Protecting livestock and securing livelihoods during threats of epidemic

Multidisciplinary mapping and modelling has enabled researchers to develop practical tools to help mitigate the worst effects of disease outbreaks.

RIFT Valley fever (RVF) is a disease with the potential to wipe out livelihoods, devastate communities and severely damage national economies.

It is a disease of sheep, goats, cattle and camels, and is caused by a virus carried by mosquitoes. It can also be transmitted to people through the body fluids of infected animals. In livestock, it causes abortions, stillbirths and the death of young animals, and so severely affects livestock production, including herd viability. In people, it mainly causes a flu-like illness, though in rare cases it can cause severe illness, occasionally resulting in death.

RVF is common in East Africa, where it is regularly found at low levels within communities. There are also periodic epidemic outbreaks. In Kenya, before 1977, it was mostly considered an animal health problem. However, people are now known to be affected. Cyclical outbreaks have resulted in the death of millions of animals and hundreds of people.

RVF can impact badly on livestock trade *Image: Florence Mutua/ILRI*

The disease has major impacts on poverty and wellbeing. Pastoralists in particular are affected as they are dependent on their animals for their food and income.

Trade-sensitive

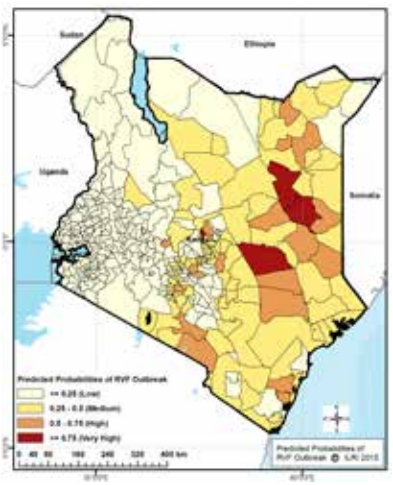
It is also a trade-sensitive disease as livestock trade bans usually follow an outbreak in an effort to contain the disease's spread. Farmers and others in the livestock supply chains can often suffer enormous losses. This is especially so as the demand for livestock products such as meat often plummets during and after outbreaks. The 2006/07 outbreak was estimated to have cost the Kenyan economy US$32m.

When researchers in Kenya from the Dynamic Drivers of Disease in Africa Consortium started work, epidemic patterns of RVF, and in particular its association with El Niño weather patterns, had been well documented. However, there was little knowledge on other disease drivers. Importantly, there were no reliable guidelines, tools or procedures that could be used to guide emergency response

measures in the event of an outbreak or warnings of one. In the past, inertia arising from failure to recognise risk and act accordingly was in part responsible for the huge losses associated with outbreaks. Insufficient capacity offered by decision makers to mount preventative and response measures was also an issue.

A multidisciplinary team of researchers from the Consortium sought to understand the various drivers of RVF epidemics. Through a synthesis of published and unpublished observations, informal meetings with decision makers and local people, and learnings from previous RVF projects funded by the EU and USAID, they first identified the problem.

Partnerships forged with a broad range of institutions meant an array of critical skills could be applied to gauge the impacts of the disease. These included African studies and medical anthropology (University of Nairobi), human health and disease surveillance (Ministry of Health, Nairobi), food safety and zoonoses (International Livestock Research Institute), medical entomology and arbovirus research (Kenya Medical Research Institute) and veterinary medicine (Kenya Directorate of Veterinary Services). This One Health approach, in which animal and human health was considered alongside environmental health, and decision makers were consulted throughout the research process, helped the team to produce practical tools to prepare for potential emergency, as well as for application in times of expected or actual emergency.



Kenya RVF risk map used in late 2015 surveillance. *Map: DDDAC team/ILRI*

Risk maps

For example, known disease hotspots were geo-referenced and analysed with detailed data on precipitation, rainfall, soil types, land use and vegetation to produce RVF risk maps. These maps replaced existing ones which were, to a large extent, insufficiently detailed. They were used by the Zoonosis Technical Working Group to plan RVF surveillance at national level from October to December 2015, and to identify areas where authorities could focus their attention and resources in a risk-based RVF surveillance. In late 2015, as meteorological forecasts warned of an El Niño occurrence, this was essential to the Kenyan government's strategy of disease monitoring and containment.

The risk maps have the potential to be used as a trade negotiation tool too, as they can identify 'clean' areas where livestock trade can take place with limited risk of spreading the disease. This could spell an end to the blanket trade bans and their disastrous effects on livelihoods. In addition, the maps have been combined with socio-economic variables which define vulnerability to determine how best to respond to an outbreak, considering differing levels of resilience of local communities.

Model-based analyses carried out by the researchers are also now offering guidance on preventative action against RVF epidemics.

Vaccination

Data from the models, taken with the risk maps, suggest that in areas where there has been no previous vaccination against RVF, at least 70% vaccination coverage needs to be implemented at least two months before an epidemic (or when the areas are still accessible) to prevent an epidemic. They also show that vaccinating strategically over a five-year period could lower the thresholds that a reactive vaccination (that is, one carried out in response to indications that an epidemic is imminent) needs to reach to stop an epidemic. These findings are expected to inform approaches considered by policymakers in the future.

Consortium researchers have presented their findings to policymakers from Kenya and elsewhere in East Africa, as well as at international level in meetings organised by the UN Food and Agriculture Organization (FAO) and the World Organization for Animal Health (OIE).

This is one of a series of impact case stories produced by the Dynamic Drivers of Disease in Africa Consortium, an ESPA-funded research programme designed to deliver much-needed, cutting-edge science on the relationships between ecosystems, zoonoses, health and wellbeing with the objective of moving people out of poverty and promoting social justice. Find more info at www.driversofdisease.org.

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