

# Getting rid of rabies

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*Prof Darryn Knobel*

The Faculty of Veterinary Science's Prof Darryn Knobel is in pursuit of eliminating dog rabies across Africa through a novel approach to rabies research. Rabies claims the lives of thousands of people across the continent every year but, for the first time in decades, using evidence-based research the elimination of this devastating disease is considered feasible. Knobel uses a simple method of understanding demographics to determine the vaccination thresholds required for rabies to die out.

Rabies is a viral zoonotic disease that affects domestic animals, wildlife and humans. Research done by Knobel and others in the international rabies community proves there are no insurmountable obstacles against the feasible elimination of dog rabies in Africa. The research has found that people are predominantly infected by rabid dogs, and that wildlife does not play a major role in spreading the disease, making it far more viable to control the spread of rabies.

If a person is bitten by a rabid animal, the virus can spread through the central nervous system, causing fatal inflammation of the brain and spinal cord. Rabies can also cause cardio-respiratory arrest, with muscles gradually becoming paralysed. A coma, followed by death is the inevitable outcome.

While treatment of humans bitten by rabid animals is essential, it is expensive. Receiving the required medical care in time is also not always easy for people living in rural and other under-serviced areas. Knobel argues that it is also not a sustainable solution as the root of the problem of controlling canine rabies is not tackled.

Africa's rural areas are populated with a large number of free-roaming dogs. There has been a long-standing assumption that the majority of these dogs are not accessible for vaccinations because they are not owned. However, surveys have contradicted these assumptions, proving that very few dogs are in fact feral. A challenge to the study is that, while most of these dogs are owned, veterinary services and vaccinations against diseases such as rabies are not readily available. Knobel's novel approach to understanding dog demography in targeted areas is imperative in determining vaccination requirements.

Studies have shown that the rabies virus is not particularly efficient at spreading through a population (that is, it has a low "reproductive rate"), but because of the large number of dogs roaming and interacting freely, rabies manages to persist. The low reproductive rate means that the threshold vaccination coverage needed to eliminate the disease in a population is relatively low. Ensuring that a sufficient proportion of dogs are vaccinated is therefore key. Knobel underscores the aim to immunise enough animals in a susceptible population to force the reproductive rate of the disease to below one. A rate below one means that, on average, fewer than one animal in the group will be infected by a rabid animal and that the disease will soon die out.

Realising that the majority of these dogs are in fact owned enabled Knobel to do demographic surveillance in targeted areas in order to accurately determine the vaccination threshold. Over a two-year period, from the

beginning of 2012 to the beginning of 2014, Knobel visited 2 000 households every six months in the Hvulukani area of Mpumalanga to monitor the number of births, deaths and migrations of dogs. This database, together with the basic reproductive rate principal, formed the basis of Knobel's study to determine how many dogs need to be vaccinated in a group in order for the disease to die out. He found that vaccinating 70% of a dog population during annual campaigns would be sufficient, even in populations with very high birth and death rates.

Understanding the demographic fluxes is important for determining the vaccination threshold. Postgraduate students are currently working under the supervision of Knobel to better understand these fluxes as a result of mortality rates, fertility treatments and their effects on migration patterns.

Knobel hopes that states will realise the vital but achievable need to control dog rabies in Africa. Veterinary service sites are needed throughout rural areas and under-serviced communities to do routine vaccinations of dogs against rabies. Based on demographic databases, the frequency of vaccinations can also be determined. Knobel envisions training local community members to conduct the censuses. Joining hands with locals will not only make the identification of owned dogs easier, but will also empower communities to take control of the problem of dog rabies. The ultimate goal of having stable, vaccinated populations of dogs throughout Africa has multiple benefits – at a human level, domestic animal level and at a wildlife level.

While so much is dependent on funding, Knobel hopes his study will evolve into a community-driven project to control dog rabies. Knobel emphasises that his approach to eliminating dog rabies is not rocket science, but based on a simple understanding of dog demography. The methodology can therefore easily be adopted by other people, resulting in a regional programme of research and control, providing evidence towards the ultimate goal of eliminating rabies in Africa.

Prof Darryn Knobel is a professor in the Department of Veterinary Tropical Diseases. His study was funded by the Morris Animal Foundation.