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Original article

SEROLOGICAL DETECTION OF SMALL RUMINANT LENTIVIRUS INFECTION IN BABYLON GOVERNORATE, IRAQ

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Summary

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Small ruminant lentivirus (SRLV) is a chronic and widespread infection among sheep and goats worldwide, leading to significant economic losses. Therefore, there is growing concern about screening for this disease, particularly in Iraq. This study aimed to detect SRLV infection in sheep and goats in Babylon Governorate, Iraq. Laboratory examinations were conducted on 110 blood samples collected from 58 ewes and 52 goats, as well as on 68 milk samples collected from 26 ewes and 42 goats from all regions of Babil Governorate, Iraq. The results revealed that 24 out of 110 blood samples tested positive for SRLV infection (21.81%). The prevalence of SRLV-positive cases was 24.13% in sheep (14/58) and 19.23% in goats (10/52). Additionally, 4 out of 68 milk samples tested positive for SRLV infection (5.88%). Among sheep, none of the 26 milk samples was positive, while 9.52% of goat milk samples (4/42) were positive. There were no significant differences between the occurrence of SRLV infection in blood and milk samples. Regarding gender differences, the serological test results indicated no significant difference between males and females. The infection rates were 25% in female sheep, 21.05% in female goats, 20% in male sheep, and 14.28% in male goats. However, significant differences ($P \leq 0.05$) were observed between different age groups. The highest infection rate was observed in sheep aged over five years (35.71%; 5/14) and between 3 and 5 years of age (35% or 7/20). In contrast, lower infection rates were observed in sheep <1 year (6.25%; 1/16) and between 1 and 3 years (12.5% or 1/8). Among goats, the highest infection rate was found in animals aged over five years (40% or 4/10). There were no significant differences observed in respiratory and pulse rates, and body temperature in relation to seroprevalence rates in this study. However, the differences among other accompanying clinical signs were significant. The results provide the first serological and clinical detection of SRLV infection in sheep and goats in Iraq.

Key words: Iraq, lentivirus, serological, small ruminants

INTRODUCTION

Small ruminant lentiviruses (SRLVs) belong to the lentivirus subfamily of retroviruses (Lara *et al*., 2005). They can cause several syndromes such as encephalomye-

litis in young goats and chronic progressive arthritis, pneumonia and mastitis in adult goats (Angelopoulou *et al*., 2008). The spread of the disease in goats and sheep all over the world is a major concern, especially in developed countries, where the infection rate reaches 80% to 95% (Jesse *et al*., 2018). There are many ways to transmit the virus, including transmission through body secretions, contact, and swallowing colostrum infected with the virus by young newborns, or it can be transmitted from sheep to goats or vice versa (Shah *et al*., 2004; Al-Qudah *et al*., 2006). There is a wide range of differences among various countries in the prevalence of SRLV worldwide. Infection rates may be as high as 82% in Australia and 73% in the United States, or low as 3.6% in Mexico and 1.9% in Turkey (Al-Qudah *et al*., 2006). In their study in Iraq, Hamzah & Mosa (2020) showed a seroprevalence rate of CAEV infection of 8.69% in goats only and no molecular surveys were performed to diagnose the disease. Most infected goats are asymptomatic, but others can exhibit long-lasting clinical symptoms such pneumonia, arthritis and mastitis (Angelopoulou *et al*., 2008; Mosa *et al*., 2020). The vaccine or treatment are not effective against SRLVs. The supportive therapy is usually expensive (Schultz *et al*., 2020). SRLVs infection leads to a substantial decrease of productivity and causes economic losses (Jacob-Ferreira *et al.,* 2023). Therefore, for its diagnosis it is necessary to use a responsive rapid and fast process. Recent studies showed that serological methods such as ELISA for rapid SRLVs detection in clinical cases have high sensitivity and specificity (Hamzah & Mosa, 2020; Potârniche *et al.*, 2023).

MATERIALS AND METHODS

This study was supported by the Scientific Committee of the Department of Internal Medicine and Preventive Medicine of the College of Veterinary Medicine, Al-Qasim Green University, No. 78-2021.

The study included 110 blood samples collected from 58 sheep and 52 goats and 68 milk samples collected from 26 sheep and 42 goats, selected from different regions in Babylon, Iraq from October 2022 to March 2023.

Temperature, pulse rate, respiration rate, and clinical manifestations such as emaciation, mastitis, arthritis, cough, excitation and dyspnea were registered for each animal in the specific form chart prepared for this purpose.

Through the use of vacutainer tubes, peripheral blood samples were aseptically drawn from the jugular vein and maintained and transported to the laboratory in ice box. Blood samples (5 mL) were collected with gel tubes without EDTA for serum separation. Sera were obtained by centrifugation of blood samples at 1200 rpm for 10 min, then aliquoted in 1.5 mL Eppendorf tubes and stored at –20 ^{o}C until further test.

Milk samples were aseptically collected from the udder by vacutainer tubes system, preserved and transported in ice box until arrival to the laboratory. All serum and milk samples were submitted to indirect ELISA for detection of the presence of anti-SRLV glycoprotein 135 (gp135) and protein 25 (p25) antibodies against SRLV on commercially available micro plates, according to the manufacturer's recommendations (IDVet France).

Statistical analysis of data was done using SPSS v. 25 with P-value of 0.05 as level of significance.

RESULTS

The results showed that 24 out of 110 blood samples collected from 58 sheep and 52 goats gave a positive reaction (21.81%). The percentage of SRLV-positive animals for each species was 14/58 (24.13%) for sheep and 10/52 (19.23%) for goats (Table 1). Four out of 68 milk samples (Table 2) collected from 26 sheep and 42 goats gave a positive reaction (5.88%). The SRLV-positive samples were only from goats (4/42; 9.52%).

There were no sex-significant differences in relation to the susceptibility to SRLV (Table 3). In sheep the infection rate in males was 2/10 (20%) and in females: 12/48 (25%). In goats the respective infection rate in males was 2/14 (14.28%) and in females – 8/38 (21.05%).

All age groups were infected by SRLV at various rates except for goats younger than one year with significant differences

Table 1. Distribution of SRLV-positive sheep and goat according to blood samples

Animals	Total tested	Seropositive	Prevalence, %
Sheep	58	14	24.13
Goat	52	10	19.23
Total	110	24	21.81
X^2		0.387057	
P value		0.533850	

Table 2. Distribution of SRLV-positive sheep and goat according to milk samples

Animals	Total tested	Seropositive	Prevalence, %
Sheep	26	0	0
Goat	42	4	9.52
Total	68	4	5.88
X^2		2.630952	
P value		0.104799	

Table 3. Small ruminant lentivirus seroprevalence (ELISA) in sheep and goats according to sex

Sex	Total tested	Seropositive	Prevalence, %
Sheep			
Males	10	2	20.00
Females	48	12	25.00
Total	58	14	24.13
X^2		0.112987	
P value		0.736769	
Goats			
Males	14	2	14.28
Females	38	8	21.05
Total	52	10	19.23
X^2		0.301611	
P value		0.582874	

Table 4. Small ruminant lentivirus seroprevalence (ELISA) in sheep and goats according to age

Esatimated age (years)	Total tested	Seropositive	Prevalence, %
Sheep			
<1	16	1	6.25 [a]
1 to 3	8	1	12.50 [b]
3 to 5	20	7	35.00 [c]
> 5	14	5	35.71 [c]
X^2		1.78	
P value		0.037	
Goats			
<1	0	0	0
1 to 3	20	2	10.00 [a]
3 to 5	22	4	18.18 [b]
> 5	10	4	40.00 [c]
X^2		1.66	
P value		0.032	

Note: prevalence rates with different superscripts are statistically significantly different (P<0.05).

Table 5. Clinical parameters of small ruminants according to lentivirus seroprevalence

Clinical parameters	SRLV positive (n=24)	SRLV negative (n=86)	P value
	Range (Mean ±SEM)	Range (Mean ±SEM)	
Body temperature (^oC)	38.4–41.9 (40.05±0.12)	38.3–41.5 (40.01±0.3)	0.16
Pulse rate (min^{-1})	72–91 (84.63±1.09)	71–91 (75.04±0.38)	0.5104
Respiratory rate (min^{-1})	27–57 (41.76±1.33)	25–53 (40.66±0.14)	0.1602

(P≤0.05) between old and young ages. Higher infection rates were recorded in sheep aged more than five years: 35.71% (5/14) and in those between 3 and 5 years: 35% (7/20), while lower infection rates of 6.25% (1/16) and 12.5% (1/8) were recorded in animals < 1 year and 1 to 3 years of age, respectively. Similarly, a higher infection rate was recorded in goats aged more than five years – 40% (4/10), followed by those aged from 3 to 5 years – 18.18% (4/22) and from 1 to 3 years – 10% (2/20) (Table 4).

All animals with chronic respiratory symptoms and other clinical signs indicative of this disease were examined. There were no significant differences with regard to body temperature, pulse and respiratory rates in sheep and goats infected with SRLV virus compared to seronegative animals (Table 5). The clinical examination performed in all goats and sheep showed significant differences (P<0.01) in the prevalence of emaciation, cough, dyspnea, mastitis, neurological signs and arthritis with incidence of 22

Table 6. Clinical manifestations of SRLV infection in 24 seropositive sheep and goats

Clinical signs	Affected No./ total No.	%
Emaciation	22/24	91.66 [a]
Cough	19/24	79.16 [b]
Dyspnea	11/24	45.83 [c]
Mastitis	1/24	4.16 [d]
Nervous signs	1/24	4.16 [d]
Arthritis	1/24	4.16 [d]
X^2	82.046	
P value	0.000	

Note: rates with different superscripts are statistically significantly different ($P<0.05$).

(91.66%), 19 (79.16%), 11 (45.83%), 1 (4.16%), 1 (4.16%), 1 (4.16%) respectively (Table 6).

DISCUSSION

The indirect SRLV ELISA screening test is a rapid and reliable method for diagnosing SRLV in both blood and milk samples with higher specificity than sensitivity. The results of this study are consistent with a previous research conducted in Iran by Dousti *et al.* (2020). The overall prevalence of SRLV infection in the studied herd was 21.81%, with individual seroprevalence in sheep of 24.13% and non-significanly different seroprevalence in goats of 19.23%.

Compared to other countries that used the same commercial indirect ELISA kit for SRLVs, the infection rate in sheep in certain areas of Babil Governorate, Iraq, was found to be higher. For example, Costa Rica, Ethiopia, and the Czech Republic reported infection rates of 2%, 3.2%, and 3.4% respectively (Villagra-Blanco *et al.,* 2015; Bartak *et al.,* 2018; Yizengaw *et al.,* 2020). In Lebanon, one study reported much higher seropositivity rates of 71% for individuals and 100% for herds (Tabet *et al.,* 2017). Similarly, in Canada, the infection rates per individual and herd were 46% and 35% respectively (Heinrichs *et al.,* 2017)

The seropositivity rate in sheep and goats with clinical signs in this study was 21.81%, which is lower than the reported rate of 38.8% in Saudi Arabia (Taha *et al.,* 2015). However, the seropositive rate in the Babylon Governorate of Iraq was not significantly higher than that in Serbia (13.2%; Savic *et al.,* 2020) and the Czech Republic (14.1%; (Bartak *et al.*, 2018).

This study is the first to detect the presence of the virus in milk, with an infection rate of 0% in sheep and 9.52% in goats. When compared to other studies, these rates were lower than those reported from Norway, Kosovo, and Algeria, with rates of 15.6%, 29.7%, and 86% respectively (Idres *et al.,* 2019).

CONCLUSIONS

The clinical signs such as arthritis, encephalitis and emaciation were not pathognomonic for this disease. The percentage of SRLVs in some regions of Babylon governorates, Iraq was higher as compared to some neighbouring countries. Susceptibility of Iraqi local breeds of goats and sheep to SRLVs infection was confirmed. There was no association between sex and SRLVs percentage. All age groups were infected by SRLVs, and infection prevalence increased with with age.

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