
Lymnaea truncatula MULLER, 1774
(PULMONATA: LYMNAEIDAE) INFECTED WITH
Fasciola hepatica (LINNAEUS, 1758) (TREMATODA: DIGENEA),
IN MOSCOW DISTRICTS, RUSSIAN FEDERATION

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ABSTRACT

We report on abundance and natural infection rates of *Fasciola hepatica* in *Lymnaea truncatula* snails from endemic rural areas of the Moscow Region. Field surveys were carried out monthly between May and October 2002, in two cattle farms of the Naro-Fominsk district and two of the Dmitrov district. Snail abundance was maximum in May (189 snails in spring) and minimum in July (5 snails in summer), probably due to more suitable microenvironmental conditions for snail development during spring. The prevalence registered during the studied period was 14.3%, with the highest (12.5%) and lowest (0.5%) estimates in September and May, respectively.

KEYWORDS: *Lymnaea truncatula*. *Fasciola hepatica*. Prevalence. Russian Federation.

Fascioliasis, caused by *Fasciola* spp., is a worldwide disease of veterinary importance that produces great economic losses in livestock due to reduced weight gain (Oakley et al. 1979), reduced fertility, abortion, progressive decrease in milk yield, and to partial or complete condemnation liver (Bundy et al. 1984, Hurtado et al. 1992). The annual losses of the agricultural sector are estimated to be US\$2,000 million globally, with more than 600 million animals infected worldwide (Dalton 1999). Snails belonging to the genus *Lymnaea* act as intermediate hosts for the parasite (Torgerson & Claxton, 1999).

In the Russian Federation, the Helminthological Institute reported a national mean prevalence of 18.6% in cattle between 1980 – 1995 (Sorokina,

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2004), and 122,000 out of 1.7 million bovines slaughtered were found infected with *Fasciola hepatica* Linnaeus, 1758 in 2001 (Gorochov, 2002). A study carried out by Safulin (2002) in lowland areas from southern Russia reported prevalences of 100% in cattle raised on farms with marshes, streams, rivers and floodplains.

The Moscow Region (European Russia) is located in the centre of the country, where *F. hepatica* and the snail *Lymnaea truncatula* Muller, 1774 are known to be the causative agent of fascioliasis and the intermediate host of the parasite, respectively (Gorochov, 1981, 2000). This region includes eleven districts regarded as endemic (Sorokina, 2004) among these Naro-Fominsk and Dmitrov that are located southwest and north to Moscow City, respectively (Fig. 1). Although a high transmission rate is likely to take place in both districts, as suggested by the large number of condemned livers found condemned every year from local slaughterhouses, no studies have ever been performed on the intermediate host. This information may be useful for further planning of control measures.



Figure 1. Map of the Moscow Region indicating the districts of Naro-Fominsk and Dmitrov.

The object of this study was to report on seasonal abundance and prevalence of *F. hepatica* in *L. truncatula* snails from rural areas of Naro-Fominsk and Dmitrov districts.

Field surveys were carried out monthly in two cattle farms of Naro-Fominsk and two of Dmitrov from May to October 2002. Cattle were allowed to graze in natural pastures during this period of the year. Snails were collected from wetlands used for livestock grazing, which showed favourable conditions for snail development (water pH of 6, low water flow, maximum water height of 15 cm). Snail abundance in each biotope was determined by the timed collection method

(total number of snails found by one person during 10 min). Snails collected were kept alive in properly labelled plastic containers with wet cotton pads and transported to the laboratory. Upon arrival, they were transferred to glass flasks, counted and identified taxonomically on the basis of shell features (Gorochov 1981) (Fig. 2). Snails were dissected for the presence of parasites under stereoscopic microscope. Infection with *F. hepatica* was assessed by morphological features of rediae and cercariae under light microscope (Manga 1999). To confirm the identity of *F. hepatica*, metacercariae adhered to the flask walls were orally administered to five Wistar rats, which were examined regularly for eggs in faeces from day 30 postinfection (PI) onwards, and killed after faecal egg shedding to search for adult *F. hepatica* flukes in bile ducts.



Figure 2. Metacercariae of *Fasciola hepatica* on the shell of a *Lymnaea truncatula* snail collected in the Moscow Region, Russian Federation. Height of the shell: 10 mm. 5x

All collected snails were identified as *L. truncatula*. Snail abundance was maximum in May (189 snails) and minimum in July (5 snails) (Table 1). This was probably due to the fact that during May (spring), microenvironmental conditions are more suitable for snail development, since temperatures range between 15 and 20°C and snow-melt water provides adequate soil moisture levels (Gorochov, 2002). On the contrary, evapotranspiration increases during July (summer), due to high temperatures ranging between 20°C and 35°C. The prevalence registered during the studied period was 14.3%, with the highest infection rate (12.5%) recorded in September and the lowest in May (0.5%) (Table 1).

Table 1. Monthly abundance of *Lymnaea truncatula* and prevalence of *Fasciola hepatica* in Naro-Fominsk and Dmitrov districts, Moscow Region, Russian Federation, from May to October 2002.

Months	Snails collected	Snails infected	Infection rate (%)
May	189	1	0.53
June	81	1	1.23
July	5	0	0.00
August	0	0	0.00
September	16	2	12.50
October	0	0	0.00
Total	291	4	14.26

In Europe and some parts of Asia, *L. truncatula* is usually the main intermediate host of *F. hepatica* (Andrews SJ 1999). Recent studies indicate that *L. truncatula* was introduced into South America (Oviedo et al. 1995; Jabbour-Zahab et al. 1997, Bargues et al. 1997, Mas-Coma et al. 2001, Meunier et al. 2001), and that it constitutes the main intermediate host in hyperendemic areas for human Fascioliasis, such as the northern Bolivian Altiplano (Hillyer et al. 1992, Esteban et al. 1999, Mas-Coma et al. 1999a, Mas-Coma et al. 1999b), and the Peruvian Altiplano (Esteban et al. 2002). To our knowledge, however, there is no information on the infection of *L. truncatula* by *F. hepatica* in Bolivia.

The maximum prevalence of 12.5% in the Naro-Fominsk and Dmitrov districts is higher than those documented in other districts within the Moscow Region. Thus, Gorochov et al. (1997) reported a mean infection rate of 10.5% in August, and Villavicencio et al. (2005) an infection rate ranging from 0.05% to 0.72%. In France, infection of *L. truncatula* with *F. hepatica* in June and July 1996 was 5.6% (Abrous et al. 1996), and Rondelaund et al. (2001) reported a prevalence varying from 0.3% to 1.1% in *L. glabra*.

In many districts of the Moscow Region other than the ones studied here, Gorochov (2000) reported prevalence varying from 0.2% to 0.5% in summer and from 2 to 3% in the autumn; this author stated that higher values indicate increased transmission levels due to environmental changes associated with anthropogenic activities. In a survey conducted by Gorochov (1981) in farms in different districts of Moscow, snail infection rates were 2%, 3% and up to 10%, while cattle prevalences ranged between 50% and 100%. Considering that in our study snail infection rates varied from 0.53% to 12.50%, we could expect outbreaks of chronic fascioliasis in the Naro-Fominsk and Dmitrov districts.

RESUMO

Lymnaea truncatula Muller, 1774 (Pulmonata: Lymnaeidae), naturalmente infectada com *Fasciola hepatica* (Linnaeus, 1758) (Trematoda: Digenea), em distritos de Moscou, Russia.

Estudou-se a abundância sazonal e taxas de infecção naturais por *Fasciola hepatica* em *Lymnaea truncatula* em áreas rurais endêmicas da região de Moscou. As coletas de campo foram realizadas mensalmente entre maio e outubro de 2002 em duas fazendas de gado do distrito de Naro-Fominsk e duas do distrito de Dmitrov. A abundância de caramujos foi máxima em maio (189 caracóis na primavera) e mínima em julho, (5 caracóis no verão), provavelmente devido às condições apropriadas dos biótopos ao desenvolvimento do molusco durante a primavera. A prevalência dos caramujos infectados durante o período estudado foi de 14,3%, sendo mais alta (12,5%) e mais baixa (0,53%) em setembro e maio, respectivamente.

DESCRITORES: *Lymnaea truncatula*. *Fasciola hepática*. Infecção natural. Federação Russa.

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