Sheep brucellosis status in the region of Ksar El Boukhari, Médéa province, Algeria

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Summary

Background: In 2002, a large-scale serological survey conducted by the Algerian Ministry of Agriculture revealed that small ruminant brucellosis is endemic in Algeria. The national prevalence was 5.68% among small ruminant herds, and the herd prevalence exceeded 10% in the Steppic region, which includes Médéa province. To remedy this situation, a new prophylactic approach was adopted in 2006 based on mass vaccination using the Rev-1 vaccine. ***Aim***: The epidemiological status of small ruminants for brucellosis was investigated after three successive vaccination campaigns. ***Methods***: 144 blood samples from 87 small sheep herds, distributed over 17 villages, were taken and analysed for the detection of anti-*Brucella* antibodies using three serological tests. ***Results***: The results, processed by both buffered antigen and complement fixation tests, showed a prevalence at the village, herd, and animal levels of [11.76 ± 0.15]%, [4.59 ± 0.044]%, and [4.16 ±0,033]%, respectively. The results of the indirect ELISA test were slightly higher, especially for the village and animal level prevalence rates, which were estimated at [23.52 ± 0.2]% and [6.94 ± 0.042]%, respectively. Our study highlighted the endemic character of small ruminant brucellosis despite the ongoing efforts to control it. Furthermore, to complete and update the epidemiological data concerning bovine, ovine and caprine brucellosis, the results of serological tests covering 3,350 cattle, 354 sheep and 229 goats, spanning the period 2019-2023, were obtained. The seroprevalence of brucellosis in cattle, sheep and goats was respectively 0.8%, 14.85% and 36.72%. This highly alarming seroprevalence of caprine brucellosis was explained by the fact that the animals detected were linked to the cases of human brucellosis reported in this region. ***Conclusions:*** Brucellosis in small ruminants remains a threat not only to livestock production but also to public health. Algerian authorities must implement a control strategy through screening, culling, and vaccination, based on the prevalence of this disease.

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■ INTRODUCTION

Commonly known as undulant, Malta, or Mediterranean fever (Alhussain *et al*., 2024), brucellosis is an infectious and contagious zoonosis caused by a small facultative Gram-negative intracellular bacterium of the *Brucella* genus (Buttigieg *et al*., 2018). It continues to be a significant livestock and public health issue worldwide, particularly in many developing countries, including those in the Mediterranean basin (Sarrou *et al*., 2017; Dahmani *et al*., 2018), the Middle East (Al-Rawahi, 2015; Al-Sherida *et al*., 2020; Almuzaini, 2023), and India (Singh *et al*., 2015).

There are six historically recognized species of *Brucella* (Liu *et al*., 2020), *B. abortus*, *B. melitensis*. *B. suis*, *B. canis*, *B. ovis*, and *B. neotomae*. These affect numerous animal species, including livestock, companion animals, and rodents, mainly cattle and camels (Alhussain *et al*., 2022), small ruminants (Ebid *et al*., 2020), pigs, reindeer, hares, dogs, and desert woodrats, but also humans (Liu *et al*., 2020; Rajendhran, 2021). It is important to note that of the four species associated with human brucellosis, the most frequent and most harmful is *B. melitensis* (García-Méndez *et al*., 2019), which is chiefly connected with small ruminant brucellosis.

This devastating disease primarily spreads among animals through the ingestion of contaminated food and water, through venereal

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transmission, or by direct contact with the placenta, foetuses, or uterine fluids (Geletu *et al*., 2021; Natesan *et al*., 2021). As the treatment is neither financially feasible nor permitted by veterinary regulations, livestock diagnosed with brucellosis are culled and destined for stamping out, contributing to increased economic losses (Singh *et al*., 2015; Elderbrook *et al*., 2019).

This neglected disease is transmitted to humans through direct contact with infected livestock, as well as by consuming raw dairy products and undercooked meat from infected animals (Kardjadj, 2016, 2017; Alhussain *et al*., 2024). In humans, the main symptoms of brucellosis include high fever, myalgia, and arthralgia of large joints, whereas in animals the disease generally leads to abortion and sterility (Gabli *et al*., 2015). It can also lead to a variety of clinical presentations, such as fever and sepsis, and involve multiple organs in humans (Sohn et *al*., 2003; Lin *et al*., 2011).

Algeria occupies 10th place in the ranking of countries most affected by human brucellosis in the world (Dahmani *et al*., 2018), with an annual rate of between 8 and 50 human cases per 100,000 individuals. Brucellosis was initially classified as the second zoonosis in Algeria, after leishmaniasis. However, in 2007, it had risen to the top of the list of zoonotic diseases (Dahmani *et al*., 2018).

This situation led veterinary health authorities to introduce medical control measures for small ruminants in at-risk regions. The vaccination campaign was launched in 2006 in the Ksar El Boukhari area (Dahmani *et al*., 2018), which was chosen as our serological study area, and where several hundred human brucellosis cases were reported between 2003 and 2015.

Our serological study aimed to provide some epidemiological data on small ruminant brucellosis, and to discuss the strategies adopted to combat this major zoonosis, including screening, slaughter, and mass vaccination.

The main objective was to estimate the seroprevalence of brucellosis in prepubescent sheep in a region where three anti-*Brucella* vaccination campaigns had been implemented. The study took into account three hierarchical epidemiological units, namely the individual level, the herd level, and the village level.

■ MATERIEL AND METHODS

Study area

Our serological study was undertaken in the Ksar El Boukhari region, which is administratively part of the department of Médéa. The region is a plateau covering over 3,288 km^2 that is located between the mountain range of the Tellian Atlas in the north and the high plains of M'sila and Djelfa in the south. The climate is semi-Mediterranean, continental, cold and wet in winter, temperate in spring, and hot dry in summer. In winter, temperatures drop below -5°C, while in summer, they can exceed 45°C. The rainfall is irregular, and annual precipitation does not exceed 350 mm. The region has over 2,300 small ruminant herds, which are constituted by two important sheep breeds in Algeria, the Ouled-Djellal breed from the south-east and the Rembi breed from the south-west, and to a lesser degree by the Berber breed from the northern Tellian Atlas Mountains (Yahiaoui *et al*., 2013).

Sampling design

Our serological study was conducted using a cross-sectional simple random sampling design (Mwatondo *et al*., 2023), with sheep herds as the sampling units. The desired sample size for the study was calculated using the formula provided by Thrusfield (2007), with an expected herd prevalence rate of 15% (reported in previous studies as more than 10%) (Aggad & Boukraa, 2006), a confidence interval of 95%, and an absolute precision of 8%.

$$N = \frac{1{,}96^2(1-p_{exp})\,p_{exp}}{d^2} \quad \text{(equation 1)}$$

Where N is the total number of sheep herds; p_{exp} indicates expected herd prevalence; d means desired precision. The Z-value of 1.96 corresponds to a 5% risk as indicated in the standard normal distribution table: N (0, 1). According to this formula, 77 sheep herds needed to be sampled. To improve precision, 10 additional herds were included, bringing the total sample size to 87 herds. These 87 herds were from seventeen villages belonging to seven municipalities in the study region. These farms were eligible for enrolment based on spatial distribution and sedentary criteria. Those intended for reproduction were considered sedentary breeding farms. Farms intended for trade or fattening, regardless of whether the animals were male or female, were excluded, as were new animals which had just been acquired and introduced into the herd. All prepubescent animals from the 87 sedentary farms were included in the study (Table I).

Thirteen blood samples could not be analyzed as they had been altered during handling. The number and distribution of the samples that were analyzed are presented in Table I and Table II. Only two of the 87 herds had over 250 sheep, the other farms ranged between 50 and 150 heads. Most of these small-sized sheep farms also raised goats and had two or fewer prepubescent lambs (Table II).

Sample identification

The information relating to the sample, recorded on an Excel spreadsheet, was as follows: location of breeding, name of the breeder, age of the animal, number of animals on the farm, number of immature sheep, absence/presence of goats.

Processing of blood samples and serums

As the adult animal population had been vaccinated, animals could not be randomly sampled. To avoid the interference of vaccine antibodies with anti-*Brucella* antibodies, the investigation therefore focused exclusively on prepubescent animals which had not been

Table I: Number of samples analyzed in selected farms /// *Nombre d'échantillons analysés dans les exploitations prises en compte*

	Number of blood samples taken	Number of blood samples processed
Total	157	144
Altered blood samples	13	-

Table II: Number of lambs per farm /// *Nombre d'agneaux par exploitation*

Number of prepubescent	Number of farms concerned	Percentage	p-value
One	34	39.09%	0.000000001217
Two	42	48.27%	
Three	7	8.04%	
Four	2	2.30%	
Five	2	2.30%	
Total	87	100%	

previously vaccinated (Garin-Bastouji, 2003) to avoid the interference of vaccine antibodies with anti-*Brucella* antibodies.

Blood was drawn from the jugular vein using 5 ml syringes equipped with single-use needles. The blood was then poured into dry (vacuum) 5 ml glass tubes. The samples were transported in a commercial cooler to maintain cold conditions and were placed in the refrigerator until centrifugation; blood samples were generally centrifuged on the same day they were collected. The blood of the animals was collected in a dry tube, and the pre-identified tubes were left to decant at room temperature. The tubes were then centrifuged at 3000 rpm for 10 minutes, after which they were separated from the blood clot and frozen in Eppendorf tubes at -20°C.

The sera were then analysed using buffered antigen (Rose Bengal test), complement fixation, and indirect ELISA at the laboratories of the French Agency for Food, Environmental, Occupational Health and Safety (French acronym: ANSES).

Serological methods

The methods used in this study were the reference techniques suitable for detection of anti-*Brucella* antibodies. The diagnostic methods that were used by ANSES included:

Buffered antigen test (Pourquier lot 365-10), NFU47-003, NFU047-020, IDEXX instructions for the IDEXX Rose Bengal Brucellosis Antigen kit, FC (Pourquier lot 74), NFU47-004, NFU047-020, IDEXX instructions for the IDEXX Brucellosis kit, Antigen for Complement Fixation Test, Pourquier* CFT Brucellosis Ag, ELISA small ruminants, NFU047-020, NFU047-019, IDEXX supplier instructions (IDEXX, Brucellosis Serum).

Each test included negative and positive internal control sera following the NFU standard set by the French Accreditation Committee (COFRAC, 2019). The values of the samples and the positive control of the kit were corrected by subtracting the value of the negative control of the kit. The results are expressed as a percentage of optical density (OD%) relative to the corrected value of the positive control of the kit (Labo Ida, 2019).

Recent epidemiological data on ruminant brucellosis

To complete and update the epidemiological data on bovine, ovine and caprine brucellosis, we gathered the results of serological tests conducted on 3,350 cattle, 354 sheep, and 229 goats between 2019 and 2023. The seroprevalence of brucellosis in cattle, sheep, and goats was thus determined over this five-year period.

Statistical analysis

McNemar's test for paired data (Somes, 1985) was applied to compare the concordance between the three serological tests for anti-*Brucella* antibody detection, namely buffered antigen, complement fixation, and indirect ELISA tests. The difference was considered statistically significant when $p < 0.05$. The results of brucellosis serology were analysed using Open-source Software in R program 4.3.1 version (R Core team, 2023).

■ RESULTS

The analysis of the serological results indicates that six sera contained anti-*Brucella* antibodies using the Rose Bengal test and the complement fixation test (FC). The prevalence rate was found to be identical for both types of tests at [11.76 ± 0.15%]. The ELISA test revealed the presence of anti-*Brucella* antibodies in 10 out of 144 serum samples. The apparent individual prevalence is therefore [6.94% ± 0.42]%. Four farms from four villages presented a positive reaction out of the total number of farms sampled, which corresponded to a prevalence at the village level of [23.52 ± 0.2]%. The results are summarized in Table III. Regarding the screening tests used, the results obtained using the indirect ELISA test appear more sensitive than those from the Rose Bengal test and complement fixation (Table IV). The geographical distribution of positive animals tested by indirect ELISA is shown in Figure 1.

Seroprevalence of ruminant brucellosis over the period 2019-2023

The results of the seroprevalence study for bovine, ovine, and caprine brucellosis over the period 2019-2023 are summarized in Table V. It is evident that there is a highly significant annual fluctuation in the prevalence of brucellosis in ruminants, including cattle, sheep and goats. The seroprevalence of small ruminant brucellosis is clearly high, particularly in goats.

Table IV: Contingency table for comparison between the three serological tests used, via McNamer test /// *Tableau de contingence pour la comparaison entre les trois tests sérologiques utilisés, via le test de McNamer*

		Complement fixation and Rose Bengal Tests		
		Positives	Negatives	Total
Indirect ELISA	Positives	6	4	10
	Negatives	0	134	134
	Total	6	138	144
p-value = 0.1336				

Table III: Serological results using Rose Bengal, complement fixation, and indirect ELISA tests /// *Résultats sérologiques obtenus à l'aide des tests au Rose Bengale, en fixation du complément et en ELISA indirects*

Prevalence	Rose Bengal test	Complement fixation test	Indirect ELISA test
At the village level	2/17	2/17	4/17
	[11.76 ± 0.15]%	[11.76 ± 0.15]%	[23.52 ± 0.2]%
At the herd level (87 herds)	4/87	4/87	4/87
	[4.59 ± 0.044]%	[4.59 ± 0.044]%	[4.59 ±0.044]%
At the animal level (144 sheep)	6/144	6/144	10/144
	[4.16 ±0.033]%	[4.16 ±0.033]%	[6.94 ± 0.042]%

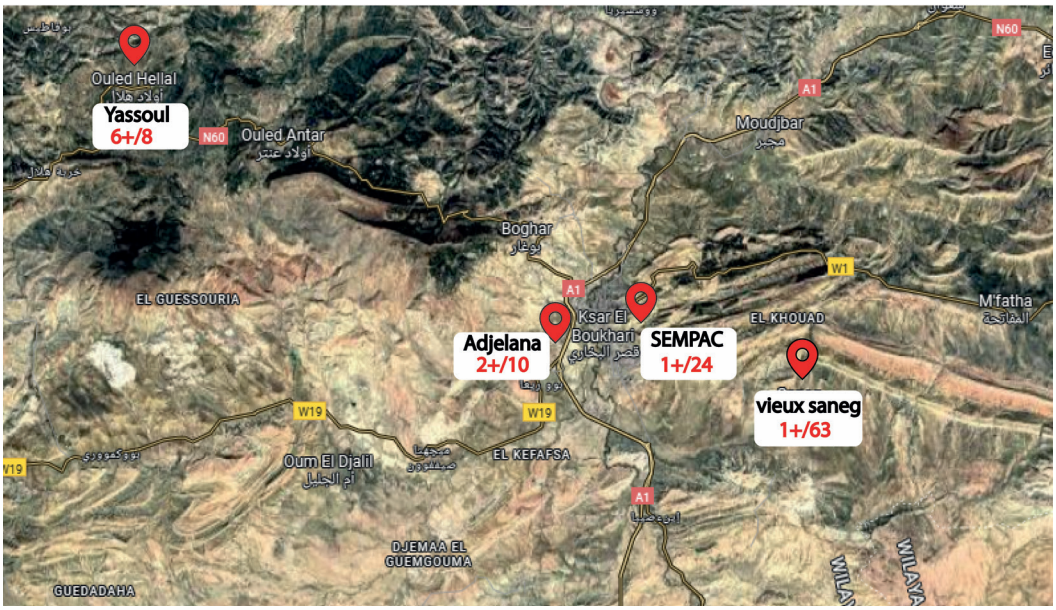

Figure 1: Spatial distribution of herds positive for the indirect ELISA test for brucellosis at the village level /// *Répartition spatiale des troupeaux positifs en ELISA indirect pour la brucellose au niveau du village*

Table V: Seroprevalence of Brucellosis over a five-year period (2019-2023) in cattle, sheep, and goats /// *Séroprévalence de la brucellose sur une période de cinq ans (2019-2023) chez les bovins, les ovins et les caprins*

Year	Cattle		Sheep		Goats	
	Number examined	Number and percentage of positives	Number examined	Number and percentage of positives	Number examined	Number and percentage of positives
2019	722	9 (1.25%)	0	0 (0%)	0	0 (0%)
2020	927	2 (0.21%)	66	24 (36.36%)	47	16 (34.04%)
2021	585	14 (2.39%)	48	4 (8.33%)	90	41 (45.55%)
2022	512	2 (0.39%)	24	1 (4.17%)	79	25 (31.64%)
2023	604	0 (0%)	91	5 (5.49%)	138	21 (15.21%)
Total	3350	27 (0.8%)	229	34 (14.84%)	354	103 (29.09%)
	p-value = **6.092e-06**		p-value = **3.65e-05**		p-value = **0.002752**	
The difference of prevalence between the three ruminant species (p-value**< 2.2e-16**)						

■ DISCUSSION

This survey, the first of its kind in Algeria, aimed to assess the prevalence of anti-*Brucella* antibodies in prepubescent sheep. It provides a precise estimate of the level of *Brucella* infection in small ruminant herds. The animals included were all prepubescent. Animals in this category, even if they have been vaccinated with anti-brucella *Rev-1* vaccine by eye, rid themselves of the vaccine antibodies six months later. This makes it possible to detect *Brucella* infection if there are presence of antibodies, they cannot result only from *Brucella* infection (Garin-Bastuji, 2003). The antibody levels in serum provide interesting evidence of the circulation of these bacteria in small ruminant farms, as they appear early after natural infection and persist for an extended period (corresponding to the entire economic lifespan of the goats).

The results of the serological analysis of the buffered antigen test appear to be similar to those of the complement fixation test, with six positive results, while 10 sera tested positive for the indirect ELISA. We found two (four with ELISA) positive breeding farms in two completely different locations. The first was in the Adjlana district, situated in the southern part of the commune of Ksar El Boukhari (1 positive out of 10 samples). This single positive case (1+/10) was likely due to the introduction of an infected animal purchased at the Adjlana district (Keb commune) livestock market. The breeders living around the market also tend to be horse dealers. The second positive breeding farm was located in the village of Yassoul (municipality of Ouled Hellal), situated in a remote, mountainous area located northwest of Ksar El Boukhari. Six animals were positive out of the eight sampled. Given the sedentary nature of the farms, the lack of contact with transhumance routes, and the abstention of breeders or even veterinarians from vaccinating these animals due to the difficulty in reaching them, the positive cases may reflect the persistence of brucellosis in this village.

The apparent individual prevalence is therefore [4.16 ± 0.033]% according to the buffered antigen test, [4.16 ± 0.033]% according to the complement fixation test, and [6.94 ± 0.042]% according to the indirect ELISA test. However, these figures do not represent reality, given that of the two positive herds, the first had (1+/10 animals) and the second had (6+/8 animals), which necessarily distorts the average. Let us imagine that we only had 16 localities; in that case, the individual prevalence would be less than 1% instead of 4%.

The analysis of the results shows a village prevalence of [11.76 ± 0.15]% according to the Rose Bengale test, [11.76 ± 0.15]% according to the complement fixation test, and [23.52 ± 0.2]%

according to indirect ELISA. The herd prevalence was found to be [4.59 ± 0.044 2]% by the buffered antigen test, FC, and indirect ELISA. The confidence interval for village prevalence is wider than that for herd prevalence because it is based on data from 17 villages compared to 87 herds. The size of the sample is closely linked to the precision of the results (Toma *et al*., 2008), when the N (size of the sample) is large, the deviation from the mean becomes small.

What could be the significance of the apparent herd prevalence of [11.76 ± 0.15]% (Rose Bengal test) in the context of three years of mass vaccination? To be able to make a decision, it would have been necessary to have data on the situation before 2006, meaning prior to the first vaccination campaign. However, we have no recent figures, apart from the large-scale survey conducted in 2002 by the Direction of Veterinary Services (DSV), as reported by Lounes (2009). This survey was carried out in 14 wilayas located further south in the study region, and involved a sample of approximately 4,000 herds. To be able to compare these results with ours, it would have been necessary to know the number of animals taken from each herd, the sampling method used, and the criteria for selecting the sampled herds. In this respect, it would be interesting to assess the prevalence of infection in three or four years in the same breeding region.

In Maghreb and Mediterranean literature, some cross-sectional surveys have been reported, although the study conditions and objectives were not entirely similar. However, it has been reported that the prevalence in sheep flocks in one region in Morocco was around 12.1% (Benkirane, 2006) and 30% in Gafsa, Tunisia (Refai, 2002).

In Greece, a national brucellosis epidemiological surveillance program indicated that herd prevalence had once reached 27% (out of 11,949 herds and 904,134 animals), prompting the health authorities to introduce vaccination (Menachem, 2002). Fifteen years of vaccinating young animals (sheep and goats aged 3 to 6 months) followed, which made it possible to significantly reduce the level of abortion as well as the incidence of human brucellosis. From then on, the authorities had the impression that the disease was under control, with very low rates of *Brucella* abortions. The decision was then made to move to the scout-slaughter strategy.

Unfortunately, the prevalence of animal brucellosis increased rapidly, leading the health authorities to resume vaccinations for young people and adults four years later. The incidence of human cases decreased again when the average animal vaccination rate exceeded 30% (Minas *et al*., 2004). Nearly two decades later, in 2022, *Brucella* bacteria continue to circulate throughout Greece in both livestock and humans (Katsiolis *et al*., 2022).

In the present study, the buffered antigen and complement fixation tests did not show any difference in sensitivity (Table IV). The buffered antigen test is a very sensitive test that can detect infection early, however, it has some specificity defects (false positives in disease-free herds). Its high sensitivity makes the test an excellent surveillance method given its ability to detect infected flocks (Philippon & Garin, 2005).

While the complement fixation test is not very sensitive, it is widely used for the confirmation of brucellosis. It should be noted that we cannot determine the phase of disease evolution based on the type of antibodies present, as the kinetics of different antibody classes is not consistent and can vary from one individual to another. When vaccinated by eye, antibodies appear quickly and disappear after 6 months. When vaccinated subcutaneously, antibodies appear late and remain longer. It is therefore late positive and remains positive for longer (Gupte & Kaur, 2015).

Our study showed that the simultaneous use of two or more serological tests (Ramdani *et al*., 2022), such as the buffered antigen, complement fixation, and indirect ELISA tests, can help overcome the current limitations for *Brucella* detection despite the non-statistically significant (two tailed p-value=0.1336) higher sensibility of the indirect ELISA test (Xu *et al*., 2023).

The results are less precise than initially expected due to the fact that our sample included an insufficient number of herds. This lower precision affects the confidence interval of the results, which became slightly larger (Thrusfield, 2007).

Nevertheless, this proves that brucellosis is a re-emerging disease (Garin-Bastuji *et al*., 2014; Akkou *et al*., 2023) and remains prevalent in both livestock and humans (Dahmani *et al*., 2018; Bennadji *et al*., 2024), alongside other abortive diseases, such as Q fever, which are significant for both economic and public health (Khaled *et al*., 2016).

Another limiting factor in this study was the relatively low number of prepubescent young per herd (Table II). This low proportion of prepubescent animals on farms can be explained not only by the more or less high rates of abortion and other health issues affecting young animals (lamb dysentery, etc.), but also by the fact that lambs are sold at all ages, especially during the Eid el-Kerber period. This is why we have not always been able to access the number of animals needed for brucellosis monitoring and surveillance (Suresh *et al*., 2023).

When a disease being investigated is "rare", we know that the sample size should be large. In future surveys, we should therefore target the period preceding the Eid el-Kebir holidays to find a greater number of prepubescent lambs per flock.

We considered that herds from the same village constituted a single epidemiological entity (Suresh *et al*., 2023). Indeed, although these herds are sedentary, they graze together in the locality (use of the same water points, exchange of rams). This approach, based on the concrete realities of the field conditions, made it possible to obtain more precise results.

Furthermore, the results of the serological tests for bovine, ovine and caprine brucellosis, obtained over a five-year period covering 2019 to 2023, made it possible to complete and update the epidemiological data for ruminant brucellosis. These recent data show that Brucella seroprevalence varies widely, but goats, which are the main source of human brucellosis, are particularly affected. For example, the overall prevalence of goat brucellosis over the five years exceeded 29% (Bennadji *et al*., 2024: Yahiaoui & Dahmani, 2024).

In a region bordering Kasr Boukhari, Bennadji *et al*. (2024) reported a worryingly high seroprevalence of human brucellosis. The primary mode of transmission to humans was through the consumption of raw milk and artisanal dairy products (Bennadji *et al*., 2024; Ilyas *et al*., 2024).

To effectively combat brucellosis in both animals and humans, it is essential to first increase the rate of serological screening, using reliable diagnostic methods such as indirect ELISA. The next steps depend on the prevalence of brucellosis. In heavily infected herds, the screening/vaccination process should be encouraged. On the other hand, in farms with low levels of infection, screening and slaughter could be carried out. In all cases, vaccination against animal brucellosis is crucial to not only reduce economic losses, but also protect public health (Moriyón *et al*., 2023).

■ CONCLUSION

The seroprevalence survey, carried out in the steppe region of Ksar El Boukhari, a junction and major marketplace for small ruminant breeding in central Algeria, demonstrated that the infection rate remains high.

The use of screening tests followed the recommendations of the World Organisation for Animal Health (WOAH) for highly infected environments. In small ruminants, WOAH recommends starting the search for anti-Brucella antibodies with the buffered antigen test (commonly known as the Rose Bengal test). In cattle, this test should be confirmed using a complement fixation test to reduce the proportion of false positives. Indirect ELISA is the most sensitive and specific test available; however, it remains expensive and is not currently used routinely for large-scale screening. This serological study in prepubescent lambs highlights the endemic character of animal brucellosis, which poses a threat to public health.

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Conflict of interest

The study was carried without any conflict of interest.

Author contributions

KS: Design, writing, statistical analyses and revision of drafts. AD: sampling, serological diagnostic as clinical researchers.

Ethics approval

All the animal studies were conducted with consideration for animal welfare, and all animal rights issues were observed in an appropriate manner. Throughout the study, no sheep suffered. Examinations and sampling of cattle were carried out following the guidelines of the Institutional Animal Care Committee of the Algerian Higher Education and Scientific Research (Agreement Number 45/DGLPAG/DVA.SDA.14).

Data availability

The data were not deposited in an official repository. The data that support the study findings are available from the authors upon request.

Declaration of Generative AI in the writing process

The authors did not use any artificial intelligence-assisted technologies in the writing process.

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Résumé

Saidani K., Dahmani A. Situation épidémiologique de la brucellose ovine dans la région de Ksar El Boukhari, province Médéa Algérie

Contexte : En Algérie, un programme de contrôle contre la brucellose est appliqué depuis 1995. En 2002, une vaste enquête sérologique menée par le ministère algérien de l'agriculture, a révélé le caractère endémique de la brucellose des petits ruminants en Algérie, avec une prévalence nationale des troupeaux de petits ruminants de 5,68% au niveau national et une prévalence de plus de 10% dans la région steppique incluant Médéa. En 2006, pour remédier à la situation, une nouvelle approche prophylactique basée sur la vaccination de masse avec le vaccin Rev-1 a été adoptée. ***Objectif*** : Le statut épidémiologique des petits ruminants vis-à-vis de la brucellose a été étudié après trois campagnes de vaccination successives. ***Méthodes*** : 144 échantillons de sang provenant de 87 troupeaux ovins de petite taille, répartis dans 17 villages, ont été prélevés et analysés pour la détection des anticorps anti-Brucella, à l'aide de trois tests sérologiques. ***Résultats*** : Les résultats, obtenus à la fois par le test de l'antigène tamponné et le test de fixation du complément, ont montré une prévalence au niveau du village, du troupeau et de l'animal de [11,76 ± 0,15] %, [4,59 ± 0,044] % et [4,16 ± 0,033] %, respectivement. Les résultats du test ELISA indirect étaient légèrement plus élevés, notamment pour les taux de prévalence au niveau du village et de l'animal, estimés respectivement à [23,52 ± 0,2] % et [6,94 ± 0,042] %. Notre étude a mis en évidence le caractère endémique de la brucellose des petits ruminants malgré les efforts déployés pour la contrôler. Par ailleurs, pour compléter et actualiser les données épidémiologiques concernant la brucellose bovine, ovine et caprine, les résultats des tests sérologiques portant sur 3 350 bovins, 354 ovins et 229 caprins, couvrant la période 2019-2023, ont été obtenus. La séroprévalence de la brucellose chez les bovins, les ovins et les caprins était respectivement de 0,8 %, 14,85 % et 36,72 %. Cette séroprévalence très alarmante de la brucellose caprine s'explique par le fait que les animaux détectés étaient liés aux cas de brucellose humaine signalés dans cette région. ***Conclusions :*** La brucellose des petits ruminants reste une menace non seulement pour la production animale mais aussi pour la santé publique. Les autorités algériennes doivent mettre en œuvre une stratégie de contrôle par le dépistage, l'abattage et la vaccination, en fonction de la prévalence de cette maladie.

Mots-clés : ovin, brucellose, morbidité, surveillance épidémiologique, vaccination, Algérie

Resumen

Saidani K., Dahmani A. Situación epidemiológica de la brucelosis ovina en la región de Ksar El Boukhari, provincia de Medea, Argelia

Contexto: En Argelia se aplica un programa de control contra la brucelosis desde el 1995. El 2022 una amplia investigación serológica, llevada a cabo por el Ministerio de Agricultura argelino, reveló el carácter endémico de la brucelosis de los pequeños rumiantes en Argelia, con una prevalencia nacional en los rebaños de pequeños rumiantes del 5,68 % a escala nacional y una prevalencia de más del 10 % en la región esteparia que incluye Médéa. El 2006, para remediar la situación, se adoptó un nuevo enfoque profiláctico basado en la vacunación masiva con la vacuna Rev-1 a. ***Objetivo***: Se estudió el estado epidemiológico de los pequeños rumiantes ante la brucelosis después de tres campañas de vacunación sucesivas. ***Métodos***: Se tomaron 144 muestras de sangre provenientes de 87 rebaños ovinos de talla pequeña, repartidos en 17 pueblos, y se analizaron para detectar los anticuerpos anti-Brucella, mediante tres pruebas serológicas. ***Resultados***: Los resultados, obtenidos a la vez por la prueba del antígeno tamponado y la prueba de fijación del complemento, mostraron una prevalencia a escala del pueblo, del rebaño y del animal de [11,76 ± 0,15] %, [4,59 ± 0,044] % y [4,16 ± 0,033] %, respectivamente. Los resultados de la prueba ELISA indirecta fueron ligeramente más elevados, especialmente para las tasas de prevalencia a escala del pueblo y del animal, estimadas respectivamente en [23,52 ± 0,2] % y [6,94 ± 0,042] %. Nuestro estudio puso en evidencia el carácter endémico de la brucelosis de los pequeños rumiantes a pesar de los esfuerzos desplegados para controlarla. Además, para completar y actualizar los datos epidemiológicos relacionados con la brucelosis bovina, ovina y caprina, se obtuvieron los resultados de las pruebas serológicas llevadas a cabo en 3 350 bovinos, 354 ovinos y 229 caprinos, durante el período 2019–2023. La seroprevalencia de la brucelosis en bovinos, ovinos y caprinos fue respectivamente del 0,8 %, 14,85 % y 36,72 %. Esta seroprevalencia tan alarmante de la brucelosis caprina se explica por el hecho de que los animales detectados estaban relacionados con casos de brucelosis humana señalados en esta región. ***Conclusiones:*** La brucelosis de los pequeños rumiantes continúa siendo una amenaza para la producción animal, pero también para la salud pública. Las autoridades argelinas deben aplicar una estrategia de control para la detección, el sacrificio y la vacunación, en función de la prevalencia de esta enfermedad.

Palabras clave: ovino, brucelosis, morbilidad, vigilancia de enfermedades, vacunación, Argelia