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Occurrence of *Fasciola hepatica* (Linnaeus, 1758) infection in Brazilian cattle of Minas Gerais, Brazil

Ocorrência de *Fasciola hepatica* Linnaeus, 1758 em rebanhos bovinos do estado de Minas Gerais, Brasil

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Abstract

Fasciolosis is a parasitic disease which is caused by digenetic trematodes, such as *Fasciola hepatica*, and which occurs worldwide. The disease causes significant economic losses in cattle because of the reduction in milk and meat production and because the parasitized livers have no economic value. Also, abortion and mortality rates increase. To determine the occurrence and dispersal of *F. hepatica* in the state of Minas Gerais, fecal samples were collected from bovines aged 12 months and older between April 2005 and April 2006. The bovines came from 1,251 rural farms of 120 municipalities/cities in Minas Gerais. Water was collected to ascertain the presence of the intermediate host in the properties where infected bovines were found. A total of 16 municipalities had infected bovines and 13 had the presence of *Lymnaea columella*. We detected infected bovines in 70% of the rural farms visited in the municipality of Itajubá. Itajubá was also found to have infected snails with the larval stage of *F. hepatica*. The results revealed that infection by *F. hepatica* in bovines of Minas Gerais was associated with the presence of the intermediate host and favorable epidemiological factors, drawing attention to the necessity of adopting proper control measures in the area.

Keywords: *Fasciola hepatica*, *Lymnaea columella*, Bovine fasciolosis.

Resumo

A fasciolose é uma doença parasitária que ocorre em todo o mundo e é causada por um trematódeo digenético conhecido como *Fasciola hepatica*. A doença é responsável por causar perdas econômicas significativas em bovinos, devido à diminuição na produção de carne e leite, condenação de fígados parasitados e aumento na mortalidade. Para determinar a ocorrência e a dispersão da *F. hepatica* no estado de Minas Gerais, amostras de fezes de bovinos com idade superior a 12 meses foram coletadas, no período de Abril de 2005 a Abril de 2006. Foram examinados bovinos provenientes de 1.251 propriedades rurais de 120 municípios do estado de Minas Gerais. Coleções hídricas também foram examinadas, a fim de verificar a presença de hospedeiros intermediários nas propriedades onde foram encontrados bovinos parasitados. Para um total de 16 municípios foi relatada a presença de bovinos infectados por *F. hepatica* e destes, 13 apresentaram também o molusco *Lymnaea columella*. Foi possível diagnosticar bovinos infectados em 70% das propriedades visitadas no município de Itajubá. Além disso, no município de Itajubá foi possível detectar a presença de moluscos naturalmente infectados com diferentes estádios larvais de *F. hepatica*. Os resultados evidenciam a necessidade de medidas de controle para esta parasitose na área estudada, uma vez que foi possível verificar a presença de bovinos e moluscos infectados por *F. hepatica*, associada a fatores epidemiológicos favoráveis a dispersão do parasito.

Palavras-chave: *Fasciola hepatica*, *Lymnaea columella*, Fasciolose bovina.

Introduction

Fascioliasis is a parasitic disease caused by the flukes *Fasciola hepatica* and *Fasciola gigantica*, which are the two most economically important helminthic parasites of animals (YOKANANTH et al.,

2005). Disease causes large economic losses in cattle due the reduction in milk and meat production, and because the parasitized livers have no economic value. Also abortions, increased mortality, and the expense of control measures (FARIA et al., 2005). The worldwide losses in animal productivity because of fascioliasis have been estimated at over USD\$ 3.2 billion per annum (SPITHILL et al., 1997). By contrast, demand for animal-derived food in developing countries is expected to increase by 2.8% per annum

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from 1993 to 2020 (YOKANANTH et al., 2005). It is believed that the control of fascioliasis could contribute significantly to improve animal production.

The largest enzootic area of Brazil is located in the Southern part of the country, with smaller foci in the Southeastern and Midwestern regions. The growing animal trade among cattle owners from various regions of Brazil has contributed to an increase in the profile of *F. hepatica* distribution in recent years. In Minas Gerais, for example, an important meat and dairy-producing area situated in the Southeastern region of Brazil, the climatic factors associated with management practices can affect helminthic infection in cattle, including *F. hepatica* infection. The State of Minas Gerais belongs to an enzootic area of fascioliasis. Sporadic reports of the disease have been made in some parts of the state, especially in the city of Itajubá (SERRA-FREIRE et al., 1995; FARIA et al., 2005); however, there are few studies (COELHO et al., 2003; FARIA et al., 2005) that account for a prevalence of *F. hepatica* infection, its epidemiology, and the control done in this area.

In this study we aimed to determine the occurrence and dispersion of *F. hepatica* in eight regions of the state of Minas Gerais, which is considered an important meat and dairy-producing state in Brazil.

Material and Methods

The present study was done between April 2005 and April 2006 in 1,251 rural farms in 120 municipalities/cities distributed in eight regions of Minas Gerais (Triângulo/Alto do Parnaíba; Central Mineira; Vale do Rio Doce; Metalurgica; Oeste de Minas; Campo das Vertentes; Zona da Mata; and Sul/Sudoeste de Minas). These regions hold almost 14 million bovine animals, which correspond to 70% of the cattle in Minas Gerais.

The number of properties to be included in the present study was defined by Instituto Mineiro de Agropecuária (IMA) using the WinEpiscopo® program, and ranged from nine to 11 farms located in different places in each city. From each farm, nine animals at least 12 months old were chosen randomly for the study. Fecal samples of about 40 g were collected individually from the rectum of each animal. Feces were kept in refrigerated boxes until sent to the laboratory. A total of 6,255 fecal samples were analyzed using the Girão and Ueno techniques (GIRÃO; UENO, 1985) for the presence of *Fasciola hepatica* eggs. The fecal debris was stained with a few drops of 1% methylene blue to differentiate plant matter (blue) from eggs of *F. hepatica* (yellow). The search for eggs was performed under stereomicroscope at a magnification of 40 times.

In the period from May 2005 to April 2006, water was collected to be examined for the presence of the intermediate host on the farms where there were infected bovines. Every possible form of water source was examined: waterhole, tap water, waterfall, puddles, swamps, and creeks.

Sampling was performed by using the quadrant method (AMATO et al., 1986) in which a 1 m² area was randomly selected for each plot, and snails were collected from the water with a steel sieve (1 mm mesh) or from aquatic plants, during a period of 20-30 minutes of investigation. The collected snails were then

placed in wet gauze strips and transported to the laboratory. Snail identification was processed according to Paraense (1983, 1986) and *Lymnaea* snails were dissected under a stereomicroscope at a magnification of 40 times to look for larval stages of *F. hepatica*.

Results

Occurrence of infected animals was determined by the presence of *Fasciola hepatica* eggs in the feces exam. From the eight regions of the State of Minas Gerais included in this study, four were positive for *F. hepatica* eggs in the feces of bovines (Figure 1). A total of 16 municipalities had infected bovines (Table 1). Some properties, such as those in the municipalities of Uberlândia, Bicas, Divinópolis, Betim, Itabira, and Igarapé, were commercial farms with a high rate of animals interchange among bovine raisers. For this reason, it was not possible to establish the origin of the animals from those farms that tested positive. On the other hand, it was possible to find the intermediate host of *F. hepatica* in almost every farm in those municipalities.

The collected intermediate host of *F. hepatica* was identified as *L. columella*. It was found in 13 municipalities where *F. hepatica* eggs were detected in the bovine feces (Table 1). Some of the snails were found in water tanks, but the majority were in drainage ditches and were associated with aquatic plants such as *Eichornia azurea* and *Heteranthera reniformis*. *Lymnaea columella* eggs were found on low leaves of these plants as well as on *Brachiaria decumbens* leaves. The total number of collected snails ranged from 0 to 135. The greatest number of snails was collected in drainage pipes and ditches in meadows in the city of Itajubá, where 135 species of *L. columella* were collected on seven farms with positive animals. The municipality of Itajubá was the only location in which was detected the presence of natural infected snails with the larval stage of *F. hepatica*. The snails were found in two farms situated in meadows near Sapucaí River.

A total of 492 snails of *L. columella* were collected and examined for intramolluscan stages of *F. hepatica* (Table 1). The municipality of Itajubá was the only one where natural infected snails with larval

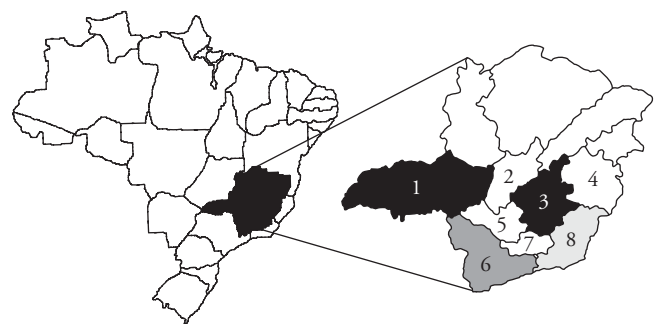


Figure 1. Location of the eight studied regions in Minas Gerais State in Southeastern Brazil (1 - Triângulo Mineiro/Alto Parnaíba; 2 - Central Mineira; 3 - Metalurgica; 4 - Vale do Rio Doce; 5 - Sul/Sudoeste de Minas; 6 - Oeste de Minas; 7 - Campo das Vertentes; 8 - Zona da Mata). The colored regions (Regions 1, 3, 6 and 8) represent the locations where *Fasciola hepatica* parasitized bovines were found.

Table 1. Geographical location of municipalities related to the presence of *Fasciola hepatica* naturally infected bovines and *Lymnaea columella* in Minas Gerais State.

Municipalities	Number of farms		Number of <i>Lymnaea</i>		Geographical location
	Sampled	Positive (%)	Sampled	Positive (%)	
Uberlândia	11	1 (9.1)	0	0 (0.0)	18° 55' 07" S and 48° 16' 38" W
Juiz de Fora	10	1 (10.0)	33	0 (0.0)	21° 45' 51" S and 43° 21' 01" W
Bicas	9	1 (11.1)	28	0 (0.0)	21° 43' 31" S and 43° 03' 34" W
São Gonçalo do Sapucaí	10	2 (20.0)	8	0 (0.0)	21° 53' 32" S and 45° 35' 43" W
Piranguinho	10	4 (40.0)	46	0 (0.0)	21° 53' 32" S and 45° 35' 43" W
Itajubá	10	7 (70.0)	135	4 (2.96)	22° 25' 32" S and 45° 27' 10" W
Varginha	10	1 (10.0)	9	0 (0.0)	21° 33' 05" S and 42° 25' 49" W
Cachoeira de Minas	10	4 (40.0)	39	0 (0.0)	22° 21' 18" S and 45° 45' 44" W
Divinópolis	10	1 (10.0)	0	0 (0.0)	20° 08' 20" S and 44° 53' 02" W
Careaçu	10	3 (30.0)	32	0 (0.0)	22° 02' 35" S and 45° 41' 57" W
Brasópolis	10	3 (30.0)	55	0 (0.0)	22° 02' 35" S and 45° 41' 57" W
Santa Rita do Sapucaí	10	2 (20.0)	66	0 (0.0)	22° 15' 08" S and 45° 42' 12" W
Betim	10	1 (10.0)	6	0 (0.0)	19° 58' 04" S and 44° 11' 54" W
Itabira	10	1 (10.0)	0	0 (0.0)	19° 37' 09" S and 43° 13' 37" W
Itabirito	10	1 (10.0)	18	0 (0.0)	20° 15' 12" S and 43° 48' 05" W
Igarapé	10	1 (10.0)	17	0 (0.0)	20° 04' 13" S and 40° 18' 06" W
Total	160	34	492	4	-

stage of *F. hepatica* was found. Infection rate of *L. columella* with *F. hepatica* in Itajubá was 2.96% (four infected snails).

Other snails, such as *Physa marmorata*, *Biomphalaria* sp., *Drepanotrema* sp., and *Pomacaea* sp., were observed in the same habitat as the intermediate hosts.

Discussion

Ruminant fascioliasis is a serious problem that causes economic losses in several countries (COELHO, 2003; LIMA, 2003; YOKANANTH et al., 2005). The epidemiology of fascioliasis is related to the ecology of the intermediate host, the habitat where it lives, the presence of water, and climatic conditions (MATTOS et al., 1997). In the present studied area, *L. columella* was found in the majority (13/16) of the places where parasitized bovines were also found.

Natural infection rates of *L. columella* with *F. hepatica* corresponded to 2.96%. These rates are lower than those found in Paraíba Valley (AMATO et al., 1986), which reached 13.9% in the months of the highest prevalence. The low presence of infected snails was probably because of the collection place and because only one collection was done without considering the seasonality of the population of snails as it is seen in most works on the subject. The importance of seasonality in infection rates of *Lymnaea* sp. was observed in the Netherlands (GAASENBECK et al., 1992), where infected snails are able to hibernate. Thus, climate may influence infection dynamics of *L. columella* by *F. hepatica*.

Although there are some records of *F. hepatica* in Minas Gerais, the state is not considered to be within an enzootic area. Nevertheless, the Southern/Southwestern region of Minas Gerais, which includes the municipalities of Itajubá, Cachoeira de Minas, and São Gonçalo do Sapucaí, has several eco-epidemiological conditions that allow the occurrence of *F. hepatica*. Therefore, it is

clear that those regions of Minas Gerais can be considered as a focus of hepatic fascioliasis. There are approximately 21 million cattle distributed over 586,000 km², which is divided into 12 regions based on diversities of physiographic and climatic conditions. Climatic factors associated with management practices can influence helminthic infection in cattle, including *F. hepatica* infection. Furthermore, the presence of *L. columella* snails, associated with the presence of large hydrological sources, such as the Sapuca River that irrigates the region, seems to be an important factor in the dispersion of the parasite to other regions and, subsequently, to a great number of infected bovines.

It was possible to detect infected bovines in 70% of the rural farms visited in the municipalities of Itajubá. Moreover, Itajubá was related to the presence of snails infected with the larval stage of *F. hepatica*. The intensive animal trade in several areas of the state, in conjunction with the presence of the intermediate host and the unfamiliarity of the farmers regarding the epidemiological factors related to fascioliasis and its transmission, are indicators that the authorities of the Official Animal Health Defense Service must adopt proper control measures in the area.

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