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Dipylidiasis in children, a generally misdiagnosed cestodiasis. First case reported in Venezuela

Dipylidiasis en niños, una cestodiasis generalmente mal diagnosticada. Primer caso reportado en Venezuela

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Abstract

The first case report of human dipylidiasis in Venezuela is presented, including the diagnosis and treatment of a two-year-old child's infection. The diagnosis was parasitologically confirmed, the child was treated with praziquantel and the animal reservoir and its fleas were identified.

Keywords: *Dipylidium caninum*, Cestode Infections, parasite, zoonoses, children, Venezuela

Resumen

Se presenta el primer caso de dipylidiasis humana en Venezuela, incluyendo el diagnóstico y el tratamiento de la infección de un niño de dos años. El diagnóstico fue confirmado parasitológicamente, se trató al niño con praziquantel y fueron identificados el reservorio animal y sus pulgas.

Palabras clave: *Dipylidium caninum*, Infecciones por Cestodos, parásito, zoonosis, niños, Venezuela.

Introduction

Dipylidiasis, a parasitosis of the intestine of canids and felids produced by *Dipylidium caninum*, a cyclophyllidean dog tapeworm, is a zoonotic infection rarely reported in humans, who may act as an accidental definitive host. This parasitosis is considered a minor zoonosis in humans, with about 350 cases reported worldwide so far [1,2]. The majority of cases has been reported in children [2-6] of nursing age [2,7,8], usually infected by the accidental ingestion of fleas or lice of their pets [7,9-11].

The objective of this report is to alert health professionals, in general, and paediatricians, in particular, on the zoonotic transmission of *D. caninum*, putting emphasis on the clinical and morphological identification of proglottids as well as egg packets or capsules, the main parasitic structures released by patients.

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Patient Information

Main problems and symptoms of the patient: the patient is a nursing male baby, 11 month and 22 days of age, who was taken to a paediatrician by his mother, as he had had gastrointestinal disorders for two months, and could not be diagnosed in other laboratories. He was attended in our laboratory when he expelled parasite structures of white colour from the anus. The child and his family (his parents, two siblings six and eight years-old and a dog) reside in the Caucagüita neighbourhood of Ejido (Mérida state, Venezuela) in a one-family home, with drinking water and sewers. The other members of the family were not coproparasitologically examined because all of whom were asymptomatic and none expelled parasite structures. The social status of the family according the Graffar, modified by Mendez-Castellanos [12], socioeconomic classification is V, indicating extreme poverty.

Clinical findings: the physical examination revealed an abnormal physical condition with loss of appetite, abdominal pain and weight and height below the percentile of his age group. At biochemical level, only a light hypoalbuminemia and a decrease of electrolytes such as sodium and calcium were detected, with the remaining parameters (total proteins, globulins, urea, creatinine, AST, ALT and potassium) being normal. Haematological and immunological analyses showed a normal white cell count (7,800xmm^3), with a discrete eosinophilia (5%), light anaemia (haemoglobin 11.3 g/dL; haematocrit 36.0%), a normal count of platelets (275,000 K/µL) and significant increase of total IgE (179.4 IU/mL, reference value for 0-3 years olds until 46 IU/mL).

Timeline: the development of the events of the patient (timeline) is graphically presented in Figure 1.

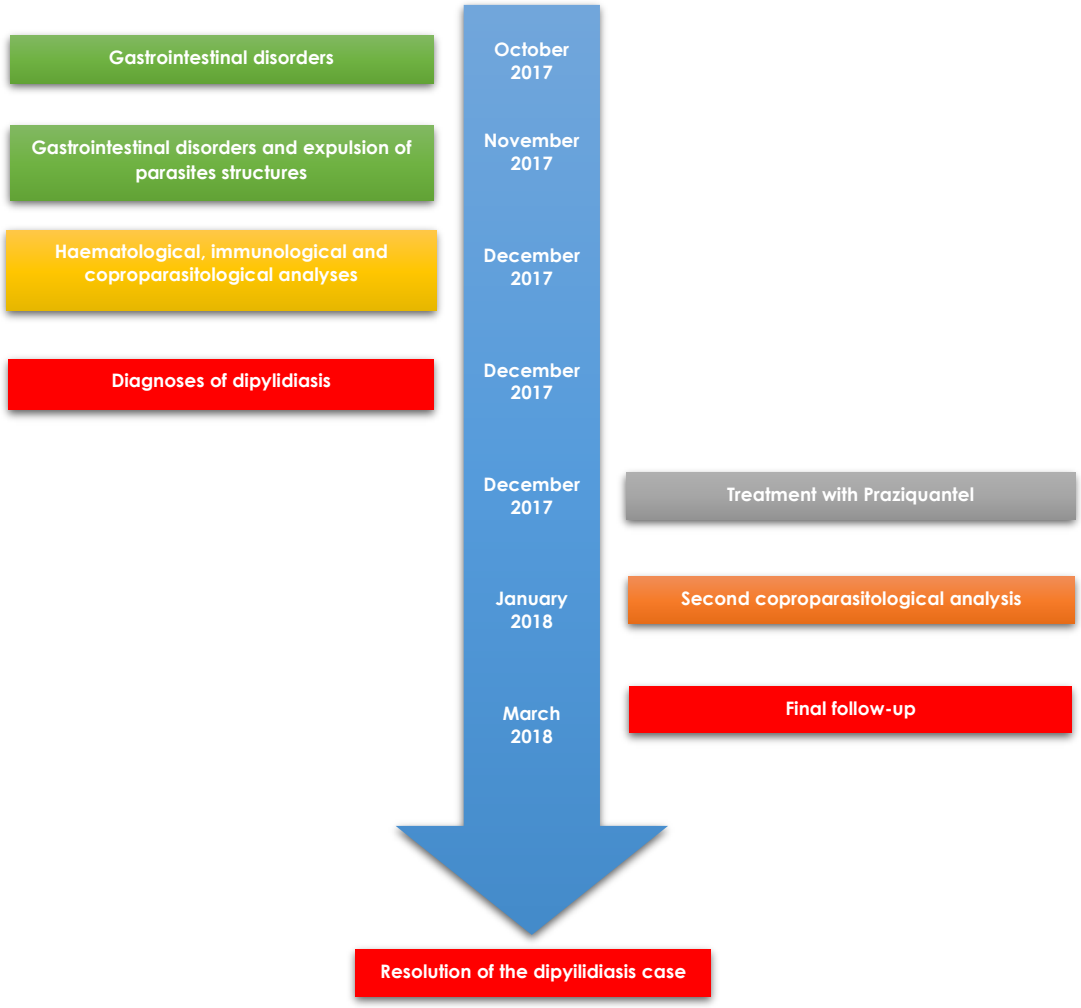

Figure 1. Timeline of *Dipylidium caninum* case report.

Diagnostic methods: stool samples, obtained from all family members, were examined using a wet mount slide and formol-ether concentration [13]. Coproparasitological analyses revealed, only in the nursing male baby, diarrhoea with liquid stools, presence of gravid proglottids (2-3/6-20 mm), containing ≥ 50 egg packets (150-300 µm) identified as belonging to the species *D. caninum* (Figure 2a-d), as well as between 0-2 leukocytes per field. No other parasites were found in the analysis.

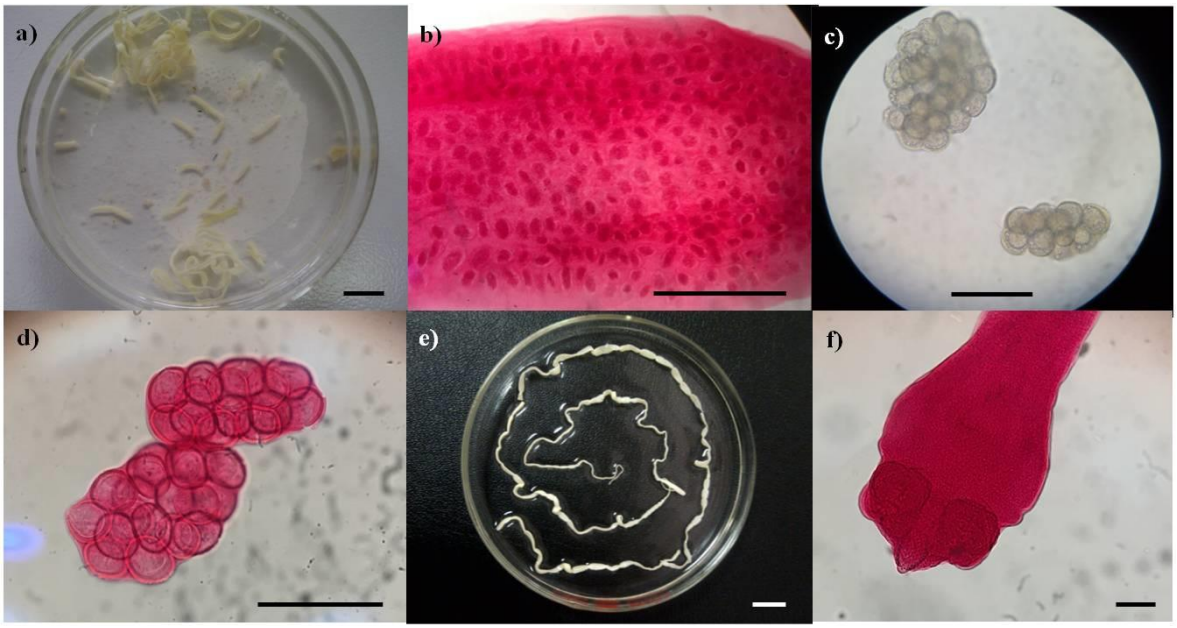

Figure 2. a) Gravid proglottids expelled by the child; b) detail of stained gravid proglottids showing egg packets; c) egg packets extracted from the proglottids; d) stained egg packets; e) strobila expelled by the child; f) detail of the scolex showing the four suckers, the rostellum and its hooks. Scale bar = 1 cm (a,e); 1 mm (b); 100 µm (c,d,f).

Therapeutic interventions: praziquantel at a single dose of 10 mg/kg of body weight was administered. The capsules of the drug were suspended in simple syrup until a suspension of 10 mg/5 mL was obtained.

Follow-up and result of the intervention: after the treatment, the child's faeces collected from the diaper were sifted, observing the expulsion of the parasite strobila of 40.3 cm/3 mm on the second day post-treatment, including the scolex (Figure 2e-f). Microscopic observation of the gravid proglottids, after staining with alcoholic chlorhydric carmine, corroborated the diagnosis by means of the observation of two genital pores, symmetrically situated at the lateral margins, and numerous egg capsules or packets, containing between 10-30 typical eggs, in the uterus. In addition, the scolex showed a rostelum with 4 circles of hooks of 12-15 µm shaped like a rose thorn (Figure 2f).

Once the strobila was released with the scolex of the tapeworm, the mother did not observe further proglottids in the patient's diaper during the following three months. The patient's physical condition was normal; he did not present any gastrointestinal symptoms. The ensuing serial coproparasitological analysis was negative; no more tapeworm proglottids, egg capsules, eggs and/or other parasites were found. Moreover, results of the haematological, the biochemical and the immunological analyses were within the reference range; total IgE decreased to 41.2 IU/mL. The mother was satisfied with the child's recovery, signed the informed consent so that the results can be disclosed and the case can be made public.

The dog, three years old, living in the patient's house did not present any gastrointestinal disorders or other symptoms, with the exception of the expulsion of *D. caninum* proglottids together with the faeces and the collection of 20 adult fleas, morphologically identified, according mainly to the presence of genal and protoracic spines, their head shape and the length of the first genal spine, as belonging to the species *Ctenocephalides canis*, one of the potential intermediate hosts of the tapeworm. The dog was treated against fleas (ivermectin, 400 mcg/kg every 14 days for two months) and tapeworms (praziquantel, a single dose of 10 mg/kg of body weight). These findings allowed completing all the links of the epidemiological chain of the infection of the child.

Discussion

Most human dipylidiasis cases have been reported in small children [1,2]. This parasitism often remains asymptomatic unnoticed by the parents, as proglottids are not observed in the faeces or parents may confuse the proglottids with food debris [14]. Proglottids of this tapeworm can easily be confused with other parasites,

such as *Enterobius vermicularis* [15,16], because its symptomalogy is nonspecific and doctors have little information about this zoonosis; or can also be confused with fly larvae or maggots due to their size [17], colour and mobility at the perianal area or on the faeces (they can move actively on the child's stool), and also due to their ability to migrate from the anus independent of defecation.

Misdiagnoses of this kind lead to erroneous treatment drugs against nematodes (benzimidazoles, pyrantel pamoate or piperazine) do not act against cestodes. Other professionals may confuse *D. caninum* proglottids with those of *Taenia solium* or *T. saginata*, as the latter are more prevalent and better known being common human cestodes. Although the treatment against intestinal tapeworms is the same, it is recommendable to diagnose the parasite at specific level, trying to shed light on its epidemiology and the different transmission route. The infection of humans by *D. caninum* is caused through the accidental ingestion of fleas or lice infected with mature cysticercoids, while the transmission of *Taenia* spp. takes place after the ingestion of undercooked or incorrectly frozen meat infected with cysticerci.

Coprological analyses do not include the routine diagnosis of dipylidiasis. As the health professionals usually are unfamiliar with this tapeworm, it is recommendable for them to know the main morphological differential characteristics of *D. caninum*: flattened gravid proglottids with two genital pores, of a whitish colour, having the shape and size of a melon or cucumber seed. After being naturally dried out, proglottids may have the appearance of rice grains; egg capsules or packets present on the faeces after the gravid proglottids have been torn [1-7].

Dipylidiasis is usually asymptomatic; however, after the prepatent period of 20 days, nonspecific symptoms may ensue likely to include some minor intestinal disorders: diarrhoea, mild abdominal pain (usually epigastric, colic-like pain), constipation, anal pain and pruritus, distention, meteorism, diminishing appetite, weight loss, allergic reactions and discrete eosinophilia, as well as heart palpitations, irritability, anxiety, agitation and insomnia [17,18]. This pathogenicity seems to be related in part to the absorption of various metabolic residues of the tapeworm [19]. All symptoms and clinical manifestations disappear after the expulsion of the parasite.

The patient's clinical improvement as a consequence of the elimination of the parasite should be emphasized. After treatment, the child was asymptomatic from a gastrointestinal viewpoint. Laboratory analyses turned out to be normal within the reference range, even the total IgE had diminished from 179.4 to 41.2 IU/mL. These findings demonstrate that the symptomatology was caused by the presence of the tapeworm.

The presence of fleas and lice in parasitized animals causes pruritus which provokes the scratching with the insects being crushed by the teeth releasing the cysticercoids in the animal's mouth. When a person has close physical contact with the animal (e.g. kissing) or it licks some objects or toys, the cysticercoids can be transmitted to human hands and/or the mouth [20,21]. Another transmission route described is the contamination of foodstuffs and beverages carrying infected insects with cysticercoids [22]. Moreover, given that the tapeworm does not multiply in the definitive host, the helminth burden in humans is generally low, with few reports of multiple infections [23]. Knowing about the *D. caninum* life cycle and about the different routes of transmission in children will favour early diagnosis and effective treatment.

Although *D. caninum* has been reported as a human parasite on the five continents [7-9,24-27], and also has been reported in canids in Venezuela [28,29], as far as we know, this is the first human-case report from that country, even after having carried out an exhaustive literature review concerning this matter.

The most recommended preventive measures against this parasitosis include avoiding the direct contact of children with dogs and cats, and regular veterinary check-ups of pets, mainly to keep domestic animals free from ectoparasites (fleas and lice) and helminths. In the case of stray dogs and cats, control programs of ecto and endoparasites have to be also implemented. Moreover, excrements of cats and dogs in recreational areas have to be removed. In spite of the low frequency of human parasitation by *D. caninum* and the generally nonspecific or absent pathology, the health care personnel, especially pediatricians and laboratory workers, have to be familiar with this tapeworm and its diagnostic structures, both macroscopic (gravid proglottids) as well as microscopic (egg capsules or packets) of this zoonosis. Children with dogs or cats as pets may become infected more frequently than suspected, since in addition to being a cosmopolitan infection, there is a growing trend towards cohabitation with pets worldwide. In the United States alone in 2012, it was estimated that there were 69,926,000 dogs and 74,059,000 cats as pets that could transmit this little-known parasitic disease [30].

Although there might have been other human cases of *D. caninum* in Venezuela, they might not have been diagnosed or reported. Therefore, the present case, which could not be diagnosed before in other laboratories, lays bare that physicians and laboratory professionals lack experience in the diagnosis of *D. caninum*, resulting in the erroneous identification of the parasite as well as in the patient's treatment. Hence, health care professionals should be made familiar with the morphological characteristics of this tapeworm, which are indispensable for parasitological diagnosis. At the same time, physicians should be informed about the drug, the correct dose for the treatment, the source of infection and the intermediate host of the tapeworm.

Conflict of interests

The authors have no conflicts of interest to disclose.

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Authors' Contribution:

GRLC: Performed the hematological, biochemical and immunological analysis of the patient. Collected data and helminthological material, identified the species, drafted and revised the manuscript. **BGMA:** Colored the helminthological material, identified the species and revised the manuscript. **GGF;** Prepared and helminthological material, identified the species and revised the manuscript. **DMJJ:** Pediatrician who performed the clinical analysis of the patient and prescribed the treatment dose. **NGO:** Supplied the treatment. Complemented the literature review, assisted in the writing and revision of the manuscript. **PMJG:** Collected fleas and avoided environmental pollution. Bibliographic review, manuscript revision writing. **FMV:** Verified the helminthological material, identified fleas, drafted and critically reviewed the manuscript.