

CASE REPORT

Infectious Diseases

Equine fasciolosis due to *Fasciola hepatica* in the Community of Madrid (Spain): First report of a rare parasitic infection in horses

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Abstract

We reported for the first time a confirmed case of equine fasciolosis in the Community of Madrid (Spain). Here, we described the clinical presentation, diagnostic approach and treatment of the affected horse, as well as the seroprevalence of *Fasciola hepatica* in the equestrian centre where it was detected. A 12-year-old mare presented in autumn with a 3-month history of decreased performance, lethargy and progressive weight loss, despite a normal appetite. Haematology and biochemical profile revealed normocytic and normochromic anaemia, leukopenia, and the sorbitol dehydrogenase value was at the upper reference limit. *F. hepatica* eggs were found in coprology, along with a high load of gastrointestinal nematodes. Flukicide treatment based on the administration of two doses of closantel (10 mg/kg, orally), given 10 weeks apart, was effective against *F. hepatica* infection in this horse, with a noticeable clinical improvement observed 1 month post-treatment. No recurrence was observed in the 12-month follow-up.

KEYWORDS

closantel, fasciolosis, hepatic disease, liver fluke, strongyles

BACKGROUND

The trematode *Fasciola hepatica* (liver fluke) is a well-known parasite of herbivores, mainly affecting the health and productivity of ruminants. Horses grazing the same pastures as sheep and cattle may also become infected and develop clinical signs,¹ reaching a seroprevalence close to 8% in some areas,² where the environmental conditions are favourable for the intermediate host (*Galba truncatula*). Nevertheless, horses tend to be more resistant to liver fluke infection than ruminants,³ and thus, there are few case reports of fasciolosis in this species.²

Fasciola infections in horses, though relatively rare, have been documented in several regions under varied circumstances. In South Africa, Alves et al. (1988)⁴ reported a single natural case of *F. hepatica* infection and experimental failures to establish infections with either *F. hepatica* or *F. gigantica*, suggesting low susceptibility in horses. In Europe, cases have been reported in Belgium⁵ and Scotland,⁶ the latter involving severe eosinophilic cholangiohepatitis in a pony. In Ireland, Quigley et al. (2017)⁷ identified a low but notable prevalence of fasciolosis through serological testing. In South America, Muñoz et al. (2020)⁸ reported the copro-prevalence of *F. hepatica* in horses in Chile's Concepción Province. Notably, Alshammari et al. (2023)⁹ found a higher

prevalence in northern Egypt, identifying key risk factors associated with infection. These findings highlight that while equine fasciolosis is generally uncommon, it can occur across diverse geographic regions, particularly where environmental conditions favour the parasite's life cycle.

Here, we describe a natural infection with *F. hepatica* in a horse from the Community of Madrid (Spain). Although the presence of this trematode and its intermediate host in this region is restricted to focal areas next to streams, ponds or irrigation channels,⁴⁻¹² fasciolosis could be considered as a differential diagnosis in horses presenting with weight loss, poor performance, lethargy, anaemia, diarrhoea, jaundice and raised liver enzymes.¹ To the authors' knowledge, this is the first confirmed case of equine fasciolosis in the Community of Madrid, describing the clinical presentation, diagnostic approach and treatment of the affected horse, as well as the seroprevalence of *F. hepatica* in the equestrian centre where it was detected.

CASE PRESENTATION

A 12-year-old Hispano-Árabe mare presented in autumn with a 3-month history of decreased performance, lethargy and progressive weight loss, despite a normal appetite. Based on

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the owner's description, equine influenza and tetanus vaccinations were up to date, and the mare had been dewormed every 6 months using an oral combination of ivermectin plus praziquantel.

The mare was kept on a meadow of 3 ha together with 54 other horses and had no history of travel outside of the Community of Madrid in the 4 years before the onset. All other horses on the property were in good body condition and remained healthy. During the spring months, the mare had also been sharing the pasture with sheep. Water was provided by an automatic pump, and they also had access to a pond (Figure 1). In addition to pasture forage, the mare received 500 g of concentrate and 1 kg of hay three times a day. As a school horse, it performed low- to moderate-intensity exercise 4 days a week.

INVESTIGATIONS

At presentation, the mare had a body condition score (BCS)¹³ of 2/9, with several bone structures prominent and visible (Figure 2a). No abnormalities were reported on physical examination apart from pale mucous membranes and bilateral immature cataracts, which did not impair its vision (Figure 3).¹⁴ Temperature, pulse and respiratory rates were within normal ranges. Dental examination was unremarkable.

A complete blood count and serum biochemistry profile were performed (Table 1). Haematology revealed normocytic and normochromic anaemia and leukopenia. The biochemical profile was within normal range, although the sorbitol dehydrogenase value was at the upper reference limit. A nested-PCR for piroplasmiasis was also performed,¹⁵ ruling out *Theileria equi* or *Babesia caballi* infections.

Faecal samples were collected and examined by a combined-sedimentation-flotation method,¹⁶ yielding a strongyle faecal egg count of 2100 eggs per gram faeces

LEARNING POINTS/TAKE-HOME MESSAGES

- Horses tend to be more resistant to liver fluke infection than ruminants, although those grazing the same pastures as sheep and cattle may also become infected and develop clinical signs.
- Equine fasciolosis should be considered as a differential diagnosis in horses presenting with weight loss, poor performance, lethargy, anaemia, diarrhoea, jaundice and/or raised liver enzymes.
- *Fasciola hepatica* infection could be underdiagnosed in non-endemic areas due to its non-specific manifestations, which also tend to be compatible with other common gastrointestinal parasitoses and liver disease.
- Coprology was key for identifying the active infection of *F. hepatica*, despite its low sensitivity for detecting the eggs of this parasite in horses.
- Flukicide treatment based on the administration of two doses of closantel (10 mg/kg, orally), given 10 weeks apart, was effective against *F. hepatica* infection in this horse.

(EPG). Then, larval culture was carried out, resulting in the identification of *Strongylus edentatus*, *Strongylus equinus* and Cyathostominae larvae. During the coprological exam, *F. hepatica* eggs were also identified (30 EPG) (Figure 4). Therefore, an ELISA with the *F. hepatica* FhrAPS recombinant surface antigen was performed on serum,^{3,17} confirming the exposure to liver fluke.

Given these results, serum and faecal samples from all the other horses ($n = 54$) were taken for coprology and serology tests. In these animals, strongyle faecal egg count ranged between 80 and 1100 EPG. Although no *F. hepatica* eggs were



FIGURE 1 The pond is located in the area where the horses grazed.



FIGURE 2 The mare suffering from clinical infection of *Fasciola hepatica* at Day 1 of diagnosis (a), 1 month post-treatment (b), and 4 months post-treatment (c). A marked and progressive clinical improvement was observed during the first 4 months post-treatment.

observed in the coprological test of these horses, seven of them tested positive for *F. hepatica* on the ELISA, suggesting they had also been exposed to the parasite.

The epidemiology of *Fasciola* infection depends on the presence of its intermediate host. Snails of the family Lymnaeidae (Gastropoda: Basommatophora), especially *G. truncatula*, are the main intermediate host of *F. hepatica* in Europe and Spain.¹ Therefore, *G. truncatula* was searched for in the nearest bodies of water where the horses were grazing (Figure 1), and several snails were collected by hand and sieve of the limnetic and benthic zones, respectively, for subsequent morphological identification. Although the shells of collected snails were conical and without operculum, they did not present the typical characteristics of *G. truncatula*, as the opening of the shell was on the left and without umbilicus¹ (Figure 5). However, the presence of the host could not be

completely ruled out, as the sensitivity of these methods is relatively low.¹

DIFFERENTIAL DIAGNOSIS

Differential diagnoses based on the clinical signs must include dental diseases, gastrointestinal parasitoses, chronic piroplasmiasis, failures in management (e.g. inadequate nutritional support, environmental stressors), hepatic injury, hyperplasia of the pituitary pars intermedia and, possibly, neoplasia.

Based on our findings, gastrointestinal parasitoses, characterised by a high parasitic load of *S. edentatus*, *S. equinus* and cyathostomins, likely associated with the fact that ivermectin is administered every 6 months with praziquantel, without

TABLE 1 Results of blood haematology and serum biochemistry at presentation (Day 0) and during the follow-up period (Day 30, Day 90).

| | Day 0 | Day 30 | Day 90 | Reference range |
|---|-------|--------|--------|-----------------|
| Complete blood count | | | | |
| Haematocrit (%) | 28.9 | 36.5 | 51.2 | 31–58.5 |
| Red blood cells ($\times 10^{12}/L$) | 5.93 | 7.52 | 7.90 | 7.2–9.6 |
| Haemoglobin (g/dL) | 9.9 | 12.5 | 17.8 | 11.7–18.8 |
| Mean corpuscular volume (fL) | 49 | 49 | 65 | 40.0–50.0 |
| Mean corpuscular haemoglobin (pg) | 17 | 16 | 23 | 15.2–19.0 |
| Mean corpuscular haemoglobin concentration (g/dL) | 34 | 34 | 35 | 33.5–38.7 |
| Platelets ($\times 10^9/L$) | 127 | 102 | 251 | 100–350 |
| White blood cells ($\times 10^9/L$) | 6.8 | 7.1 | 8.3 | 7.2–11.8 |
| Lymphocytes ($\times 10^9/L$) | 2.92 | 3.42 | 5.06 | 1.7–7.6 |
| Neutrophils ($\times 10^9/L$) | 3.33 | 3.35 | 2.91 | 2–7.2 |
| Monocytes ($\times 10^9/L$) | 0.07 | 0.14 | 0.08 | 0–1.0 |
| Eosinophils ($\times 10^9/L$) | 0.48 | 0.21 | 0.33 | 0–0.4 |
| Serum biochemistry | | | | |
| Aspartate aminotransferase (UI/L) | 195 | 278 | 261 | 102–350 |
| Sorbitol dehydrogenase (UI/L) | 11 | 10 | 10 | 0.3–11 |
| Gamma-glutamyl transferase (UI/L) | 20 | 16 | 21 | 12–40 |
| Total bilirubin (mg/dL) | 1.1 | 1.3 | 1.4 | 0.1–1.4 |
| Total protein (g/dL) | 7 | 7.4 | 6.5 | 5.3–7.9 |
| Urea (mg/dL) | 45 | 31 | 27 | 20–50 |
| Creatinine (mg/dL) | 1.6 | 1.9 | 1.6 | 0.85–1.9 |
| Creatine phosphokinase (UI/L) | 291 | 486 | 520 | 110–548 |



FIGURE 3 Bilateral immature cataracts identified during the physical exam and considered as an incidental finding not related to the parasite infection. The cataracts were likely congenital and do not impair the horse's vision.

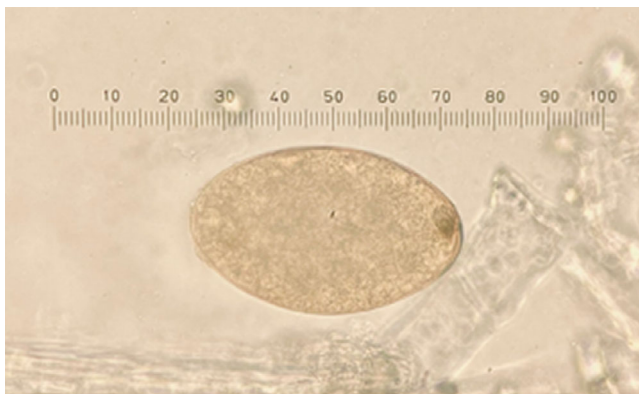


FIGURE 4 A *Fasciola hepatica* egg detected during the coprological test of the sick mare.

considering the rotation of active ingredients, together with the presence of *F. hepatica*, was considered the most likely.

TREATMENT

The mare was treated with closantel (10 mg/kg, orally [PO]; two doses were given 10 weeks apart). Although closantel is not licensed for equine fasciolosis, its use as treatment for horses with liver fluke has been reported.^{2,18} In addition, 8 mL of a multivitamin supplement (vitamin B1 0.10 mg/mL; vitamin B2 0.04 mg/mL; vitamin B6 0.10 mg/mL; vitamin B12 0.05 µg/mL; nicotinamide 1.50 mg/mL; dexpanthenol 0.05 mg/mL) was administered subcutaneously (SC) every other day for 2 weeks. All the other horses were treated with moxidectin (400 µg/kg, PO), but no follow-up was performed due to the owner's economic limitations.

OUTCOME AND FOLLOW-UP

The mare was doing well at reassessment 2 weeks following initiation of the treatment. Noticeable improvement of the BCS (3/9) was observed within 1 month (Figure 2b). Additional haematology, serum biochemistry and coprological



FIGURE 5 One sample of the snails found in the pond close to where the horses grazed. Its operculum, the aperture located on the left side, as well as the size and morphology of the shell, confirmed it was not of the *Galba* species.

analyses were performed on Days 30 and 90 post-treatment. Strongyle faecal egg count significantly decreased (<200 EPG) on Day 30. At this point, haematocrit, red blood cell and haemoglobin values had normalised, while white blood cells remained below the reference range until Day 90 (Table 1). The mare was serologically negative to *F. hepatica* and fully recovered following 4 months (Figure 2c), and no recurrence was observed in a 12-month follow-up.

DISCUSSION

Fasciolosis is an uncommonly reported parasitosis in horses. Although its seroprevalence could range from 0% to about 8%, or even higher in some endemic areas, very few cases of *F. hepatica* infection have been clinically described in horses so far.^{2,19,20} Here, eight of 55 (14.6%) horses from a non-endemic area of Spain (Community of Madrid) tested positive on the ELISA for *F. hepatica* antigen. Only one of them, a 12-year-old Hispano-Árabe mare, excreted eggs and displayed clinical signs of infection.

Clinical signs and clinicopathology changes of equine fasciolosis are non-specific and consistent with those observed in other gastrointestinal parasitoses and liver disease, such as weight loss, poor performance, lethargy, anaemia, diarrhoea, jaundice and/or raised liver enzymes.^{1,2} As liver disease is a common and frequently idiopathic syndrome in horses,^{21,22} *F. hepatica* could be responsible for some of these cases,² especially in geographical regions where the parasite and its host are rarely found and, consequently, fasciolosis is not routinely included in the differential diagnosis of these patients.

In this particular case, *F. hepatica* infection was diagnosed along with a high parasitic load of *S. edentatus*, *S. equinus* and cyathostomins, all of which could cause lethargy, decreased performance and progressive weight loss, as well as anaemia and leukopenia at high loads.¹ Thus, the individual contribution of each kind of parasite to the mare's whole clinical picture could not be figured out. Nevertheless, the shedding of eggs, together with a positive result for

F. hepatica on the ELISA, strongly suggested an active fluke infection in this patient. Even though ELISA results indicated that other horses sharing pasture with this mare could have also been exposed to the parasite, none of them developed a clinical infection. Then, we hypothesise that some individual factors of this mare, especially the leukopenia, may have somehow increased its susceptibility to fluke infection and contributed to the development of mature stages of *F. hepatica*. Whether the leukopenia was the cause or the consequence of the high gastrointestinal nematode loads remains unclear, though. Regarding the bilateral immature cataracts (Figure 3), they were considered an incidental finding, as a sporadic familial occurrence of cataracts has been previously described in Arabian horses^{14,23} and, then, they were likely congenital and not related to the parasite infection.

Although there is no licensed flukicide treatment for horses, use of triclabendazole (15 mg/kg)²⁴ or closantel (10 mg/kg),¹⁸ both PO, is reported in the literature and regularly used by veterinary surgeons.² The former kills all parasitic stages of *F. hepatica*, while the latter only kills juvenile flukes from 6 to 8 weeks of age and adults.²⁵ Alternatively, oxclozanide (10 mg/kg, PO) or nitroxylin (7 mg/kg, SC) could also be used,^{2,20} but they have no activity against any immature forms of *F. hepatica*.²⁵ In Spain, triclabendazole is only available as a pour-on formulation for cattle, but there were some oral formulations of closantel for sheep that could be used off-label in this case, following the recommended dose and route of administration (10 mg/kg, PO).^{2,18} Given the limited flukicide activity of closantel and the life cycle of *F. hepatica*, which may need about 10 weeks to reach maturity in the mammal liver (extrapolated from ruminant studies),¹ the treatment was repeated 10 weeks apart to get the maximum efficacy spectrum and completely remove *F. hepatica* infection. The mare responded well to this treatment, with a noticeable clinical improvement observed within 1 month (Figure 2b). Four months after the first dose, it was fully recovered (Figure 2c), and no recurrence was observed in the 12-month follow-up. Adverse effects were not observed.

AUTHOR CONTRIBUTIONS

Carolina R. Sanz and **Arancha Meana** conceived and designed the project. **Carolina R. Sanz** performed the clinical exams and acquired the biological samples. **Carolina R. Sanz** and **Juan David Carbonell** collected the snails and performed the morphological identification. **Carolina R. Sanz** analysed the clinical samples and interpreted the data. **Guadalupe Miró** and **Arancha Meana** supervised the laboratory analyses. **Carolina R. Sanz** wrote the original draft. All authors reviewed and approved the final version of the manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

ETHICS STATEMENT

The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered to. This study did not require official or institutional ethical approval as it was not experimental. The horses in this study were examined with the written consent of their owners.

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