Lecture #15  Phylum Nematoda:  General Anatomy
          Order Rhabditida:  Strongyloides.

Objectives:
1) Define nematode anatomical terms with regard to function.
2) Describe the rhabditiform and filariform esophagi characteristic of adult and larval stages of species in the Order Rhabditida.
3) Draw the life cycle of Strongyloides sp.
4) Describe the pathogenesis of Strongyloides infections and important routes of infection in dogs, horses and pigs.
5) Outline control measures for Strongyloides infections in dogs, horses and pigs.

Outline:
I.  General morphology and physiology of nematodes.
   A.  Movement by sinusoidal (“S” shaped) undulation requiring elevated pressure of fluid in body cavity or pseudocoelom.
      1.  Greater than external atmospheric pressure.
      2.  Keeps worm rigid until muscles (longitudinal) contract to bend it.
         a.  muscles extend from hypodermal lateral cords.
         b.  muscles form dorsal and ventral fields.
         c.  muscles innervated from dorsal and ventral cords.
   B.  Feeding requires ingestion at anterior end and forcing nutrient into collapsed intestine.
      1.  Buccal cavity with or without teeth.
      2.  Esophagus of various configurations.
         a.  rhabditiform
         b.  strongyliform
         c.  filariform
         d.  stichosome esophagus or trichurid
   C.  Intestine
      4.  Anus or cloaca near posterior end.
   C.  Excretion at mid ventral pore near anterior end.
      1.  Excretory glands
      2.  Excretory ducts running in lateral cords
   D.  Reproduction - for almost all species of nematodes only sexual replication.
      1.  Males smaller than females.
         a.  males have prominent to vestigial copulatory bursa - often characteristic of genus.
         b.  male copulatory spicules are cuticular folds of the cloaca used to open the vulva of the female - also characteristic of genus.
         c.  testis, seminal vesicle and vas deferens are one long continuous tube ending at the ejaculatory duct in the cloaca.
      2.  Females also have a tubular reproductive tract that is usually composed of two branches.
         a.  Ovary, oviduct, uterus and vagina make up a continuous tube that opens to the outside at the vulva on the ventral surface near posterior or anterior ends or at midbody.
         b.  Eggs in the uterus are released to the outside through the vulva.
BEGIN STUDIES OF INDIVIDUAL NEMATODE PARASITES

II. General morphology for species in the Order Rhabditida.
   A. Free-living generation that has sexual replication.
      1. Adults are less than 10 mm long.
      2. Rhabditiform esophagus
   B. First stage larvae and non-parasitic stages have rhabditiform esophagi.
   C. Third stage larvae that are infective, and parasitic females found in the mucosa or the small intestine have filariform esophagi.

III. Strongyloides sp.: S. stercoralis in dogs, (primates and cats strain variable). S. papillosus in ruminants.
     S. westeri in equine species. S. ransomi in swine. A MOST UNUSUAL PARASITIC NEMATODE

A. Life Cycle: prepatent time in host 5-7 days

B. Pathological lesions - enteritis at location of parasitic adult females that are only 2-7 mm long; petechial hemorrhages in lungs where larvae migrated. Hyperinfection can occur due to autoinfection in dogs and man, usually associated with immunosuppression of the T helper 2 (TH2) response.

C. Clinical signs and diagnosis – Disease usually in very young (2 weeks –2 months) or naïve, congested lung sounds, diarrhea, larvated eggs (ruminants, horses, pigs) or rhabditiform L1(dogs, cats, man) in fresh feces; fecal culture yields filariform larvae with “notched” tail.

D. Treatment and control - young animals are the source of environment contamination, whereas lactating mothers are source of infection to newborns. Reinfection of mothers from her environment (newborns) maintains infection from one set of offspring to the next. Treat newborns to prevent environment contamination. Can also treat mares at foaling with ivermectin to reduce lactogenic infection in foals. Clean dog runs/cages twice a day to stop the homogonic cycle.

E. Zoonotic infections with Strongyloides stercoralis between dogs and humans MUST be considered when S. stercoralis is diagnosed in a pet. Strain variability makes this unpredictable and requires rigorous monitoring of infections, especially in immunocompromized individuals, human or dog. Autoinfection due to quick L1 to L3 within gut leads to hyperinfection.

WHAT COMMON THERAPEUTIC ACTION LEADS TO IMMUNOCOMPROMIZED PET?
   A. ANTHELMINTIC TREATMENT
   B. ANTIBIOTIC TREATMENT
   C. CORTICOSTEROID TREATMENT
   D. SURGERY