

Case Report

First documented case of feline cystic echinococcosis in the Aysén region, Chile

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ABSTRACT

This case report describes the first documented case of cystic echinococcosis (CE) in a domestic cat in the western side of the southern Andes, known as northern Patagonia in Chile, highlighting the epidemiological relevance of *Echinococcus granulosus* across non-traditional hosts. CE is notably prevalent in the Aysén region, posing a significant public health challenge. The patient, a seven-year-old domestic cat, was diagnosed with multiple abdominal cysts via ultrasound following a year of observed abdominal distension by the owners. The cysts were surgically removed, and the diagnosis confirmed through microscopy, PCR and histopathology. This occurrence adds to a limited global record, with only six other cases previously reported in Uruguay, Russia, Italy, Turkey, and Argentina. The report emphasizes the importance of ongoing public health education and strategic control measures within the region.

1. Introduction

Cystic echinococcosis (CE), primarily caused by *Echinococcus granulosus sensu stricto*, poses significant health risks and economic burdens in human and livestock populations (Eckert and Deplazes, 2004). Typically, the domestic dog act as a definitive host while a range of animals including all livestock species can serve as intermediate host developing the larval stage of the parasite mostly in liver and lungs. The parasite rarely infects cats but case reports of CE in this species highlight the parasite's capability to infect a diverse array of hosts including sheep, cattle and goats. Notable cases from Russia and Italy, involved significant findings through ultrasonography and molecular diagnostics, identifying multiple abdominal cysts and intraperitoneal vesicles respectively (Bonelli et al., 2018; Konyaev et al., 2012). Further reports from Turkey and Uruguay documented multiple hydatid cysts in a cat's kidneys and a co-infection with feline immunodeficiency virus, respectively (Armua-Fernandez et al., 2014; Erdem et al., 2021). Finally, in the Patagonian region of Argentina, two cats presented with abdominal

distension suggested that CE should be included as a rare item in the list of prediagnosics in endemic areas (Avila et al., 2021).

In Chile, particularly in regions like Aysén which are highly endemic for CE, the environmental contamination with eggs of *E. granulosus* could significantly contribute to the spread of the disease among all hosts. The incidence of CE in Aysén was reported to be 18.6 cases per 100,000 inhabitants in 2021 and is managed through interventions such as regular deworming of dogs, public health education, and pilot livestock vaccination (Cortés and Valle, 2010; MINSAL, 2021). However, persistent socioeconomic and cultural factors may compromise the effectiveness of these control measures.

2. Case presentation

A seven-year-old neutered female cat was presented at a veterinary clinic in Aysén with abdominal enlargement that had persisted for one year. The cat, living in a peri-urban area in Coyhaique, was referred for ultrasound and bloodwork. The cat weighed 4.9 kg, had a body

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condition score of 3/5, a heart rate of 204 beats/min, and a respiratory rate of 36 breath/min. Lymph nodes were non-reactive. Bloodwork revealed lymphocytosis, monocytosis, eosinophilia, and thrombocytopenia, with normal blood chemistry values. Tests for feline immunodeficiency virus and feline leukemia virus were negative.

At the ultrasonographic examination of the patient a heterogeneous parenchymal mass was identified caudal to the left kidney, measuring approximately 4.8 × 3.6 cm. There was no detectable involvement of adjacent organs. Additionally, the ultrasound revealed multiple anechoic structures devoid of sediment, which were displacing the abdominal organs. These structures could not be definitively associated with any specific organ (Fig. 1A). An exploratory laparotomy was performed to investigate the characteristics of these structures and their relationship with other abdominal organs (Fig. 1B). During the surgery, multiple cystic structures, ranging from 3 mm to 40 mm in diameter (Fig. 1C), were identified. These structures were independent, non-adherent, avascular, and freely movable within the cavity. Most of these cysts were removed, except for the smaller ones retained within the omental folds, totaling 980 g in weight (Fig. 1D). The abdominal cavity was subsequently closed, and the patient recovered from the procedure without complications. Seven days post-operation, during a follow-up visit, the patient displayed proper wound healing and exhibited no clinical signs of distress. As a precautionary measure, praziquantel at a dose of 10 mg/kg for 20 days was prescribed to address any potential parasitic involvement suggested by the presence and nature of the cysts. A significant number of cystic structures were identified, characterized by a multi-layered wall, autolytic structures and accumulations of small-sized cellular elements were observed within many of the cysts, hooks were also observed at microscopic examination of cystic fluid (not shown). Histology showed the structure of a hydatid cyst with a germinal and laminated layer (Fig. 1E). A prominent inflammatory infiltrate predominantly composed of histiocytes was noted in the interstitial spaces. This finding suggests a complex interaction between the cystic structures and the host's immune response, indicative of a potentially chronic inflammatory condition. Cysts were used for DNA extraction and PCR using commonly used primers for genotyping (Bowles et al., 1992). Sequencing of PCR products confirmed the infection with *E. granulosus sensu stricto*. The patient lived for 2 years

after the laparotomy and presented again abdominal growth; however, it was not possible to perform a necropsy to investigate the cause of the recurrent problem. (See Table 1.)

Following the diagnosis of CE in a domestic cat, a targeted environmental and epidemiological investigation was conducted. This included the deworming of all dogs sharing environment with the cat, encompassing pets from both the cat's owner and neighboring households. PCR of five environmental canine fecal sample amplifying a short section of the *cox1* gene (Bowles et al., 1992), resulted negative for

Table 1
Bloodwork Results for a Domestic Cat with Cystic Echinococcosis. This table summarizes the bloodwork findings of a domestic cat diagnosed with cystic echinococcosis, highlighting key deviations from normal reference ranges.

Test	Value	Reference values	Test	Value	Reference values
RBC	9.12	5.3–10.6 M/uL	Glucose	132	74–159 mg/dL
Hematocrit	30	29.7–44.5 %	Creatinine	1.0	0.8–2.4 mg/dL
Hemoglobin	12	9–15 g/dL	BUN	17	16–36 mg/dL
WBC	20.67 ↑	5.5–19.5 k/uL	Phosphorus	4	3.1–7.5 mg/dL
Neutrophils	5.9	2.5–12.5 k/uL	Calcium	9.8	7.8–11.3 mg/dL
Lymphocytes	9.93 ↑	0.4–6.8 k/uL	Total Protein	7.7	5.7–8.9 g/dL
Monocytes	3.28 ↑	0.15–1.7 k/uL	Albumin	2.4	2.2–4.0 g/dL
Eosinophils	1.39 ↑	0.1–0.79 k/uL	Globulin	5.3	2.8–5.1 g/dL
Basophils	0.17 ↑	0–0.1 k/uL	ALT	57	12–130 U/L
Platelets	109 ↓	175–600 k/uL	AP	95	14–111 U/L
			GGT	5	0–4 U/L
			Bilirubin	0.3	0.0–0.9 mg/dL
			Cholesterol	153	65–225 mg/dL

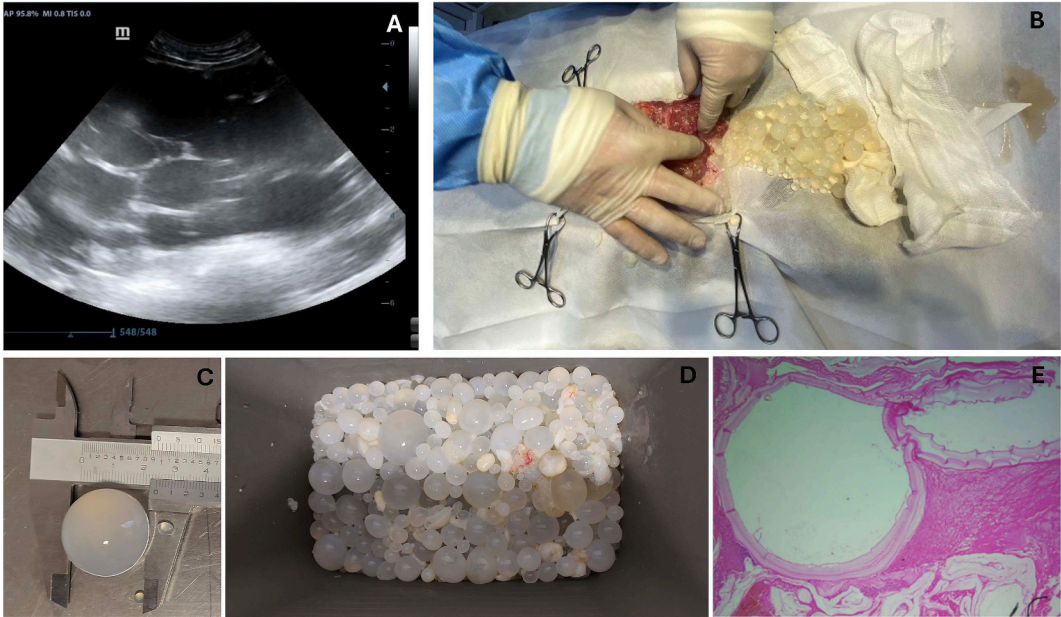


Fig. 1. Gross and histopathological findings in a feline case of cystic echinococcosis: A) Abdominal ultrasound examination of the cat showing several cysts-like structures. B) Exploratory laparotomy showing the extraction of several cysts-like structures from the abdomen of the feline patient. C) Measurement of one of the largest cysts found around 4 cm. D) All cysts extracted together weighing 980 g. E) Histological section of one of the cysts showing the presence of a germinal and laminated layer typical from *E. granulosus*.

E. granulosus. Educational initiatives were implemented to enhance community awareness about the risks of hydatid disease and the importance of preventive measures. These included the distribution of audiovisual educational materials designed to promote understanding of the disease's transmission cycle and preventive hygiene practices. Antibody response against *E. granulosus* was measured in two family members rendering negative results. The investigation also highlighted frequent interactions between domestic and farm animals, and common unsupervised dog sightings, pointing to potential disease transmission pathways. These findings underscored the need for enhanced surveillance and rigorous control measures in rural settings, critical for preventing future outbreaks of CE in the region.

3. Discussion and conclusions

The identification CE in a domestic cat in the Aysén region of Chile represents the first documented case in this country. CE is typically rare in cats, suggesting that unique biological or environmental factors may facilitate these infections. The epidemiological situation in Aysén, where CE is endemic, reflects a scenario where domestic cats, like humans, might become accidental hosts through environmental exposure to parasite eggs. This occurrence aligns with similar cases reported globally, such as in Italy, Turkey, Russia, and Argentina. Notably, most cases involve young to middle-aged cats with outdoor access, increasing their risk of encountering infectious materials. The cat reported here likely encountered the parasite while outdoors. This commonality points to the necessity for vigilant surveillance and preventive strategies, particularly in rural or endemic regions. In this case no viral infection that could hinder the immune system was present as in the case detected by Armua-Fernandez (Armua-Fernandez et al., 2014).

The confirmation of *E. granulosus* s.s. as responsible for the infection aligns with the previous reports showing this species is the most common in Chile (Alvarez Rojas et al., 2017). This is relevant since *E. granulosus* s.s. is the most common species within the *E. granulosus sensu lato* complex able to infect humans worldwide (Alvarez Rojas et al., 2014). The documentation of CE in a cat in Aysén not only contributes to our understanding of the disease's host diversity but also reinforces the need for ongoing public health education, improved diagnostic methods, and robust control measures to mitigate this zoonotic threat.

In response to this case, continuous monitoring of the affected family and their property was implemented. This monitoring aimed to assess ongoing risks and to ensure the effectiveness of the preventive measures put in place. Regular health checks were conducted on all dogs in the household, and periodic environmental assessments were carried out to ensure the reduction of parasitic load in the surroundings.

The use of multiple diagnostic techniques (ultrasonography, histopathology, and PCR) strengthens the reliability of the findings, and the long-term follow-up provides valuable insights into disease progression. Additionally, the study contributes to public health awareness, prompting deworming measures and educational initiatives within the affected community. However, this case report does not allow for generalizations about feline CE across Chile, as it represents an isolated occurrence. The lack of necropsy confirmation at the time of recurrence limits conclusions about disease progression. Additionally, no direct environmental source of infection was identified, making it unclear how the cat acquired the parasite. In conclusion, this study enhances understanding of *E. granulosus* infections in non-traditional hosts in endemic regions.

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Animal ethics

The study did not require ethics approval.

CRediT authorship contribution statement

Sandra Tarazona: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Claudia Alvarez:** Methodology, Investigation, Conceptualization. **Nicolás Pérez Gómez:** Investigation, Formal analysis, Data curation, Conceptualization. **Miguel Oyarzo:** Methodology, Investigation, Formal analysis. **Galaxia Cortés-Hinojosa:** Validation, Methodology, Investigation. **Cristian Bonacic:** Writing – original draft, Methodology, Formal analysis. **Cristian A. Alvarez Rojas:** Writing – review & editing, Writing – original draft, Validation, Supervision, Data curation.

Declaration of competing interest

On behalf of the authors, I declare we have no conflict of interests.

Data availability

This manuscript does not report data generation or analysis.

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