



**Global Alliance
for Rabies
Control**

RABID BYTES

The newsletter of The Global Alliance for Rabies Control

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EDITORIAL

Building Capacity Through Access to Resources

Implementing effective rabies prevention and control measures—whether at a national or local level—requires trained and experienced people from both the human and animal health sectors. GARC builds capacity in these sectors by working through [partnerships and networks](#) to provide resources and training needed for effective rabies elimination programs. This contributes to our goal of bringing an end to deaths from canine rabies by 2030.

As part of GARC’s commitment to building in-country capacity to eliminate rabies, the *Canine Rabies Blueprint* and the GARC websites have recently been updated to improve access to up-to-date guidance and resources for the rabies control community.

The [Canine Rabies Blueprint](#) now has links to a large number of recently published resources and new technical papers. The section on optimising the design of dog vaccination programmes has been revised, and the Stepwise Approach towards Rabies Elimination (SARE) tool has been updated based on field experience and feedback. New case studies have been added to illustrate how regional networks and improved data reporting bulletins have benefited the development of national and regional control strategies.



The relaunched [GARC website](#) now has a fresh new look, has been restructured to better reflect GARC’s core areas and to help visitors more easily access their areas of interest. The [resources section](#) is a central access point to all of GARC’s resources, including the FAQs about rabies, technical guidance through the rabies blueprints, educational materials, community news stories and our online educational courses. The home page contains a navigation bar that quickly directs website visitors to the desired information.

Finally, there is an improved [World Rabies Day section](#) with a new system to help with the [registration and promotion of events](#) and an updated [toolkit](#) for event organisers. Once again, we are proud to offer the [World Rabies Day Awards](#) to recognise individuals and organizations that have made exceptional contributions to rabies control in their communities. We encourage you to register your planned WRD events and nominate your rabies champions for an award this year.

We hope you will find some time to explore both of these updated sites and let us know what you think.

Contributed by Louise Taylor and Deepashree Balaram of GARC who oversaw the updates. Many people contributed to the website updates, but we would especially like to thank Ryan Wallace, Ad Vos, Thomas Müller and Conrad Freuling for their help with the blueprint revisions and GARC’s webmaster Andy Hebrank who works his magic in all of our websites.

NEWS FROM GARC AND WRD

Overcoming Challenges with Training That Prevents Rabies Deaths

Daniel Stewart of GARC, an expert in dog behaviour and handling, gives a personal account of his recent work in Ethiopia.

May 2017 was my third visit to Ethiopia to train, encourage and continue the efforts of a combined team from Ohio State University (OSU), Centres for Disease Control and Prevention (CDC) and the Global Alliance for Rabies Control (GARC). Although the project has been running for some time, my direct involvement with the project started in August 2016 when GARC was asked to train 25 staff from the veterinary and human health departments of the Ethiopian government. Thirty people arrived and August was wet, with the rainy season in full flow and working conditions on the streets of Addis Ababa anything but pleasant.

However, over 10 days we covered bite case follow up, reading dog body language and assessing dog behaviour as well as the use of humane catching equipment. This equipment would be used in future mass vaccination campaigns. OSU and CDC veterinarians also showed the participants correct, effective and humane methods of vaccination and euthanasia. The online courses of the GARC Rabies Education Certificate and Animal Handling and Vaccination Certificate were important training tools. The team left Ethiopia having made new friends and hopefully ambassadors in the fight against Rabies.



"Proud participants of the Ethiopian Government with certificates from the REC and AVC" Photo: Rick Harrison, Ohio State University



"A group for dogs living on the street with homeless people" Photo: Daniel Stewart

We continued training in December 2016, when the time in Ethiopia was extended to 3 weeks. The weather was a lot drier but the previously trained cohort of staff had increased and changed, which presented some challenges. We managed to run stationery vaccination points, small door to door vaccination campaigns as well as sight re-sight surveys around two separate sub-cities. The sight re-sight survey was a start to finding out the approximate number of dogs in the city of Addis Ababa. This first 3 weeks survey certainly did not finalise the population size, but gave the team and the Ethiopian government an initial estimation. The number of dogs vaccinated was low but the gain in experience for the Ethiopians exceeded my expectations.

My next trip to Ethiopia was in May 2017, when our original CDC staff member had to be replaced due to their commitments to another disease outbreak. As normal though, the three organisations came together and managed to run a very successful training period. This trip had a lot more challenges, with 5 positive rabid dogs having to be euthanised on the streets of Addis (with one biting a member of the public in front of us). We learned the true difficulties of getting treatment in the Ethiopia for dog bite victims, when we had to seek booster vaccines for 5 staff members who received dog bites (as a precaution not because of a positive rabid dog bite). We also experienced very serious animal welfare concerns and extremely poor sanitation in some parts of the city.

This visit we vaccinated 5,500 animals, splitting 24 trained staff into 4 groups of 2 vets, 2 animal handlers, 2 certificate writers and adding 1 survey person and a team leader from either GARC, CDC or OSU to each team. In one area we encountered a large concentration of cats living in close proximity to dogs and humans, so we vaccinated a relatively high percentage of cats.



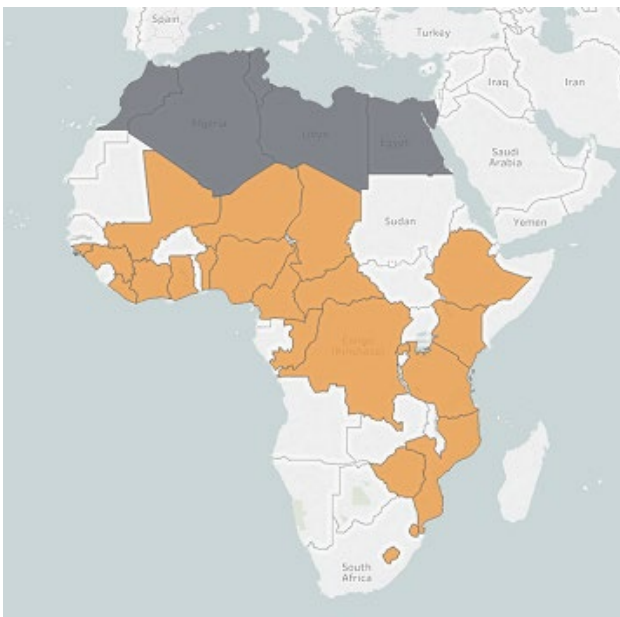
"A good and effective vaccination team" Photo: Daniel Stewart

The practicalities of working and overcoming challenges in the field can be daunting and often leads to failure and the cancelation of important vaccination campaigns. However, with professional training and organisations working together with staff on the ground, it is very clear that the confidence to overcome any obstacle can be built.

Africa United Against Rabies: The PARACON Epidemiological Bulletin

The primary objective of the Pan-African Rabies Control Network (PARACON) is to unite all sub-Saharan African countries in their common fight against rabies and to help these rabies endemic countries to develop and implement effective rabies elimination strategies. The buy-in from almost all target countries (37 of 44 PARACON countries) has been instrumental to the success of the network and this has been particularly evident with the launch of the PARACON Epidemiological Bulletin.

The PARACON Epidemiological Bulletin is an integrated system designed solely for rabies data collection, collation, analysis and dissemination that has been developed specifically for PARACON member countries. It is built on the powerful [DHIS2 health management information system](#) already in use in 30 African countries and has been customised to collate and analyse rabies specific parameters. It is widely accepted that data is key to any disease intervention strategy and rabies is no different. Contemporary and accurate data is essential for success in multiple stages throughout a country's path towards elimination, especially when obtaining stakeholder buy-in at the start of any rabies control initiatives and when providing evidence of freedom from rabies after successful intervention. The [PARACON Bulletin](#) was therefore developed to facilitate data collection and user feedback at the national level for all participating PARACON countries.



The map depicts the countries that have submitted data to the PARACON bulletin to date. Orange: countries that have submitted data; Dark Grey: countries that belong to the MEEREB network.

Vitaly, the data collected on the bulletin belongs solely to the country and permissions have to be provided by each sector (medical and animal health) for the data to be made publicly viewable. PARACON encourages transparency in data sharing, as rabies is a transboundary disease that requires collaboration among neighbouring countries and regions.

GARC and PARACON would like to thank all of those countries that have thus far submitted data to the PARACON bulletin. Since its launch at the end of June in 2016, 25 sub-Saharan countries have been introduced to the PARACON Bulletin. Of these 25 countries, 7 countries have provided permissions from both the medical and animal health sectors, whilst an additional 11 countries have provided permissions from at least 1 sector. In addition, data has been submitted by 22 countries, showing remarkable participation from all countries.

We are encouraged to see that the majority of the countries that have been introduced to the bulletin are using it as a tool for improving rabies surveillance and data reporting in their country. Furthermore, we would like to thank all of those countries that have thus far granted official permission for their data to be

made publicly available. Rabies control relies on this type of collaboration. By sharing data, each country can work with their neighbours and present a united effort against rabies.

The shared data will be presented on the newly revised GARC website, under the [PARACON Bulletin section](#), in the form of an interactive map – similar to that which is used for the ERN website. This map will automatically display the most up-to-date data submitted by countries in the form of graphs, maps and pivot tables. These visuals will be interactive in that the user will be able to select certain criteria for improved ease of use and enhanced analysis. This interactive map is currently being developed and will be available before the upcoming PARACON meeting in September.

For countries that have not yet been introduced to the bulletin, GARC will aim to do so at the second sub-regional PARACON meeting later this year. The meeting will focus on Anglophone countries in Africa and is scheduled to be held from 13-15 September 2017 in Pretoria, South Africa. More details regarding the upcoming meeting can be found on the [PARACON pages](#) of the newly revised GARC website. With strong participation from all African countries, the bulletin promises to become a central repository of data for countries to use to argue for and to track progress towards a rabies free Africa.

Contributed by Terence Scott and Andre Coetzer, coordinators of the PARACON network and the Epidemiological Bulletin. More information on the PARACON Bulletin is available at: rabiesalliance.org/networks/paracon/bulletin

Shine a Light on Rabies Heroes in Your Community!

The second World Rabies Day Awards, brought to you by MSD Animal Health and GARC, celebrate the great work done by individuals and organisations to end rabies.

This year the focus is even more on the work being done in communities – we'd like to recognise the unseen heroes at the grassroots level who make life safe for all the people and animals who live around them. We invite you to send in nominations for individuals from any sector – charity/NGO, government or private – who go above and beyond to make a difference where they work.

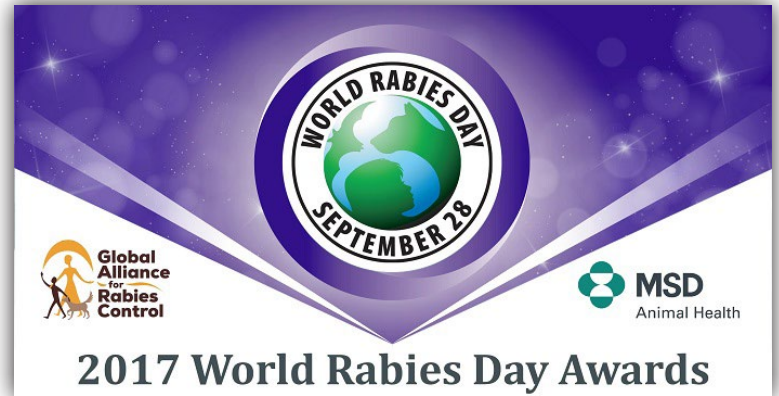
And in the organisation category, this year we're focusing on the non-governmental sector, and inviting entries for NGOs/charities registered in the country where their community work is based.

You can send in multiple nominations, for other individuals and organisations, for your own organisation, and even for yourself. One individual and one organisation will be awarded in each region - Asia, Africa and the Middle East, Europe and the Americas. Each award consists of US\$ 1,200 or resources of equal value, an award plaque and a certificate. This year we are also introducing certificates of recognition for shortlisted entries.

The Awards are your opportunity to raise global awareness of rabies champions in your communities, which could lead to international and national support for their work – [nominate](#) a champion today!

The deadline for nominations is August 7, 2017.

The World Rabies Day Awards are brought to you by MSD Animal Health and the Global Alliance for Rabies Control.



Inviting All Organizations to Join the End Rabies Now Campaign

The World Rabies Day 2017 theme is **Rabies: Zero by 30**, reflecting and supporting the global goal of eliminating rabies deaths by 2030.

The End Rabies Now campaign is a multi-partner communications campaign to increase awareness and support for this goal. The campaign includes all the major international rabies stakeholders, and is coordinated by GARC.



ENDRABIESNOW

99.9% FATAL 100% PREVENTABLE

The goal of eliminating rabies deaths by 2030 needs the support of human and animal health and welfare organizations, whether large or small, to show governments and policy makers that the elimination of rabies must be made a priority. We therefore invite your organisation to take action this World Rabies Day by joining the End Rabies Now campaign.

Become part of the global movement to end rabies by signing up here - <https://endrabiesnow.org/supporters/organizations>, and share your rabies elimination efforts with the world.

NEWS FROM THE COMMUNITY

Dog Data Mapping in Nepal

A public information website for Nepal—www.dogdata.uk—has just been set up to show where and when anti-rabies vaccinations have taken place by mapping the locations of recently vaccinated dogs. The site was developed by Himalayan Animal Rescue Trust (HART) but involves the collaboration of other animal welfare NGOs as well. It also shows recent censuses of dog populations and will eventually include information on neutering campaigns.

Visitors to the site can initially see an overview of vaccination areas countrywide, and then they can zoom in to their own town and street to see when and by whom their local animals were vaccinated. The syringe symbols denoting each vaccination are green for the first four months, then turn yellow for the next four months, then red for the next four, and then finally into grey outlines for the last four months. After 16 months, the syringes disappear because it is presumed that by then the area will have lost most of its protection and the dogs should be re-vaccinated.

Many of the major animal welfare NGOs in Nepal are already contributing their data, including Animal Nepal, Community Dog Welfare and National Animal Welfare Research Centre, and several others have been invited to join. Data collection is facilitated by the use of an Android mobile phone app, MARVIN, developed by HART. This app records vaccination data and calculates how many animals must be included to ensure at least 70% population coverage. If the app is not used, summary data can be posted to the site and can be shown over the town or village that has been covered to indicate the numbers of animals reached and date of delivery.

Another app acts as a census recorder and helps organisations obtain a good estimate of the dog population, condition and constituent animals in a specified area.

The aims of the site include:

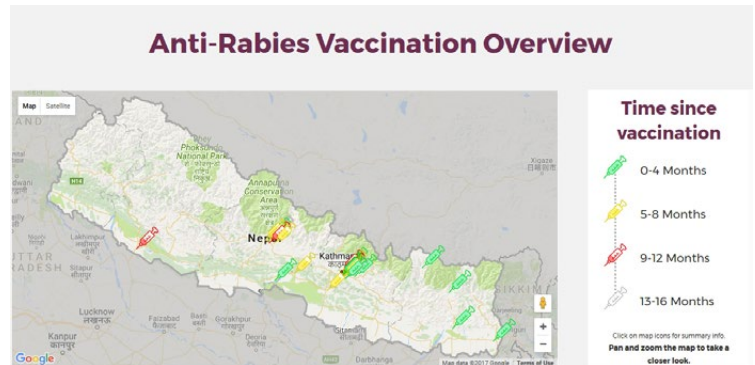
- Informing the Nepali public about whether their local dogs are immunised or not
- Informing the Nepali authorities about vaccination programmes in their areas
- Informing NGOs and other groups where work has taken place so as to avoid overlaps
- Informing researchers with recent information on canine vaccination data

Rabies surveillance in Nepal is challenging, and so it is hoped that the site can play a part in improving rabies surveillance by providing a facility to log the location of rabid animals, both suspected and confirmed. In order to be a useful conduit for citizen science, the site will need to be repeatedly brought to the attention of the public. A press and media campaign will be launched in due course that will attempt to fix Dog Data—as a reliable and simple resource for all—in the public mind.

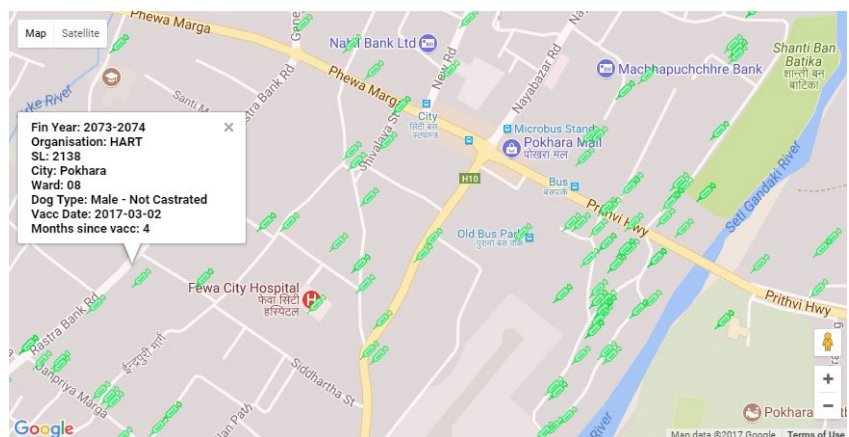
The vaccination of dogs is only one key component of any national rabies elimination strategy. Disease surveillance, the timely provision of human pre- and post-exposure vaccination and public awareness are also essential. It is hoped that the provision of clear evidence regarding dog vaccinations will enable the responsible authorities in Nepal to better define and develop a national strategy.

The site is very much in its infancy and any feedback and queries are welcomed. Please contact enquiries@dogdata.uk for further information.

Submitted by Barbara Webb, of [Himalayan Animal Rescue Trust \(HART\)](http://Himalayan Animal Rescue Trust (HART)). The website is publicly accessible at www.dogdata.uk.



A map of Nepal indicates where vaccination campaigns have been held on the Dog Data website.



At the street view level, clicking on the syringe symbol reveals details of the dog and when it was vaccinated. (DogData.uk)

Rabies Without Borders

On the 17th of July, a 5 year old girl [died of rabies](#) in the Sarawak General Hospital in Kuching, the capital of Sarawak in Malaysia. This little girl became the fourth child victim of rabies from this small area this month, all of them bitten by dogs around the town of Serian, near to the Sarawak border with Indonesia (see map). The first victims, a 6 year old girl and her 4 year old brother died on July 4th. A third case, a child of 7 years old was under intensive care observation, but died on July 13th. These are the first human rabies deaths in Malaysia [in 20 years](#) and naturally are of great concern.

Other children bitten and initially suspected of having contracted rabies have tested negative and so far remain symptom free, but on July 18th a [52 year old man was confirmed](#) as having contracted rabies following a dog bite in early May.

The rabies virus is suspected as having crossed into Sarawak from the Kalimantan region of Indonesia. A notification of a total of 32 rabies cases in dogs and cats from two villages near Serian was [sent to the OIE dated July 10th](#), and this was updated with a total of 23 more cases from 9 more villages in a [report dated July 18th](#). Most concerning in this second report is one rabid dog reported in Taiping, Perak, in peninsular Malaysia, but it is not clear how the outbreaks are connected. Further reports will be submitted on an ongoing basis.

Since 1954, Malaysia has been one of a small number of rabies-free areas in Asia, but incursions across its borders have been an ongoing battle. A dog rabies [outbreak that crossed into the far northern states of Malaysia from Thailand](#) removed the country's rabies-free status in 2015. This previous outbreak was detected in dogs and brought under control without any human cases occurring. The current situation would appear to be more serious, as it looks now like rabies could have been circulating in dogs in Southern Sarawak for some months. This outbreak will need to be curtailed in dogs and no cases in dogs confirmed, and will delay Malaysia being able to claim that it is Rabies-free once again.

As of the [news report on July 18th](#), seven villages had been declared rabies infected areas and the Sarawak Veterinary Services Department had vaccinated 7,655 pets, including 2,205 dogs, 5,424 cats and 26 other animals, and 73 stray dogs have been captured. Rabies awareness campaigns are urging people to get their pets vaccinated and seek treatment for dog bites, and 250 people have received Post Exposure Prophylaxis to prevent the symptoms of rabies. The OIE notification details more stringent animal movement controls, further vaccination efforts and surveillance outside these affected zones that will be increased.

These situations are similar to an [incursion into the Arequipa region of Peru from Bolivia](#) which occurred in 2015, and the introduction of rabies onto the historically rabies-free Indonesian islands of [Flores in 1997](#) and [Bali in 2008](#). [Recent genetic analysis](#) suggests that Flores and Bali were also infected following the introduction of rabid dogs from the Kalimantan region of Indonesia, and several other inter-island introductions via dogs transported on fishing boats have also been proposed.

Such incursions into previously rabies free areas are a continuing threat to rabies-free areas whilst ever any country in a region harbours ongoing rabies transmission. Land borders between countries may be very rural, remote from the capital, and sometimes disputed territory, making rabies control programmes especially difficult to enact. Much of the interior of Sarawak is rugged, dense rainforest for example. Such areas may have very low levels of routine vaccination and surveillance activities. Although islands have the advantage of their naturally impenetrable borders, it is clear that human-mediated transportation of rabid animals is a big risk where fishing or other boats frequently travel across them.

These cross-border threats undermine efforts of individual countries to gain and to maintain rabies freedom, a fact that underscores the need for regional cooperation. Regional networks can support coordinated rabies control efforts across whole regions, and highlight countries in need of extra assistance for building the capacity to reduce the burden of rabies, As travel increases exponentially, support for rabies control in all countries is of global benefit.

Written by Louise Taylor of GARC, based on news reports in [The Star Online](#), the [MalayMail Online](#), and the notifications to the OIE and published articles referenced by the links.



Human and animal cases have been reported from Serian, and one rabid dog from Perak (both circled). Maps from Google maps

In a recent article in Infectious Diseases of Poverty, researchers published a new, more comprehensive model for estimating dog populations that considers how variability in poverty levels and human population densities can impact dog ownership and rabies vaccination coverage

Linking Poverty to Dog Ownership Models Shrinks Dog Population Estimates

In a recent article in *Infectious Diseases of Poverty*, researchers published a new, more comprehensive model for estimating dog populations that considers how variability in poverty levels and human population densities can impact dog ownership and rabies vaccination coverage. Using these new models, the researchers estimated that current dog population levels in Uganda were much lower than those previously predicted. This decrease in predicted dog population levels—if validated—may strongly influence the current understanding of the rabies burden in Africa and the feasibility of rabies elimination in this region.

The new dog population models were developed using the results of knowledge, attitudes and practice (KAP) survey conducted in 24 villages in Uganda with diverse poverty levels, dog ownership practices, and population densities. The results represent 798 households, and the analyses took into consideration several variables, including poverty levels (calculated from the percent of people living below the international poverty level of US\$1.25 per day), population density, household size and the level of dog care provided.

After data collection, the models, built using multilevel logistic regression, were used to predict dog population and vaccination coverage for the entire country. Researchers found that obtaining accurate projections of dog populations may not be as straightforward as simply applying the overall human:dog ratio to country-wide population numbers. Instead, the poverty level and human population density for a region should also be considered for more accurate dog population approximations.

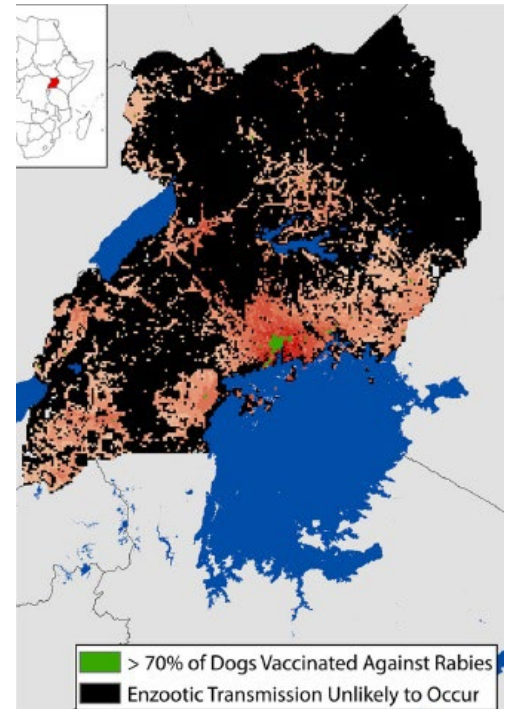
The results of the KAP study showed that dog ownership was lower in high poverty/low population density (poor/rural) areas, lower in low poverty/high population density (affluent/urban) areas but higher in high poverty/ high population density (poor/urban) areas. When these factors were incorporated into a multivariate regression model, the estimated number of dogs country-wide also dropped. After adjusting for poverty and human population, the human:dog ratio was 47:1, and the total number of dogs in Uganda was 729,486 dogs. This represents a two-fold drop compared to population estimates based solely on the unadjusted human:dog ratio of 25:1, which gives a dog population size of 1,373,844.

Additionally when poverty was considered, rabies vaccination rates also showed a significant decrease, from 57% unadjusted to 35.4% overall coverage nationally. Researchers then used the modeled estimates of dog population density and vaccination coverage to determine where in Uganda the risk of rabies would be highest (see figure). Areas where fewer than 4 dogs /km² exist (black areas in the figure) and areas where more than 70% of the dogs were vaccinated (green areas in the figure) were presumed not to be able to sustain transmission of rabies. For other areas, increasingly darker shades of red indicate a greater risk of rabies to people living there. These modeled estimates showed that nearly 90% of Ugandans live in communities where enzootic rabies transmission is possible and highlight where rabies vaccination resources are most needed.

This study was one of the very first to show how poverty levels impact dog population levels, but further validation of these models needs to be undertaken to ensure that the estimates obtained through these methods are accurate. In particular this model does not include unowned dogs, which cannot be estimated accurately from a KAP survey. The population predictions developed here create a more refined understanding of the pattern of dog distribution in Uganda, knowledge which can be used to enhance current vaccination strategies, but they cannot be used to replace the knowledge gained through routine rabies surveillance.

Even so, understanding that poverty impacts dog populations and the rabies risk by creating a non-uniform pattern of distribution will be essential when planning and implementing rabies control efforts in African countries with high poverty levels. These findings should allow for more effective rabies vaccination campaigns as well as allow for rabies control resources to be directed to regions where they will have the greatest impact for more effective outcomes.

Submitted by Laura Baker, GARC, summarized from "The impact of poverty on dog ownership and access to canine rabies vaccination: results from a knowledge, attitudes and practices survey, Uganda 2013" by Wallace et al. in Infectious Diseases of Poverty (2017) 6:97.



The rabies risk map for Uganda published with the study. Areas with darker red represent higher densities of unvaccinated dogs, and therefore greater risks to the communities that live with them.

...Recent Research continued from page 8.

juvenile dogs with owners did not produce protective levels of antibody by day 360. Previously vaccinated animals had higher antibody responses, but whilst unvaccinated animals had a satisfactory antibody titre by day 180, these fell by day 360.

Wildlife Rabies

[The phylogeography of Myotis bat-associated rabies viruses across Canada](#). As rabies in carnivores is increasingly controlled throughout much of the Americas, bats are emerging as a significant source of rabies virus infection of humans and domestic animals. This study used Myotis bats collected over 25 years and partial genome sequencing and host genetic barcoding was used to identify several rabies variants associated with Myotis species, with different geographic spreads. The findings demonstrate that rabies virus has emerged in the Myotis genus independently on multiple occasions and highlights the potential for emergence of new viral-host associations within this genus.

[Oral vaccination of wildlife against rabies: Differences among host species in vaccine uptake efficiency](#). Differences in the oral vaccine titers needed to induce a protective immune response against rabies in different reservoir species have been noted, but the mechanisms remain unclear. The vaccine virus strain, SPBN GASGAS, was investigated in red fox (readily vaccinated) and a species refractory to this route of administration (striped skunk). The absence of virus infected cells in palatine tonsils of skunks suggests a less efficient uptake of or infection by vaccine virus which may lead to a reduced response to oral vaccination.

Genetics

[Using viral gene sequences to compare and explain the heterogeneous spatial dynamics of virus epidemics](#). Phylogeographic reconstructions of viral lineage movement are used to study of the spatial dynamics of rabies virus epidemics in different hosts and habitats. The study found a higher diffusivity of RABV in domestic dogs compared to RABV in other mammals, indicating that factors relating to human geography play a significant role in RABV dispersion in domestic dog populations. More generally, our results suggest that human-related factors are important worldwide in explaining RABV dispersion in terrestrial host species.

[First Complete Genomic Sequence of a Rabies Virus from the Republic of Tajikistan Obtained Directly from a Flinders Technology Associates Card](#). A brain homogenate derived from a rabid dog in the district of Tojikobod, Republic of Tajikistan, was applied to a Flinders Technology Associates (FTA) card. A full-genome sequence of rabies virus (RABV) was generated from the FTA card directly without extraction, demonstrating the utility of these cards for readily obtaining genetic data.

Upcoming Conferences

[WSAVA 2017](#), the annual congress of the World Small Animal Veterinary Association 2017 will be held in Copenhagen, 25-28 September, 2017

The 28th Rabies in the Americas meeting, RITA XXVIII, will be in Calgary, Canada from 22-25th October, 2017. For further details see <http://www.ritaconference.org>

The 10th Asia for Animals conference will be held in Kathmandu, Nepal from November 27th to 29th 2017. The theme is Changing Human Behaviour. [For more information see http://afakathmandu.com](http://afakathmandu.com)

The editors of the GARC newsletter are Louise Taylor and Laura Baker. You can contact them through newsletter@rabiesalliance.org. Typesetting is by Pete Else. For further information on the Alliance's work see www.rabiesalliance.org.