



Document heading doi: 10.12980/APJTB.4.2014APJTB-2014-0034 © 2014 by the Asian Pacific Journal of Tropical Biomedicine. All rights reserved.

Dipylidium caninum infection in an infant: a rare case report and literature review

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ARTICLE INFO

Article history:

Received 16 Jan 2014

Received in revised form 12 Mar 2014

Accepted 26 May 2014

Available online 14 Jun 2014

Keywords:

Dipylidiasis

Dipylidium caninum

Cestode infection

Praziquantel

ABSTRACT

Dipylidiasis is a zoonotic parasitic infection caused by *Dipylidium caninum*, a common intestinal tapeworm of dogs and cats. Humans may be accidental hosts when the cysticercoid larva is ingested, mainly infants and young children due to their playing habits and their proximity with dogs and cats. It is considered a rare infection in the world. In the past 20 years only 16 cases have been reported in Europe, China, Japan, India, Sudan, Latin America and the United States. We describe a case of dipylidiasis observed in a 9-month-old girl who likely acquired the infection through games with her pet dog. In a stool sample, we observed 6 proglottids of tapeworm. Each proglottid segment was about 8–9 mm long and 2–3 mm thick. A wet mount revealed proglottids with two genital pores, one on each side, and eggs were clustered in packets containing 8–12 and surrounded by a thin membrane. The patient was successfully treated with a single dose of praziquantel. The pet dog was seen by the veterinary and also showed parasitism by *Dipylidium*. To the best of our knowledge, this is the only human case reported in Spain according to the literature reviewed.

1. Introduction

Dipylidiasis is a zoonotic parasitic infestation caused by *Dipylidium caninum* (*D. caninum*), also known as the cucumber tapeworm or the double-pored dog tapeworm, a common intestinal cestode parasite of dogs and cats that requires the participation of an arthropod as intermediate host in its life cycle. Humans become infected by accidental ingestion of dog flea (*Ctenocephalides canis*) or cat flea (*Ctenocephalides felis*) containing the *D. caninum* cysticercoid larva[1]. The dog louse *Thichodectes canis* and human flea *Pulex irritans* also act as intermediate hosts[2,3]. The natural host passes eggs in stool and then they are ingested by the larval fleas and mature inside the infected adult fleas.

Dipylidiasis has a worldwide distribution. The risk of infection in humans is low, mainly affecting infants and children due to their playing habits and proximity with dogs and cats[4]. Since the early twentieth century, less than 100 cases have been reported in the medical literature. A recent review of the past 20 years, yielded only 16 cases described (14 children from 11 months to 9 years old and

2 adults of 40 and 41 years old) in Europe, China, Japan, India, Sudan, Latin America and the United States[2,3,5–17]. The infection usually presents with non-specific systemic manifestations and non pathological changes. Diagnosis is made by identification of rectal expelled proglottids or by microscopic identification of egg packets in stool. Eggs grouped in packets are typical of dipylidiasis and stool specimens on several different days may be necessary for the detection of these packets[3,4]. The present study describes a case of dipylidiasis observed in a 9-month-old girl from Cádiz (Spain) who could have acquired infection through games with her pet dog.

2. Case report

The mother of a 9-month-old girl from Cádiz, Spain, reports that she found in the morning on three different occasions over a month period, small, ivory white, rice-like structures as worms of approximately 1 cm in length in her daughter's stool, and obtained a stool sample containing six specimens of these structures preserved in 10% neutral buffered formalin. The family had no history of travel outside the regional area but owned a dog without flea collar and poorly controlled by a veterinary with which the girl frequently played. The infant was otherwise asymptomatic, and had height and weight percentiles according to her age,

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and no history of nutritional deficiency. The six specimens were macroscopically studied. The structures resembled proglottids of a tapeworm when observed under a hand lens. Each proglottid segment was about 8–9 mm long and 2–3 mm thick (Figure 1).



Figure 1. *D. caninum* proglottids.

The wet mount revealed proglottids with two genital pores, one on each side (Figure 2), and eggs clustered in packets containing 8–12 eggs surrounded by a thin membrane (Figure 3). The history of contact with a pet and the morphological data of the proglottid segments suggested the diagnosis of asymptomatic intestinal dipylidiasis due to *D. caninum*. The pet dog was seen by the veterinary and also showed parasitism by *Dipylidium*. The girl was treated with praziquantel (10 mg/kg bodyweight) in a single dose. Stool samples examination after one and two months threw no evidence of proglottids or eggs of the parasite.

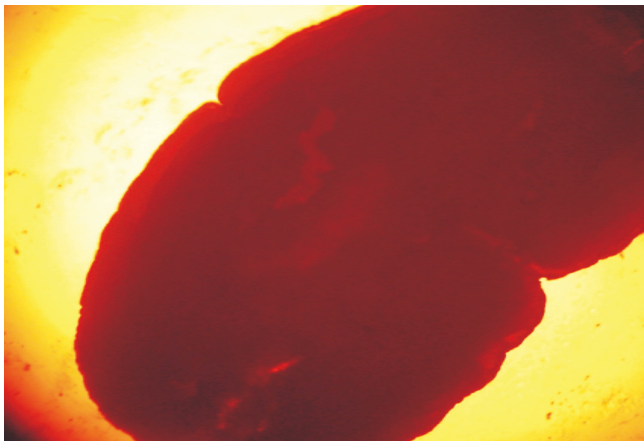


Figure 2. *D. caninum* double pore proglottid.

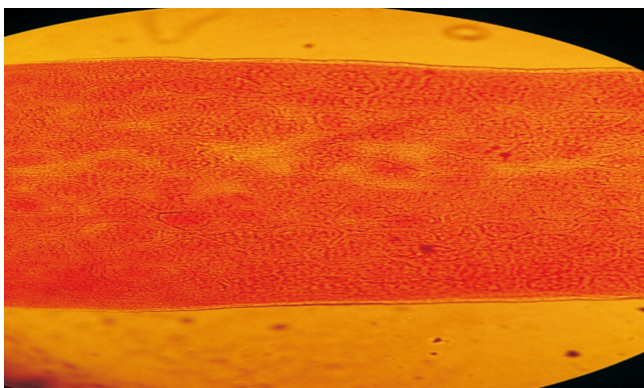


Figure 3. *D. caninum* egg packets.

3. Discussion

D. caninum belongs to the class Cestoda and the order Cyclophyllidea. Dipylidiasis infection occurs throughout the world and has a natural infection cycle in members of the dog and the cat families (1%–60%), depending on the geographic area^[1], and occasionally in certain wild animals such as fox, jaguar, wildcat, hyena, dingo, *etc.* which act as reservoirs^[18–21]. It is the most common intestinal tapeworm in dogs, constituting an important veterinary problem, especially in urban areas where stray dogs abound. The frequency of canine dipylidiasis is high but varies by country. In Mexico the prevalence is up to 60%, in Chile it ranges from 2% to 54%, 45% in Kenya, 20% in Jordan, from 1% and 15% in Brazil, around 13% in Spain and Uruguay, 9% in the UK and only 1% in Germany. Parasitism is more intense in animals over one year old, which can house up to 400 parasites. In cats parasitism rates are slightly lower and parasite load is also smaller. The dipylidiasis, like other cestodiasis in dogs and cats, usually does not cause pathology and rarely produces clinical manifestations in the dog or cat.

Once a dog or cat bites the adult infected fleas, the larval forms of the tapeworm stick to its teeth and contaminate its saliva. The larvae grow in the small intestine and within 2–3 weeks they mature into adult tapeworms measuring 17–70 cm in length and 2–3 mm in thickness. The body of the adult worm is composed of a scolex with four suckers, a neck and 60 to 175 proglottids. Each proglottid has two lateral genital pores. The gravid proglottids are located distally and each one contains egg packets with 3–30 eggs, mostly 8–15, of 25–40 μm in diameter. Gravid proglottids look like pumpkin cucumber seeds or rice grains and can migrate out of the anus or pass in the stool of the host, intact or disintegrated (releasing eggs or egg packets) and henceforth the life cycle of the worm continues. The adult worm has a life span of approximately one year^[1,2].

This tapeworm in humans is uncommon and the cestode does not multiply because it is not its definitive host. There have only been two such reports in India and in both cases the patients were less than five years old^[22,23]. Just 14 other reports of dipylidiasis have been communicated worldwide in the last 20 years, mostly in children^[5–7,9–16,17]. In the same period, we have only found two cases of parasitism in adults^[8]. Infection in humans occurs when they ingest the infected fleas containing the infective stages of the worm, accidentally or through food contaminated with fleas or with saliva of pet animals. Young children and toddlers are at greater risk of infection.

D. caninum completes its life cycle in human small intestine as in its natural hosts. Most of infections are asymptomatic, although mild diarrhea, abdominal colic, anorexia, restlessness, agitation, constipation, rectal itching and pain due to the emerging proglottids can occur. Sometimes urticaria and eosinophilia are present in the blood count and rarely, allergic manifestations such as pruritus and skin rash^[4,11,17]. Therefore, it is exceptionally diagnosed and reported, and may be misdiagnosed as *Enterobius vermicularis* (pinworm)^[2,11,15]. Children can remove proglottids spontaneously or with bowel movements and may find them on the banks of the anus or diapers. Symptoms subside with the expulsion of parasites.

Diagnosis of *D. caninum* in children relies on the accurate history given by the parents or caretakers of the child. Diagnosis is done by the parasitological study of the stool, observing the characteristic rice–grain–like proglottids and the pathognomonic egg packets in the gravid uterus in histologic sections of the parasite[2,7]. Accurate diagnosis is important, as treatment for pinworm infection will not eliminate *D. caninum*. Currently there are molecular techniques that perform DNA sequencing to identify the parasite[8].

For treating dipylidiasis various drugs have been used: acranil, paromomycin, metoquine, niclosamide and praziquantel. Niclosamide is little used as it requires a prior bowel preparation with fluid regime the previous afternoon and overnight. Praziquantel, a pirazinisochinolinic derivative, is a broad spectrum antihelminthic that acts increasing the permeability of the cell membrane of the parasite and causing loss of intracellular calcium, contractions and muscle paralysis. This action is followed by the adhesion of phagocytes to parasites and death thereof. The parasite disintegrates in the gut, hence no remains are found in the stool. The recommended dose is 400–600 mg in adults and 10–20 mg/kg of body weight in children, administered orally in a single dose, which kills the tapeworms within 24 h. In heavy or persistent infections, a second oral dose can be administered. The drug is absorbed from the gastrointestinal tract, well tolerated, with few adverse effects. Teratogenicity has not been demonstrated, but its use in pregnant or nursing women is not recommended because it is excreted in breast milk[2,4,7,11]. The best way to elude human infection is treating infected animals to kill the fleas, deworming them, and preventing children from playing with stray animals.

The present case shows that although dipylidiasis is rare in humans, the true incidence of human infection is unknown, as it is often misdiagnosed or not reported due to the existence of few clinical symptoms which are associated with other infections. Our patient had history of contact with a dog, and the probable source of the infection could be the accidental swallowing of the infected fleas while playing with her pet dog. To the best of our knowledge, this is the only human case reported in Spain according to the literature reviewed.

Conflict of interest statement

We declare that we have no conflict of interest.

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