

TITLE:

A Serological Survey of Eight Infectious Diseases in a Population of Free Ranging Deer (*Cervus timorensis russa*) in Mauritius

AUTHORS AND DETAILS:

Roger, M. ^(1,2), Sauzier, J. ⁽³⁾, Jaumally, M.R. ⁽⁴⁾, Jori, F. ^(1,5)

⁽¹⁾ International Centre for Research, Development and Agronomy (CIRAD), Montpellier, France.

⁽²⁾ Centre for Research and Intelligence of Emerging Diseases in the Indian Ocean (CRVOI), Sainte Clotilde, Reunion.

⁽³⁾ Mauritian Deer Farming Cooperative Society Ltd, Curepipe, Mauritius.

⁽⁴⁾ Division of Veterinary Services, Reduit, Mauritius.

⁽⁵⁾ Mammal Research Institute, Department of Zoology and Entomology, University of Pretoria, South Africa.

Email: Roger, M. matthieu.roger@cirad.fr; Sauzier, J. mdfcs1@intnet.mu; Jaumally, M.R. jaumally@intnet.mu; Jori, F. ferran.jori@cirad.fr

ABSTRACT:

Rusa deer (*Cervus timorensis russa*) is the most important red meat production of Mauritius. More than 70.000 heads are exploited annually for 440 tones of venison. This survey was undertaken in 2007 in order to update the status of the Mauritian deer population for eight infectious diseases, since no systematic health survey had been performed in the last ten years. A total of 369 deer from 28 extensive herds were randomly sampled during hunting operations. Male deer were more represented than females whereas the age distribution was balanced. Positive results were found for bovine tuberculosis (one case of *Mycobacterium bovis*, macroscopical examination and PCR confirmation), Johne's disease (1.7%, n=351, indirect ELISA and PCR confirmation), cowdriosis (95.5%, n=178, IFAT), leptospirosis (25.9%, n=363, MAT), bluetongue (4.1%, n=369, competitive ELISA), and EHD (1.3%, n=369, indirect ELISA). Negative results were found for *Brucella abortus* (n=355, indirect ELISA; n=99, Rose Bengal Test) and Rift Valley Fever Virus (n=88, indirect ELISA). Those results are the first for Johne's disease, leptospirosis, ~~and~~ bluetongue and EHD in Rusa deer in Mauritius. They also confirmed the maintenance of bovine tuberculosis and cowdriosis in the deer population since the 1980's and the probable absence of *Brucella abortus* ovis and Rift Valley Fever Virus. This survey provided evidence of the need to monitor the health of farmed wildlife more regularly in order to detect zoonosis, infectious diseases of livestock and initiate an eradication program with the long term goal of certifying healthy farms and export venison overseas.

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KEYWORDS:

Rusa deer, *Cervus timorensis russa*, Mauritius, Leptospirosis, Tuberculosis, Johne's disease, Cowdriosis, Bluetongue, Epizootic Hemorrhagic Disease of Deer (EHD), Surveillance.

INTRODUCTION

In 1992, the Mauritian venison exportations to Reunion Island, the main importing client, had to stop with the Maastricht treaty signature and the European Union (EU) creation (Reunion included). Since then, the production and exportation conditions of the Mauritian deer meat do not meet anymore the food safety standards demanded by the European rules. Nevertheless, Rusa deer (*Cervus timorensis russa*) is the most important red meat production of Mauritius with more than 70.000 heads exploited annually for 440 tones of venison. However, although Mauritius is considered free of major livestock diseases, the Mauritian disease surveillance is principally based on a clinical monitoring of live animals and carcasses and no large scale serological information is available since the 1980's for the deer population. Around 50 extensive farms breed 60.000 deer whereas only 8 intensive farms breed 10.000 deer. In order to update the disease status of the Mauritian deer population, a serological survey targetted towards eight infectious diseases of public health and economic importance was undertaken in 2007.

MAIN TEXT OF PAPER

Material and Methods

A total of 369 deer from 28 extensive herds were randomly sampled during commercial hunting operations. Male deer were more represented than females whereas the age distribution was balanced. Pathological samples were taken from one male deer suspected of tuberculosis (lymph nodes and lungs) and from one female deer presenting diarrhea (intestine) suspected of Johne's disease. All the 369 sera and pathological samples were sent to Onderstepoort, South Africa, for analysis. The Onderstepoort Veterinary Institute tested leptospirosis (Microscopic Agglutination Test), bovine tuberculosis (macroscopical examination and PCR confirmation on lungs and lymph nodes), brucellosis (Rose Bengale Test), cowdriosis (Indirect Fluorescence Antibody Test), Rift Valley Fever (indirect ELISA), bluetongue or EHD (indirect ELISA) and bluetongue specifically (competitive ELISA). The Faculty of Veterinary Science (University of Pretoria, Onderstepoort) tested Johne's disease (indirect ELISA and PCR confirmation on intestine) and Brucellosis (indirect ELISA). For cowdriosis and Rift Valley Fever, the sampling was targeted on the coastal herds in accordance with the presence of potential vectors and in order to test less samples for economic reasons. For leptospirosis, eight serovars (strains) have been tested that belong to eight serogroups: *Bratislava* (Australis), *Canicola* (Canicola), *Grippytyphosa* (Grippytyphosa), *Hardjo* (Sejroe), *Icterohaemorrhagiae* (Icterohaemorrhagiae), *Szwajizak* (Mini), *Pomona* (Pomona), *Hardjo* (Sejroe) and *Tarassovi* (Tarassovi).

Results

Positive results were found for 6/8 diseases tested: leptospirosis, bovine tuberculosis (one confirmed case of *Mycobacterium bovis* by PCR), Johne's disease (PCR confirmation), cowdriosis, bluetongue, and EHD. Negative results were found for *Brucella abortus* and Rift Valley Fever Virus. Prevalence of the eight diseases tested in the free ranging deer population in Mauritius is displayed in Table 1.

For leptospirosis, 94/363 free ranging deer had an anti-leptospire agglutinins titer above 1/100 which represents 20/28 herds (71.4%) with at least one positive response. The most representative serogroups were Tarassovi (36,1%, n=39, IC_{95%}[7,6; 13,9]), Pomona (27,8%, n=30, IC_{95%}[5,4; 11,1]), Sejroe (16,7%, n=18, IC_{95%}[2,7; 7,2]) and Mini (14,8%, n=16, IC_{95%}[2,3; 6,5]). Only two positive responses were for the serogroups Grippytyphosa and Canicola (1,9%, n=2, IC_{95%}[0,0; 1,3]), one for Icterohaemorrhagiae (0,9%, n=1, IC_{95%}[0,0; 0,8]). The serogroup Australis was not detected. The highest titers detected were for the serogroups Tarassovi (3200), Pomona and Sejroe (1600). ~~Two serogroups were detected for ten animals and 3 serogroups for two animals (same herd).~~

Table 1: Prevalence of the eight diseases tested in the free ranging deer population in Mauritius.

	Leptospirosis	Tuberculosis	Johne's Disease	Brucellosis <i>B. abortus</i>	Cowdriosis	Rift Valley Fever	Bluetongue	EHD
Number	94/363	1 case	6/351	0/355 0/99	172/178	0/88	15/369	5/369
%	25,9	Present	1,7	≤ 1,0	95,5	≤ 3,6	4,1	1,3
CI _{95%}	[21,4; 30,4]		[0,4; 3,1]	[0,0; 1,0]	[92,5; 98,5]	[0,0; 3,6]	[2,0; 6,1]	[0,2; 2,5]

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Discussion

Bovine Tuberculosis is the major disease of farming deer and ~~the disease-it~~ has been described in every country breeding deer (Mackintosh et al. 2002) ~~as well as included~~ Mauritius (Jaumally and Sibartie 1983, Sibartie et al. 1983). The isolation and PCR confirmation of one case of bovine tuberculosis in our study indicate that the disease is still circulating in Mauritius. Since this zoonosis can be transmitted by inoculation or inhalation by opening the carcass (Wilkins et al. 2008), a zoonotic risk might exist for personnel manipulating carcasses during commercial hunting operations.

Cowdriosis is considered by the Mauritian authorities as a major economical disease for the bovine population (Roger 2001) and has been described in a Mauritian farmed deer in 1982 (Poudelet et al. 1982). The important seroprevalence found in our study (95.5%, n=178) could be explained by an enzootic stability from the infectious agent within the deer population which is probably exposed regularly to the bacteria. Despite this situation is not detrimental to the health of deer population, that species ~~becomes may be~~ a reservoir for the more sensitive ruminant population neighbouring deer farms.

Johne's disease is described for the first time in Mauritius with serological results (1.7%, n=351) and PCR confirmation on a suspected case. However, no information is available for the situation in small ruminants and bovine populations. A large scale screening needs to be done for the domestic ruminant population, based on the herd level to improve the sensitivity of the serological diagnosis.

Bluetongue and EHD viruses presence is described also for the first time in Mauritius which is in accordance with the situation in the other countries in the region. Actually, bluetongue and EHD viruses have been isolated in Reunion Island (Breard et al. 2004, Breard and al. 2005) and bluetongue is suspected in Madagascar.

Leptospirosis is described for the first time as well in Mauritius. With 25.9% of seroprevalence (n=363) for the Mauritian free ranging deer population, public health risks might exist for personnel participating to commercial hunting operations. Because serological tests are only indicative of exposure to leptospire, further efforts are necessary to isolate them from the urine or renal tissue of free ranging deer to confirm the

presence of spirochetes and their potential dissemination into the environment even leptospirosis has already been described in farmed deer in New Zealand (Ayanegui-Alcerreca 2007). Our findings indicate that persons who have contact with free ranging deer and their products are at risk for zoonotic disease (Silverman et al. 2004).

Brucellosis was described in the 70's in Mauritius and it was considered as eradicated since the 80's (Barre 1981). Our study confirms this status with any positive results with two diagnostic diagnostic-tests used to detect antibodies against *Brucella abortus*.

Concerning Rift Valley Fever, no information was available in Mauritius although the disease was never reported to the OIE by the Mauritian authorities. Our study presents the first serological results for this disease that is currently spreading across the Indian Ocean. Actually, this zoonotic mosquito borne disease that affecting from humans and animals has been described in Madagascar (Morvan et al. 1991), recently in Mayotte (Sissoko et al. 2009), and is suspected to be present in Comoros Islands.

CONCLUSION

Those results are the first serological evidence of Johne's disease, leptospirosis, and bluetongue and EHD in Rusa deer in Mauritius. They also confirmed the maintenance of Bovine tuberculosis and cowdriosis in the deer population since the 1980's. *Brucella abortus* and Rift Valley Fever Virus are probably not circulating in Mauritius. This survey provided evidence of the need to monitor the health of commercial farmed wildlife (Mauritian deer but also feral pig population) more regularly in order to detect zoonosis, infectious diseases of livestock and initiate an eradication program with the long term goal of certifying healthy farms and selecting those able to export venison overseas. Moreover, this diseases could represent a risk for persons involved in the deer venison industry and require further investigation from the public health perspective.

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