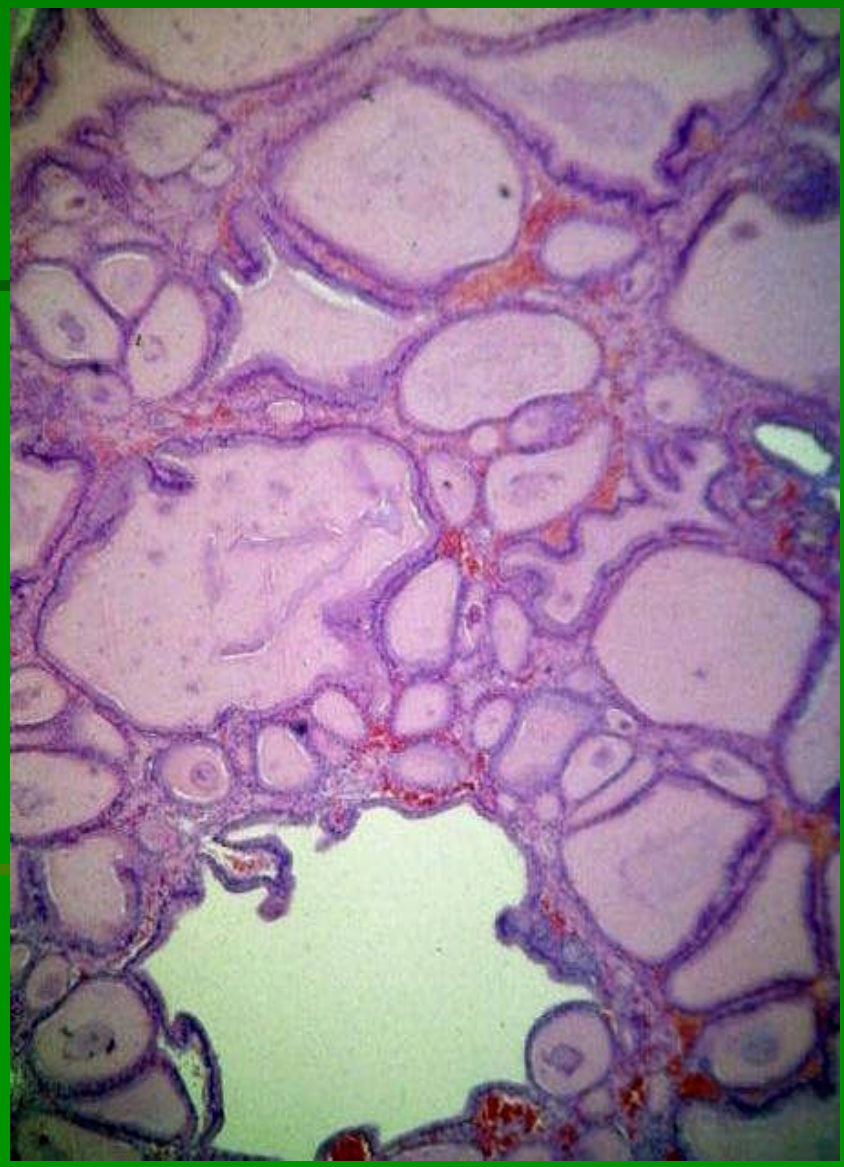
Merino sheep

Nutritional Goiter

-due to iodine deficiency

-consumption of goitrogenic plants (soybeans, rape, kale, cabbage and turnips)

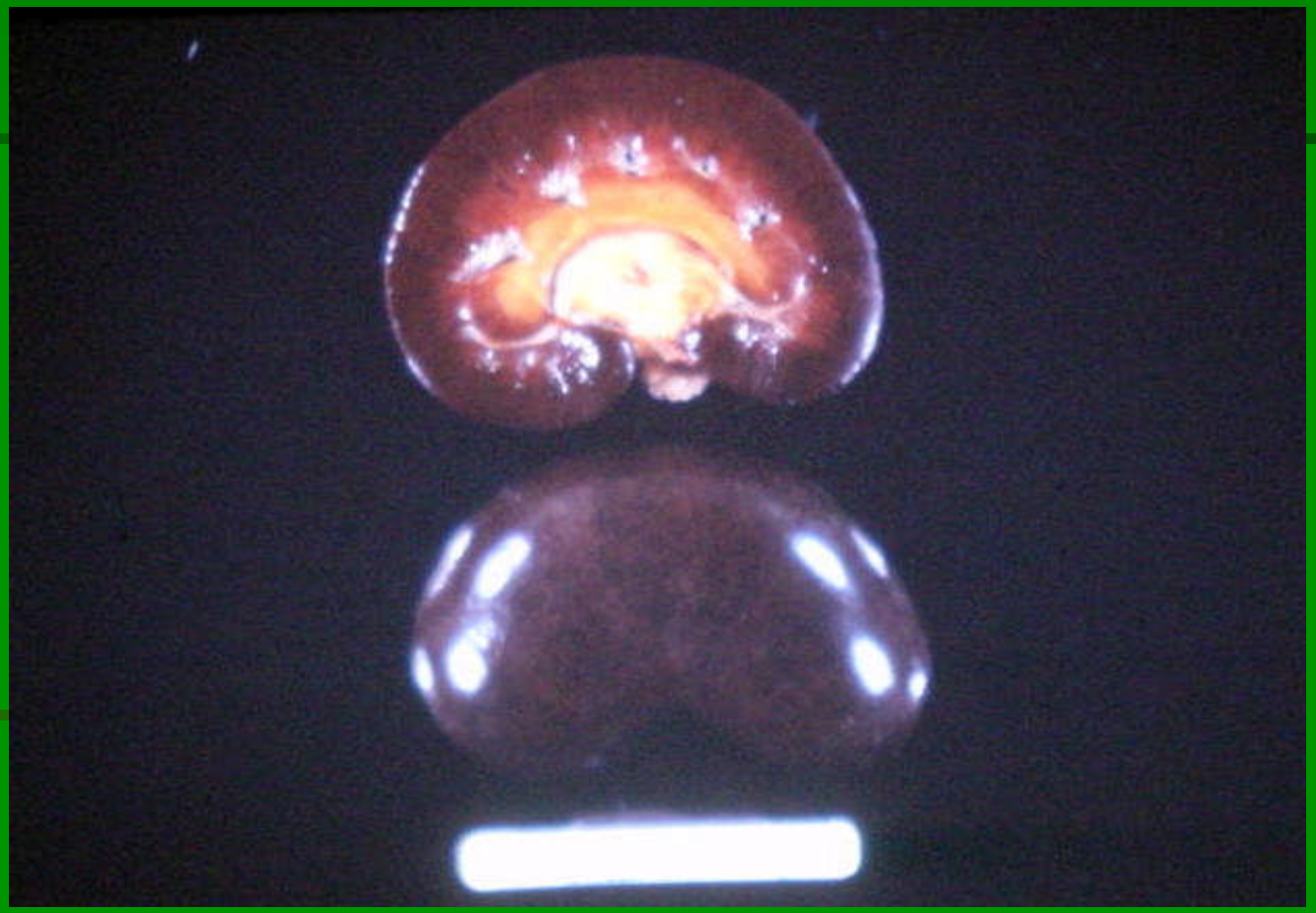
http://www.pipevet.com/photos/goiter.htm
Pipestone Vet Clinic



Clinical exam

Necropsy

Necropsy



Blood smear (Wright Geimsa)

Describe 3 morphologic changes:

Polychromasia (Hb)

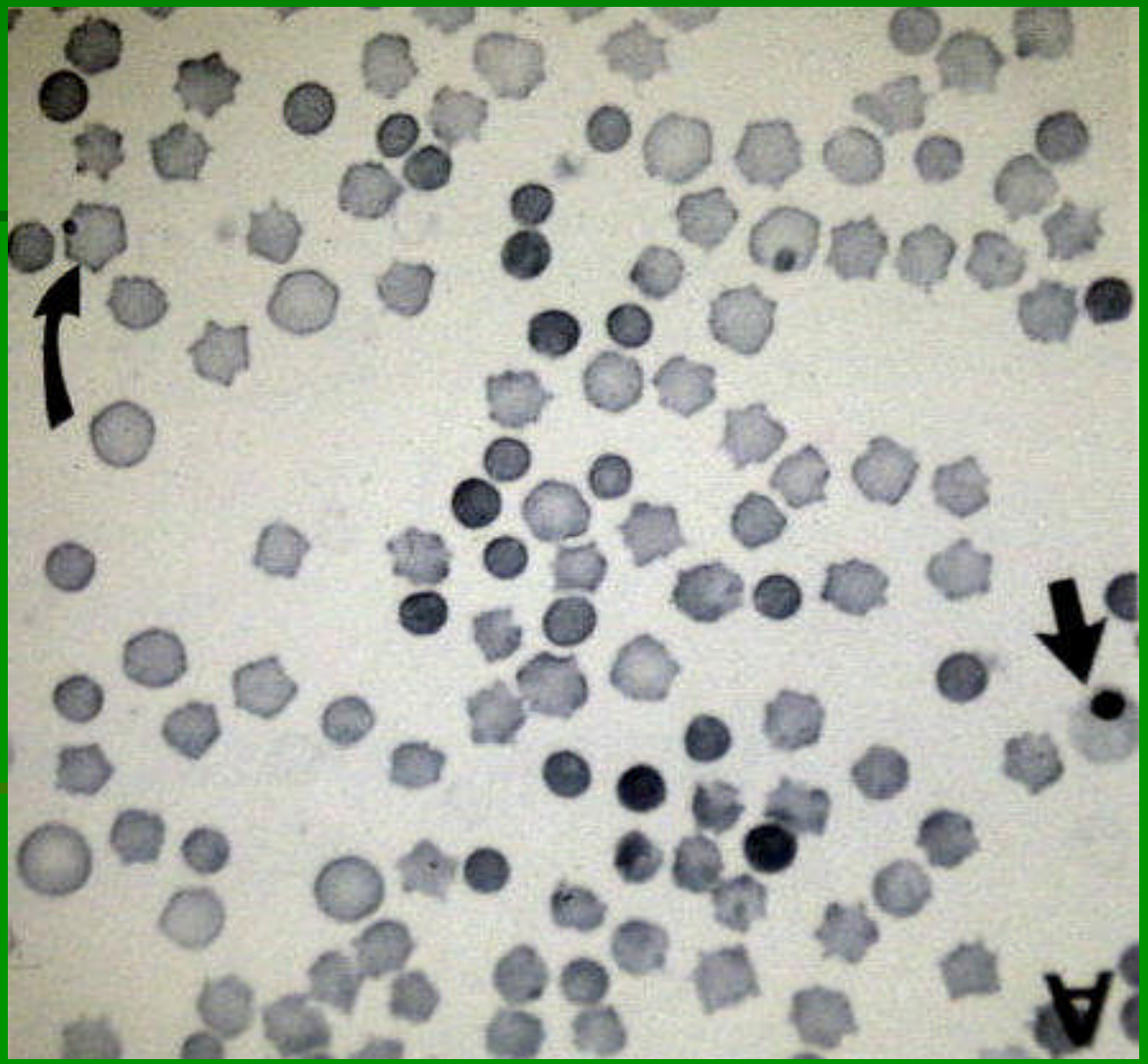
Poikilocytosis (shape)

Anisocytosis (size)

Describe arrows:

Heinz body (curved arrow)

Howell Jolly body (straight arrow)



Presumptive Diagnosis:

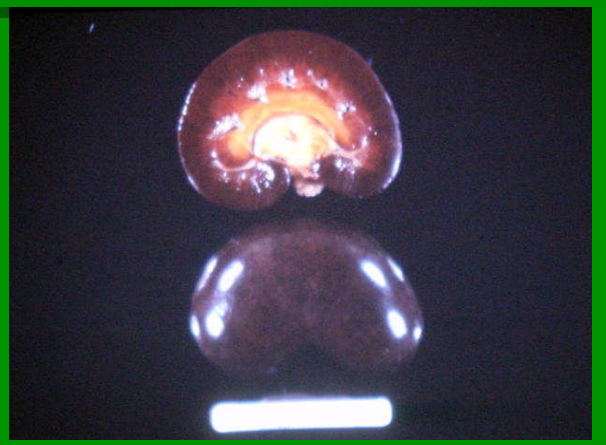
Copper Toxicosis

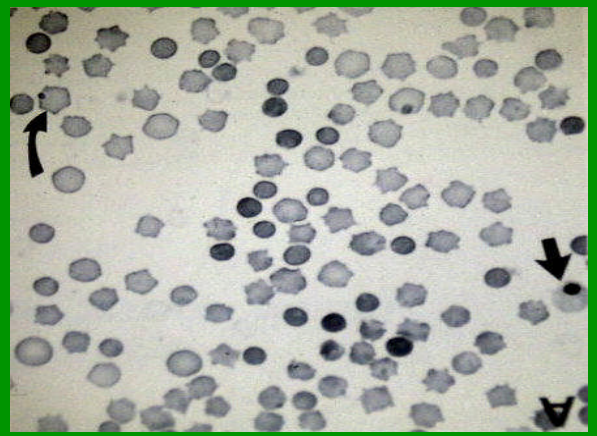
- Icterus/hemolysis

- Enlarged black/brown liver/spleen

-“Gun-barrel” black kidneys

-Hematuria/hemoglobinuri





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 the transporting p-type ATPase
- Northern Ronaldsay Sheep

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

Long Evans Cinnamon (LEC) Rat

Tissue from a sheep

Uterus

What are the nodules?

Normal caruncles

Syndesmochorial placenta

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

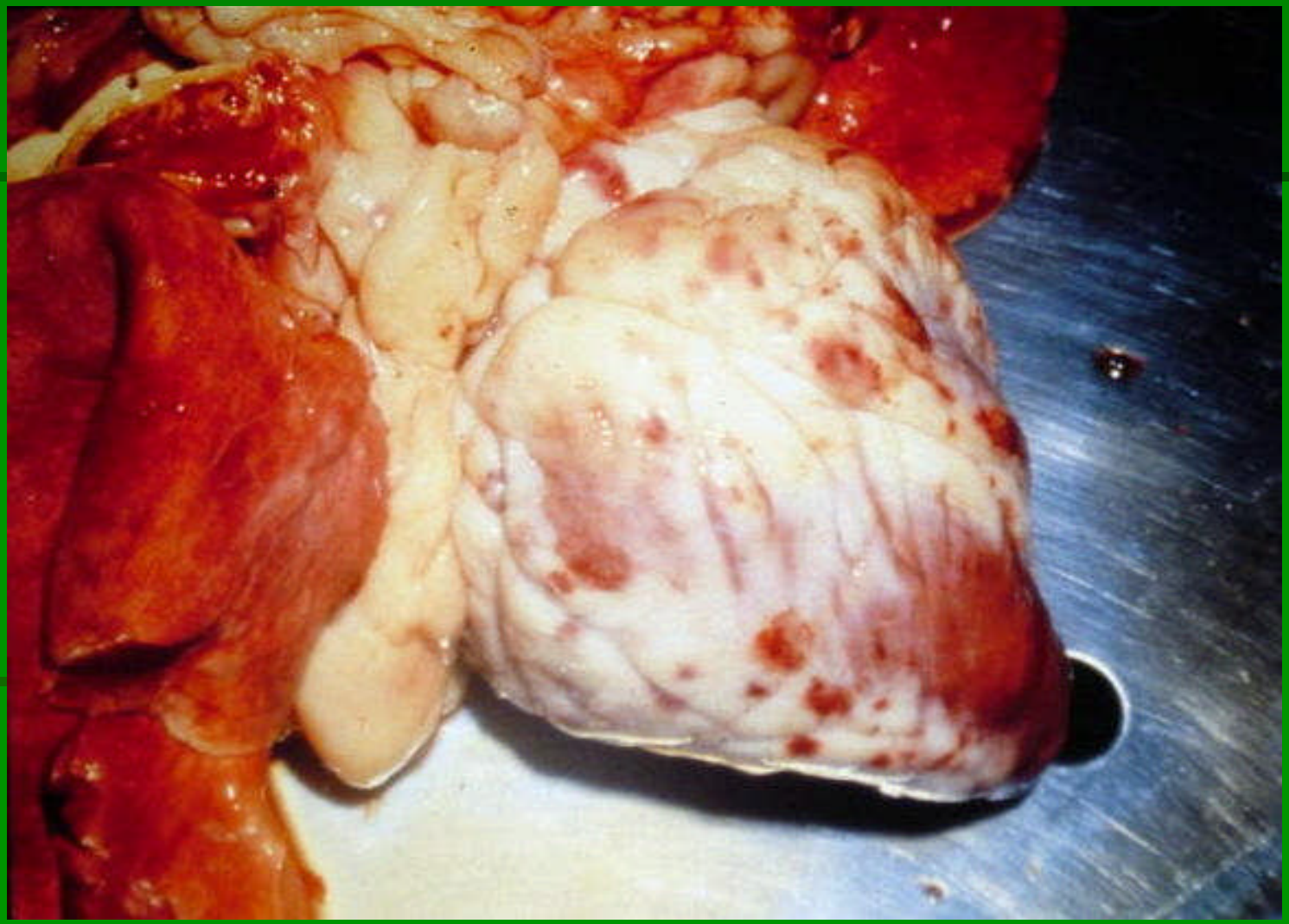
Describe seasonal estrous cycle for sheep/goats?

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)

Sheep – subcutaneous surface of the skin



Presumptive diagnosis?

Lymphosarcoma

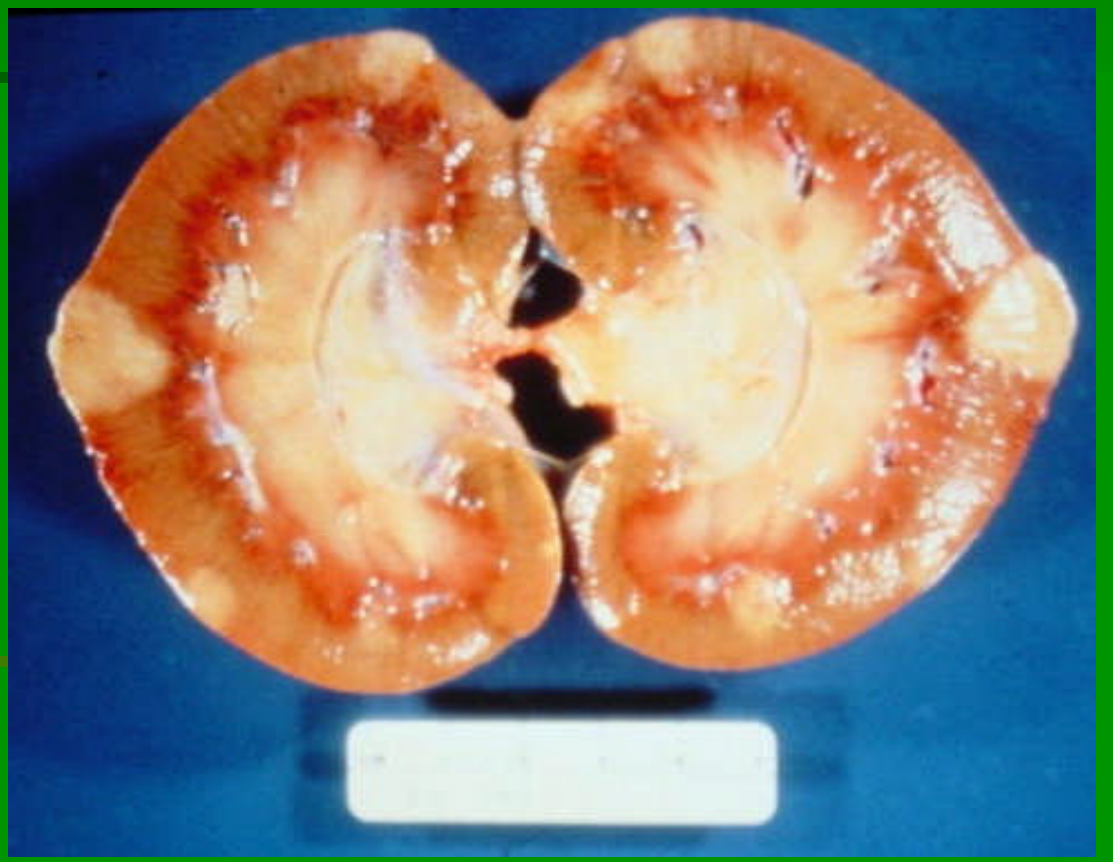
Bovine Leukemia Virus

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



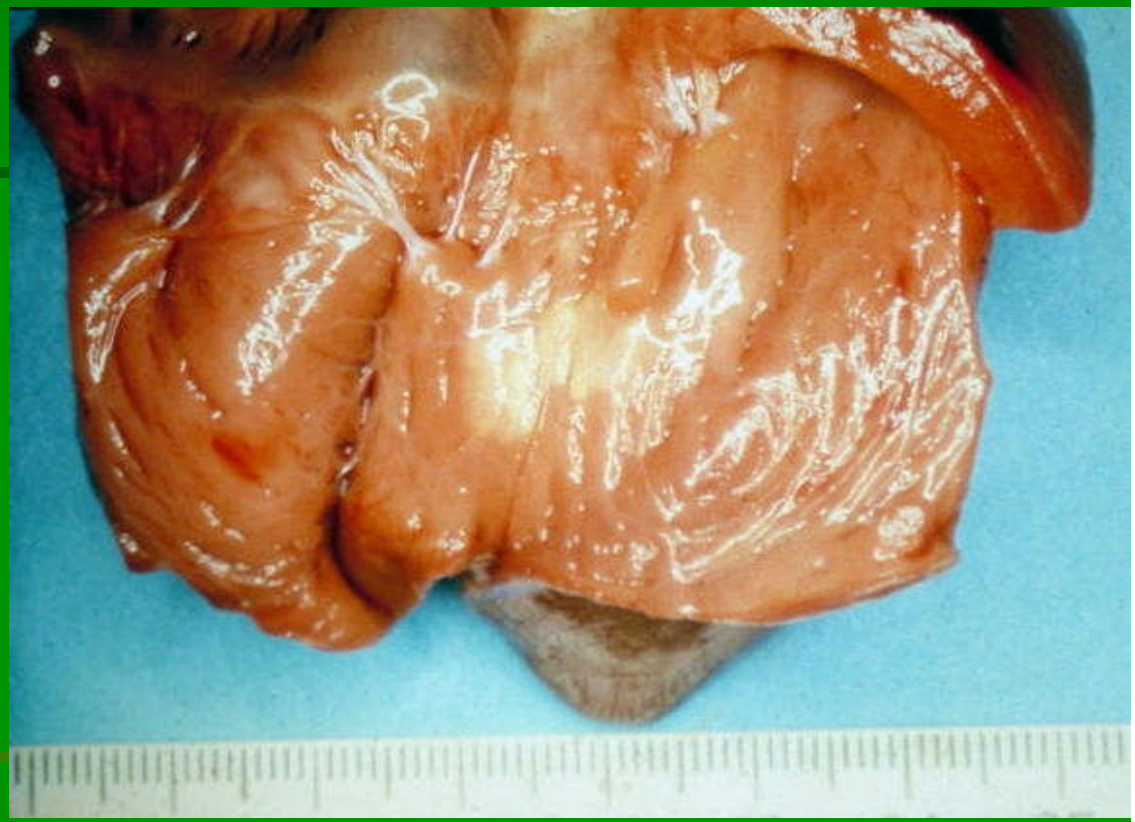
Clinical signs:

-Dyspnea, paresis, stiffness, inability to stand

-Other lambs found dead

-Creatinine Kinase (CK) and aspartate aminotransferase (AST) elevated

Tissue from a lamb



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

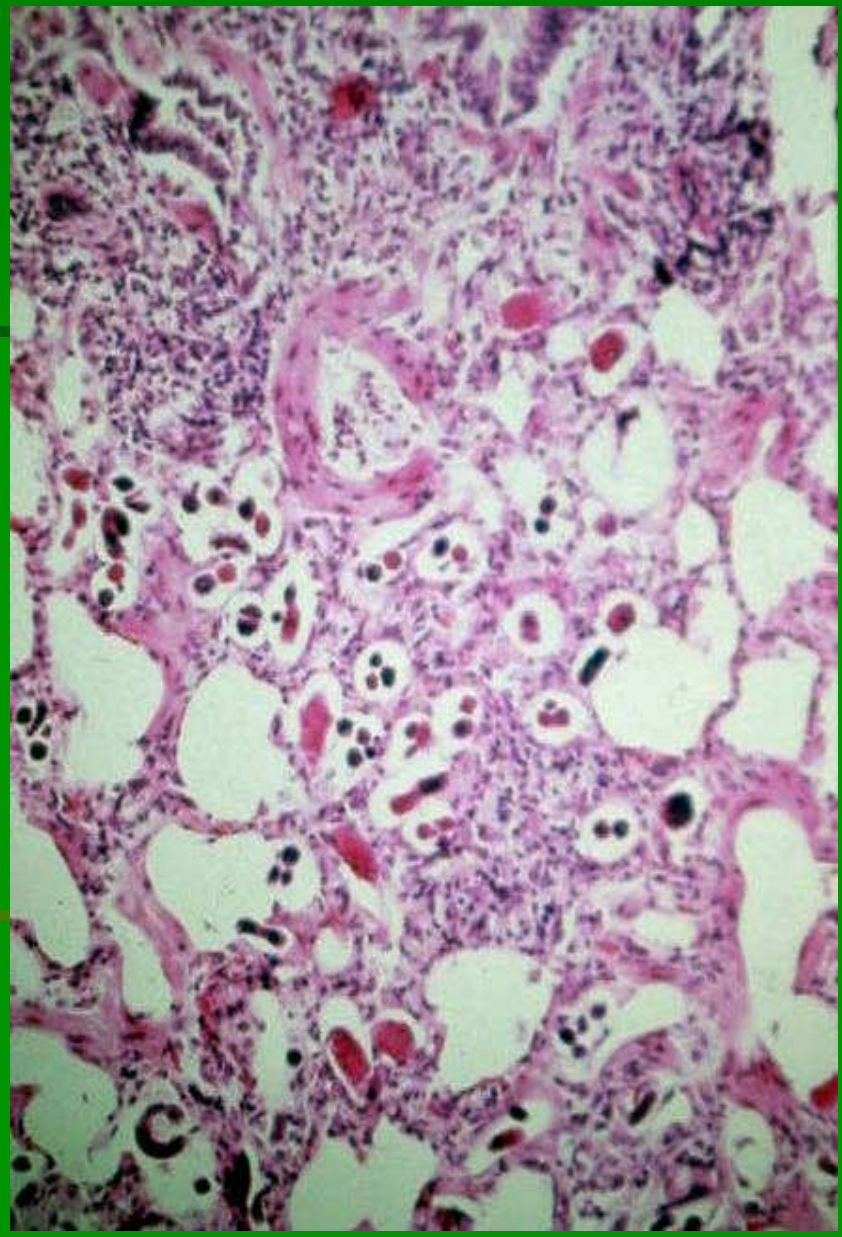
-Evaluation or awareness of regional soil content
-Supplementation of affected animals or late stage gestational ewes with Vitamin E or Selenium injections
-Properly balanced dietary rations

*be cautious of selenium “toxicity”

Tissue from a sheep

Presumptive Diagnosis?

- Lungworms
- *Dictyocaulus filaria**
- *Protostrongylus rufescens*
- *Muellarius capillaris*
- Less common in goats



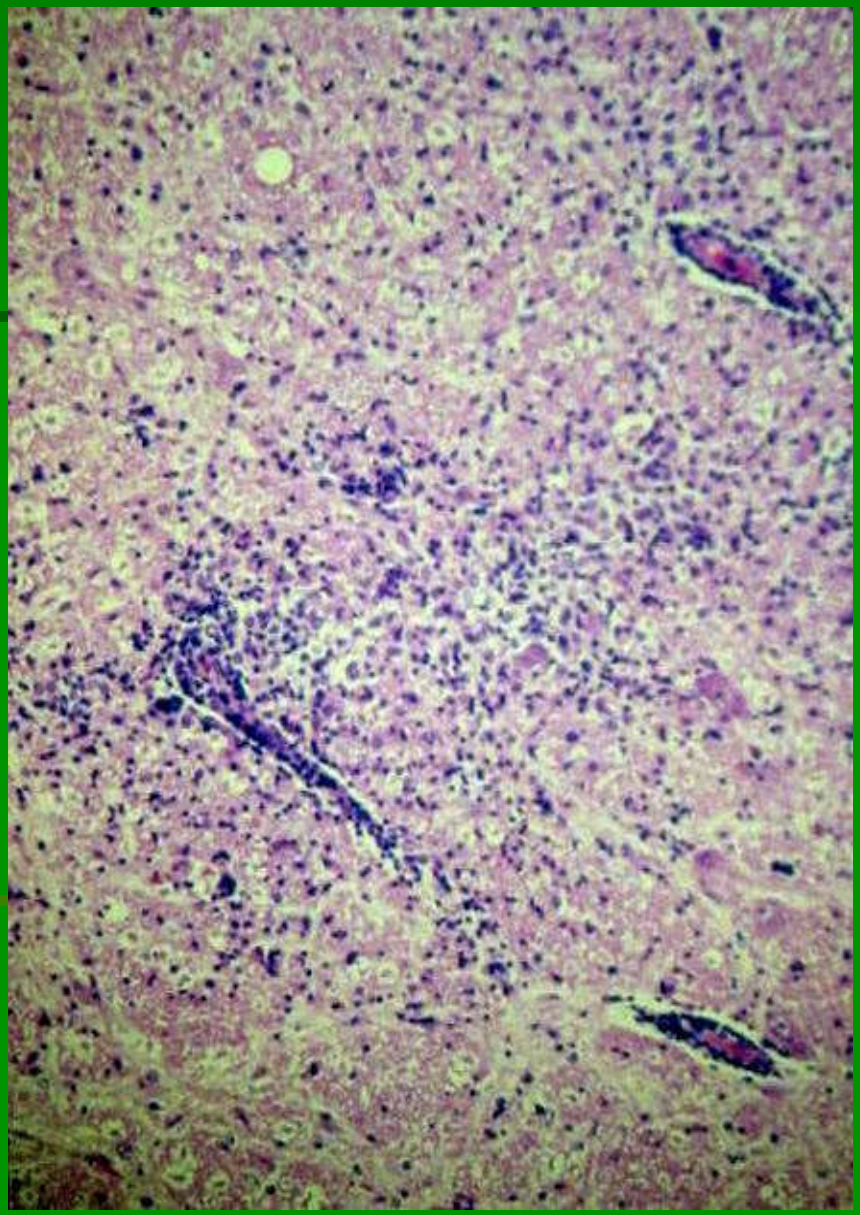
Tissue from a goat

-Abortion
-CNS signs

Cold enrichment (20^{O}C) beneficial in culturing the organism

Diagnosis?

Listeria monocytogenes



Most likely diagnosis?

Corynebacterium pseudotuberculosis

-Disseminated superficial abscesses of lymph nodes

- Very common

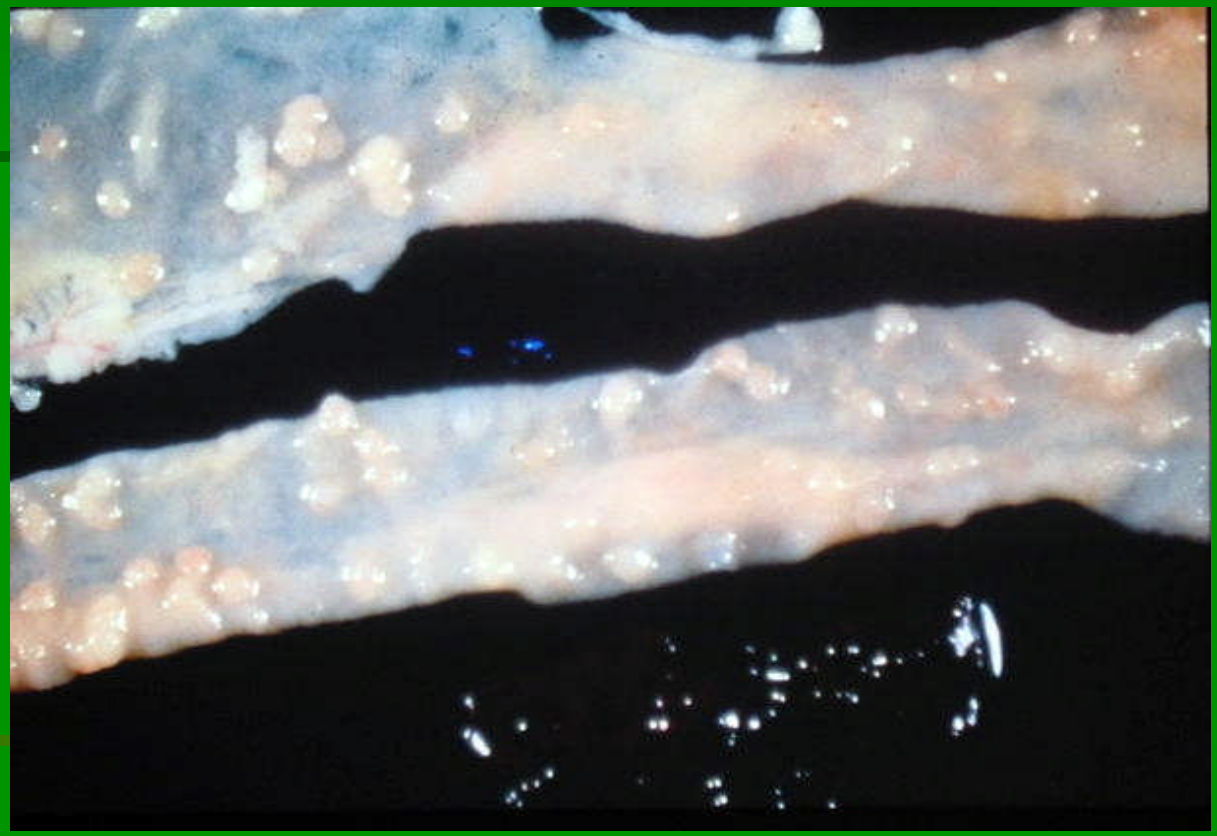
-Gram + coccobacillus

-Thick caseous exudate

-ELISA available

Goat small intestine

Young animal with hemorrhagic diarrhea



Presumptive diagnosis?

Coccidiosis

(***Eimeria ninakohlyakimovae, E. arloingi, E. christenseni)***

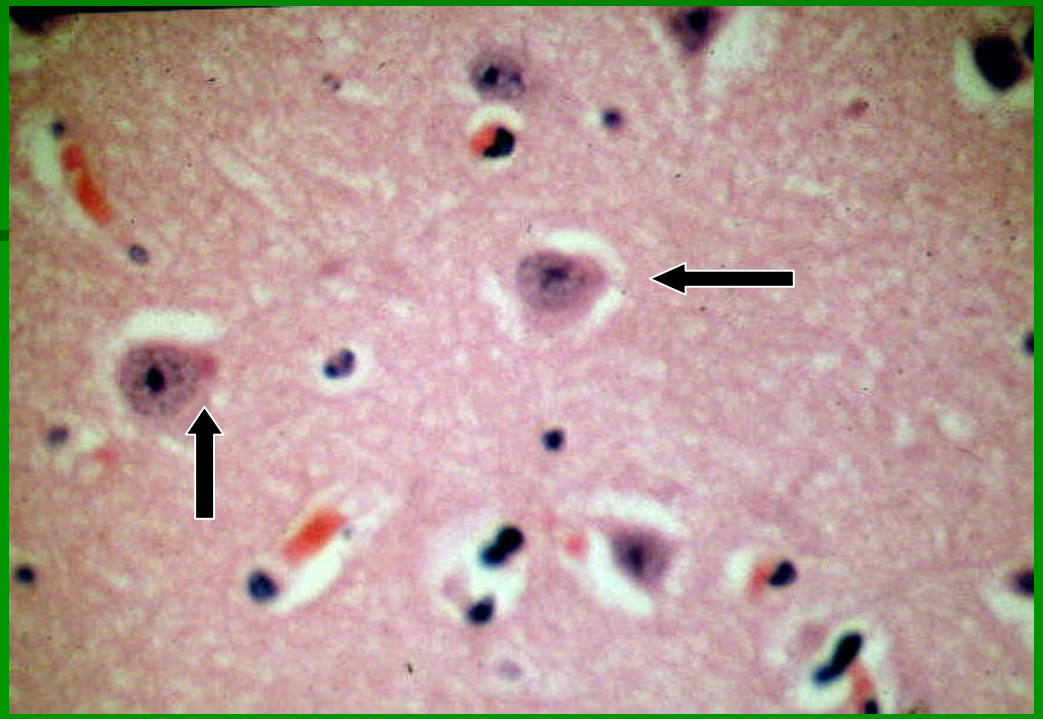
Necropsy Findings:
GI may appear congested, hemorrhagic, or ulcerated and have scattered pale, yellow to white mucosal plaques

-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

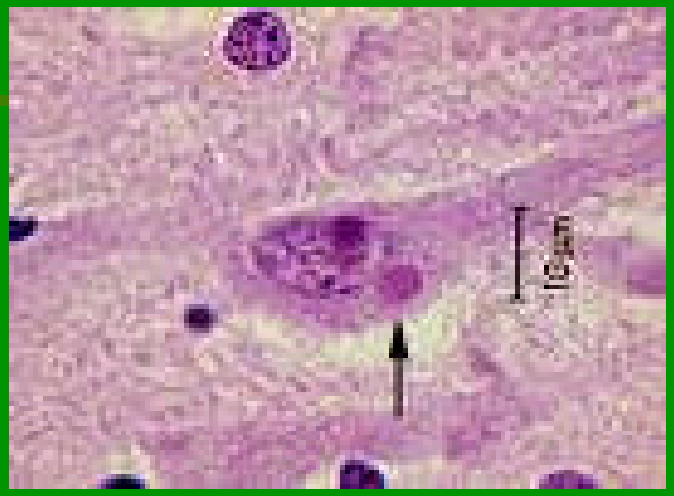
Diagnosis?

Rabies
(Lyssavirus-genus)
(Rhabdovirus-family)



Histology

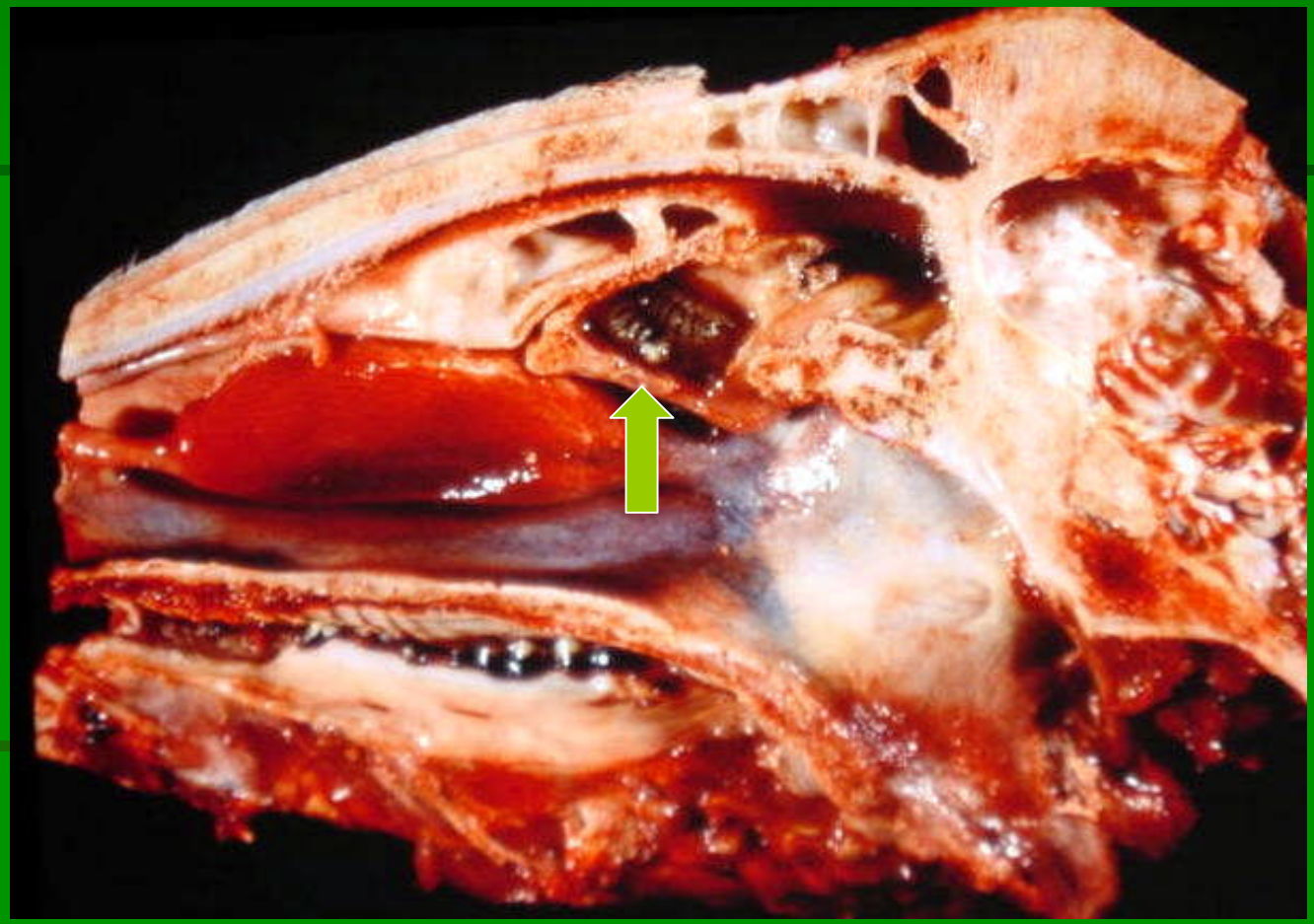
-Negri bodies in the cytoplasm of the neuron
-Confirmation made by fluorescent antibody stain of the brain



Zoonotic!

Reportable!

Frontal sinus of a sheep

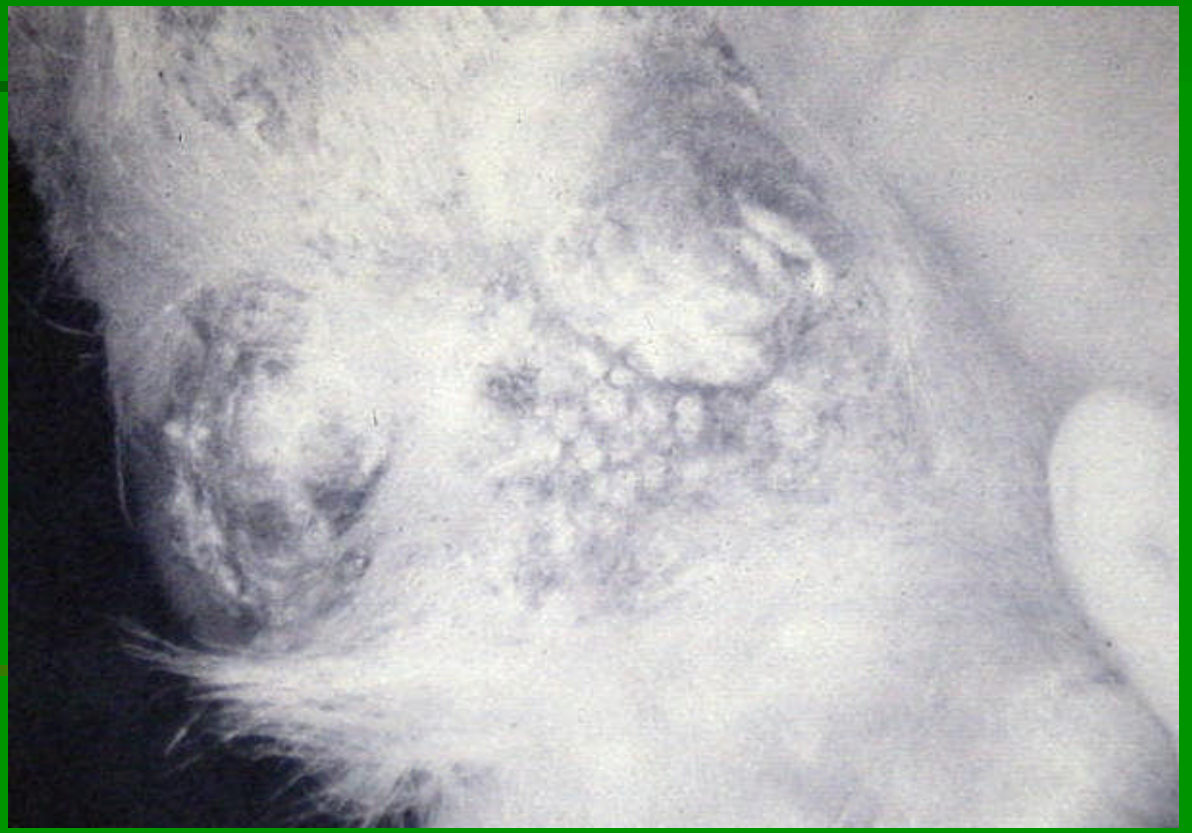


Name the Parasite

Oestrus ovis
Nasal bot fly - larva

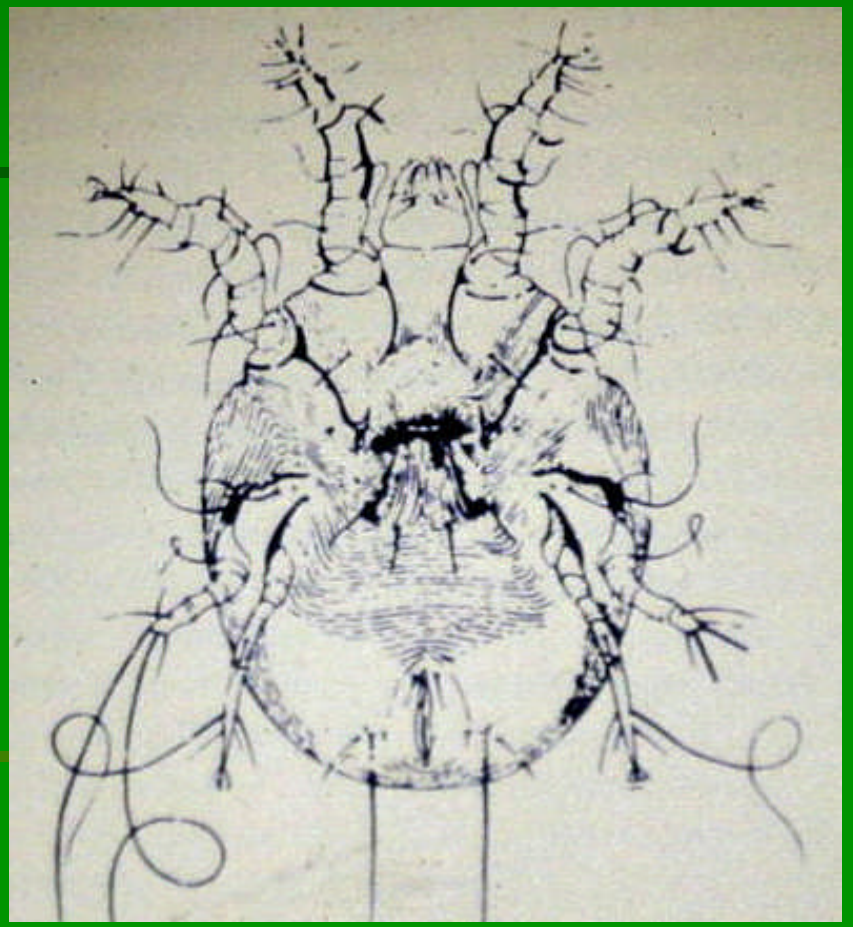
Clinical Exam – fetlock of a goat

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

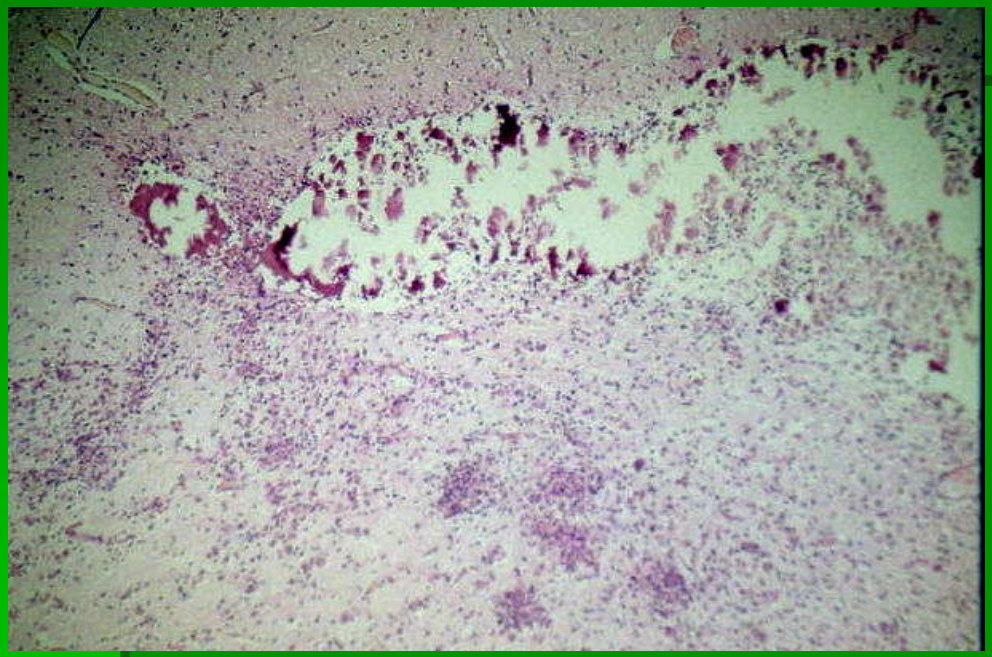
(*Melophagus ovinus)*

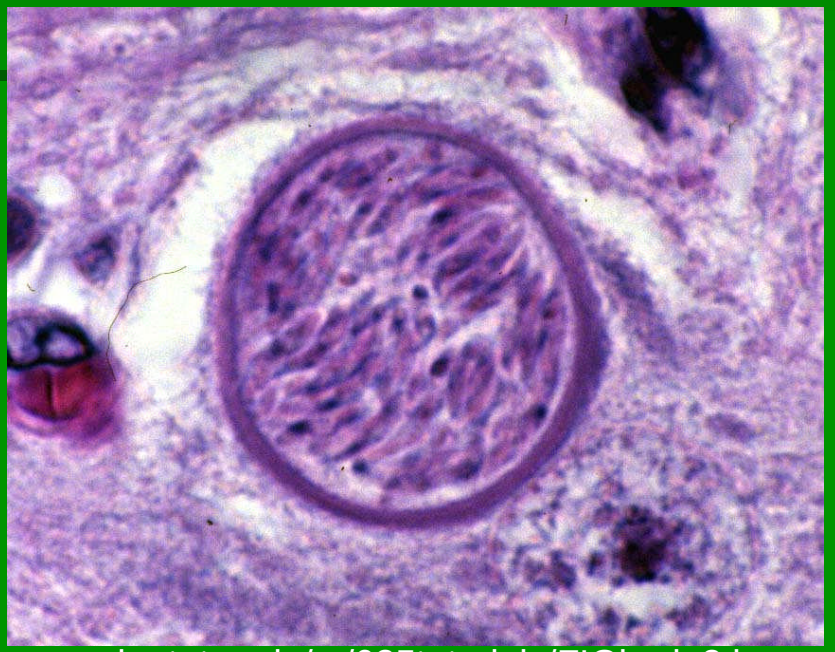
wingless, flat, brown, bloodsucking fly

Can transmit which virus?

Bluetongue

Brain from aborted goat fetus





www.k-state.edu/.../625tutorials/FIGbrain2.jpg

Moderate gliosis, non-suppurative encephalitis, perivascular mononuclear infiltrates

Diagnosis?

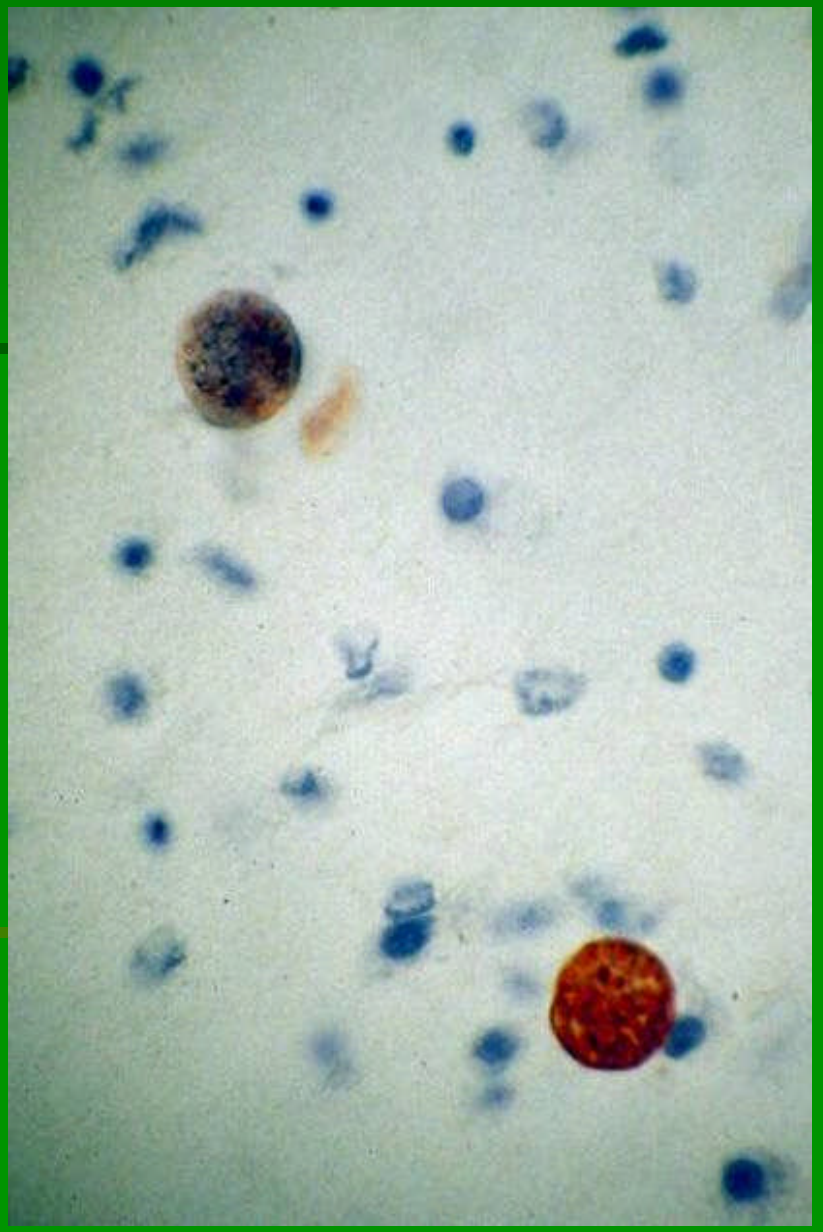
Neospora caninum

-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

-Immunohisochemical staining specific for the organism (immunoperoxidase)



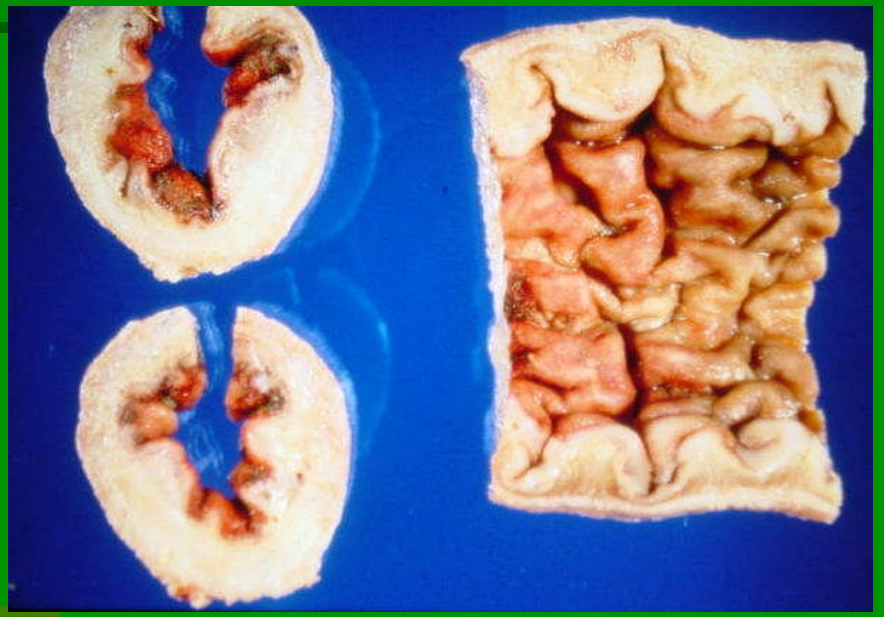
Definitive host?

Dog

Rule outs?

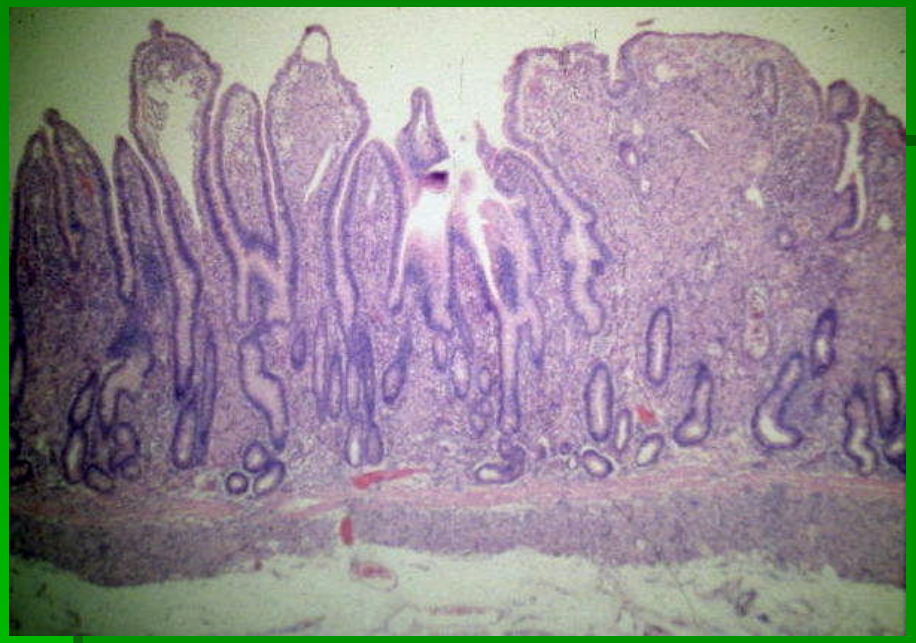
Toxoplasma sp. (smaller)

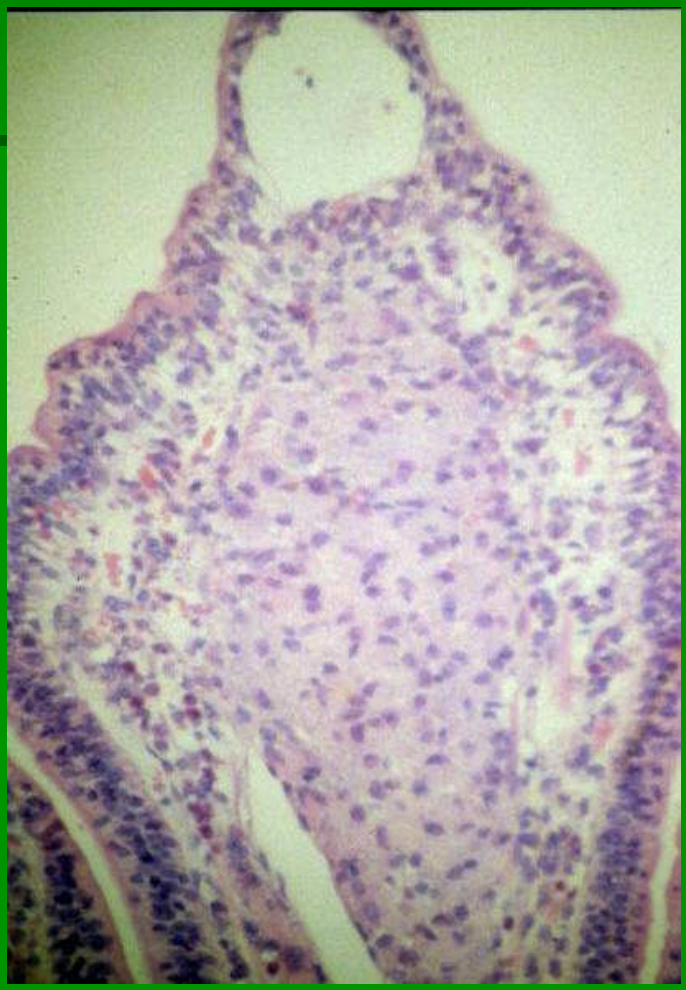
Tissue from a sheep



unthriftiness, weight loss and intermittent diarrhea

Histopathology

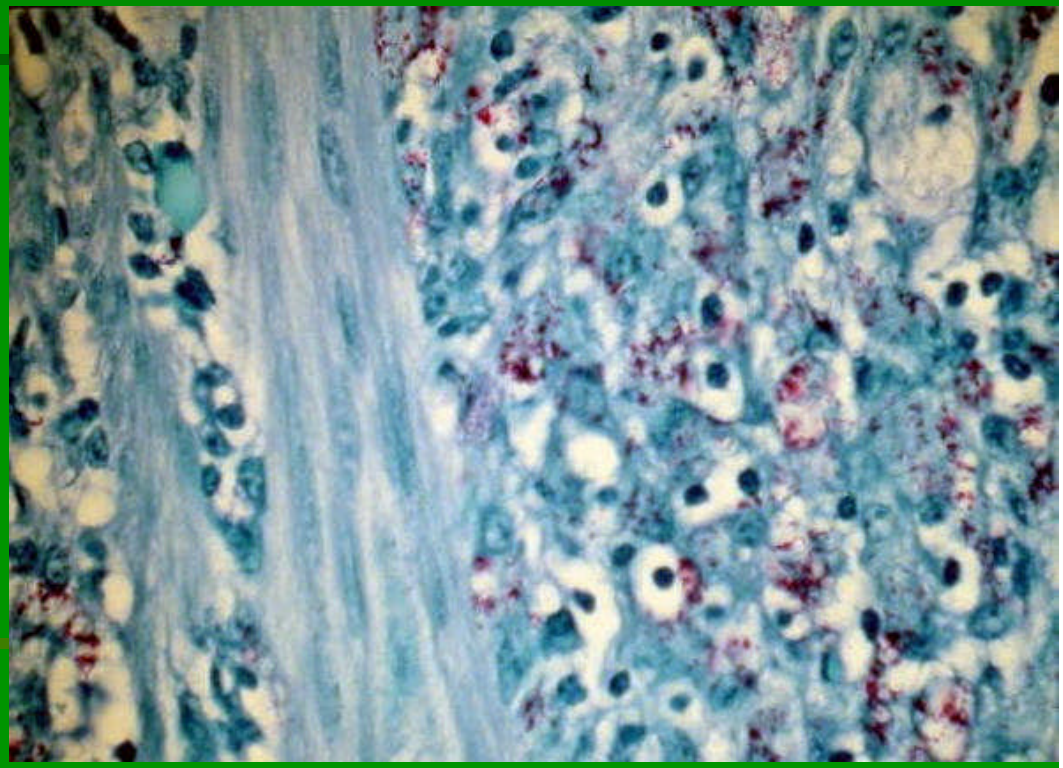




Diagnosis?

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...