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SEROLOGICAL EVIDENCE OF COXIELLOSIS IN SHEEP FARMS OF NAMIBIA

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Q fever (Query fever) is a zoonotic disease caused by *Coxiella burnetii* infection, which is an obligate gram negative intracellular bacterium (Lai et al., 2014). Its preferred target host cells are tissues, macrophages and circulating monocytes. Domestic ruminants, a wide variety of domestic and wild animal species are implicated as reservoirs for most human infections (Matthewman et al., 1997; Sellens et al., 2016). Transmission to humans and other animals commonly occurs by contact with animal after births or by pathogen-contaminated dust or aerosols, via tick bites or contaminated milk ingestion (Anderson et al., 2015; Njeru et al., 2016). Coxiellosis in domestic ruminants causes abortions and stillbirths, resulting in significant economic losses (Anderson et al., 2015; Joulie et al., 2015). In the some studies, sero-prevalence figures in cattle (7.4-51.1%), sheep (6.7-20.0%), camels (20.0-46.0%) and goats (20.0-46.0%) revealed variation based on eco-regions and year of study (Njeru et al., 2016). The primary objective of this study was to establish whether or not coxiellosis present in the study area.

This study was carried out on farms from major sheep and goat producing areas in Karas and Hardap regions of southern Namibia. In 2014, Karas had 750000 sheep, 251000 goats and 73000 cattle on 1218 farms whereas Hardap had 107000 cattle, 794000 sheep and 106000 goats on 1404 farms (Anon. 2014). Both regions have arid to desert conditions and experience very low rainfall with an annual precipitation between 12 and 248 mm (Anon. 2017). Livestock are raised under extensive free range with an average farm size of 7300 ha in commercial and communal farms (with shared grazing).

Farms were selected by systematic random sampling from a list of 450 farms that participated in the European Union export scheme in 2016. The sample size was calculated using the formula:

$$n = [1 - (1-\alpha)^{1/D}] \times [N - (D-1)/2]$$

where, n is the sample size; N is the population size; D is the number of positives in the population and α is the desired confidence level (Cannon and Roe, 1982).

The sample size was designed to detect at least one positive animal for the presence of Q fever antibodies (with 95% confidence) if the sero-prevalence is 10% in the target group, assuming 100% sensitivity and 100% specificity for the ELISA test used (IDEXX, 2011). Samples from six farms in Karas and three farms in Hardap were retrieved from Serum Bank, Central Veterinary Laboratory, Windhoek. The predominant sheep breeds on the study farms were Dorper, Van Rooy and Karakul.

Seven out of the nine farms tested positive, giving a herd level prevalence of 78%. However, the numbers

of farm tested were low and may not be representative of all the 2622 farms in the two regions. Besides, at farm level, there was evidence of clustering and wide variation of sero-positivity with some farms showing positives ranging from 2.7 to 68.7%. Overall, animal level prevalence was 17.6% (Table 1). These findings are consistent with other investigators who found the prevalence to range from 6.7-20% in sheep (Njeru et al., 2016); 11.0-33.0% in small ruminants (Vanderburg et al., 2014) and 18.9% in sheep (Psaroulaki et al., 2006). Some suspect cases were detected from farm 2 and 3. Since the suspect animals were not identified individually, but only as a group and their herd mates tested positive, suspects were classified as positive.

Table 2: Seroprevalence of coxiellosis in sheep farms of Namibia

Factor	No. tested	% Positive	% Suspected
Overall	273	17.60	4.00
Karas region	**184**	**24.46**	**5.98**
Farm 1	35	5.70	0.00
Farm 2	35	68.60	14.00
Farm 3	37	2.70	16.00
Farm 4	34	0.00	0.00
Farm 5	36	47.20	0.00
Farm 6	7	14.30	0.00
Hardap region	**89**	**3.37**	**0.00**
Farm 7	22	0.00	0.00
Farm 8	34	2.90	0.00
Farm 9	33	6.10	0.00
Age (year)*			
Young	**15**	**40.00**	**0.00**
<1	6	50.00	0.00
1-1.5	9	33.33	0.00
Adult	**124**	**32.00**	**0.00**
1.5-2.0	13	15.40	0.00
2.0-3.0	62	38.70	0.00
>3.0	49	26.50	0.00

** Only cases with age record were considered*

The Chi-square analysis showed that significantly greater proportion of animals less than one year of age were positive for *C. burnetii* antibodies (P<0.05). However, the number of animals in this age group was low. An odds ratio of 1.45 (95% CL: 0.48-4.37 at P>0.05) showed that the younger animals were 1.45 times more likely to be seropositive for *C. burnetii* than adult animals. The sero-positive lambs might have acquired the antibodies from colostrum or as a consequence of natural infection. The number of positive animals aged 1.5-2.0 years was relatively low (15.4%). The older (2-3 year) animals showed a high prevalence (38.70%) possibly due to prolonged exposure to the disease. However, lower prevalence in 3-4 year-old animals compared to 2-3 year old animals, did not support prolonged exposure as a reason for increased sero-positivity but might have, resulted from the waning of antibody titres over time. The 2-3 year-old animals were sexually active and being used for breeding purposes so the pathogen is likely to be highest among this category. Joulie et al. (2015) also found more pathogen burdens in younger and primiparous females than older multiparous females.

The study established the existence of *C. burnetii* in sheep flocks of southern Namibia. However, risk factors such as sex, breed, species and region of origin as well as zoonotic, biological or economic impact of coxiellosis could not be assessed. It is recommended that the above issues be investigated in future studies. Education of farmers, farm personnel and veterinarians on the occupational risks associated with the disease and where feasible introduction of control measures such as vaccination and composting of manure are advocated (Taurel et al., 2014; Joulie et al., 2015).

SUMMARY

A retrospective serological study was performed to establish the presence of Q fever in Namibian sheep flocks using 273 sheep sera sampled from six farms from Karas and three farms from Hardap. The overall seroprevalence of coxiellosis in the nine farms investigated was 17.6%. The seroprevalence of *Coxiella burnetii* infection in these animals ranged non-significantly from 15.4 (1.5-2.0 year-old) to 50.0% (<1.0 year old). Younger group of animals, however, was 1.45 times more sero-positive than the older group. Further studies on the impact of sex, breed, species and geographical region of origin as well as determination of the zoonotic, biological or economic impact of coxiellosis are advocated.

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