Dipylidium caninum in a 4-month old male

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ABSTRACT

Dipylidium caninum, known as the double-pored dog tapeworm, is a parasite that commonly infects dogs and cats worldwide. Humans may be an accidental host if the infective stage, the cysticercoid larva, is ingested.[1,2] Although rare, it is more commonly seen in infants and children.[2-5] This case study involves an infant misdiagnosed with pinworm infection twice before a laboratory evaluation was able to confirm *Dipylidium caninum*. Accurate diagnosis is important, as treatment for pinworm infection will not eliminate *Dipylidium caninum*.

INDEX TERMS: Dipylidiasis, Cestoda, cestode infection, anticestodal agents, Praziquantel, Niclosamide, tapeworm, tapeworm infection

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CASE PRESENTATION

A 4 month old male was brought to the emergency room at 11:00 pm with symptoms of severe irritability, apparent abdominal pain, and agitation. Patient history revealed the patient exhibited similar symptoms in the past which were always highlighted at night. On two separate occasions, after seeing small, white, rice-like particles in the patient's diaper, the patient was taken to his pediatrician. Examination of the patient's stool for ova and parasites was negative. On both occasions, the infant was diagnosed with pinworm infection and prescribed Mebendazole. The drug seemed to subdue the symptoms, but only for a couple of weeks.

Additional history revealed that the family owned a dog. The dog had been treated for worms two months before the infant became symptomatic. A complete blood count (CBC) was ordered on the patient and the results were within normal range. However, the differential revealed a slight eosinophilia. Shortly after being admitted, a fresh stool specimen was collected from the patient and examined for ova and parasites. The stool examination revealed small, white, seed-like structures which were identified as proglottids, measuring 7mm by 3mm and tapered at both ends. Microscopic examination revealed egg packets that were approximately 145 by 120µm, containing 8-10 eggs. These findings were consistent with a diagnosis of *Dipylidium caninum*. The patient was treated with a single dose of Praziquantel. He displayed no symptoms in follow-up visits and no further ova or parasites were noted.

DISCUSSION

Dipylidium caninum belongs to the class Cestoda and the order Cyclophyllidea.[6] It naturally infects both dogs and cats, yet human infection is far less likely. The true incidence of human infection is unknown, as it is often misdiagnosed or not reported because few clinical symptoms are associated with the infection. Although most patients are asymptomatic, possible symptoms include abdominal pain, a decrease in appetite, weight loss, diarrhea, and perianal pruritus.[5,7]

Proglottids (or segments) have been described as resembling cucumber seeds, pumpkin seeds, or watermelon seeds when moist, and rice grains when dried (Figure 1).[1,4,5,7] They are longer than they are wide (approximately 12 by 3mm),[8] contain two sets of reproductive organs, are tapered at both ends, and possess a genital pore on both sides (Figure 2).[1-3,9] This differentiates *Dipylidium caninum* from the other cyclophyllid cestodes and contributes to its other name,

"double pored" tapeworm.[9] The proglottids are motile and move by lengthwise expansion and contraction and may actively migrate from the anus.[7] For this reason, they are often mistaken for *Enterobius vermicularis* (pinworm). Although similar in length, female pinworms are 0.3 to 0.5mm wide, tapered at one end, and move in a serpentine fashion.[7] The proglottids of *Dipylidium caninum* have also been mistaken as fly larvae, maggots, or vegetable matter.[7,10] Accurate diagnosis can be made by pressing the gravid proglottids between two glass slides and examining by light microscopy. *Dipylidium caninum* proglottids should exhibit bilateral genital pores and egg packets.[7,10] The egg packets contain an average of eight to fifteen eggs, and are considered diagnostic (Figure 3).[5,8,10] The eggs are round to oval in shape, measure an average of 25-40µm in diameter, and contain an oncosphere with 6 hooklets.[4,7,9]

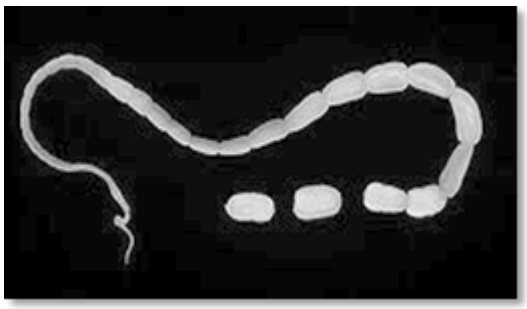

Figure 1. *Dipylidium caninum* proglottids: http://www.dpd.cdc.gov/dpdx/HTML/ImageLibrary/A-F/Dipylidium/body_Dipylidium_il6.htm

When proglottids are passed in the feces, they will eventually disintegrate and release eggs into the environment, where possible ingestion by the larval stage of the flea can occur. Development of the cysticercoid larva occurs within the flea, which becomes the infective stage. When the flea is ingested by the definitive host (cat, dog, or human), the adult worm develops within 3-4 weeks.[4,8] The adult worms reside in the small intestines of the host, attached by their armed scolex, and produce proglottids. The proglottids mature, become gravid, detach from the tapeworm, and migrate to the anal opening or are passed in the stool.[8] This continues the life cycle of the parasite, as eggs are released into the environment. In humans, the infection is called dipylidiasis. It has been suggested that dogs may transfer the infection to humans by licking them after nipping at fleas.[1,6,7]

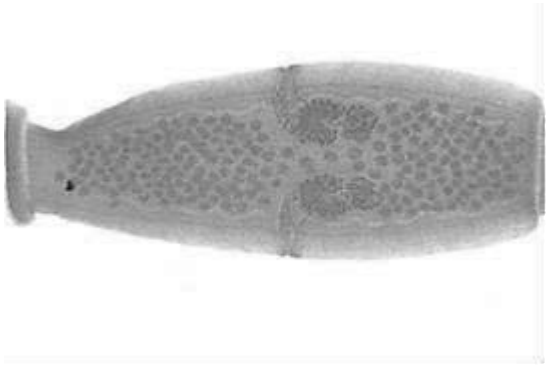

Figure 2. *Dipylidium caninum* "double pore" proglottid: http://www.dpd.cdc.gov/dpdx/HTML/ImageLibrary/A-F/Dipylidium/body_Dipylidium_il3.htm#row2

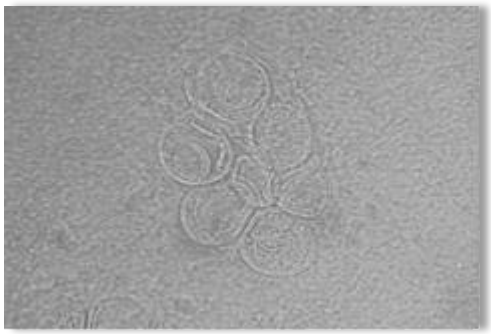

Figure 3. *Dipylidium caninum* egg packet, 400x, photo by Michele Zitzmann

Adult worms are flat and range from 10-70 cm in length.[1,4,9] The body consists of the head (scolex), the neck, and a segmented section called the strobilus. The scolex has four suckers and a conical, retractile rostellum "armed" with 1-8 rows of hooks, depending on the age of the parasite.[1,4,9] Each segment contains two proglottids and each proglottid has both male and female reproductive organs, which classifies the organism as hermaphroditic.

The recommended treatment for *Dipylidium caninum* is a single dose of Praziquantel (10 mg/kg of body weight).[2,4,5,7,10] This medication works by increasing the cell membrane permeability in susceptible worms.[11] As a result, there is a loss of intracellular calcium, massive spasms, and paralysis of their musculature.[11] The phagocytes are then able to attach to the worms and cause their death.[11] Niclosamide is also effective against dipylidiasis, although it may not be readily available in the United States.[7] Follow-up fecal examinations are generally performed after periods of time to ensure drug efficacy.

Mebendazole is the current drug of choice for pinworm infection. Although it may temporarily alleviate the symptoms of *Dipylidium caninum*, it will not eliminate the tapeworm.[7] Misdiagnosis is quite common and it is difficult to find data concerning misdiagnosis studies involving pinworm and Dipylidium caninum infections. Laboratory testing for pinworm infection ranges from $26-$50 and treatment with Mebendazole ranges from $50-$100.[12,13] These costs are in addition to doctor/hospital visit fees. Often, a young patient is misdiagnosed two to three times before a correct diagnosis of Dipylidium caninum is achieved. This case should raise awareness that Dipylidium caninum can mimic pinworm infection, and appropriate laboratory diagnosis should be pursued to avoid unnecessary healthcare costs.

Some recommendations for prevention of *Dipylidium caninum* infection are:[4,6]

- Avoid allowing children to play with animals that have fleas.
- Monitor and control flea infestation in pets. Periodic administration of products available to prevent fleas will reduce the risk of infection.
- Avoid exposure to dog or cat feces (especially in public recreational areas & sandboxes).
- Avoid allowing pets to kiss or lick children.

CONCLUSION

Human infections with *Dipylidium caninum* are often underdiagnosed and can easily be confused with pinworm infections. Since pinworms are a more common pediatric problem, it is often diagnosed based on clinical symptoms. Laboratory testing should be pursued in order to make an accurate diagnosis. The presence of characteristic egg packets and/or proglottids confirms the diagnosis of *Dipylidium caninum*. For treatment purposes, it is important to make a differential diagnosis between pinworm and *Dipylidium caninum.* Treatments other than Praziquantel or Niclosamide may not be effective in completely eliminating *Dipylidium caninum*. It is important to prevent infections by controlling interaction between children and pets, maintaining an environment free of fleas, and keeping pets healthy.

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ERRATA: In the Spring 2011 Volume of Clinical Laboratory Science on page 85 in the Introduction it states "There are two forms of the illness...*Trypanosoma brucei rhodesiense* (west african)...*Trypanosoma brucei gambiense* (east african)". These should instead state east and west respectively.