

# VIRTUAL CONVENTION 2021



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## Looney Tunes Neurologic Diseases of Small Ruminants

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The image shows the classic Looney Tunes logo. The words "LOONEY TUNES" are written in a large, white, stylized font with a red outline and a drop shadow. Below the letters, the words "REG. U.S." and "PAT. OFF." are visible in a smaller, white font. The background is a dark red with a blue circular shape behind the text.

LOONEY TUNES  
REG. U.S. PAT. OFF.

# Neurologic Disease of --- Sheep & Goats

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# Learning Objectives

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- Learn how to perform a CSF tap in small ruminants
- Learn the signs, diagnosis, treatment & prevention for several neurologic diseases affecting small ruminants
- Learn how to manage a neurologic case in a small ruminant

# Diagnostics

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- A good PE
- A good Neuro Exam
  - Blind ?
  - Cranial nerves ?
  - Lateralized signs ?
  - Ataxic ?
  - Mentation ?
- Try to localize the lesion

# CSF Tap

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- Supplies:
- 18 g 3 1/2 " Spinal needle
- EDTA tubes
- Red top tubes
- White tape
- Surgical scrub & gloves
- Lidocaine
- Sedation ?

# CSF Tap

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- Lumbosaccharal  
Space

More diagnostic

Less risk





# CSF Tap

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- Sternal recumbancy
- Lumbosacral space
- Surgical prep 4" x 5" w/ tape
- Lidocaine .5 – 1 cc
- 18g 3 1/2" spinal needle
- 2 "pops"
- 2 – 3 mls divided into EDTA and plain





# CSF Tap Normal

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Color	Colorless
Specific Gravity	1.004 – 1.008
Erythrocytes	<35
<b>WBC's</b>	<b>0 – 9 / mm<sup>3</sup></b>
Neutrophils	None to Few
Lymphocytes	95%
<b>Protein (mg/dl)</b>	<b>12 – 30</b>
Glucose (mg/dl)	56.0 **

# Listeriosis

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- Gram + non-spore forming rod
- Can survive for months in soil, water and feed
  
- Abortion form (type 1)
- Septic form (type 1 & 4)
- Neurologic form “

# Listeriosis – Septic Form

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- Neonates
- Weak, unable to nurse, FPT
- Intention tremors
- Hypo or Hyperthermia, Hypo or Hyperglycemia
- Seizures nystagmus and death

# Listeriosis – Neuro Form

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- Organism enters buccal mucosa from a cut and travels up the Trigeminal nerve
- **Lateralizing signs** – circling, head tilt, ptosis, inability to eat or swallow, drooling
- Preference to lay on one side, but also down
- CSF – increased PMN w/ monocytosis, increased protein



# Listeriosis

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## ■ Treatment: ?

- Nuflor<sup>®</sup> - 20 mg/kg q 48 hrs.
- Tetracycline – 20 mg/kg SID or BID x 5d
- Penicillin – 60,000 IU/kg IV q 6 hrs.
- Penicillin – 80,000 – 120,000 IU/kg IM BID
- Supportive

# Listeriosis

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## ■ Prevention

- Avoid poor quality silage & forage
  - pH > 5.5
- Chlortetracycline
  - 6 – 12 mg/kg PO daily
- Prevent fecal contamination of feed

## ■ Zoonotic



# Polioencephalomalacia

Thiamine deficiency ( $B_1$ )

Causes:

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- Poor quality forages
  - Hay stored > 1 year
- Amprolium
- Thianinease producing bacteria
  - High CHO diets, Grain overload, Feed changes
- Sulfur toxicity
  - (molasses, ammonium sulfate)
- Bracken fern

# Polioencephalomalacia

## Thiamine deficiency (B<sub>1</sub>)

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Signs:

- Blind
  - Intact PLR's, especially early
  - Dorsal medial strabismus
  - nystagmus
- Opisthotonos
- May go down
- CSF – often normal
- Subclinical – poor growth rates



# Polioencephalomalacia

## Thiamine deficiency (B<sub>1</sub>)

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## Treatment:

- Dx by response to TX
  - Often within 2 hours
- 10 – 15 mg/kg Thiamine q 4 hrs IV &/or IM
  - IV slowly                      Keep from light
- If B complex dose based on B<sub>1</sub>
- Supportive
  - Dexamethasone / Mannitol for edema

# Polioencephalomalacia

## Thiamine deficiency (B<sub>1</sub>)

### Necropsy

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- Cerebral Cortex
  - Soft, Edematous, Grey to Yellow
  - Flattened gyri
  - Necrotic Areas Fluoresce
- Cerebellum
  - May be Herniated

# Enzootic Ataxia Swayback

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- Condition of Newborn and Growing Kids
- Weak kids, easily fatigue
- Head nodding, muscle tremors
- Ataxia, symmetrical progressive paralysis
- May also see anemia, fractures
- Demyelination of nerves

# Enzootic Ataxia Swayback

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- Copper deficiency

- Either 1°

- < 4 ppm in feed

- or 2°

- Excess Molybdenum, Sulfate, Iron,

- Manganese, Cadmium, Lead



# Enzootic Ataxia Swayback

## Diagnosis

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- Normal blood copper
  - 9.4 – 23.6  $\mu\text{mol} / \text{l}$  (.6 – 1.5 ppm)
- Enzootic Ataxia blood or serum copper
  - < 8  $\mu\text{mol/l}$  (0.5 ppm)
- liver copper
  - < 20 ppm dry weight



# Enzootic Ataxia Swayback

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## Treatment:

- Oral copper
- Parenteral copper
- Prevention
  - Feed 5 – 15 ppm
  - Copper : Molybdenum – 6 : 1 during gestation
  - Top dress pasture w/  $\text{CuSo}_4$  2-3 kg / hectare
  - Sulfate levels < 3500 ppm

# CAE (OPP?)

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- Arthritis
- Encephalitis
- Hard Bag
- Pneumonia



# CAE

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- Dairy breeds 1–6 months or very old
- Progressive paresis
  - Usually begins in 1 rear leg
  - Dog sitting
  - Often BAR in front end
- Paralysis may take 1 – 2 weeks
  - Blind, tremor, circling, opisthotonos, decreased PLR, depression, fever





# CAE

# Prevention

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- Do not feed colostrum from infected dams
  - Feed colostrum from negative dams only
  - Pasteurize colostrum
    - 56° C for 1 hour
  - Feed colostrum supplement
  - Elective C-section

# TSE's

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- BSE = Mad Cow
- Scrapie
- CWD
- Creutzfeld Jakob
- Atypical Scrapie
  - Nor 98
- FSE
- T. Mink Enceph.
- KURU
- Gerstmann-Straussler-Scheinker
- Fatal Familial Insomnia

# Scrapie

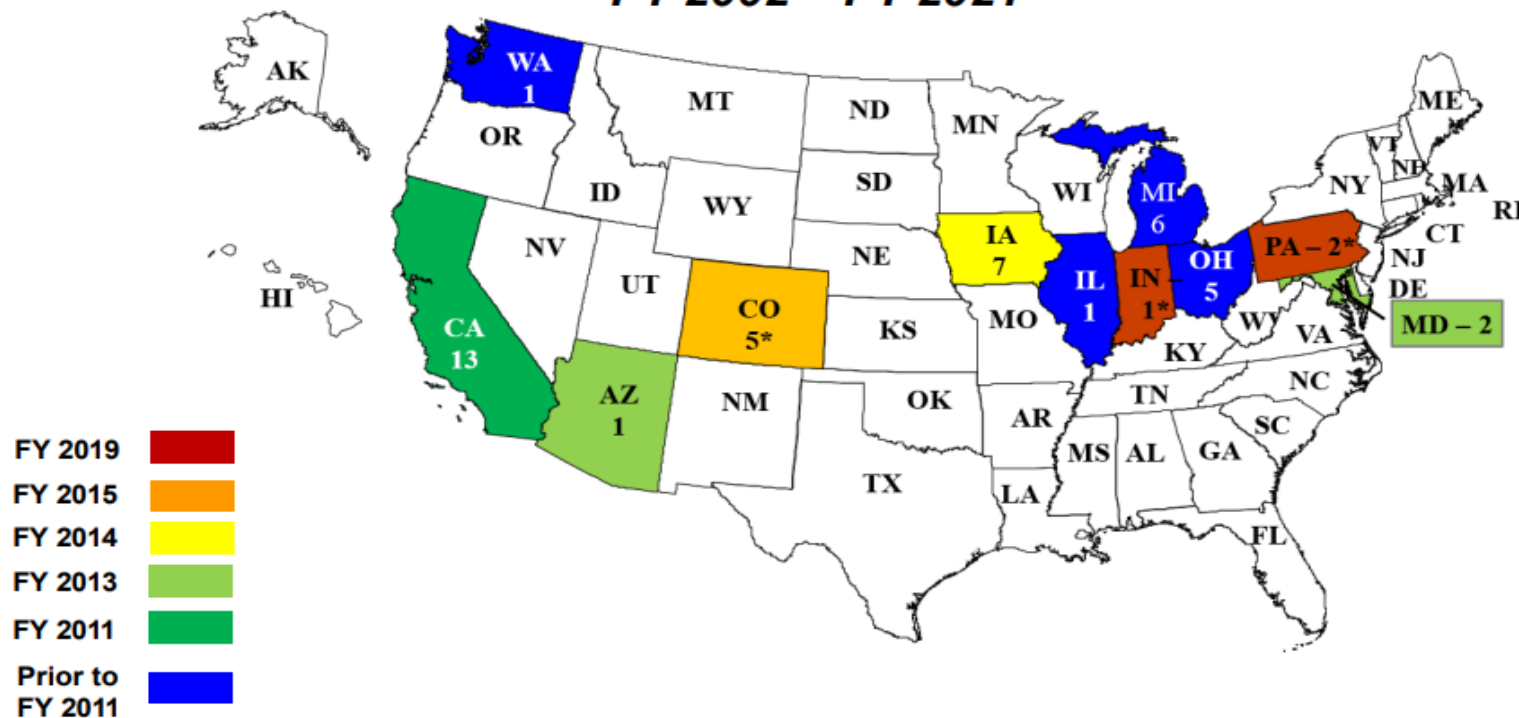
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- Prion - protein particle that is infectious
- Causes astrocytic gliosis
- No detectable immune response
- Persists in environment for perhaps years
- Uncommonly reported in goats
- Usually but not always associated w/ sheep contact



# Scrapie Cases in Goats

## FY 2002 – FY 2021



(Figure 1)

Color code indicates fiscal year of last case by State. 44 NVSL confirmed cases.

\* States with 1 RSSS positive goat; samples collected November 2014, July 2018, and June 2019

# Small Ruminants get 3 types of TSE's

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- Classical Scrapie
- Atypical Scrapie
- BSE



# Classical Scrapie

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- > 2 years old usually 2 – 5
- Duration of signs is 2 weeks – months
- Spread by placenta
  - But not so much in goats

# Classical Scrapie

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- Behavior changes:
  - Isolation
  - Aggression
  - Disorientation
  - Abnormal vocalization

# Classical Scrapie

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- Sensory Changes:
  - Hyperexcitable
  - +/- Pruritus
  - Alopecia
- + /- Ecstasy when scratched



# Classical Scrapie in Goats

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- Changes in Movement:
  - Ataxia
  - Hypermetria
  - Head tremor
  - Paresis in rear



- Other signs:
- Weight loss with good appetite
- Signs can lateralize!

# Atypical Scrapie = Nor 98

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- Much more rare
- Worldwide distribution
- More rostral in brain
- Most detected in aged healthy sheep on routine postmortem following culling
- 1 12 yr. old goat found dead



# BSE

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- Experimental infection in goats
  - Ataxia
  - Trembling
  - Lethargy
  - Weight loss
  - No Pruritus

# Scrapie Genetics

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## Sheep codon

- 171
  - R vs Q
- 136

## Goat codons

- R143
- S146
- H154
- K222
- M142

# Differential for Scrapie

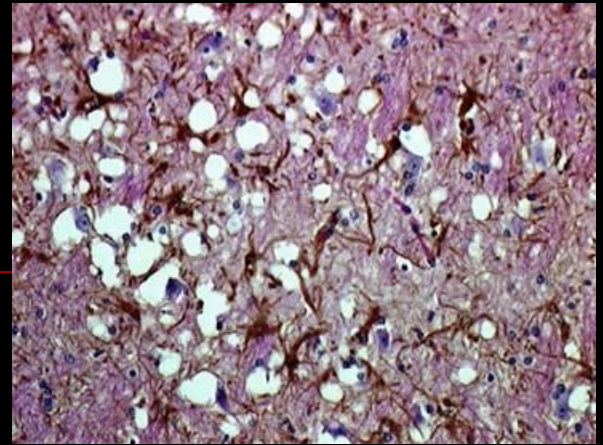
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- Listeria
- CAE
- Hepatic / Renal encephalitis
- Abscess
- Tumor
- Rabies

# Diagnosis of Scrapie

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- Postmortem
- 3<sup>rd</sup> eyelid
- RMALT – rectal mucosal biopsy
  - 87% accurate in sheep



# Tetanus

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- *Clostridium tetani*
- Sources:
  - Dehorning/castration
  - Surgery
  - Kidding
  - Wounds
  - Shearing



# Tetanus treatment

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- Penicillin PPG or IV
- Antitoxin 10,000 – 15,000 IU, IV BID
- Debride wound and apply hydrogen peroxide
- Supportive care

# Otitis Media

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- Signs: **head tilt**, facial nerve deficits, ptosis, ataxia, nystagmus, listing to one side
- May be associated w/ external ear infection
  - Especially due to mites
- Spread internally secondary to respiratory infection
- CSF: may see increased protein but no monocytosis

# Otitis Media

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## ■ Treatment

- Systemic & local antibiotics
- NSAID's
- Myringotomy
- Surgical management
  - Lateral ear resection



# Tick Paralysis

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- Dermacentor
  - Ixodes (in Australia)
- produce neurotoxin
- Ascending motor paralysis leading to death
  - Manually remove ticks – may need to shear
  - Topical pyrethrins
  - Ivermectin works too slowly

# Rabies

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- Aggressive form is most common in goats (83%)
- Aggressive animals may bite or attack other animals or objects
- Increased vocalization (72%) , sexual hyperactivity, running, pharyngeal paralysis, salivation (29%), paralysis (17%).

# Rabies

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- Incubation period may be 2 weeks to several months
- Once clinical signs develop death occurs in 1 – 10 days
- Diagnosis:
  - Negri bodies in the hippocampus and Purkinje fibers

# Rabies

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- Prevention:
- No vaccines are approved
  - Vaccines approved for sheep are sometimes used and considered efficacious
- **Killed vaccine**
- MLV's cause post-vaccination paralysis

# Border Disease

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- Hairy Shaker Lamb Disease
- Pestivirus
- Causes infertility, abortion, stillborns
- Tremors and shaking
- Kids DO NOT show typical “hairy” condition
- May be under reported due to infertility

# Pseudorabies

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- Herpes virus
- Intense pruritus
- Ataxia
- Disorientation
- Death within 72 hours
  
- Almost always associated with swine



# Meningeal Worm

## *Parelaphostrongylus tenuis*

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- Up to 84% of WT Deer infected in Eastern US
- PP period in deer is 3 months
- In aberrant hosts:
  - Larva migrate through GI wall into peritoneal cavity and enter the spinal cord through the dorsal nerve roots and migrate to the grey matter

# Meningeal Worm

## *Parelaphostrongylus tenuis*

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- Signs 45 – 53 days post ingestion
- Usually Fall & Winter
  - But can be Spring
- Gradual or Acute
- CSF – eosinophilic pleocytosis w/  
increased protein



# Meningeal Worm

## *Parelaphostrongylus tenuis*

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### ■ Signs:

- Lame or ataxic – rear more common
- Hypermetria
- Recumbency – may still be BAR
- 10% show cranial nerve signs
- 2° signs from being down are common

# Meningeal Worm

## *Parelaphostrongylus tenuis*

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### ■ Treatment:

- Fenbendazole 50 mg/kg PO x 5 days
- Flunixin 1 mg/kg q 24 hrs. IV or IM
- Ivermectin most effective on larva prior to entering CNS

# Meningeal Worm

## *Parelaphostrongylus tenuis*

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### ■ Prevention:

- Eliminate deer – hunting, 12' fences
- Eliminate snails & slugs
  - Drain pastures – eliminate wet spots
  - Guinea fowl or Peacocks
  - Vegetation proof zone - limestone
- Ivermectin q 30 d. or Doramectin q 45 days
  - May - December
  - Resistance ?

# Meningeal Worm

## *Parelaphostrongylus tenuis*

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- Vaccine is in development
- \$ 300,000
- > 3 years away

# The “Other” Meningeal Worm

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- *Elaphostrongylus cervi*
- Red deer
- Seen in the U.K.

# Trauma, Abscess, Tumor

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- Necessary to localize the lesion
- Radiographs may be helpful
- Tumors slowly progressive signs
- Tumors rarely reported in sheep & goats

# Differential Diagnosis

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- Heat stress
- Hypoglycemia/ Hyperglycemia
- Hypocalcemia or magnesemia
- Pregnancy toxemia
- Hepatic encephalopathy
- Uremic encephalopathy

# Differential Diagnosis

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- Neurologic coccidiosis
- Tick paralysis
- Clostridial Disease
- Lameness
- Plant or other toxic substances
  - Rye
  - Ionophore



# Supportive Neurologic Treatment

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- Steroids or NSAID's
  - Solu-Delta
  - Dexamethazone .5 – 1 mg/kg IV or IM SID
  - Banamine 1.1 mg/kg IV SID or BID
  
- Watch steroids if pregnant

# Supportive Treatment

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- Thiamine
  - 10 – 15 mg/kg IV or IM SID
- DMSO
  - 1 mg/kg in 5% dextrose IV SID
- Fluids w/ or wo/ Protein
- Physical Therapy
- Systemic Antibiotics
- Vitamin E / Selenium
- Transfaunation

# Antibiotics

- Penicillin
- Amoxicillin
- Tetracycline
- Nuflor



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## Questions:

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