Dealing with Deer Worm

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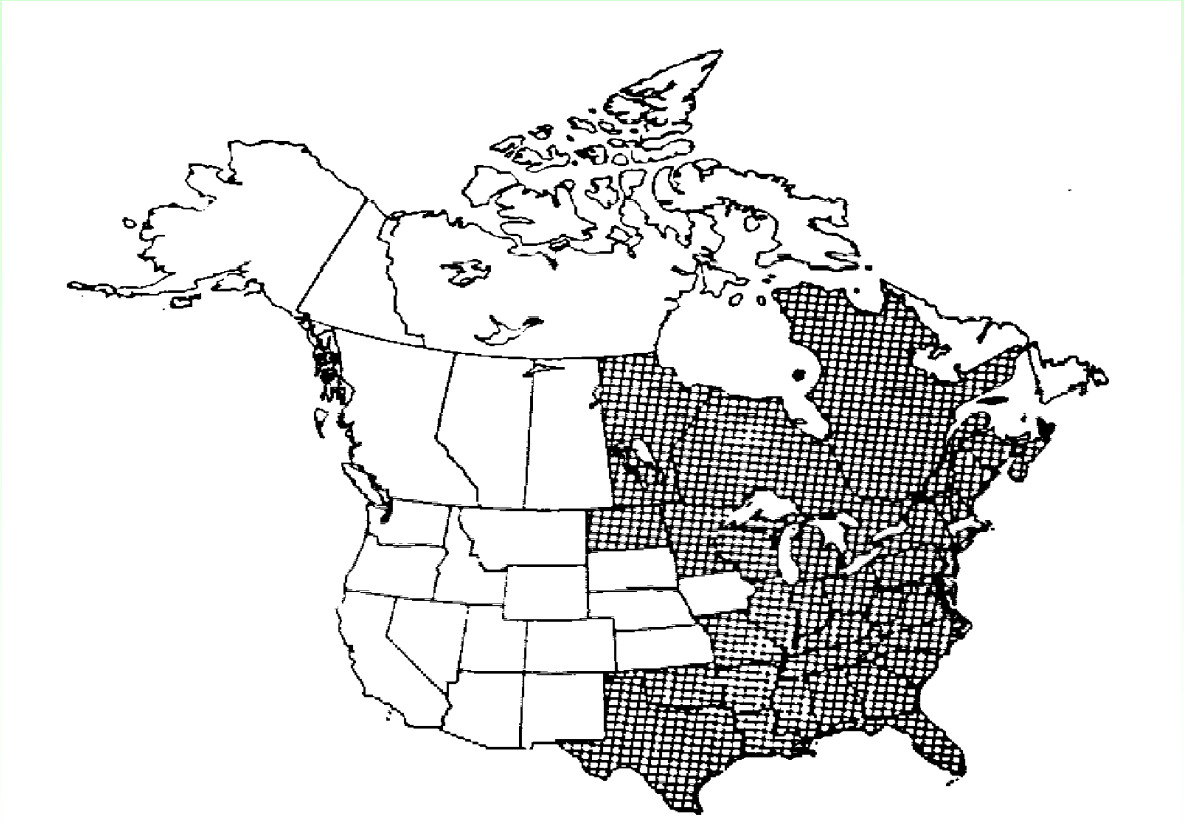
Parelaphostrongylus tenuis

- *P. tenuis*
- deer worm, meningeal worm
- nonpathogenic in the white-tail deer, *Odocoileus virginianus*

Reported Distribution - *P. tenuis*



Prevalence of *P. tenuis* in White-tailed Deer

- 41% of 172 adults - Ontario
- 58% of adults, 33% of juveniles – NY
- ~90% of hunter killed deer around Ithaca
- 59% of deer > 1 year - MN
- 0 to 100% in counties in S.E. USA (soil type?)

Life cycle in deer

- slug or snail eaten (or contaminated vegetation)
- parasite larvae migrate through abomasal (stomach) wall to peritoneal cavity
- enter lumbar spinal nerves
- reach spinal cord in 10 days
- develop in gray matter of spinal cord

Life cycle in deer

- return to surface of spinal cord at 40 days
- mature and migrate to cranium
- eggs laid into blood vessels
- hatch into first-stage larvae in lungs
- enter bronchial tree, coughed up, swallowed and passed in feces

First-stage larvae of *P. tenuis*

- pass larvae 90+ days after deer infected
- in mucous coat of deer fecal pellet
- killed by drying, solar radiation
- resist freezing

Intermediate hosts

- land snails and slugs crawl over deer feces
- larvae penetrate gastropod's foot
- develop to infective stage (3-4 months)
- persist for life of snail or slug or excreted in slime trail on vegetation
- 0.04% infected on summer range, 0.16% in winter yards
- mean of 3 larvae each snail

Aberrant hosts of *P. tenuis*

- moose
- caribou
- wapiti
- red deer
- black-tailed deer
- mule deer
- antelope
- sheep
- llamas
- alpacas
- goats
- fallow deer
- (cattle)
- (horses)

Infection of Aberrant Hosts

- stay longer in spinal cord
- worms active, coil on themselves
- may reinvade cord or brain
- immune response
- usually don’t produce eggs to complete life cycle

Experimental incubation period

- goat kids: 11 - 52 d (huge number given)
- lambs: 11 - 27 d
- llamas: 45 - 53 d
- fallow deer: 54 - 67 d
- signs common in fall, early winter but can be any month of the year

Clinical signs of *P. tenuis*

- unsteady or exaggerated gait
- stiffness, lameness
- hind leg weakness or paralysis
- progression to forelimbs
- circling, head tilt, twisted neck
- depression, blindness, rapid eye movements
- seizures, death

Dog sitting

Hind legs crossed

Hind legs weak or all 4 legs paralyzed

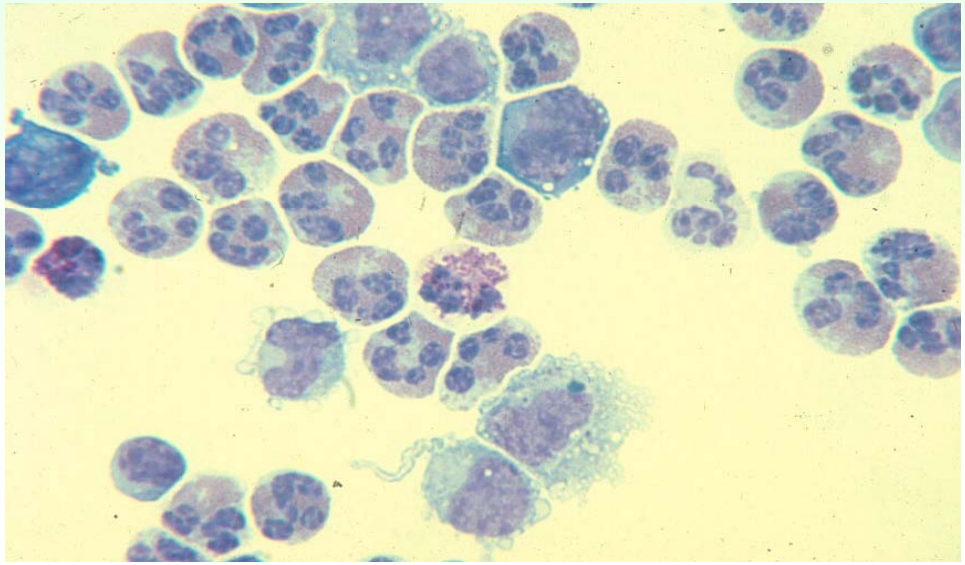
Skin damage done with back foot because itches

seizures

http://www.neurovideos.vet.cornell.edu/Video.aspx?vid=11-17

Cerebrospinal fluid with *P. tenuis*

- lumbosacral tap
- increased cells, usually eosinophils
- increased protein



Differential diagnoses
Sheep and goats

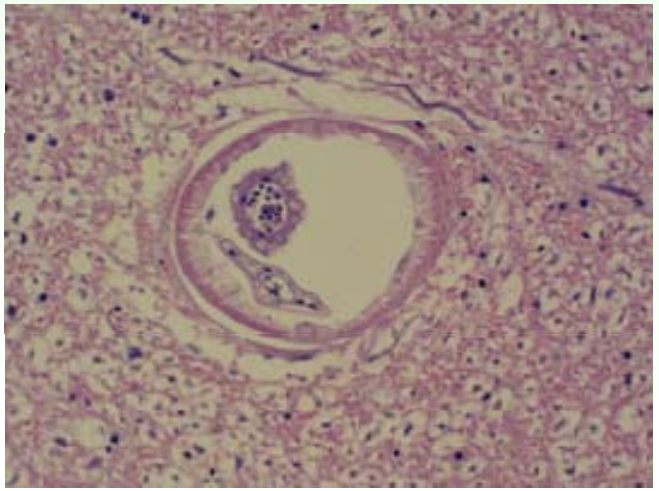
- listeriosis
- polioencephalomalacia (thiamine defic.)
- brain abscess
- rabies
- scrapie

Differential diagnoses
Sheep and goats

- fracture, vertebral body abscess
- copper deficiency
- tail docking infection
- OPP = ovine progressive pneumonia or CAE
- foot rot, white muscle disease

Necropsy Findings

- exclude other diseases
- sections of parasite in cord or brain
- linear migration tracks and meningitiis
- lymphocytes, plasma cells, eosinophils



Treatment of *P. tenuis* in White-tailed Deer

- ivermectin
  - kills larvae penetrating abomasum
  - ineffective after day 6 (in spinal nerves)
  - transient decrease in larval output
- albendazole (Valbazen) 25 mg/kg for 2 weeks kills adult worms (kills alpacas!)

Treatment of *P. tenuis* in aberrant hosts

- often better to slaughter sheep, meat goats
- no controlled studies in sheep or goats
- escalation of drug dosages
- ivermectin 0.2 to 1.0 mg/kg for 1-5 d (Ivomec)
- fenbendazole 10 to 50 mg/kg for 1-5 d (Safeguard)
- usually both simultaneously

Treatment of *P. tenuis* in aberrant hosts

- anti-inflammatory drugs important
- corticosteroids if not pregnant: dexamethasone 0.1 mg/kg once a day for 3 to 5 days
- flunixin (Banamine) 1 mg/kg once or twice a day for 3 days

Physical Therapy

- deep straw bedding
- roll from side to side
- avoid urine scald, maggots
- flotation tank, cart
- sling? Don't hold up by tail!
- weight bearing, range of motion, muscle massage

Prognosis

- depends on number of larvae ingested
- poor if recumbent (10 to 20% of down llamas recover)
- fair to good if can stand unaided (75 to 85% improve or recover)
- improvement over weeks to months
- some recover without therapy

Prevention of exposure

- exclude deer with double fencing
  - 6-strand electric slopes outward, inner netting, 8 ft high
  - or two fences of electric tape few feet apart
- exclude snails and slugs
  - cordon sanitaire between fences
  - gravel, limestone, or plowed regularly
  - molluskicides (contaminate water)
- Guinea fowl and chickens to eat mollusks

Prevention of exposure

- do not pasture at edge of woods
- avoid low-lying poorly drained fields
- fence off deer watering spots
- use fields deer prefer for hay, not grazing
- guardian dog may help
- take advantage of hunting season!

Prevention in sheep and goats

- no controlled studies published
- optimism prevalent in llamas and alpacas
- injectable ivermectin every 4 wk (2 wk?)
- pour-ons? (not sheep)
- fenbendazole
- guaranteed to select for resistant stomach and intestinal worms! Die of barberpole worms!