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Rift Valley fever:
Challenges and new insights for prevention and control using the “One Health” approach

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Akademisk avhandling

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Abstract
Rift Valley fever (RVF) is an emerging viral zoonosis that causes frequent outbreaks in east Africa and on the Arabian Peninsula. The likelihood of RVF global expansion due to climate change and human anthropogenic factors is an important issue. The causative agent, RVF virus, is an arbovirus that is transmitted by several mosquito species and is able to infect a wide range of livestock as well as people. The infection leads to mass abortions and death in livestock and a potentially deadly hemorrhagic fever in humans. RVF has severe socio-economic consequences such as animal trade bans between countries, disruption of food security, and economic disaster for farmers and pastoralists as well as for countries. Human behavior such as direct contact with infected animals or their fluids and exposure to mosquito bites increases the risk for contracting the disease.

To better understand the challenges associated with RVF outbreaks and to explore prevention and control strategies, we used the One Health approach. The local community had to be involved to understand the interaction between the environment, animals, and humans. We focused on Sudan, Saudi Arabia, and Kenya. First, we systematically reviewed the literature and then we performed cross sectional community-based studies using a special One Health questionnaire. Climatic and remote sensing data were used in combination with statistics to develop a sub-region predictive model for RVF.

For both Saudi Arabia and Sudan, the ecology and environment of the affected areas were similar. These areas included irrigation canals and excessive rains that provide an attractive habitat for mosquito vectors to multiply. The surveillance systems were unable to detect the virus in livestock before it spread to humans. Ideally, livestock should serve as sentinels to prevent loss of human lives, but the situation here was reversed. Differences between countries regarding further spread of RVF was mainly determined by better economic and infrastructure resources.

In Sudan, there was a lack of knowledge and appropriate practices at the studied community regarding RVF disease symptoms and risk factors for both animals and humans. The community was hesitant in notifying the authorities about RVF suspicion in livestock due to the lack of a compensation system. The perceived role of the community in controlling RVF was fragmented, increasing the probability of RVF transmission and disease.

In Kenya, our study found that better knowledge about RVF does not always translate to more appropriate practices that avoid exposure to the disease. However, the combination of knowledge, attitudes, and practices may explain why certain communities were less affected. Strategies to combat RVF should consider socio-cultural and behavioral differences among communities. We also noticed that RVF outbreaks in Kenya occurred in regions with high livestock density exposed to heavy rains and wet soil fluxes, which could be measured by evapotranspiration and vegetation seasonality variables. We developed a RVF risk map on a sub-regional scale. Future outbreaks could be better managed if such relevant RVF variables are integrated into early warning systems.

To confront RVF outbreaks, a policy is needed that better incorporates ecological factors and human interactions with livestock and environment that help the RVF pathogen spread. Early detection and notification of RVF is essential because a delay will threaten the core of International Health Regulations (IHR), which emphasizes the share of information during a transboundary disease outbreak to avoid unnecessary geographical expansion.

Keywords. Rift Valley fever, Sociocultural practices, Community involvement, Ecological factors, Risk map, Early warning system, Surveillance system, International Health Regulations, and One Health approach.

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