



Rift Valley fever in Mozambique - epidemiology, diagnostics and vaccine use

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Abstract

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Background: Rift Valley fever (RVF) is an arthropod-borne disease that causes huge losses among livestock in Africa and Arabic Peninsula, due to high death and abortion rates. RVF phlebovirus (RVFPV) also infects humans, raising public health concerns worldwide. RVF is endemic in Mozambique however, outbreaks were just reported in the south. In this thesis, we have analyzed the serological status of domestic ruminants, and African buffaloes, identified RVFPV mosquito vectors in Gaza province, evaluated the stability of a formalin RVFPV vaccine stored at different temperatures in Mozambique, and evaluated RVFPV antigens for oral immunization of mice.

Materials and methods: Blood samples were collected from cattle (n = 2724), goats (n = 1283), sheep (n = 148), and African buffaloes (n = 69), between February 2010 and May 2011 (study I), in 2013 and 2014 in the three regions of Mozambique (study II), and 2014 to 2016 in Gaza (study III), furthermore, mosquito trapping was performed for morphological identification and RVFPV detection (study III). Serological status of the herds was achieved by ELISA and PRNT. In study IV we evaluated the stability of a formalin-inactivated RVFPV-vaccine treated in four different temperature conditions, by assessing the antibody response in animal groups A-D. Two RVFPV antigens (N and Δ Gn proteins) were expressed in *Arabidopsis thaliana* plants and administered orally to mice in two experiments (n =4, each group and n = 8 in the control) (study V).

Results and discussion: RVFPV seropositivity rate ranged from 7% to 36.9%. The seroprevalences in livestock and African buffaloes were high suggesting that RVFPV is actively circulating in Mozambique. *Culex*, *Anopheles*, and *Mansonia* were abundant potential vectors of RVFPV; Members of *Culex* genus were found to carry RVFPV, however, identification down to species was not performed; the formalin-inactivated vaccine elicited strong and long lasting antibody response in cattle, irrespectively of the storage condition; *A. thaliana* plants successfully expressed RVF antigens, which in turn induced strong anti-body responses in mice. Further studies on the use of these antigens in ruminants are pending investigations.

Conclusions: (1) RVFPV is actively circulating among livestock and African buffaloes in Mozambique which requires a continuous and intensified surveillance; (2) a member of *Culex* genus is a candidate vector for RVFPV in South Mozambique; (3) formalin-inactivated RVFPV vaccine used for cattle in Mozambique is stable; (4) RVFPV antigens expressed in *A. thaliana* plants elicited strong antibody response in mice and are eligible for use as vaccine candidates.

Keywords: Rift Valley fever phlebovirus, *Arabidopsis thaliana*, RVF antigens, seroprevalence, mosquito vectors, cattle, goats, sheep, African buffaloes, Mozambique

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