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Evaluation of the Rift Valley fever vaccination programme in Mozambican cattle

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av

Belisário Moiane

Huvudhandledare
Docent Kerstin Falk
Karolinska Institutet
Institutionen för Mikrobiologi, Tumör och Cellbiologi

Bihandledare
Professor Åke Lundkvist
Karolinska Institutet
Institutionen för Mikrobiologi, Tumör och Cellbiologi

Professor Luís Neves
Eduardo Mondlane University
Veterinary Faculty
Department of Para-clinical

Betygsnämnd
Professor Tina Dalianis
Karolinska Institutet
Institutionen för Onkologi och Patologi

Docent Öjar Melefors
Karolinska Institutet
Institutionen för Mikrobiologi, Tumör och Cellbiologi

Docent Ann Ahlbin
Statens Veterinärmedicinska Anstalt
Enheten Kemi, Miljö och foderhygien

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ABSTRACT

Rift Valley fever (RVF) is a viral disease that is spread by various arthropods (primarily mosquitoes) and affects ruminants and humans. RVF has led to tremendous losses of livestock in many African countries, Saudi Arabia, and Yemen, and its zoonotic impact on human deaths has been documented in most of the endemic countries where large outbreaks have occurred.

The RVF virus (RVFV) is composed of three single-stranded RNA gene segments (designated S, M, and L) with negative polarity, and it is transmitted mainly by mosquitoes of the genera *Aedes* and *Culex*, and various biting flies.

Outbreaks are associated with heavy rainfall and expansion of vegetation, both of which favour increases in mosquito population and thus lead to a high risk of infection in livestock and humans.

In Africa, control of RVF is based on immunization with the formalin-inactivated vaccine or the Smithburn attenuated vaccine, the former of which has been administered to cattle in Mozambique since 2002.

In the first part of the present research project, we evaluated the effect of transportation and storage conditions on the efficacy of the formalin-inactivated vaccine in cattle: in Maputo Province, three groups were immunized with vaccine stored at 4 °C (group A), at 25 °C (group B), and at temperatures alternating between 4 and 25 °C (group C), respectively; in Zambezia Province, animals were vaccinated as stipulated by the Directorate of the National Veterinary Services (group D).

Antibodies against RVFV were monitored by indirect enzyme-linked immunosorbent assay (ELISA), immunofluorescence assay (IFA), and the plaque reduction neutralization test (PRNT).

Pre-vaccination screening of cattle for neutralizing antibodies showed seropositivity in 17% and 7% in Maputo and Zambezia Provinces, respectively, and those animals were excluded from the study.

After initial inoculation with the RVFV vaccine, neutralizing antibodies were detected in more than 74% of the cattle in all groups, and levels of those antibodies were even higher after booster immunization. ELISA detected a response to anti-RVFV N protein antibody in about one third of the cattle in all groups after primary vaccination, and almost 80% of the animals were seropositive after booster immunization. Also, after both primary and booster vaccinations, the anti-RVFV N protein antibody titres were higher in group D compared to groups A, B, and C.

These results demonstrate that the current storage and transportation conditions in Mozambique have no influence on the efficacy of the formalin-inactivated RVFV vaccine given to cattle.

The second stage of the research focused on a cross-sectional study aimed at evaluating the circulation of RVFV, by detection of neutralizing antibodies by PRNT in 404 cattle serum samples collected from different herds in six districts in Maputo Province, during 2010-2011.

The PRNT results revealed that 36.9% (95% CI 32.2%–41.6%; n=149), of cattle sera had RVFV neutralizing antibodies, which is high for an area where RVFV disease has not been reported for several decades. These findings suggest that RVFV is actively circulating among the cattle in the six districts.

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