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Global Alliance for Rabies Control

RABID BYTES

The newsletter of The Global Alliance for Rabies Control

EDITORIAL

Why Do Countries Need Capacity Building Support?

Capacity building is an essential component of the work of many international organisations and NGOs, including GARC. In the case of governments, this might seem unnecessary – technical expertise exists within many countries, and the assumption is that governments are able to access funds to train their people or send them to other countries to learn new skills and knowledge. Unfortunately, in the case of rabies control, this has not usually led to concrete and sustained action in building local expertise on diagnostics, surveillance, vaccinating animals, and raising community awareness.

One reason for this lack of action is the low priority of rabies prevention among the many public health concerns of national governments, leading to a lack of resources allocated to tackle this disease. Bringing in external capacity building support therefore serves a number of functions. The most obvious role is a direct increase of skills and resources within the country, ideally with people who are in a position to use those skills effectively to take rabies elimination forward.

Diagnostic training in Zimbabwe. Photo: GARC

The second function, related to the first, is the ability of these trained individuals to train others across the country, resulting in a much greater capacity within the country to deal with rabies. An additional benefit is that the increased skills can result in a greater commitment to rabies elimination, building a strong group of local advocates within the country.

Providing external capacity building support demonstrates to governments that international stakeholders are committed to helping countries develop their own sustainable resources and abilities to meet the global goal of eliminating rabies death by 2030.

And finally, it demonstrates practical ways forward, sending a message to countries that rabies is a problem that can be solved.

At GARC's Pan-African Rabies Control Network regional meetings, animal and human health sector representatives from African countries learn how to use tools that will facilitate their rabies control efforts, including the Stepwise Approach towards Rabies Elimination, the Rabies Blueprint, the GARC Education Platform and the Rabies Epidemiological Bulletin.

These have been followed and complemented by more in-depth in-country planning and training workshops focused on the development of national plans, training in diagnostics, surveillance and vaccinating animals, support to set up surveillance programmes or pilot vaccination campaigns. Collaboration with local partners to provide field training generates a model programme that can be expanded to other areas. Similar regional capacity building networks are being strengthened in the Middle East and Eastern Europe and will be established for Asian countries this year.

For elimination efforts to succeed, rabies needs to be made a priority disease by every government in an endemic country, with national control plans created and implemented. Capacity building support can kick-start this process and facilitate activities that demonstrate its feasibility.

Contributed by Deepashree Balaram, GARC

News from GARC and WRD

Fundraising Campaign Reaches its Target!

Our end-of-year fundraising campaign was to print Want a Friend, Be a Friend booklets to be distributed in Harare, Zimbabwe.

Harare is experiencing a severe outbreak of rabies, and GARC is working on a mass dog vaccination with in-country partners the Zimbabwean Ministry of Livestock and Veterinary Services, Zimbabwe National SPCA ZNSPCA) along with their Harare SPCA branch, Veterinarians for Animal Welfare Zimbabwe (VAWZ) and the Twala Animal Trust.

This mass dog vaccination (kicking off this month) is an ideal time to strengthen local children's understanding of the importance of taking good care of dogs and understanding how to behave safely around them.

"*Rabies prevention isn't taught in schools in Zimbabwe. A* **Want a Friend, Be a Friend** *booklet might be the only information children receive about this fatal disease*."

-Lambert Gwenhure, Laboratory Scientist at the Ministry of Agriculture, Zimbabwe.

Last year, veterinary students delivered these booklets to children in South Africa during a similar exercise. This is what the students had to say:

"The booklets contain all the vital information and will make sure that what we taught will remain fresh in their minds and at their fingertips if ever they need a reminder."

"With the help of the rabies booklets the learners will also be able to share their knowledge with other members of the community."

"We even managed to inspire some of them to become veterinarians."

Sharing the "Want a Friend" booklets with partners at the vaccination campaign

Imagine that! Life-saving knowledge and inspiration to join the ranks of people working to prevent rabies in the future.

It puts a smile on our faces to say the campaign reached its target and raised **£1,007.04**! As a result, hundreds of copies of *Want a Friend, Be a Friend* booklets will be handed out during the vaccination campaign to local children in the coming months.

Thank you to everyone who donated and otherwise supported the campaign – particularly those who preferred to remain anonymous and may not have received a personal thank you.

Contributed by Liz Davidson, who coordinated the fundraiser on behalf of GARC

Taking the Steps Required to Eliminate Canine-Mediated Human Rabies on Unguja Island, Zanzibar

In their efforts to control and eliminate dog-mediated rabies, the Revolutionary Government of Zanzibar hosted a review workshop to support their strategic island-wide dog vaccination project that has been ongoing on Unguja island since August 2017. During a two-day workshop in January 2018, collaboratively facilitated by the GARC and World Animal Protection, participants from the Ministry of Agriculture, Ministry of Health, Department of Local Governance and the Zanzibar Disaster Management Commission came together to undertake a Stepwise Approach towards Rabies Elimination (SARE) assessment for Unguja island. The SARE assessment was promptly followed by the use of the novel "Practical Workplan towards Achieving Rabies Elimination" (PWARE) tool. The PWARE tool is the latest tool developed by GARC to help countries strategically eliminate canine rabies by facilitating the development of a core Action Plan for the country based on the activities that were highlighted as outstanding during the course of the SARE assessment.

Continued on page 3...

...**SARE Zanzibar** *continued from page 2.*

With the country having prior exposure to the SARE tool from previous Pan African Rabies Control Network (PARACON) meetings, the rabies focal persons for Unguja deemed an in-country SARE assessment an ideal mechanism to reassess the various components of their existing rabies control programme. The comprehensive, yet simple to use, Excel-based SARE tool relies on user input on specific activities within different components *viz*. legislation; data collection and analysis; laboratory diagnosis; information, education and communication; prevention and control; dog population-related matters; and cross-cutting issues, allowing focussed workshop sessions to take place. The output of the SARE assessment provides countries with measurable steps to progress from being dog rabies endemic (Stage 0) to its control and eventual elimination (Stage 5).

Meeting participants

The final SARE score for Unguja (2.5 out of 5) was indicative of a country/region where large-scale rabies control initiatives are established and routinely implemented. Countries at this stage along the SARE pathway are often close to achieving success in terms of the control of dog-mediated rabies and require a concerted effort towards maintaining their programmatic momentum.

Workshop session

In order to assist countries in creating workplans for the implementation of rabies control activities within their countries, GARC has now developed an automated workplan generator. The PWARE is also an Excel-based tool that automatically develops a workplan for a country based on their own specific pending SARE activities. The fully customizable workplan comes completed with editable i) objectives, ii) outcomes, iii) key performance indicators and iv) responsible authorities for each of the pending activities. Furthermore, by coupling each of the pending activities with a specific timeframe to completion, the workplan automatically plots specific Gantt charts and graphs showing the distribution of activities over the allotted time period, ensuring an even distribution of intended activities over the allotted time.

By being the first country to use the SARE and PWARE tool combination, the Revolutionary Government of Zanzibar has taken the initiative of prioritizing rabies control on the island. By combining their dedication and passion with the available tools and their newly developed workplan, their progress is all but assured.

Written by Andre Coetzer. Global Alliance for Rabies Control, South Africa.The workshop was made possible by the generous support of World Animal Protection.

Vet Training Program Links Rabies Knowledge to Hands-On Vaccination Practices

To bridge the gap between classroom teaching and practical experience, an all-female veterinary association at the University of the Philippines (UP) recently participated in their annual veterinary medicine field training program—with a focus on rabies education. The program, known as the Service through Extension and Training (or SET), provides a venue for the members of the Lady Veterinary Students' Association (UPLVSA) to apply what was learned in their academic coursework to actual, real-world experiences in the field and give back to the community at the same time.

Dr. Meriam Micklay collecting GARC educational materials for a campaign in Baguio City. Photo: Roxanne Bunayog, UPLVSA

This year's SET program, held in January 2018 in Baguio City, emphasized improving students' rabies control knowledge and the practical aspects of rabies vaccination campaigns. These annual SET programs are typically coordinated and supported by community and government units, and this year, the GARC Philippines office stepped into this role and provided technical input and materials for the training event, including instruction in the Rabies Educator Certificate (REC).

Dr. Dianne Licuan represented the GARC team during the SET event, and lectured on the guidelines for conducting a mass vaccination campaign for dogs, emphasizing proper animal handling and vaccination techniques. A pre-test indicated that students were already fairly knowledgeable about rabies, but there were some gaps, especially in the areas of disease transmission and communication/information dissemination techniques. Further group discussions of these topics allowed students to explore some difficult concepts related to rabies, including transmission through the preparation and consumption of illegally slaughtered dog meat and the vaccination regimen for someone who has received bites from multiple suspected rabid animals in a short period.

Vet student vaccinating a dog during a fixed point vaccination. Photo: Roxanne Bunayog, UPLVSA

The students then conducted a rabies mass-vaccination campaign in coordination with Baguio City's local veterinary office and the Regional Animal Disease Diagnostic Laboratory office. A fixed point style rabies mass vaccination campaign was run by five different student groups at different points in the area around the Department of Agriculture Office; but students eventually also implemented a house-to-house campaign to increase the number of dogs vaccinated. To assist the students, government and UPLVSA alumni veterinarians were on hand to coordinate with the Baguio City Veterinary Office throughout the SET event to provide guidance for the students as they vaccinated 160 dogs and cats in the neighborhood that day.

The lady vets posing with local veterinary staff from Baguio. Photo: Roxanne Bunayog, UPLVSA

Students were exposed to many different fields of veterinary medicine during the SET program, aside from rabies control. Additional hands-on experiences were offered on surveillance, laboratory sample collection and processing, slaughterhouse and meat processing implementation, dairy cattle management, and milk processing. In addition to the technical knowledge and the new skills, students learned how to work in partnership with local government officials across different sectors to implement various veterinary activities, providing a skill set essential for the success of future vaccination campaigns.

Summarized by Laura Baker, GARC, from the SET activity report by Dianne Licuan, GARC Philippines

Raising Money with the Hope to End Rabies

Donations of all sorts power a charity like GARC: grants awarded to fund specific projects on the ground in Africa or Asia; mechanisms that allow discounted rates for charities; in-kind support in the form of a rabies expert's time; the loan of a meeting venue; a volunteer's time translating our resources; or straightforward cash donations. GARC tries very hard to make every donation we receive stretch as far as possible towards our mission of an end to the suffering that rabies causes.

As the year closes, GARC would like to extend a special thanks to all of our individual donors and fundraisers who have supported us in 2017. We are always grateful for your support and we love to hear about the personal or professional connections that motivate you to support our mission. Over the years, we have been inspired by all those who have run, hiked, biked, baked or sailed to raise money to support GARC's goal to end rabies. In particular, we wanted to recognize two supporters from the UK who set themselves remarkable challenges and used the JustGiving fundraising platform, each raising several hundred pounds for GARC this year.

Ruth Gregory at the summit of Snowdon at 4 am. Photo: Ruth Gregory

In July, Ruth Gregory climbed Mount Snowden in Wales in the dark. Her efforts were in memory of a friend, Harriet Stewart, who lost her battle with thyroid cancer earlier in the year. Harriet had lived her life to the fullest, travelling the world and climbing the highest mountains, always with a smile on her face, and Ruth clearly wanted those memories of her to live on. Despite a fall causing some discomfort, Ruth persisted with the climb and reached the summit at 4am just as dawn broke.

In August, Phil West, a freelance graphic designer who has worked with GARC over the last few years and is an avid amateur cyclist, tasked himself with an incredibly arduous challenge – to cycle from his home in the UK to Asia, camping along the way. Phil was inspired to choose GARC as he wanted to give something back, and felt that our charity's mission was in keeping with the trip, especially as rabies and feral dogs were a big problem in the countries he cycled through. The "West goes East" route took Phil through Western, Eastern and Southern Europe experiencing spectacular scenery, heat, cold, mountains, and more than one angry dog chase. Weighing a little less than when he set off, he finally made it to Asia when he crossed the Bosphorus Strait in Istanbul, Turkey. Two months to the day and with 3,181 miles cycled through 19 countries behind him, it was certainly time to celebrate!

We are so grateful to these two adventurous people, to those who sponsored them, and to all of our other donors who help support our work through donations large and small. We promise to make every donation go as far as we possibly can towards reaching an end to the tragedy of rabies.

Written by Louise Taylor, GARC. You can still make a donation to Ruth's or to Phil's fundraising pages, or you could contribute to GARC's year-end campaign to raise funds to print bite prevention booklets for children in Zimbabwe.

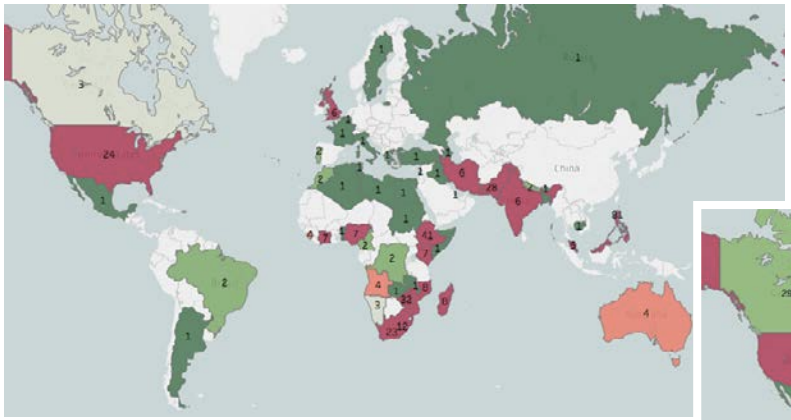
The Power of Free Online Courses

GARC's educational platform continues to expand awareness of rabies and provide information on how to implement rabies control programs around the world.

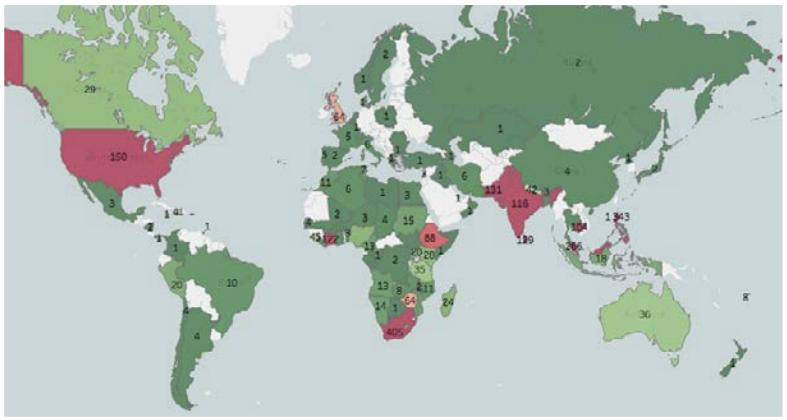
The number of graduates completing the first course, the Rabies Educator Certificate (REC), has been rising steadily ever since it was officially launched in February 2015. By the end of January 2018, the community of REC graduates reached 3,685, spread across almost every country in the world. Over 350 people have also completed the second course, the Animal Handling and Vaccination Certificate (AVC), in the two years since it was released.

Although some of these graduates were certified through training events led by GARC or our partners, the vast majority completed the course by themselves at their own convenience using the freely available online platform. By providing access to high quality, up-to-date, and freely accessible training tools, GARC can help to build capacity to deliver life-saving information and strengthen professional skills everywhere it is needed.

Sign up to take our free courses here.



Map of AVC graduates at the end of January 2018



Map of REC graduates at the end of January 2018

News from the Community

ManuMitra Tackles Nepal's Urban Street Dogs One Ward at a Time

In Nepal, the Kathmandu Metropolitan City (KMC) authority has developed a novel approach to street dog management and rabies control by devolving responsibility to the smallest unit of local government – the ward. An Animal Management Committee (AMC) is established in each ward, with the prerogative to ensure that all street dogs are registered to a named animal care-giver, rabies-vaccinated, and (if desired) sterilized; additionally, all residents are educated in responsible dog ownership. The project, named ManuMitra (meaning *friend of human* in Nepali) was launched in March 2016 as a core program of KMC's Urban Health Division.

Rabies is endemic in Nepal with frequent outbreaks inside the capital. A household questionnaire in 2016 found that half of Kathmandu's 80,000 owned dogs have the freedom to roam publicly at any time (contributing to a street dog population estimate of 22,000), and abandonment of sick or unwanted dogs is high.

"For 50 years, KMC poisoned 10,000 street dogs per year (half the population) with no effect on rabies or nuisance issues. Then we spent 15 years relying on NGOs and the private sector for a solution, but the dogs are there because of the community, so the solution must lie within the community. We looked at other models of municipal dog management in south Asia but they seemed to lack a mechanism of community mandate and empowerment," said Hari Kumar Shrestha, chief of KMC's Urban Health Division.

Continued on page 7...

...**ManuMitra** *continued from page 6.*

One of the responsibilities given to each AMC is to identify local residents who care for street dogs, and recruit them as Animal Management Assistants (AMAs). Each AMA joins a peer-supported training program and is given an official ID badge and first aid kit. By harnessing the energy and dedication of AMAs, the KMC is building a people-powered model of dog management, which can be activated to respond to other animal management issues, such as human-wildlife conflict or abandoned cattle.

ManuMitra means "friend of human" in Nepali. Photo: ManuMitra program

"It was a risk to design a project which hinges entirely on the community. But we found no shortage of local people willing to work voluntarily for street dogs. Even (or perhaps especially) in the most underprivileged communities, there are individuals who resolve human-dog conflict or unofficially act as a font of knowledge on dogs. They are the experts in their local dogs and local humans, and they are permanent residents. It would be inappropriate for us to come and attempt to do their job – the only question we should ask is, 'how can we help these people?'" queried Basanta Gautam, ManuMitra's community coordinator.

Photo: ManuMitra program

To date, AMCs have been established in 20 of the city's 32 wards, and 126 AMAs are active across the city. Under ManuMitra, all government schools include education on rabies and dog bite prevention, while dog managed zones are established in areas that require more urgent intervention (e.g., the Parliament building, schools and hospitals).

"Now we can walk through the wards and see that all of the dogs are ear-notched (indicating they are sterilized). AMAs will call us if there are any new unsterilized, sick or suspect rabid dogs. Our AMAs are becoming frontline community animal health workers, literally saving lives by preventing rabies, protecting children and vulnerable people from dog bites, and making the community a better place to live by combatting cruelty and ensuring the welfare of street dogs for their lifetime," said Dr. Prabin Thapa, ManuMitra's veterinary coordinator.

Biannual street surveys already show a declining density and changing composition of street dogs in ManuMitra intervention zones, including a 70% reduction in lactating females, which has been attributed to the effects of increased community engagement. This has also spelled an improvement in rabies control efforts, with 20 out of 32 wards participating in the ManuMitra program attaining an average rabies-vaccination coverage of 86%. In addition, some of the more established AMCs are now organising their own mass anti-rabies vaccination (MARV) campaigns, sourcing rabies vaccine directly from the livestock department.

Contributed by Sarah Vallentine, ManuMitra Program Manager. ManuMitra is being technically supported by the Jane Goodall Institute Nepal with funding from Humane Society International for its pilot year. Additional information on the program can be found in the Nepali Times, "A Woof of Fresh Air," and on YouTube, "ManuMitra: Sustainable Dog Management Model," and on the ManuMitra Facebook page.

First Monoclonal Antibody Replacement for RIG Launched

The first monoclonal antibody product developed to replace the rabies immunoglobulin (RIG) component of rabies post exposure prophylaxis (PEP) is now available across India. Rabishield is manufactured by the Serum Institute of India, in partnership with Mass Biologics, of the University of Massachusetts Medical School in the US, which developed the technology and was launched in late October after much anticipation.

Current estimates show that only 1% of people who should be treated with RIG actually receive it. The extremely high cost and scarcity of human RIG is a huge problem in most canine rabies-endemic countries. Equine RIG (eRIG, manufactured in horses) is less scarce and much cheaper, but still presents significant production barriers to production, which means manufacturers are ceasing production. The use of eRIG has also been associated with very rare, but severe cases of anaphylactic shock. Because of these concerns, alternatives to RIG and eRIG have been in development for decades now.

Rabishield is a human monoclonal antibody manufactured by recombinant DNA technology. It has been tested *in vivo* and *in silico* against a large number of street rabies isolates and passed clinical trials in India showing that it is as effective as human RIG. According to the manufacturer, the product offers passive immunization against all rabies serotypes found in India. It is described as more potent, requiring a lower dose (3.33 IU/kg body weight) than current rabies immune globulins (20 or 40 IU/kg of body weight for HRIG or ERIG, respectively), which the manufacturer claims makes it much more cost-effective.

The arrival of a new product that could increase access to life-saving PEP is, of course, welcomed, but it has also raised some concerns. The product contains just one mAb, which does not meet the WHO recommendations that a mix of at least two antibodies is needed to guard against the possibility that rabies strains that escape the protection of a single mAb will be discovered. Given the novelty of the Rabishield product, under WHO recommendations, post-marketing surveillance should be rigorously pursued to ensure that any failures are adequately documented.

Local wound infiltration at the State Intra-dermal Anti-rabies Clinic and Research Centre, Shimla, India. Photo: Dr O.K. Bharti

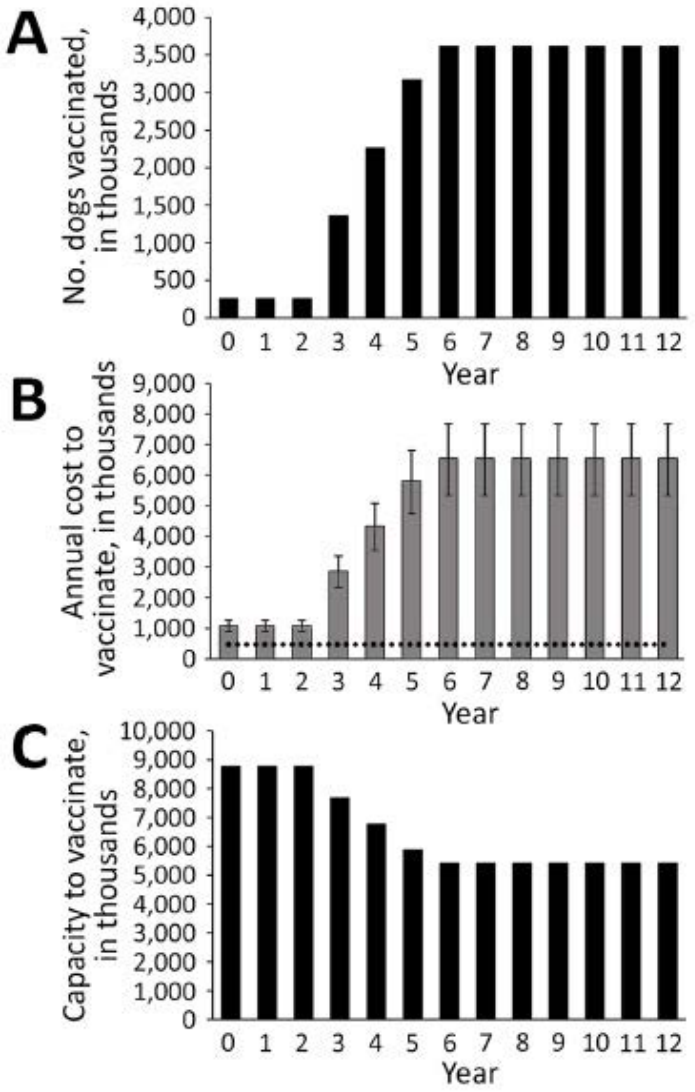
The recent recommendations from the WHO Strategic Advisory Group of Experts that reviewed rabies PEP add two further points relating to the cost-effective use of RIG and its alternatives. First, new data from Cambodia and Tanzania suggests that thorough wound washing and prompt administration of vaccine alone is sufficient to protect 99% of category III bite victims from rabies. With this in mind, it is unclear that the manufacturer's claim that the product will "significantly reduce the overall mortality rate" will hold true. Second, after thorough wound infiltration, it is no longer recommended that extra RIG is administered intramuscularly distant to the wound, as it has been shown to have very limited value. This would suggest that the new product labelling (which suggests that any product that cannot be infiltrated into the wound should be injected elsewhere intramuscularly) is not promoting the latest recommendations, and the lowest possible dose and cost per patient.

Information on the price of the product is not readily available online, but in the state of Himachal, a 2.5 ml (100 IU) vial is costing Rs. 8450/- or $132 (Dr Bharti, pers. comm.). In the same state 5 ml vials of high quality eRIG (with no reported anaphylaxis events following local wound infiltration of thousands of patients) containing 1,500 IU cost just $10 (Dr Bharti, pers. comm.). Based on these figures, the new product would cost $4.39 per kg of bodyweight compared to $0.27 per kg of bodyweight for the existing eRIG product. Thus the new product is not as cheap as some had hoped, and further cost cuttings will likely be necessary before this product is useful to most communities, especially in poor endemic regions.

Written by Louise Taylor of GARC, based on the press release for the product and other references linked to above. With thanks to Dr. Omesh Bharti for his inputs and for providing the cost of the products.

A Planning Tool for Eliminating Human Rabies Deaths through Mass Dog Vaccination

In 2016, the World Health Organization (WHO), the World Organization for Animal Health (OIE), the Food and Agriculture Organization (FAO), and many non-governmental organizations (NGOs) released a framework to achieve the joint goal of eliminating dog-mediated human rabies by 2030. But the goal requires overcoming substantial challenges. Dog-rabies endemic countries are at different stages in their control efforts; most countries have to overcome important hurdles, including limited public health infrastructure, competing health and social priorities, poor understanding of the local epidemiology, logistic and operational concerns, not enough trained vaccination personnel, and/or insufficient planning capabilities to project resources needed to run a successful dog-vaccination campaign.



GDREP tool outputs. Reproduced from Undurraga et al. (2017), Emerging Infectious Diseases, 23 (12):2114-2116.

Drawing from multiple datasets, including national dog vaccination campaigns, rabies literature, and expert opinion, researchers at the US Centers for Disease Control and Prevention (CDC) roughly estimated the resources needed to achieve the elimination of dog-mediated human rabies deaths by 2030, based on World Health Organization (WHO) recommendation of vaccinating 70% of the dog population for several years to eliminate dog rabies. Their aim was to describe the global rabies situation, highlighting some of the main challenges that may complicate elimination efforts in a consistent framework, the Global Dog Rabies Elimination Pathway (GDREP).

The GDREP focuses of four key factors that determine rabies elimination efforts: country development, cost of dog vaccination programs, potential demand for dog rabies vaccine, and available vaccinators. But while those global estimates may help stimulate and inform the ongoing discussion about rabies elimination, they may not help inform country-level decision making toward rabies elimination.

The researchers have now addressed this limitation by making public the first of a series of user-friendly spreadsheet tools requiring only limited country-specific data, to assist countries in their planning efforts towards the goal of eliminating dog-rabies through mass dog vaccination. Specifically, this first planning tool helps users to estimate the time and overall costs required to achieve the elimination dog mediated human rabies deaths by 2030, based on the GDREP framework. Outputs from the planning tool allow programme managers to predict workload, budget and capacity needs for an elimination campaign (see figure).

To use the tool, users need to input demographic data (human population, percent urban, human-to-dog ratio), current dog vaccination coverage, logistic data for the campaigns (available vaccinators, dog vaccination rates, campaign duration), and an estimated cost per vaccinated dog. The tool provides default values based on publicly available data, but country-users can improve these input values based on local expertise and statistics.

The spreadsheet-based planning tool is available for download via the technical appendix here and a collaboration with GARC has developed an online version of the same tool which can be accessed here.

Contributed by Eduardo A. Undurraga, part of the CDC team that developed the tool, now based at Pontificia Universidad Católica de Chile. More details about the use of the GDREP for global modelling are available here and about the planning tool here. GARC's web developer, Andy Hebrank developed the online version of the tool.

Modelling Helps to Better Understand Rabies Transmission

Citywide vaccination campaigns in N'Djamena, the capital city of Chad, and a deterministic model based on epidemiological data have demonstrated that rabies elimination can be achieved in Africa. The modelling research was published in December in Science Translational Medicine.

Vaccination in Chad. Photo: Swiss TPH

Dog vaccination was undertaken from October to December 2012 and during the same months in 2013. In both intervention rounds around 20,000 dogs were vaccinated, which represents about 70% of N'Djamena's dog population. Before the campaign, dog rabies was prevalent in N'Djamena with around 4 cases observed per month, which represents an annual incidence of 0.7/1'000 dogs. After the campaigns no dog rabies cases were observed in the city for over 9 months (January to October 2014).

The transmission model suggests that the conditions for rabies virus persistence in N'Djamena's dog population were not maintained and that interruption of dog to dog transmission occurred from early 2013 to November 2014. The model also showed that population replacement by the birth of susceptible dogs contributed more strongly to the loss of population immunity than individual dog immunity loss.

Analysis of viral phylogenetic data was also carried out and agreed with the transmission model, that the viral reproductive number, which is the average number of new infections resulting from a rabid dog, fell below 1.

Recurring rabies cases observed in the city from October 2014 onward are strongly suspicious of reintroduction, rather than sustained ongoing transmission from 2013. Dog rabies cases from 2014 onward were phylogenetically distinct from those circulating in N'Djamena before the intervention and were most likely imported from peri-urban and rural areas adjacent to the vaccination zone.

The findings highlight that dog rabies control in African cities should be planned for larger areas, including suburban and rural areas and be coordinated regionally between neighbouring countries to achieve sustainable elimination. The recent creation of the Pan African Rabies Control Network (PARACON) is, therefore, an important first step toward the goal of eliminating dog rabies from Africa by 2030.

Children take their vaccinated dogs home. Photo: Swiss TPH

N'Djamena has a very heterogeneous distribution of the dog population and very varied vaccination coverages were achieved by district. This demonstrates that dog vaccination campaigns will need to be adapted to local conditions to reach sufficient coverage. The study further supports the need for improvements in and reinforcement of rabies surveillance in rural and more remote areas to achieve inclusive and comprehensive rabies reporting that can then be used to guide vaccination decisions.

As other studies have previously shown, the example of N'Djamena shows that the amount of money invested per human live saved is less for canine vaccination alongside post-exposure prophylaxis (PEP) than it is for PEP alone. The cost of the vaccination campaign amounted to around 5 USD per dog vaccinated. Based on the cost and performance of the intervention in N'Djamena and on a representative dog demographic survey conducted in 2014, the cost of a national Chadian dog vaccination campaign is estimate to be between 2.5 and 3 million Euros. Whether this investment will also lead to lower use of vaccine for PEP and consequently to cost savings for public health, depends strongly on a good collaboration between the human and animal health sector. However, dog vaccination is financially the best option for long term animal rabies control and rabies prevention in humans.

It can be concluded that mass vaccination of dogs, coupled with PEP, would be sufficient to eliminate rabies transmission in an African city, in both dogs and humans, as long as vaccination is extended to larger areas and coupled with dog movement control.

Contributed by Dr Monique Lechenne of the Swiss Tropical and Public Health Insitute (Swiss TPH). The vaccination campaigns and the research activities were a close collaboration between the Swiss TPH, their local partner NGO (Centre de Support en Santé International, CSSI) and the governmental veterinary laboratory (Institut de Recherche en Elevage pour le Developpement, IRED). Closely involved in the analysis of the rabies strains were also the Pasteur Institute in Paris and the Swiss Institute for Bioinformatics in Lausanne. Beside the modelling paper, other relevant articles can be found here, here and here.

Recent Research

February 2018

Human Case Reports

Case Report: Failure of Therapeutic Coma in Rabies Encephalitis. Multiple efforts to replicate this expensive and intense protocol have not been successful. In this article, the failure of the protocol in 3 Indian patients with canine-acquired rabies is discussed.

"Scratches/Abrasions without Bleeding" Cause Rabies: A 7 Years Rabies Death Review from Medical College Shimla, Himachal Pradesh, India. Over a 7 year period, 5 out of 19 deaths were associated with scratches without bleeding for which patients did not seek PEP.

PrEP and PEP

Immunogenic response in obese patients undergoing rabies post-exposure prophylaxis with combined equine rabies immunoglobulin and rabies vaccination. There is concern that the higher volume of passive rabies immunoglobulin (RIG) used in obese patients might suppress their vaccine responses. This study compared the immune responses to combined equine RIG and rabies vaccine treatment among category III bites victims who were obese, with a control group. There was no evidence of immunosuppression of antibodies' responses in obese patients. Combined ERIG and rabies virus vaccination for post exposure treatment is safe.

Protecting children from rabies with education and pre-exposure prophylaxis: A school-based campaign in El Nido, Palawan, Philippines. All 4,700 school children from all 27 public elementary schools in El Nido were offered PrEP and rabies education was integrated into the school curriculum. Active surveillance of the cohort revealed a higher incidence of suspect rabies exposures than passive surveillance in the local bite treatment centre. Despite a decrease in the number of category III bites, there was no significant decrease in overall bite incidence. However, there was a high uptake of PrEP and an increase in rabies awareness among children in all grade levels. Children who received PrEP and subsequently were bitten required reduced PEP doses, resulting in cost-savings.

Epidemiological characteristics and post-exposure prophylaxis of human rabies in Chongqing, China, 2007-2016. A total of 809 fatal human rabies cases were reported in Chongqing from 2007 to 2016, with a majority of cases noted in farmers (71.8%), especially in males (65.3%) and in age groups 35-74 and 5-14 years old (83.8%). Of 548 human rabies cases studied in more detail, 95.8% were victims of dog bites or scratches, and only 4.0% of the dogs were vaccinated previously. After exposure, 87.8% of the cases did not seek any medical services, and none received timely and standardized PEP.

Wildlife Rabies

Rabies and Distemper Outbreaks in Smallest Ethiopian Wolf Population. Widespread deaths recently devastated the smallest known population of Ethiopian wolves. Of 7 carcasses found, all 3 tested were positive for rabies. Two wolves were subsequently vaccinated for rabies; 1 of these later died from canine distemper. Only 2 of a known population of 13 wolves survived.

Quantifying the burden of vampire bat rabies in Peruvian livestock. Questionnaires were used to quantify under-reporting of livestock deaths from vampire bat rabies (VBR) in three regions of southern Peru. Modelling projected that 4.6 (95% CI: 4.4-8.2) rabies cases per reported case were occurring and identified other areas with potentially greater VBR burden than indicated by official reports. Spatially-corrected models estimate 421-444 deaths from VBR/100,000 cattle in 2014, costing US$121,797-171,992. Cost benefit analysis favoured vaccinating all cattle over the current practices.

Canine Rabies Control

Tool for Eliminating Dog-Mediated Human Rabies through Mass Dog Vaccination Campaigns. The WHO and collaborating agencies have set the goal of eliminating dog-mediated human rabies by 2030. Building on experience with rabies endemic countries, the authors constructed a user-friendly tool to help public health officials plan the resources needed to achieve this goal through mass vaccination of dogs.

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...***Recent Research*** *continued from page 11.*

Rabies elimination research: juxtaposing optimism, pragmatism and realism. Research provides cause for optimism as to the feasibility of the 2030 elimination goal through strategies based around mass dog vaccination. The authors summarize some of the pragmatic insights generated from rabies epidemiology and dog ecology research that can improve the design of dog vaccination strategies in low- and middle-income countries and which should encourage implementation without further delay. They also highlight the need for realism in reaching the feasible, although technically more difficult and longer-term goal of global elimination of canine rabies.

Barriers of attendance to dog rabies static point vaccination clinics in Blantyre, Malawi. Static point (SP) vaccination campaigns often suffer from low attendance and therefore low vaccination coverage, despite being logistically and economically more feasible than door-to-door approaches. The authors analysed data for 22,924 dogs from a city-wide vaccination campaign to study barriers to attendance at SP offering free rabies vaccinations. Distance played a crucial role in SP attendance with very few people willing to travel more than 1.5 km. Dogs from areas with higher proportions of people living in poverty were more likely to be vaccinated and puppies, pregnant or lactating female dogs were less likely to be presented for vaccination. Some owners were not aware of the campaign (27%) and others could not handle their dog (19%).

Landscape attributes governing local transmission of an endemic zoonosis: rabies virus in domestic dogs. Utilising detailed epidemiological data and 152 complete viral genomes collected between 2004 and 2013 the study shows that the localized presence of dogs but not their density is the most important determinant of diffusion, implying that culling will be ineffective for rabies control. Rivers and roads acted as barriers and facilitators to viral spread, respectively, and vaccination impeded diffusion despite variable annual coverage. This nuanced understanding of the spatial processes that underpin rabies transmission can be exploited for targeted control at the scale where it will have the greatest impact.

Awareness

Assessing the impact of public education on a preventable zoonotic disease: rabies. A cluster cross-sectional survey concerning rabies was undertaken in 600 households in 38 randomly selected towns following an awareness campaign and in matched control regions. This survey demonstrated that the relatively simple awareness campaign was effective at improving knowledge of rabies symptoms and vaccination schedules, and those in the awareness campaign group were also 1.4 times more likely to report that they had vaccinated their pets.

Upcoming Conferences

The 18th ICID (International Congress on Infectious Diseases) will be held in Buenos Aires, Argentina from 1 March 2018 - 4 March 2018. Further details are available here.

The 4th Middle East, Eastern Europe, Central Asia and North Africa Rabies Expert Bureau (MEEREB) Meeting will be held April 23 - 25, 2018 at Les Pensieres Center for Global Health, Veyrier-du-Lac (France) For further details, go to the website here.

NECTM7, the 7th Northern European Conference on Travel Medicine, will be 2 May 2018 - 4 May 2018 in Stockholm, Sweden. Further details are on their website.

The 5th International One Health Congress, organized by the One Health Platform will be held in Saskatoon, Canada from 22-25 June 2018. Further details can be found here.

The 6th ACC&D International Symposium on Non-Surgical Fertility Control for Dogs and Cats, will be held in Boston, MA, United States, from 22 -24 July 2018. This is an opportunity to learn, discuss and network with innovators about the most promising advances to prevent unwanted litters and use new and existing tools effectively in the field. See www.acc-d.org/resource-library/symposia/6th-symposium or email symposium@acc-d.org for more information.

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.