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Research Note

The proportion of liver excised in Algerian abattoirs is not a good indicator of *Fasciola hepatica* infections in local cattle breeds

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Abstract

Clinical and serological investigations on 175 cattle were carried out in 1999 at the slaughterhouse of Jijel, northeastern Algeria, to verify if partial ablation of a liver infected with *Fasciola hepatica* represents a good epidemiological indicator in the case of fasciolosis, as partial excision of the liver is widespread throughout North African countries. This study was also performed to determine if there is a direct relationship between the quantity of liver confiscated for fasciolosis and the serological response of slaughtered animals. A significant relationship between highly infected livers and positive serological titres was noted. However, two groups of results were conflicting: the presence of macroscopically healthy, undamaged livers with a positive serology (8.3% of 120 cattle), or the existence of highly damaged livers with a negative serology (13.0% of 31 cattle). These results indicate that partial removal of the liver in the case of fasciolosis is unreliable, so this method does not represent a good tool to establish epidemiological data on this disease.

Fasciolosis due to *Fasciola hepatica* is considered as one of the main parasitoses of livestock in Algeria and economic losses caused by this disease are very important, especially for confiscated hepatic masses. A preliminary study, carried out at the slaughterhouse of Jijel, northeastern Algeria, revealed a 10,000-euro loss per year (1 million dinars) caused by the confiscation of livers infected with *F. hepatica* (Mekroud *et al.*, 2004). Most epidemiological data on the prevalence of this disease in ruminants originated from slaughterhouse records. The screening of animals for this parasite in the field (by serology and/or coprology) is not carried out.

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Algerian legislation is rigorous enough for the distraint of cattle and sheep livers for fasciolosis at the slaughterhouse and the finding of a single fluke in the bile ducts of a liver leads to the confiscation of the whole organ. In practice, the ablation of one lobe of the liver or the removal of a thin layer of the outer parenchyma along the inferior surface of the liver, at the level of the common bile duct, are commonly used in North African countries because of the commercial value of this organ (12 euros per kg in 2004 in Algeria). Consequently, the veterinary inspector must determine the mass of liver to be confiscated when flukes are detected. However, this practice of liver removal may generate two paradoxical situations: (i) the inspector does not detect any obvious damage to the hepatic parenchyma (burrowing phase of young flukes through the liver) and considers this organ

healthy, or (ii) he can condemn a variable quantity of the liver because of persistent lesions of cholangitis, but without living flukes.

As the ablation of one liver lobe is frequent in many slaughterhouses of North African countries when fasciolosis is detected, it is interesting to determine if this method is appropriate for establishing real epidemiological data on this disease in livestock. Hence, the following two questions arise: (i) can a correlation between the quantity of the liver confiscated for fasciolosis and the antibody response of slaughtered animals be found? and (ii) are the observations noted in slaughtered ruminants sufficiently reliable to establish true epidemiological data for fasciolosis?

The study was carried out in 1999 at the slaughterhouse of Jijel. A total of 175 cattle, 2 to 5 years old and mainly composed of bull calves of local breed, was investigated. All animals were recognized as healthy during clinical inspection before slaughtering. A blood sample (5 ml) was collected from the jugular vein of each ruminant before being centrifuged at 3000 revs per min for 10 min at room temperature. Sera were stored at −25°C and were subsequently analysed using the ELISA method proposed by Chauvin & Boulard (1992).

After slaughtering, the livers of cattle were meticulously inspected to determine the following two parameters: (i) the prevalence of natural fasciolosis and (ii) the proportion of hepatic tissue confiscated in relation to the liver weight of each animal, i.e. the intensity of hepatic lesions. Individual values of the second parameter were arbitrarily classified in the following four groups of livers, i.e. macroscopically healthy livers (distraint: 0%), and little (hepatic tissue confiscated: 1–10%), moderately (11–40%), and highly (>40%) damaged livers. The level of antibodies for each animal was the final parameter and was expressed as the percentage of the optical density (OD) found for each serum when compared to that of a positive control. These percentages were also grouped into three serological categories according to Chauvin & Boulard (1992), i.e. negative (OD, <20%), doubtful (20–30%), and positive cattle (>30%). A χ^2 test for paired groups (MacNemar test) was made to determine the existence of eventual relationships between serological titres and the intensities of hepatic lesions (Stat Itcf, 1988). If the above parameters moved in the same way, the χ^2 test was not significant so that there was an important statistical relationship and the serological titre will predict the group of damaged livers. By contrast, if the two parameters fluctuated independently from each other, the test will be significant, thus indicating a low relationship between the studied parameters or to its absence.

Negative titres of antibodies and macroscopically healthy livers (table 1) were found in a total of 83 of 120 cattle (69.2%). Positive titres and highly damaged livers were noted in 20 of 31 cattle (64.5%). The other results were conflicting, as 10 of 120 cattle (8.3%) were positive in serology and each showed an apparently healthy liver. Four of 31 cattle (13.0%) had negative titres despite their highly damaged livers.

The statistical results obtained by comparing serological titres and the intensities of hepatic lesions are given in table 2. When a comparison was performed between negative and positive cattle, there were significant relationships between the above two parameters for moderately (11–40%) and highly (>40%) damaged livers. Similar findings were noted when a comparison was made between doubtful and positive ruminants, whatever the intensities of hepatic lesions. In contrast, in the case of comparisons between negative and doubtful cattle, no statistical dependences between the two parameters were noted, thus indicating the existence of insignificant relationships.

In infected cattle, most intensities of hepatic lesions were correlated with their serological responses, as there was a significant relationship between highly damaged livers and positive titres. Conversely, a similar relationship was noted between healthy livers and negative cattle. In spite of these obvious correlations, two groups of results warrant special comments. Firstly, the presence of cattle (8.3%) with positive serology and no adult flukes might, in our opinion, only be explained by the existence of immature infections, with young flukes burrowing through the liver parenchyma. An argument in support of this was provided by Chauvin (1994), who reported that the level of IgG, known as a good indicator of fasciolosis in ruminants (Behm & Sangster, 1999), increased in sheep from weeks 3 or 4 post-infection, whereas the animals showed macroscopically healthy livers. A similar finding was reported by Chauvin *et al.* (2001), as these authors found positive serologies at week 12 post-infection in sheep whose livers were macroscopically healthy. Secondly, 13.0% of ruminants had negative serologies, despite highly damaged livers. As many dead flukes were

Table 1. The intensity of hepatic lesions caused by *Fasciola hepatica* and the serological titres in 175 cattle examined from a slaughterhouse at Jijel, Algeria.

	No. of cattle (%) with			
Clinical state of the liver (*Fasciola hepatica*)	Negative serology (OD <20%)	Doubtful serology (OD 20–30%)	Positive serology (OD >30%)	Totals
No macroscopic lesions (0%)	83 (69.2)	27 (22.5)	10 (8.3)	120
Little damaged livers (1; 10%)	2 (18.2)	4 (36.4)	5 (45.4)	11
Moderately damaged livers (11; 40%)	3 (23.1)	4 (30.8)	6 (46.1)	13
Highly damaged livers (>40%)	4 (13.0)	7 (22.5)	20 (64.5)	31
Totals	92	42	41	175

OD, optical density.

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Table 2. Comparison of serological titres with the intensities of hepatic lesions in 175 cattle infected with *Fasciola hepatica* using a MacNemar test.

Comparison of liver groups		Comparison of serological titres: Negative; Positive (<20%; >30%)	Negative; Doubtful (<20%; 20–30%)	Doubtful; Positive (20–30%; >30%)
Negative; Highly damaged	0%; >40%	$\chi^2 = 2.57$, NS	$\chi^2 = 21.5$, $P < 0.001$	$\chi^2 = 2.57$, NS
Negative; Moderately damaged	0%; 11–40%	$\chi^2 = 3.76$, NS	$\chi^2 = 19.2$, $P < 0.001$	$\chi^2 = 2.57$, NS
Negative; Little damaged	0%; 1–10%	$\chi^2 = 5.33$, $P < 0.05$	$\chi^2 = 7.56$, $P < 0.01$	$\chi^2 = 0.52$, NS

NS, not significant. *P*, level of probability. Number of freedom degrees: 1 for each comparison.

found in the bile ducts, the more likely hypothesis is that these ruminants would be treated by an anthelmintic before slaughtering so that their livers would be in a process of recovery. According to Martinez-Moreno *et al.* (1997), even with a powerful anthelmintic such as triclabendazole, parenchymatous lesions and cholangitis might persist for several months following treatment or even several years before a subsequent regression and this might explain the presence of persistent hepatic lesions in cattle showing negative serological titres. If the above hypothesis is considered valid, it is interesting to note that the recovery of these livers would already be at an advanced stage, as anti-*Fasciola* antibodies persisted from 2 to 6 months following the administration of an anthelmintic (Levieux *et al.*, 1992; Boulard *et al.*, 1995).

Even if a relationship between serological titres and the quantities of livers confiscated for fasciolosis was found in the present study, this does not occur in all cases studied. In our opinion, the partial removal of infected livers cannot be used as a reliable epidemiological indicator for fasciolosis. For this reason, it would be more appropriate to determine the prevalence of natural infections with *F. hepatica* in livestock using more classical and more appropriate methods of detection (serology and/or coprology). Partial removal of livers in the case of fasciolosis must be banned in Algerian slaughterhouses, as macroscopically healthy organs cannot be considered as unaffected by fasciolosis with this method.

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