LECTURE #3: MUCOFLAGELLATES: TRICHOMONADS, *GIARDIA*

General Morphology of Mucoflagellates

A. Cell body
- Shape – Pear-shaped (*Giardia*), spindle-shaped (trichomonads)
- Special organelles
  - nucleus (single or double)
  - flagellum (multiple)
  - undulating membrane (present or absent)
  - axostyle = a stout median rod (present or absent)

Tritrichomonas foetus bovine
Bovine Genital Trichomoniasis

A. Morphology
- Trophozoites only
- Spindle-shaped (some-what pointed at both ends)
- 3 anterior flagella, one posterior flagellum with undulating membrane
- Axostyle present

B. Life Cycle

4. Bovine Reproductive systems (prepuce, penis, vagina, uterus, fetus)
   - Direct life cycle – venereal disease, transmitted from bulls to cows
   - No Cyst stage
   - Multiply by binary fission
5. Transmission
   - Sexually transmitted during copulation
   - Artificial insemination via contaminated semen

C. Pathogenesis (definitive mechanism has not be confirmed)
1. Cow's immune / inflammatory reaction may be destructive to fetal-maternal tissues
2. Trichomonad contact, excretions, or enzymes may be cytotoxic to fetal / maternal tissues

D. Clinical Disease
1. Complaint -- Abortions (early to mid-term), failed pregnancy, infertility suspect,
2. Pathological findings -- vaginitis, cervicitis, pyometra, endometritis, mummified fetus

E. Diagnosis
1. Bull -- Preputial wash or scrapings
2. Cow – History of abortions, cervical mucus, uterine fluid, fetal tissue
3. Lab -- Fresh wet-mounts for trophozoite, culture kits, PCR

F. Treatment – none available

G. Control
- Strict surveillance of bulls
- Cull infected bulls, replace with young bulls
- Use hygienic AI
- Vaccines (not-complete protection) [Trichguard, TrichGuard V5L]

H. Epidemiology
- Bulls -- permanently infected / infective.
- Cows -- Immune response can eliminate infection if left unbred for 3-4 months. (But immunity is only temporary against reinfection)

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***Tritrichomonas foetus* feline *(T. blagburni*)**
Large Bowel Feline Trichomoniasis

A. Morphology
- Trophozoites only
- Spindle-shaped (some-what pointed at both ends)
- 3 anterior flagella, one posterior flagellum with undulating membrane
- Axostyle present

B. Life Cycle
1. Feline large intestine
   - Direct life cycle – fecal-oral contact
   - No Cyst stage
   - Multiply by binary fission
2. Transmission
   - Ingestion of trophozoite in feces.

C. Pathogenesis (Suspect contributing factors)
1. Interactions with endogenous bacterial flora
2. Adherence to host mucus and epithelium
3. Elaborations of cytotoxins and enzymes
4. Activation of host immune / inflammatory response
5. Rarely – invasion of sub-epithelial tissue

D. Clinical Disease
1. Complaint – Intermittent, chronic diarrhea
2. Pathological findings -- large bowel diarrhea (frequent defecation, small volume of feces, tenesmus (straining), increased urgency, mucus may be present)

E. Diagnosis
1. Motile trophozoites on fresh wet-mounts
   - Don't confuse with *Giardia*
2. in vitro culture kit with PCR

F. Treatment
1. Ronidazole {*Tricho Plus*} (30 to 50 mg/kg every 12 hrs. for 14days) [be alert for neurotoxicity]
2. Unresponsive to metronidazole.

G. Control
- Strict hygiene in group housing and cat shows.

H. Epidemiology
1. Cats from High density populations, group housing
   - Catteries – Breeding and boarding
   - Pure-breed show cats

Giardia spp.
Giardiasis

A. Morphology
- Trophozoites
  - Tear-shaped (rounded anteriorly)
  - 2 bilateral nuclei
  - Ventral "adhesive disk"
  - 4 pairs of flagella (1 anterior pair, 1 posterior pair, 1 ventral pair, & 1 caudal pair)
  - Pair of median axonemes that give the appearance of an axostyle.
  - 2 crescent-shaped median bodies – dark staining organelles of undetermined function.
  - No undulating membrane
- Cyst
  - Ellipsoidal
  - Cyst "wall" containing 2 developed trophozoites
  - 4 nuclei
  - Axonemes
  - 4 median bodies

B. Life Cycle
1. Small intestine on mucosal surface.
   - Direct life cycle – fecal-oral contact
   - Multiply by binary fission
2. Transmission
   - Ingestion of cyst from feces
     - Fecal-contaminated water, food, or fomites, or self-grooming
   - (Ingested trophozoites will not survive)

C. Pathogenesis
1. Trophozoite attachment to surface of epithelial cells of small intestine
   - Damages epithelial cells, blunts intestinal villi
   - Causes dysfunction of epithelial cells
   - Maldigestion, malabsorption, diarrhea

D. Clinical Disease
1. Complaint – Persistent Diarrhea: watery to loose, fatty, strongly malodorous
2. Pathological findings -- Fatty diarrhea, malabsorption syndrome

E. Diagnosis
1. Direct fecal analysis (intermittent shedding makes this difficult)
   - Loose stool: Motile trophozoites on fresh wet-mounts
     - In cats: don't confuse with *Tritrichomonas*
   - Solid stool: Cyst stage – don't confuse with yeast
     - Fecal float centrifugation with zinc sulfate solution
2. Antigen detection kits, ELISA (SNAP Tests)

F. Treatment
1. Dog: Metronidazole [Flagyl], Fenbendazole [Panacur], Febental-pyrantel-praziquantel [Drontal plus]
2. Cat: Metronidazole [Flagyl], Fenbendazole [Panacur], Febental-pyrantel-praziquantel [Drontal plus]
3. Calves: Fenbendazole [Panacur], Albendazole [Valbazen]
4. Companion Animal Parasite Council (CAPC) recommends treating only symptomatic dogs & cats to decrease development of antiprotozoal resistance.

G. Control
1. Prevent fecal contamination
2. Sanitation and disinfection of environment with a chlorine bleach product

H. Epidemiology
1. Pets from high density situations
   - Catteries, kennels, shelters, dog parks

I. Zoonosis
1. Giardia molecular assemblages seem to be rather host specific.
   - Cat and dog strains do not cross-infect
   - Human to human infection primarily
   - Rarely is there transmission from dog to human.
   - Subtypes within assemblages may vary in host specificity
     - Assemblage A-I – Humans, dogs, cats, other animals (rare zoonosis b/w dog & human)
     - Assemblage A-II – Humans
     - Assemblage A-III & A-IV – exclusively animals (unspecified)
     - Assemblage B -- Humans & various animals
     - Assemblage C & D – Canines
     - Assemblage E – Alpacas, cattle, goats, pigs, sheep.
     - Assemblage F -- Felines

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