Several morphologically distinct *Giardia* species are recognized. However, *Giardia* isolated from humans and other mammals are morphologically identical and therefore the taxonomic status and zoonotic potential are not clear. Many investigators prefer *GIARDIA INTESTINALIS* as the official name for the species infecting humans and other mammals. However, the name *G. lamblia* has historically been the more widely used in the medical literature.

- World wide dist. in all classes of vertebrates
- In humans *Giardia* infection common
- In dogs incidence 5 to 22%

### Table 1. Genotypes and Host Ranges of *Giardia intestinalis* Isolates

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Host range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assemblage A</td>
<td>Humans, livestock, cats, dogs, beavers, guinea pigs</td>
</tr>
<tr>
<td>Assemblage B</td>
<td>Humans, chinchillas, coyotes, beavers, rats, muskrat, rabbit</td>
</tr>
<tr>
<td>Dog (C &amp; D)</td>
<td>Dogs</td>
</tr>
<tr>
<td>Cat (F)</td>
<td>Cats</td>
</tr>
<tr>
<td>Livestock (E)</td>
<td>Alpaca, cattle, goats, pigs, sheep</td>
</tr>
<tr>
<td>Rat (G)</td>
<td>Domestic rats</td>
</tr>
<tr>
<td><em>G. microti</em></td>
<td>Muskrats, voles</td>
</tr>
</tbody>
</table>

Host list not complete. Classification is undergoing continuous change.

- Trophozoite (9-21 x 5-15µm): Motile, teardrop or pear shaped, flagella, with one side shaped into a sucking disc for attachment to epithelium. Two nuclei each with large endosome. Bilaterally symmetrical and dorsoventrally flattened
- Cyst (8-12 x 7 - 10µm): Oval, contains 2 or 4 nuclei when passed, resistant and immediately infective. When ingested 2 trophozoites are released. Oval with thin, refractile wall
- Life Cycle
  - Cysts infective when passed
  - Trophozoites excyst (2 trophs - leave cyst) in upper small intestine
  - Trophozoites attach to microvilli of small intestine
  - Multiply by binary division; no sexual reproduction
  - PPP = 6 – 8 days (up to 16 days)
  - Trophozoites encyst in lumen of large intestine
  - Cysts may survive for weeks in water or moist environment
- Predisposition
  - Kennels and pet stores
• Pathology - Probably multifactorial
  - Mechanical: Massive numbers of trophozoites blanket intestinal epithelium and thus block absorption. Damage brush border of epithelial cells resulting in a deficiency of several disaccharidases especially lactase
  - Biochemical: Toxins produced by the parasite seem to interfere with enzyme activity at level of villus. Excessive mucous secretion due to irritation by parasites
  - Bacterial overgrowth
  - Villous atrophy - villi cuboidal vs. columnar

• Clinical Signs (Dog & Cats)
  - Highly variable – no clinical signs to severe diarrhea
  - Animals less than 1 year of age most susceptible
  - Most prominent sign is diarrhea, stool is soft, greasy and mucoid
  - Weight loss
  - Some animals may pass large number of cysts and still have formed feces.
  - Dry skin and poor hair coat due to deficiency of fat and soluble vitamins absorption.
  - Growth retardation in young animals secondary to Malabsorption
  - Flatulence

• Diagnosis
  - Use ZnSO4 flotation for cysts (Centrifugation)
    - Will sink after about 1 hour
    - Cysts shrivel within minutes to hours
    - Want sp. gr. 1.18
  - Most sugar and salt solutions distort cysts
  - Wet mounts (direct smear) of a fresh sample is the only way trophozoites can be observed – diagnostic sensitivity poor
  - One slide unstained, another stained with Lugol's iodine to reveal internal structure
  - Excretion of *Giardia* sp. cysts is intermittent, so check more than one stool
  - Canine fecal ELISA (*Giardia* cyst antigen) from IDEXX is highly reliable indicator of positive infection in puppies and kittens. But a single negative test does not necessarily mean animal does not have Giardia.

• May be one of the most commonly over-diagnosed, under-diagnosed and misdiagnosed parasitic diseases.

❖ Treatment
  • *Dogs:*
    → **Fenbendazole; 50mg/kg PO SID for 3 days**
    → **Drontal Plus (Praziquantel/Pyrantel pamoate/Febantel); 5.4 to 7mg/kg SID for 3 to 5 days**
    - Metronidazole (Flagyl®) - 25 mg/kg P.O. BID x 5 days
      - Side effects (neurological toxicity; ataxia, seizures, weakness etc.)
      - Resistance may be common
      - Not approved for any use in animals in U.S.
    → **Bath animals on day of last treatment. (Removal of cysts from hair and skin)**
    → **Treat all in contact dogs and cats**
    → **FBZ or Drontal Plus may be used in combination with Metronidazole.**
    → Control also involves prevention of fecal contamination of feed, water (bowls) and soiled bedding. These materials need to thoroughly cleaned (dishwasher...
or washing machine for cloths) ad pickup and dispose of feces outdoors. In kennels or catteries floors should be kept as clean and DRY as possible.

- GiardiaVax (Fort Dodge)
  - Said to prevent adherence of trophozoite and reduce cyst shedding.
  - Results have been mixed

- **Cats:**
  - Fenbendazole – same dose as for dogs - first choice
    - Metronidazole - 10-25 mg/kg s.i.d. x 5 days
    - Metronidazole - 8-10 mg/kg b.i.d. x 10 days

- **Fecal examination either by zinc sulfate centrifugation or Giardia snap test should be done 14 days following treatment.**
  - To ensure dog or cat is truly negative it is recommended to conduct 3 fecals over a 7 to 14 days period. Need 3 consecutive negative fecals.

- **Epidemiology and Public Health**
  - Cats and dogs have been infected with some isolates from humans
  - No documented evidence of humans infected with canine or feline isolates
  - There appears to be 2 main genotypes of Giardia (A & B) infecting humans.
    - These two genotypes have been found in dogs, cats, cattle, pigs, prairie dogs, bobcat, groundhog, & sheep.
    - While all Giardia sp. may not be capable of infecting humans it must be considered a potential zoonosis.

- **References:**