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Rift Valley Fever : processes of emergence and dissemination

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Risk factors of Rift Valley fever (RVF) emergence remain partially unknown [1]. RVF is endemic in the Ferlo area (northern Senegal).A serological study performed in this region in small ruminants associated with an entomological study showed that the risk of RVF transmission, was spatially heterogeneous [2, 3] and linked to the pond structure. In the same area, we identified from satellite images three main landscape indexes potentially linked with the vector dynamic. These indexes were included as explanatory variables in a logistic-regression mixed model. The 500-m landscape closure index was significantly correlated with higher serologic incidence. These results highlight the potential of high resolution remote sensing to characterize the landscape structure at a relevant scale to describe RVF risk areas [4].

The re-emergence of the virus during rainy season in this very dry area may be explained by two processes: transovarial transmission within the vector, or introduction of the virus by nomadic ruminants coming from endemic areas. A quantitative risk assessment indicates that the risk of introduction of the virus by nomadic herds is very low. Thus, it is likely that RVF is endemic in this area as a result of transovarial transmission within the vector population.

Globalisation of legal and illegal trade and travel may increase the risk of the large-scale spread of the virus and introduction from endemic into disease-free areas. Assuming the virus has not survived in Yemen, data from field studies and literature was used to qualitatively assess the likelihood of “re-introduction” of RVF into Yemen through the legal and illegal importation of small ruminants from the Horn of Africa. After developing the different pathways and the matrix of likelihood combinations, first results were an overall probability of introduction assessed low outside the rainy season, medium in summer and most likely to occur via ovine males exported during festival periods.

Finally, we modelled and estimated the basic reproduction number (R0) for RVF in the Ferlo region using serological data (2003-2004) with two methods: the first based on an ordinary differential equation model fitted to serological test data and the based catalytic models’ theory. With the first method, the value of R0 (which gave a root mean square value of 1and and was therefore considered to be the most accurate estimate) was 1.5. With the second method, R0 values were 2.84 for young sheep and 1.69 for adults.
A regional project (Indian Ocean-Southern Africa) will be implemented in the next years to test main persistence and emergence assumptions and propose control recommendations.

References

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