

Prevalence of parasitic lesions in lungs and livers of cattle and sheep at Constantine's slaughterhouse, Northeast Algeria

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Keywords

Ruminants, *Fasciola hepatica*, echinococcosis, *Cysticercus tenuicollis*, abattoirs, Algeria

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Summary

A cross-sectional survey was conducted at Constantine's slaughterhouse in Northeast Algeria between February 2018 and February 2019. Livers and lungs of 2574 sheep and 1036 cattle were examined for the presence of lesions. The overall prevalence of lung lesions was 33% and 32% in sheep and cattle, respectively. The most frequent lesion in sheep lungs was red hepatization (19%) followed by pleurisy (12%). In cattle, the most frequent lung lesion was cystic echinococcosis (24%), followed by pleurisy (7%) and emphysema (5%). Lungworm infection (9%), atelectasis (0.2%) and suppurative bronchopneumonia (0.2%) were observed only in sheep lungs. On the other hand, cystic echinococcosis (24%) and tuberculosis (1.5%) were only observed in cattle. The prevalence of lung abscesses was 2% in sheep and 1% in cattle. The prevalence of lung lesions was higher in cattle older than eight years (66%) than in cattle younger than two years (14%). The overall prevalence of liver lesions was significantly higher in cattle (15%) than in sheep (11%). The highest prevalence of lesions in cattle livers was due to cystic echinococcosis (8%), followed by abscesses (6%), *Fasciola hepatica* infection (2%), and perihepatitis (1%). *Cysticercus tenuicollis* infection was observed in 6% of the examined sheep, followed by abscesses (5%). The highest prevalence of *C. tenuicollis* occurred in winter (9%) followed by autumn (6%). Lung and liver lesions represent a serious problem to the livestock industry in Algeria. Further studies are needed to implement appropriate control programs.

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■ INTRODUCTION

The livestock population in Algeria is estimated at roughly 1,780,000 cattle and 29,430,000 sheep (FAOSTAT, 2021). Ruminant production is one of the main sources of meat in Algeria and plays a vital role in the country's food security (Kardjadj, 2017). Several diseases and poor health management practices represent real constraints to efficient herd management and profitable production. Furthermore, the country faces a huge deficit in dairy and meat products, leading to 0.307 billion USD of meat importation in 2014 (Kardjadj, 2017).

Slaughterhouses ensure meat traceability and meat safety for consumers and are one of the main animal- and zoonotic-disease sentinels (Jaja et al., 2017). Furthermore, examination of lesions found in

slaughtered animals provides information on epidemiology of livestock diseases, constitutes a diagnosis tool to determine the extent of public exposure to some zoonotic diseases, and enables calculation of economic losses caused by condemnation of the affected organs and carcasses (Belina and Melese, 2017). Livestock develops several subclinical diseases such as cystic echinococcosis, fasciolosis (*Fasciola hepatica* infection) and *Cysticercus tenuicollis* infection, for which inspection at slaughterhouses represents one of the suitable and cheapest methods of diagnosis (Belina and Melese, 2017; Belalmi et al., 2020b). Condemnation of edible offal unfit for human consumption represents one of the losses caused by these diseases (Mekroud et al., 2004; Erbetto et al., 2010).

Cystic echinococcosis (CE), or hydatid cysts, is a major zoonotic disease, caused by the larvae of *Echinococcus granulosus* (Fasihi Harandi et al., 2012; Borhani et al., 2016). In North Africa, the sheep-dog epidemiological cycle is the main source of human infection (Fasihi Harandi et al., 2012; Bardosh et al., 2016). One million humans around the world are infected by *E. granulosus*, and an estimated burden of 183,573 (88,082–1,590,846 range) disability-adjusted life years is attributed to CE (Borhani et al., 2020). In Tunisia, the yearly overall

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cost of CE was estimated by Majorowski et al. (2005) at 10–19 million USD. The yearly prevalence rates of CE infection in slaughterhouses of Constantine, in Northeast Algeria, were estimated at 3.3% and 9.7% in cattle livers and lungs, respectively, and 0.5% and 1.1% in sheep livers and lungs, respectively (Gherroucha et al., 2021).

Fasciola hepatica is a minor zoonotic disease and is endemic in several regions of the world (Rapsch et al., 2006). It has an indirect life cycle, involving lymnaeid snails as intermediate hosts and herbivores as definitive hosts. Adult flukes are located in the bile ducts (Beesley et al., 2018). The prevalence rates of *F. hepatica* infection found in different slaughterhouses of Northeast Algeria were 2.7% in Constantine (Gherroucha et al., 2021), 14.6%–27% in Jijel (Mekroud et al., 2004), and 52.4% in El Taref (Ayad et al., 2019). The financial loss associated to liver condemnation due to *F. hepatica* infection was estimated at 10,000 EUR per year at Jijel's slaughterhouse (Mekroud et al., 2004). *Cysticercus tenuicollis* infection is caused by the metacystode stage of *Taenia hydatigena* (Boufana et al., 2015) whose adult worms are found in the small intestines of dogs, cats and wild carnivores (Mokhtaria et al., 2018; Khaled et al., 2020). In ruminants, this disease is neglected because the parasite has neither economic nor health significant impact, and the infection is asymptomatic although larva migration infrequently induces hepatitis.

Data on parasitic-lesion prevalence would enable decision makers of the livestock sector and veterinarians to improve ruminants' health, and thus farm profitability and human health. Therefore, the present study aimed to i) estimate the prevalence of lung and liver lesions in sheep and cattle, and ii) identify the types of gross lung and liver lesions.

MATERIALS AND METHODS

Study area

The present cross-sectional survey was conducted at Constantine's slaughterhouse (Northeast Algeria). This region has a Csa climate (hot-summer Mediterranean climate), characterized by cold and humid winters and hot and dry summers according to Köppen and Geiger's classification (Kottek et al., 2006). Cattle and sheep populations are estimated at 45,000 and 200,000, respectively (pers. commun., Direction des services agricoles, 2019).

Study population

Between February 2018 and February 2019, slaughtered ruminants were examined on 56 occasions (on average five times monthly). At each slaughterhouse visit, on average 18 cattle (between 2 and 50) and 45 sheep (between 5 and 220) were examined. The number of slaughtered animals was roughly constant according to the season for cattle (215–376), whereas it was variable for sheep (281 in winter and 831 in summer). In total 2574 sheep and 1036 cattle, randomly chosen, were involved in the study. Due to the lack of traceability, the exact origin of slaughtered animals remained unknown. They came from different localities in Constantine Wilaya and from neighboring provinces. The sex and age of each cattle were recorded. Three age groups were considered: less than 2 years, between 2 and 8 years, and more than 8 years. Because there were only few cattle from the middle group, results were not detailed for them. All sheep were less than 1-year old males.

Lung and liver lesion sample collection

The same experienced person examined the liver and lungs of the animals for the presence of any lesion. The examination comprised visual inspection, palpation of the organs, and systematic incision of livers according to FAO and WHO's guidelines (FAO/WHO, 2004).

Statistical analysis

The percentages of different lesions were compared using the Mantel-Haenszel Chi-square test and Fisher exact test with Rstudio Team (Boston, USA, 2019), an integrated development environment for R software, version 3.6.2. Differences were considered significant at 5% threshold and highly significant at 1%.

RESULTS

The maximum number of lesions per animal was 7 in cattle and 5 in sheep, but more than half of the infected cattle (54.6%) and sheep (67.0%) had only one lesion (Figure 1).

Lung lesions

The overall prevalence of lung lesions was 33% and 32% in sheep and cattle, respectively. The most frequent lung lesions in sheep were red hepatization (19%) and pleurisy (12%) ($p < 0.001$). In cattle they were CE (24%), pleurisy (7%) and emphysema (5%) ($p < 0.001$) (Table I). Lungworm infection (9%), atelectasis (0.2%) and suppurative bronchopneumonia (0.2%) were observed only in sheep, whereas CE (24%) and tuberculosis (1.5%) were observed only in cattle (Table I). The prevalence of lung lesions was higher in cattle older than 8 years (66%) than in cattle younger than 2 years (14%) ($p < 0.001$). There was no seasonal variation in the prevalence of lung lesions in cattle and sheep ($p > 0.05$), except for red hepatization in cattle with no case in summer ($p < 0.001$) (Figures 2 and 3).

Liver lesions

The overall prevalence of liver lesions was significantly higher in cattle (15%) than in sheep (11%) ($p < 0.001$) (Table II). The most prevalent lesions in cattle were CE (8%), abscesses (6%), *F. hepatica* infection (2%) and perihepatitis (1%) ($p < 0.001$). Coinfection of both liver and lungs by CE concerned 7% of the inspected cattle, i.e. the vast majority of cattle with CE lesions in liver also had lesions in lungs, although the opposite was not observed. Among the 20 cattle

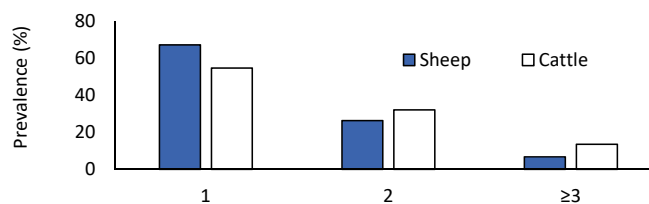


Figure 1: Number of parasitic lung and liver lesions in sheep and cattle slaughtered at Constantine's slaughterhouse, Northeast Algeria // Nombre de lésions parasitaires pulmonaires et hépatiques chez les ovins et bovins abattus à l'abattoir de Constantine, nord-est de l'Algérie

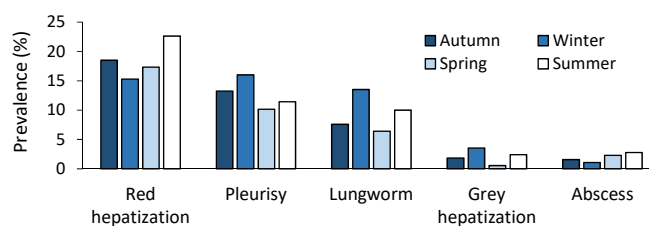


Figure 2: Prevalence of lung lesions in sheep according to season at Constantine's slaughterhouse, Northeast Algeria // Prévalence des lésions pulmonaires chez les ovins selon la saison à l'abattoir de Constantine, nord-est de l'Algérie

with fasciolosis lesions, 35% also had CE, either in the liver, in the lungs, or in both.

The most prevalent lesions in sheep were those of *C. tenuicollis* (6%), only observed in sheep, and abscesses (5%). There was no seasonal variation of *F. hepatica* infection prevalence in cattle ($p > 0.05$), whereas the highest prevalence of *C. tenuicollis* in sheep occurred in winter ($p < 0.05$) (Figure 4).

DISCUSSION

In the present study, there was no difference between the overall prevalence of lung lesions in sheep (33%) and cattle (32%). Such close prevalence values of lung lesions were also reported in Tanzania in cattle (30%) and sheep (31%) (Mellau et al., 2010). However, the main lesions are different in sheep and cattle, and the causes are not identical for both species.

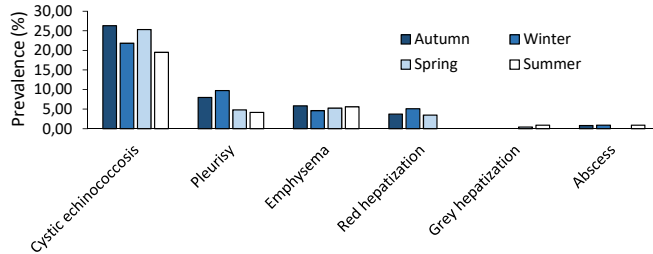


Figure 3: Prevalence of lung lesions in cattle according to season at Constantine's slaughterhouse, Northeast Algeria // Prévalence des lésions pulmonaires chez les bovins selon la saison à l'abattoir de Constantine, nord-est de l'Algérie

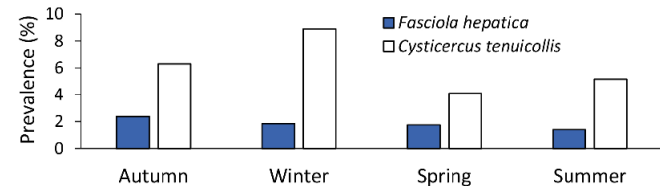


Figure 4: Prevalence in liver lesions of *Fasciola hepatica* in cattle (blue) and *Cysticercus tenuicollis* in sheep (white) according to season at Constantine's slaughterhouse, Northeast Algeria // Prévalence des lésions hépatiques de *Fasciola hepatica* chez les bovins (bleu) et de *Cysticercus tenuicollis* chez les ovins (blanc) en fonction de la saison à l'abattoir de Constantine, nord-est de l'Algérie

Table I: Prevalence of sheep and cattle lung lesions at Constantine's slaughterhouse, Northeast Algeria // Prévalence des lésions pulmonaires des ovins et des bovins à l'abattoir de Constantine, nord-est de l'Algérie

Lesion	Sheep (n = 2574)		Cattle (n = 1036)		P
	Number of infected animals	Prevalence (%) [95% CI]	Number of infected animals	Prevalence (%) [95% CI]	
Pleurisy	312	12.12 [10.86–13.38]	71	6.85 [5.31–8.39]	< 0.01
Red hepatization	493	19.15 [17.63–20.67]	35	3.38 [2.28–4.48]	< 0.01
Grey hepatization	48	1.86 [1.34–2.39]	3	0.29 [-0.04 –0.62]	< 0.01
Atelectasis	6	0.23 [0.05–0.42]	0	0	> 0.05
Suppurative bronchopneumonia	4	0.16 [0.04–0.42]	0	0	> 0.05
Emphysema	2	0.08 [-0.03–0.19]	56	5.41 [4.03–6.78]	< 0.01
Abscesses	54	2.1 [1.6–2.7]	7	0.68 [0.18–1.17]	< 0.01
Tuberculosis	0	0	15	1.45 [0.72–2.18]	< 0.01
Lungworm infection	224	8.7 [7.61–9.79]	0	0	< 0.01
Cystic echinococcosis	0	0	246	23.75 [21.15–26.34]	< 0.01
Total num. of lesions*	849*	32.98 [31.17–34.80]	335*	32.34 [29.49–35.18]	> 0.05

CI: confidence interval; * Some animals had several lesions // CI : intervalle de confiance ; * Certains animaux ont présenté plusieurs lésions

Table II: Prevalence of sheep and cattle liver lesions at Constantine's slaughterhouse, Northeast Algeria // Prévalence des lésions hépatiques des ovins et des bovins à l'abattoir de Constantine, nord-est de l'Algérie

Lesion	Sheep (n = 2574)		Cattle (n = 1036)		P
	Number of infected animals	Prevalence (%) [95% CI]	Number of infected animals	Lesion [95% CI]	
Abscesses	129	5.01 [4.17–5.85]	60	5.79 [4.37–7.21]	> 0.05
Necrosis	0	0	2	0.19 [-0.07–0.46]	> 0.05
Perihepatitis	9	0.35 [0.12–0.58]	12	1.16 [0.51–1.81]	< 0.01
<i>Fasciola hepatica</i>	1	0.04	20	1.93 [1.09–2.77]	< 0.01
<i>Cysticercus tenuicollis</i>	144	5.59 [4.71–6.48]	0	0	< 0.01
Cystic echinococcosis	0	0	82	7.92 [6.27–9.56]	< 0.01
Tuberculosis	0	0	0	0	> 0.05
Total num. of lesions*	273*	10.61 [9.4–10.8]	158*	15.25 [13.1 –17.4]	< 0.01

CI: confidence interval; * Some animals had several lesions // CI : intervalle de confiance ; * Certains animaux ont présenté plusieurs lésions

It is known that the development of lung lesions is the result of interaction between the physiology and immunity of the host organism, the pathogen (bacteria, viruses, parasites and mycoplasmas) and environmental factors, which could explain differences between prevalence values in different Algerian slaughterhouses or between species. The important variations in temperature in different Algerian localities, ranging from hot in summer to very cold in winter, promote the development of respiratory diseases. This could explain that the most frequent lesions in sheep lungs were red hepatization, an anatomopathologic classification mainly used for sheep, and pleurisy. In addition, age, geographic location, nutrition, stress factors and unhygienic conditions are determining factors causing pneumonia in ruminants (Azizi et al., 2016).

In the present study, strongylosis was observed in 9% of inspected sheep lungs. Crude postmortem examination is not the most sensitive method for assessment of pulmonary strongylosis prevalence in sheep; Borji et al. (2012) show that coproscopy is more sensitive than slaughterhouse inspection. As the sheep examined in the present study were all less than one year old, it was not possible to estimate the effect of age on the occurrence of strongylosis, although several researchers have shown a relationship. Borji et al. (2012) report that one-year-old or younger animals are more susceptible than older animals that develop acquired immunity and therefore have a lower prevalence. The presence of strongylosis in the examined animals is partly explained by the difficulty in controlling snail or slug populations that are intermediate hosts in the indirect life cycle of these parasites.

Ovine lung adenocarcinoma, also known as Jaagsiekte disease, was microscopically confirmed in a single case. The macroscopic and histopathological features observed were typical and similar to those described by other authors (Mekibib et al., 2019; Belalmi et al., 2020a). Due to the long incubation period and the subclinical form of the disease, its presence in other parts of the country is probable and could be promoted by the unrestricted transport of animals between regions. Unfortunately, the existing serological tests do not allow the diagnosis of the disease (Mekibib et al., 2019).

The prevalence of lung abscesses was 0.7% and 2.1% in cattle and sheep, respectively, a result lower than that of 8.1% reported by Hashemnia et al. (2019) in slaughtered sheep. The precise etiology of the abscesses could not be determined by gross examination of the lesions, whether in the lungs or the livers where those lesions were also important (5% in sheep and 6% in cattle). Microbiological and histologic examinations would therefore be necessary to determine their exact cause. According to Azizi et al. (2013), the bacteria *Staphylococcus aureus*, *Pasteurella multocida*, *Klebsiella pneumoniae*, *Corynebacterium pseudotuberculosis* and *Actinomyces pyogenes* have been found following examination of lung abscesses.

In cattle, the most frequent lung lesions were CE (24%), pleurisy (7%) and emphysema (5%). CE prevalence at Constantine's slaughterhouse was higher during the present study than during the previous decade, assessed by data compilation from the eight slaughterhouses of the wilaya (Gherroucha et al., 2021). This difference may be due to a real, and dangerous for human health, increase of the prevalence, attesting an increasing infection in dogs, hosts of the adult parasite. It could also attest that the detection of the cysts, particularly of the smallest lesions, was better performed during the present study than previously, perhaps because slaughterhouse inspectors generally lack time to examine offal correctly. Finally, this result may also attest that CE prevalence is highly variable not only between Algerian provinces but also between slaughterhouses of the same province, since the previous study included Constantine's slaughterhouse and slaughterhouses in its wilaya.

It may seem surprising that cattle were more infected by CE than sheep, when the latter is more involved in the epidemiological cycle of

this parasite (Fasihi Harandi et al., 2012; Bardosh et al., 2016). Only less than one-year-old sheep were examined in the present study, which may explain that no CE was observed in the sampled animals. The discrepancy between cattle and sheep infection by hydatid cysts was also recently observed in other areas of Algeria (Benchikh El Fegoun et al., 2020). These authors have, moreover, determined that cysts in cattle have lower fertility rates than those in sheep. As a result, cattle infection plays a minor role in the epidemiology of *Echinococcus granulosus*, attesting only the persistence of the infection in a given area. However, a better control of cystic echinococcosis is necessary in Algeria. This requires, first of all, better traceability of animals in order to allow the application of the necessary eradication measures in endemic areas. A recent tripartite agreement involving breeders, slaughterhouses and the National Office of Livestock Food (ONAB) enabled to hope for positive developments of this issue (L'événement, 2021).

Lung lesions were positively correlated with age in cattle, and their number was significantly higher in adult (66%) than in young (14%) animals. This could be explained by an accumulation of lesions due to untreated or poorly treated lung conditions. On the other hand, in the present study, no seasonal variation of lung lesion prevalence was observed. This could be due to the chronicity of most lung diseases since, with chronic diseases, the season cannot be an epidemiological index (Najjari et al., 2020).

Djafar et al. (2020) assessed the seroprevalence of tuberculosis in three regions of Eastern Algeria, including Constantine. They conclude that the estimated prevalence (3%), twice that observed during the present study (1.5%), places Algeria in an intermediate position between developed countries (seroprevalence lower than 0.1%) and countries of Africa, Latin America and Asia (high seroprevalence of 10%–24%). They also conclude that the low seroprevalence observed in their study could be the result of the country's policy of purchasing breeding herds from officially-tuberculosis-free countries, thus controlling and limiting the risk of introducing tuberculosis infected animals into Algerian farms. The low prevalence of tuberculosis observed during the present study may also result from such policy.

In the present study, the prevalence of CE infection in cattle was lower in livers than in lungs (8% vs 24%). Similarly, Bardonnet et al. (2003) recorded a lower infection in livers than in lungs which harbored 65% of the observed CE lesions in 5158 cattle slaughtered in five regions of Algeria. Ayad et al. (2019) found an even lower CE prevalence (2.5%) in cattle liver in Bejaia. Such low prevalence could be due to the age of slaughtered animals, environmental conditions, density and size of dog population, but also to the diversity of *E. granulosus* genotypes as suggested by Mellau et al. (2010), and Ayad et al. (2019).

The prevalence of *F. hepatica* in cattle was 2% and it was very low in sheep (less than 0.1%), which is consistent with results recorded at Constantine Wilaya's slaughterhouses between 2009 and 2018 (2.7% in cattle and 0.2% in sheep) (Gherroucha et al., 2021). At the Bejaia slaughterhouse, Ayad et al. (2019) also found that *F. hepatica* was more prevalent in cattle (3%) than in sheep (0.1%). In Mitidja Region, the overall prevalence of *F. hepatica* in slaughtered cattle was estimated at 6% (Chaouadi et al., 2019). This higher prevalence could be due to the fact that these authors used liver examination and microscopic bile examination, which is a more sensitive method. Higher prevalence has also been reported by Mekroud et al. (2004) in Constantine (9% in slaughtered cattle and 6% in live cattle) and in Jijel (27.0% in slaughtered cattle and 27.3% in living animals). The discrepancy between both regions could be explained by the environmental and climatic differences of grazing areas and by the density of intermediate hosts. During the present study, only one case of fasciolosis was observed in sheep, although only young sheep (mainly 7–9 months old) were slaughtered and these young animals are considered more susceptible

to this infection. Two reasons might explain this low prevalence. Firstly, as this susceptibility is well known, breeders may delay the grazing period of lambs. Secondly, since sheep develop acute fasciolosis, clinical signs are severe, sometimes leading to death (Chauvin et al., 2007), which could prevent farmers from bringing them to the slaughterhouse, because they slaughter preferentially animals in good condition.

The present study further showed that there was no statistically significant seasonal variation of *F. hepatica* infection prevalence. On the contrary, Ayad et al. (2019) reported a decrease in the prevalence of *F. hepatica* infection in cattle from winter to end of summer, whereas it remained roughly constant in sheep. In contrast, Jaja et al. (2017) found that the prevalence of liver flukes was higher in summer and autumn than in winter and spring in three slaughterhouses of the Eastern Cape Province (South Africa).

Of the examined sheep, 6% were infected by *C. tenuicollis*. The highest prevalence of *C. tenuicollis* occurred in winter (9%) and autumn (6%). Mokhtaria et al. (2018) recorded a similar prevalence (8%) in Tiaret area. In Tunisia, Khaled et al. (2020) reported that infection prevalence by *C. tenuicollis* was 3% in sheep. According to these authors, the importance of this infection and the losses it may cause due to condemnation of livers are underestimated because it is not zoonotic and does not cause significant economic losses in the sheep sector. To eliminate this parasite, they suggest implementing low-cost control measures.

CONCLUSION

The present study shows that lung and liver lesions represent a serious problem for the livestock industry and may pose health risks to consumers in Constantine area. Since only healthy animals are slaughtered, the true prevalence of different lung and liver conditions may be higher in livestock as a whole. Improved traceability of slaughtered animals would enable to identify the main factors responsible for ruminants' various pathologies, and thus help to improve control programs against these diseases. Unfortunately, the study did not allow to assess economic losses due to organs' condemnations that would have provided insight into the impact of these diseases on the economy of the country. A complete assessment should also include losses due to mortalities, weight loss, and decrease in milk and wool production. In addition it should serve to estimate disability-adjusted life years in humans in order to study the impact of these diseases on public health. Such further economic studies are therefore needed to implement appropriate control programs that aim at reducing the prevalence of these diseases which have a severe impact on humans and animals, as well as on the entire cattle and sheep industry.

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Conflicts of interest

The authors declare they have no conflict of interest.

Author contributions statement

DG participated in study design and planning, collected data, and carried out results analysis and interpretation, drafted the first version and critically reviewed the manuscript; LB participated in study planning; MG reviewed the manuscript.

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Résumé

Gherroucha D., Benhamza L., Gharbi M. Prévalence des lésions parasitaires dans les poumons et les foies de bovins et d'ovins à l'abattoir de Constantine, nord-est de l'Algérie

Une enquête transversale a été menée à l'abattoir de Constantine, dans le nord-est de l'Algérie, entre février 2018 et février 2019. Les foies et les poumons de 2574 ovins et 1036 bovins ont été examinés pour la recherche de lésions. La prévalence globale des lésions pulmonaires a été de 33 % chez les ovins et de 32 % chez les bovins. La lésion la plus fréquente dans les poumons d'ovins a été l'hépatite rouge (19 %), suivie de la pleurésie (12 %). Chez les bovins, la lésion pulmonaire la plus fréquente a été le kyste hydatique (24 %), suivi de la pleurésie (7 %) et de l'emphysème (5 %). La strongylose pulmonaire (9 %), l'atélectasie (0,2 %) et la bronchopneumonie suppurée (0,2 %) n'ont été observées que dans les poumons des ovins. En revanche, le kyste hydatique (24 %) et la tuberculose (1,5 %) n'ont été observés que chez les bovins. La prévalence des abcès pulmonaires a été de 2 % chez les ovins et de 1 % chez les bovins. La prévalence des lésions pulmonaires a été plus élevée chez les bovins âgés de plus de huit ans (66 %) que chez ceux âgés de moins de deux ans (14 %). La prévalence globale des lésions hépatiques a été significativement plus élevée chez les bovins (15 %) que chez les ovins (11 %). Chez les bovins, ces lésions hépatiques ont été majoritairement dues au kyste hydatique (8 %), suivi par les abcès (6 %), l'infestation par *Fasciola hepatica* (2 %) et la périhépatite (1 %). Les infestations par *Cysticercus tenuicollis* ont été observées chez 6 % des ovins et les abcès chez 5 % de ces animaux. La prévalence la plus élevée de *C. tenuicollis* a été observée en hiver (9 %), suivi par l'automne (6 %). Les lésions pulmonaires et hépatiques représentent un grave problème pour l'élevage en Algérie. Des études complémentaires seront nécessaires pour mettre en œuvre des programmes de contrôle appropriés.

Mots-clés : ruminant, *Fasciola hepatica*, échinococcose, *Cysticercus tenuicollis*, abattoir, Algérie

Resumen

Gherroucha D., Benhamza L., Gharbi M. Prevalencia de lesiones parasitarias en los pulmones e hígados de bovinos y ovinos en el matadero de Constantina, en el noreste de Argelia

Se realizó una investigación transversal en el matadero de Constantina, al noreste de Argelia, entre febrero de 2018 y febrero de 2019. Se examinaron los hígados y pulmones de 2 574 ovinos y 1 036 bovinos en busca de lesiones. La prevalencia global de las lesiones pulmonares fue del 33 % en los ovinos y del 32 % en los bovinos. La lesión más frecuente en los pulmones de ovinos fue la hepatización roja (19 %), seguida por la pleuresía (12 %). En los bovinos, la lesión pulmonar más frecuente fue el quiste hidatídico (24 %), seguido de la pleuresía (7 %) y el enfisema (5 %). La strongilosis pulmonar (9 %), la atelectasia (0,2 %) y la bronconeumonía supurativa (0,2 %) solo se observaron en los pulmones de los ovinos. En cambio, el quiste hidatídico (24 %) y la tuberculosis (1,5 %) solo se observaron en los bovinos. La prevalencia de los abscesos pulmonares fue del 2 % en los ovinos y del 1 % en los bovinos. La prevalencia de las lesiones pulmonares fue mayor en los bovinos de más de ocho años (66 %) que en los de menos de dos años (14 %). La prevalencia global de las lesiones hepáticas fue significativamente mayor en los bovinos (15 %) que en los ovinos (11 %). En los bovinos, la mayoría de lesiones hepáticas se debieron a quistes hidatídicos (8 %), seguidos por los abscesos (6 %), infestación por *Fasciola hepatica* (2 %) y perihepatitis (1 %). Se observaron infestaciones por *Cysticercus tenuicollis* en el 6 % de los ovinos y abscesos en el 5 % de estos animales. La mayor prevalencia de *C. tenuicollis* se observó en invierno (9 %), seguida por el otoño (6 %). Las lesiones pulmonares y hepáticas constituyen un grave problema para la ganadería en Argelia. Serán necesarios más estudios para aplicar programas de control adecuados.

Palabras clave: rumiante, *Fasciola hepatica*, equinococcosis, *Cysticercus tenuicollis*, mataderos, Argelia