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SHORT COMMUNICATION

Dicrocoelium dendriticum: an emerging spurious infection in a geographic area with a high level of immigration

Dicrocoelium dendriticum, commonly known as the Lancet liver fluke, is endemic in the Old World since prehistoric times (Le Bailly and Bouchet, 2010).

D. dendriticum is distributed worldwide. The adults of *D. dendriticum* are 5 to 15 mm in length and 1.5–2.5 mm in width. They live in the bile ducts of the definitive host (ruminants such as cow and sheep). The eggs excreted in faeces are mainly ingested by land snails of the *Helicella, Theba and Zebrina* genera. The definitive host gets infected by eating vegetation with ants mainly of the genus *Formica* infected with metacercariae. The young flukes move to the liver and start laying eggs after 10–12 weeks (Bartolomé *et al.*, 1987; Karadag *et al.*, 2005).

Human infection is very rare and occurs through accidental ingestion of infected ants by eating unwashed raw vegetables or drinking contaminated water (Acha and Szyfres, 2005). Although the subclinical form predominates (Saucas *et al.*, 1989), it can produce chronic cholangitis and dilatation, swelling or adenomatous proliferation in the bile ducts. Spurious infection is more frequently observed after ingesting raw liver of infected animals with eggs or adult worms (Saucas *et al.*, 1989; Díaz *et al.*, 2007).

The diagnosis of a true infection is carried out through close examination of faeces after a diet free from raw herbivore animal food (Wolfe, 2007). The lack of observation of eggs after a strict diet would indicate that it is a spurious infection. The standard treatment is with Praziquantel or Triclobendazol, but in case of spurious infection, treatment is not recommended, except the elimination of raw animal viscera from diet.

In Spain there is a high prevalence of *D. dendriticum* in animals, increasing in mountainous areas or flat land with limestone (Otranto and Traversa, 2002; Duchácet and Lamka, 2003), with rates of 23 to 100% (Wolfe, 2007; Magi *et al.*, 2009). Controlling this parasite in livestock is particularly difficult, due to the diversity of the definitive hosts that can be affected, the unspecificity of intermediate hosts and the complex biological life cycle (Otranto and Traversa, 2002).

The province of Almería (Southern Spain) has highly increased the number of foreigners over recent years, from 17.4% in 2008 to 20.8% in 2009 [data from the national Institute for Statistics (INE). They come mainly from countries with low income (Morocco, Romania, Latin America, Senegal, Russia and Mali).

A monitoring study was carried out including all patients from our health area with presence of *D. dendriticum* eggs in faeces, from November 2005 (first case reported) to 31 December 2008 (Cabeza *et al.*, 2007).

The parasitological study of stools was carried out after the concentration of faeces (modified Ritchie method) (Ritchie, 1948) and subsequent visualization with an optical microscope.

To determine whether it was a true or spurious infection, parasitological study was repeated after subjecting the patient to a meat and viscera-free diet during the 3 days prior to collecting the stool sample.

The epidemiological study was carried out through an epidemiological survey of the patients at the Tropical Medicine Unit of our hospital or a revision of the Clinical

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history and subsequent storage in an encrypted database using SPSS 15 for statistical analysis.

During the study, we analyzed 12 246 samples finding eggs of *D. dendriticum* in the stools of 75 foreign patients; mainly from Sub-Saharan Africa, a smaller proportion from Maghreb and just one patient, from Romania. The average age of the population was 29 years (range 9 to 55).

The isolations in years were: 1 (1.3%) patient in 2005, 11 (14.7%) patients in 2006, 11 (14.7%) patients in 2007 and 52 (69.3%) patients in 2008, with the following confidence interval and prevalence values per year (Table 1). A total of 98.7% of the patients lived in Western Almería, 89.3% (67 cases) of them belonged to the municipality of Roquetas (77 423 inhabitants in 2008-Data provided by the INE). Of these 75 cases, only 39 patients have been included in this study, 3 women and 36 men. The average age was 28.6 (9–47) years, with an average time of residence in Spain of 27 months (range 2 to 72).

The epidemiological study of the studied population is reflected in Table 2.

Due to the peculiarities of the life cycle of *D. dendriticum*, infection in humans is very rare, as it takes place through the ingestion of ants containing the metacercaria (infective form). In humans, it is common to find the parasite in the form of a 'parasite in transit', after eating raw or undercooked liver of herbivores containing adult specimens of this species (Bada, 1988; Saucas *et al.*, 1989; Schweiger and Kuhn, 2008). Our study includes a large number of cases, all of them spurious infections as there were no visualizations of *D. dendriticum* eggs after following a diet free from animal meat or viscera during the 3 days prior to collecting the samples.

TABLE 1. Prevalence of *D. dendriticum* per years

Year	Prevalence
2005	0.34 (0.28–0.40)
2006	0.62 (0.54 –0.70)
2007	0.32 (0.26–0.37)
2008	0.78 (0.69–0.87)
Total prevalence	**0.61 (0.53–0.69)**

Of all the cases studied, only two patients stated that they had eaten raw liver, the rest ate it cooked or did not eat it at all, therefore it seems that the infestation or false parasitation could be due to consumption of the viscera annexes of these animals.

Although among the symptoms of a true parasitation are constipation, cholangitis, biliary obstruction, chronic diarrhoea, abdominal pain and hepatomegaly (Magi *et al.*, 2009), only 60% of the patients presented abdominal pain at the time of the visit and 18% of the patients had sporadic cases of diarrhoea, probably due to other concomitant parasitations (*Strongyloides stercoralis*, *Trichuris trichiura*, etc.). In addition, the elimination from the diet of raw or poorly cooked liver of these animals and the subsequent parasitological study confirmed these results as no eggs of the parasite were observed after the diet (Zabala Martín-Gil *et al.*, 2007), confirming that they were spurious infections.

There are many studies carried out in Spain and in other countries (Díaz *et al.*, 2007) showing that it is more frequent in areas with a higher altitude and lower temperatures where land molluscs predominate. These climate and orographic conditions are in Western Almería (Duchácet and Lamka, 2003; Manga *et al.*, 1995; Biggeri *et al.*, 2007).

The most favourable climate conditions for the infection of the definitive host is autumn as there are abundant pastures, humidity and a large amount of molluscs discharging cercariae (Manga *et al.*, 1995; Manga-González *et al.*, 2001). Spring contamination depends on the survival through winter of the molluscs infected in autumn, being lower in cold winter years. In conclusion, the greatest risk of dicroceliosis in animals (lambs, calves, etc.) in dry and arid areas is in late winter–spring and autumn (Manga *et al.*, 1995).

The factor that has the most influence in the number of isolated cases of *D. dendriticum*, is the type of population attended at our hospital: foreign patients whose culture,

TABLE 2. Epidemiological study

Geographical origin	Situation in Spain	Cultural level	Symptoms	Eating habits	Meat origin
38 (97.4%) South-Africa	30 (76.9%) Undocumented	19 (48.7%) Illiterate or only can read and write	23 (58.9%) abdominal pain	34 (87.2%) ate lamb (10 liver and only 2 ate it raw)	19 (48.7%) no veterinary control
14 Senegal					
7 Mauritania	9 (23.1%) legalized	11 (28.2%) Primary School	7 (18%) occasional diarrhoea	4 (10.2%) unknown data	16 (41%) authorized shops
6 Guinea-Bissau			7 (18%) no symptoms	1 (2.6%) ate veal	
6 Mali		5 (12.8%) High School studies	2 (5.1%) unknown data		4 (10.3%) unknown data
3 Gambia					
1 Nigeria		4 (10.3%) unknown data			
1 (2.6%) Morocco					

eating habits and religious beliefs, influence the kind of food they consume, like eating lamb instead of pork which is forbidden by their religion or the belief that the consumption of viscera (liver) strengthens them. It is important to notice that this parasite has not been detected in any native patient.

Another aspect worth noticing is the eating habits regarding meat among this population, as a high proportion (almost half of the respondents) sacrifice the animal at their own homes without any sort of veterinary control, or purchase meat in premises specialized in products of Maghrebian origin. All patients were advised to buy meat and its derivatives at authorized premises.

It would be interesting to know the prevalence rates of parasitation of this trematode in herbivore animals in our region as the studies carried out in Spain were from the northern region (Díaz *et al.*, 2007; Pérez *et al.*, 2008; Manga-González and González-Lanza, 2005). Due to the high number of spurious infections detected, the hygienic-sanitary measures should be reinforced offering appropriate information by social mediators or trained medical staff, as long as the veterinary controls, because the conditions are appropriate for a true infection to take place. We must also pay attention to the clinical development of all cases.

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