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“Bridging the gap between increasing knowledge and decreasing resources”

Mitigation of the Impacts of Rift Valley Fever through Targeted Vaccination Strategies

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Abstract

The rapid evolution of Rift Valley fever (RVF) outbreaks generates exceptional challenges in its mitigation and control. A decision-support tool for prevention and control of RVF in the Greater Horn of Africa identifies a series of events that indicates increasing risk of an outbreak and matches interventions to each event. Using a 2-host (cattle and sheep) and 2-vector (*Aedes* and *Culex* species) RVF virus transmission model, we simulated the impact of vaccinating either 50% or 75% of the host population implemented over a period of 11 and 15 days respectively at different time points identified in the tool. The time points include issuance of RVF early warning representing a lead time of 11 weeks based on the recent outbreak in 2006/2007 in Kenya, onset of heavy rains with a lead time of 6 weeks, occurrence of mosquito swarms and first RVF cases in livestock at outbreak onset and laboratory RVF virus confirmation 3 weeks after outbreak onset. The impact is measured by estimating the area under incidence curve (AUC). The results show that vaccinating 50% of the host population at these time points, that is, early warning, onset of heavy rains, first RVF cases and laboratory confirmation leads to proportional reductions in AUC of 79%, 79%, 77% and 66% respectively in cattle and 65%, 70%, 42% and 1% respectively in sheep, relative to the baseline (no control) scenario. Increasing vaccination coverage to 75% during the same time points resulted in moderately higher reductions of 81%, 91%, 82% and 71% in cattle and 75%, 85%, 77% and 36% in sheep respectively. Delaying 50% vaccination by a week following the onset of outbreak resulted in reductions of 72% and 31% in cattle and sheep respectively. The results suggest that targeted vaccination can be effective in mitigating the impacts of RVF outbreaks. However, challenges associated with prediction of the outbreak, availability and delivery of vaccines need to be addressed. Impacts appear to depend on host diversity, with sheep potentially requiring more intensive vaccination coverage. If confirmed by empirical studies, these findings have important implications for the implementation of risk-based RVF interventions.

Keywords: Impacts, Rift Valley fever, vaccination, Kenya