



**Global Alliance
for Rabies
Control**

RABID BYTES

The newsletter of The Global Alliance for Rabies Control

Editorial: A Stepwise Approach to Rabies Elimination.....	1
Maximizing the Reach of the REC through Vet Schools...	2
1st Meeting of Regional Rabies Focal Persons.....	3
Communicating Rabies Information while Supporting Schools.....	4
Rabies Control Program Costs.....	5
Striving for a Rabies-Free State in the Himalayas.....	6
The Ethics of Rabies Control Efforts.....	7
'Uapikun Has a Question'.....	7
Last Mile for Rabies Elimination in Latin America.....	8
Collaboration for Canine Rabies Control in Guatemala.....	9
Response to GARC News Article.....	10
Applied Research "Towards Elimination of Dog Mediated Human Rabies".....	10
Recent Research.....	12
Upcoming Conferences.....	13

EDITORIAL

The Stepwise Approach towards Rabies Elimination (SARE)

The realization that programs for rabies control and elimination require several chronological and critical steps has been well recognized over the past decades and is supported by examples from the developed world where rabies elimination has been achieved.

Rabies epidemiology is not entirely simple, and we are still gaining new information on transmission dynamics, distribution patterns, host interactions and the role of reservoir host densities, the structures and dynamics of dog populations and more. For human rabies, prevention and elimination primarily rely on interventions on the animal side – which is why this disease represents and defines the need for and principles of One Health, with all the socioeconomic complications therein implied.

From these perspectives, the Stepwise Approach towards Rabies Elimination (SARE) was a key initiative to simultaneously acknowledge the complexities of rabies control and to develop a process framework that would make rabies control programs more manageable and effective (Fig 1).

To develop the concept of a SARE into an actual tool that could be uniformly applied to assist rabies control programs, a workshop was organized and conducted by the Food and Agricultural Organization of the United Nations (FAO) and the Global Alliance for Rabies Control (GARC) (6-8 November 2012, Rome). Twenty-one participants included rabies experts from two rabies-endemic countries (Kenya and China), academic institutions, the World Health Organization (WHO) and the World Organisation for Animal Health (OIE).

Since then, the SARE has been integrated with the [Canine Rabies Blueprint](#) and applied, adapted and improved during numerous national and regional workshops, with the cooperation of the tripartite (FAO, OIE and WHO), GARC, US CDC, World Animal Protection and others. Specific countries where the SARE has been evaluated nationally include Kenya, Guatemala, Haiti, Ethiopia, Cameroon, Sierra Leone, Uganda, Cambodia and the Philippines. Regionally, the inaugural Pan African Rabies Control Network (PARACON) workshop in South Africa (2015), included extensive sessions based on SARE (34 countries). This was followed by a secondary PARACON workshop in Ivory Coast (2016, 16 countries) and southern African and East African workshops of GARC/World Animal Protection and GARC/ US CDC in South Africa (5 countries, 2016) and Kenya (4 countries, 2017), respectively.

The above events are just some of the examples of the application, uptake and dynamic evolution of the SARE. As a result, GARC and FAO organized a 2016 meeting in Bangkok – with the participation of the US CDC, WHO and OIE. This meeting was designed to produce the latest version of the SARE, based on cumulative experiences and improvements to the tool and its application since its first inception in 2012.

We are pleased to herewith announce the latest version of the SARE, with details now available online (<http://caninerabiesblueprint.org/A-stepwise-approach-to-planning>). Among others, SARE workshops will be included in the next meeting of PARACON (South Africa, September 2017) as well as the Predemics series of workshops coordinated by Institut Pasteur (Iran, October 2017).

As the daunting challenge of reaching zero human rabies deaths by 2030 looms, we take courage in the key initiatives, practical tools and renewed global cooperation that will help us reach this goal.

Contributed by Prof. Louis Nel, Executive Director of GARC



The fundamental structure of the SARE



Integration of the canine rabies blueprint and the SARE

NEWS FROM GARC AND WRD

Maximizing the Reach of the REC through Veterinary Schools

In the Philippines, the GARC online education tools are being integrated into some veterinary college curricula. Here we share two stories about how the skills of students are being boosted so that they can participate more confidently in rabies education and vaccination in their communities.

Dr. Maria Catalina De Luna tells us how she has been using the Rabies Educator Certificate (REC) course at the College of Veterinary Medicine at the University of the Philippines Los Baños, Laguna:

“I started this year requiring my veterinary students to take the Rabies Education Certificate course as part of the National Service Training Program-Civic Welfare Training Service (NSTP-CWTS). NSTP is a requirement for all colleges in the country and is mandated by law. Using the REC course enables them to build their knowledge and skills in how to communicate that knowledge before they do extension work in the community. Students who passed the REC course this year are already using this knowledge in their community education projects.”



Student educators in the classroom.
Photo: Dr. De Luna



Recent REC graduates from the College of Veterinary Medicine, University of Los Baños, The Philippines. Photo Dr. De Luna.

By the first semester of this academic school year, 75 first-year students enrolled in the college’s animal welfare course (VMED 90) were required to take both GARC’s Animal Handling and Vaccination and Rabies Educator Certificate courses. In the feedback that I received, most of the students admitted that they were skeptical at first about whether the course would be useful and practical for them. However, they were very pleased after finishing the courses, since most of them had already participated in some vaccination drives, as part of their student organization activities. They shared that the courses helped boost their confidence, especially when dealing with pet owners during vaccination activities.

Since our veterinary school has committed its support to the local government for their rabies eradication campaign, we are planning to make the GARC certificate courses a requirement for all incoming first year students from now on. The college is also planning to coordinate with the four existing student organizations, to convince them to require all their members to take the courses. We believe that this will help to boost the student’s skills and benefit both the collaboration with the LGUs as well as with our own vaccination campaigns. A local rabies eradication campaign is now being proposed as a separate extension program of the veterinary college.

The pictures show students at work during the most recent house-to-house vaccination drive at one of the barangays near to the University. I observed that the students were very confident, especially in handling dogs and cats, as well as with talking with the pet owners.”

Dr. Alvin Alvarez, Dean for the College of Vet Medicine at the Cavite State University, Philippines describes his experience.

“Following a ‘Better Lives for Dogs’ conference at Paranaque in the Philippines, I heard about GARC’s online education courses and had an idea. What if the students at our veterinary college in Cavite State University, The Philippines were required to take GARC’s REC courses as part of their studies?”



Photo: Dr. Alvin Alvarez



Photo: Dr. Alvin Alvarez



Photo: Dr. Alvin Alvarez



1st Meeting of the Regional Rabies Focal Persons in East Africa

The Panel of Rabies Program Directors of the Americas (REDIPRA) has proven very successful in moving forward rabies control and elimination activities across Latin America. Based on this success, the idea was conceived to develop similar structures for various sub-regions in Africa. These smaller communities of rabies focal persons, operating under the umbrella of the Pan African Rabies Control Network (PARACON), would collaborate, share and disseminate pertinent rabies information to drive international co-operation towards rabies control and elimination on the African continent. In turn, these communities are envisioned to feed more detailed sub-regional knowledge and information into the larger regional PARACON network.

In light of this vision, the first regional rabies focal persons meeting was held in Nairobi, Kenya from 7-9 February 2017 and was hosted collaboratively by the Global Alliance for Rabies Control (GARC), the US Centers for Disease Control and Prevention (US-CDC) and the Kenya Zoonotic Disease Unit (Kenya ZDU). As rabies control strategies are developed in East Africa, this meeting was intended to bring together rabies focal persons to discuss how individual country plans can be coordinated within communities, regions and the larger African continent.



The participants represented the ministries of health, agriculture, and one health programs from selected East African countries. During the course of the workshop, 10 country delegates from Ethiopia, Kenya, Rwanda and Tanzania and 25 international partners (many of which had specific interests and expertise in each of the represented countries) gathered to share their knowledge, assess their progress towards rabies control and elimination and improve communications within their own and across neighbouring countries.

Meeting Objectives:

- Analyze current status of national canine rabies elimination programs in the sub-region
- Establish the role of a planning community comprised of rabies country focal persons
- Determine regional and national targets for canine rabies control
- Propose strategies and a sub-regional roadmap to achieve the control and elimination of canine rabies throughout the sub-region
- Share the experiences, lessons and progress with the regional PARACON network
- Identify regional resources and stakeholders that can be leveraged to support the rabies control efforts and identify gaps that need to be addressed

Throughout the course of the 3 day meeting, a detailed workshop focused on the Stepwise Approach towards Rabies Elimination (SARE) and the [Rabies Blueprint](#) with its vital links to the SARE assessment. Country representatives were encouraged to update their country's SARE assessment scoresheet. This produced a more accurate and detailed assessment of the current situation for each country, which in turn enabled users to accurately monitor progress. Easily achievable priority activities for each country in both the short- and the medium-term were devised by the country focal persons to progress along the SARE scale. Common, core priority activities were highlighted for the group as a whole. Furthermore, the [PARACON epidemiological bulletin](#) was introduced to the participating focal persons as a useful tool for data collection, collation, analysis and dissemination, including a community-specific dashboard for the display and analysis of sub-regional data.

Following this, country representatives highlighted specific progress, challenges, current activities and future plans for their rabies control efforts. Presentations from the stakeholders and international organisations who have an interest or who have current projects in each of the countries were also given, bolstered by in-depth discussions around these activities.

As many of the delegates were unfamiliar with the REDIPRA structure, upon which the concept for the meeting was based, the morning session of the last day was structured to provide a background into this structure as well

Continued on page 4...

Communicating Rabies Information whilst Supporting Schools

In celebration of Rabies Awareness Month in the Philippines this March, GARC and the Department of Education (DepEd) are collaborating to include a rabies information campaign as part of the Brigada Eskwela Program for schools.

Brigada Eskwela (National Schools Maintenance Program) is a yearly activity conducted in all public schools a week before the start of the school year. Embracing the spirit of the bayanihan (the spirit of communal unity, work and cooperation), Brigada Eskwela brings together teachers, parents, and community members to help clean and prepare the schools for the opening of the school year in June.

The Brigada Eskwela program has been effective for the DepEd in ensuring the wellness and safety of the students throughout the school year, as well as promoting strong partnership and collaboration among various groups. As a result of these strengths, the week of Brigada Eskwela makes a suitable avenue for increasing rabies awareness among children as well as teachers, parents, and the whole school community. Consequently, DepEd released a Memorandum (DepEd Memo No. 34, s. 2017) to support rabies awareness and prevention through Brigada Eskwela for elementary and high schools.

Using the Rabies Educators Certificate (REC) Course, selected DepEd health teacher-coordinators and social mobilization coordinators will be trained to create a pool of rabies educators who can serve as resource speakers during the rabies information campaign of Brigada Eskwela. This will be conducted among selected areas in the country with high animal and human rabies cases.

On March 3, the first lecture on the rabies education campaign in schools was conducted in Zamboanga City Schools Division. A total of 29 school health and social mobilization coordinators passed the REC. The passers are then expected to cascade the information to their respective districts and schools. Representatives from the local government animal and human health offices were also invited to discuss their ordinances and programs in their locality. Further lectures are scheduled for other regions of the Philippines over the coming months. Participants during the first Lecture on Rabies Education Campaign in Schools held in Zamboanga City.



Participants during the first Lecture on Rabies Education Campaign in Schools held in Zamboanga City.

Contributed by Eunice Mendoza, GARC's Community Education Officer in the Philippines. Read more about Brigada Eskwela in an inspiring article by teacher Lilio Tuares Carreon Jr. [here](#).

...**Regional Rabies Meeting** continued from page 3.

as an overview and more detailed success stories from the Latin American region. The similarities in challenges and experiences between Latin America and sub-Saharan Africa were clear and the session provided an excellent forum for discussions regarding the experiences from Latin America and their specific approaches to rabies control and elimination. A clear emphasis was placed on the fact that all of the tools required for rabies control and elimination are now available. The delegates agreed that Africa could not only succeed in its goal for canine rabies control and elimination, but that it could also be achieved by the global target of 2030.

Following this, achievable goals were set by developing a clear and concise roadmap and building collaboration between the countries in the community. Finally, the meeting was drawn to a conclusion by discussing and deciding upon the crucial link of this newly founded community with the larger PARACON network, ensuring that no overlap or redundancy was created in the formation of this community. The participants all agreed that this community would form a close-knit working group within the PARACON network to support the initiatives driven by GARC and PARACON. Lastly, the [meeting outcomes](#) were discussed and agreed upon; including the decision that Kenya would chair this community for the next two years. The roadmap for the community will be shared with the larger PARACON network at the next Anglophone PARACON meeting scheduled for later this year (2017) in South Africa.

Contributed by: Andre Coetzer, Terence Scott and Louis Nel on behalf of PARACON

What Factors Affect a Rabies Control Program Costs?

A [recent article by Elser, et al.](#) in *Transboundary and Emerging Disease* provides a helpful analysis of the cost variability involved with expanding or implementing rabies control programs. The study's researchers, mainly based at the U.S. National Wildlife Research Center in Colorado, compared three different rabies control projects, and identified factors—such as population density, program funding sources, and existing infrastructure—that can impact how much a vaccination program will cost. One of the significant findings was to show how much the factors contributing to program costs can be dependent upon the location of the program site.

In this study, the authors evaluated three canine rabies vaccination demonstration sites that were coordinated by the World Health Organization and supported by the Bill and Melinda Gates Foundation, primarily during the years 2010-2012. These sites were enzootic for rabies and included: 1) KwaZulu-Natal, South Africa (primarily semi-rural) 2) South-Eastern Tanzania (primarily rural), and 3) Cebu, an urban area in The Philippines, a program which also included a rural site. The programs exhibited a wide variation in how well-established their programs were, the level of government investment in rabies control campaigns, and in the population density of the area.



Dog vaccination station in The Philippines, 2016.
© Gelay Conception and GARC.

By comparing the cost per dog vaccinated at the three different sites, the authors found that programs operating in areas with lower population density had higher costs. When breaking down the component costs related to vaccination, expenses due to transportation and accommodations contributed most significantly to campaign costs in rural areas due to the need for house-to-house canvassing in areas with low density dog populations. Overall, labor costs were the largest expense for any of the campaigns, regardless of location.

PEP costs were less variable across sites, and population density did not play a role in the expense of providing PEP. Cost comparisons showed that because the biologic itself was such a

significant expense, the other factors influencing the cost of PEP were low in comparison.

How well-established a rabies control program is also plays a significant role in how expensive a campaign will be. If a site had been part of an existing rabies control program prior to the new campaign, then expenses related to building physical infrastructure (such as freezers or training materials) were less because these things were already in place. Trained personnel can also be easier to find at locations with pre-existing programs, and programs operating at more well-established sites tend to run more efficiently, also driving down costs.

When governments continue to fund rabies elimination programs over the long term, there is a stronger likelihood that the program will remain in place indefinitely. Sustainable projects that operate over the long-term have reduced costs overall due to the improved operational efficiencies described above.

One drawback of the study was that data collected from each site was not collected in a similar way across sites, making some cost comparisons challenging. For example, only for some sites (The Philippines and southeastern Tanzania) were vaccination costs broken down to the district level, including the cost per dog vaccinated. But this was not available for any of the data collected from the Kwa-Zulu Natal program. Future studies should collaborate with data collection methods so that more in-depth analysis can occur.

Planning rabies control and vaccination campaigns for the first time can be challenging, and requires an understanding of all associated expenses to develop an appropriate budget. Funding underestimations can lead to delays in implementation or inadequate vaccination coverage, resulting in a poor outcome for rabies control in the area. To carry out a successful and efficient campaign, a thorough understanding of the costs associated and the factors affecting those costs is necessary.

Submitted by Laura Baker, GARC, summarized from "[Toward canine rabies elimination: Economic comparisons of three project sites](#)" by Elser et al. in *Transboundary and Emerging Disease*.

Veterinary Leader Strives for a Rabies-Free State in the Himalayas

To share what inspires those involved in the effort to eradicate rabies, we are taking a closer look at the work and the lives of some of the winners of the World Rabies Day MSD Animal Health Award from 2016.

Motivated by a strong desire to improve animal welfare and public health, Dr. Thinlay N. Bhutia has spent his career working towards a rabies-free state in his Himalayan home of Sikkim, India. Bordered by Bhutan and Nepal, this mountainous region has been the first state in India nearly to attain this goal, an achievement spearheaded by Dr. Bhutia's strength in leadership and his tireless advocacy for humane dog population management and rabies vaccination of both canines and wildlife.

Dr. Bhutia began his remarkable career as a state veterinary officer in India, but saw a unique opportunity for championing rabies control as the program coordinator of the first government-sanctioned, state-wide program—the Sikkim Anti-Rabies and Animal Health (SARAH) Division. This program advocates for the humane treatment of animals, while focusing on sterilization, rabies vaccination, and community education as control measures.

Dr. Bhutia's high regard for the compassionate care of animals has always been a driving force for his work. He notes, "I feel strongly that improving animal welfare is an important part of a veterinarian's role." And these values have manifested in many aspects of the SARAH program's efforts as he has worked to change societal attitudes towards the treatment of dogs.

At the inception of the SARAH program, Dr. Bhutia helped end the mass shooting of stray dogs, a common, but ineffective practice employed for rabies control. Working with Vets Beyond Borders, sterilization—a more humane approach for managing dog populations—became the norm. In addition, seeing that attitudes in the community were negatively affected by problem dogs, Dr. Bhutia has been successful in driving the message that when dogs are treated in a humane way, then they are less likely to bite. Through community education programs, Dr. Bhutia has been able to maintain the no-cull policy, which was often challenged when new problems surfaced with aggressive dogs.

Collaborating closely with Vets Beyond Borders, Dr. Bhutia and the SARAH program implemented the first state-wide mass vaccination program in India in 2010, an effort which continues annually and will have a lasting impact on difficult-to reach, stray dog populations. One nominator for Dr. Bhutia's MSD award described the program's impressive successes, noting, "There has been an overwhelming positive impact since the inception of SARAH... there is now a small, manageable street dog population in Sikkim and fewer stray dog puppies in distress. There is less fighting of stray dogs particularly in breeding season, and the majority is healthy and friendly." With these efforts, the state of Sikkim has been free of canine rabies since 2010 and almost free of human rabies deaths since 2006, and with only two unconfirmed human cases arising in 2016.

Dr. Bhutia's leadership in rabies control has not been limited to typical veterinarian duties. To achieve the goal of a rabies-free state, Dr. Bhutia has been involved in a broad range of leadership activities and has been committed to the One Health approach, recommending rabies-control actions for the government and for the medical community alike and providing guidance for clinical protocols and the collection of epidemiological data, as well as making significant contributions to animal care after natural disasters and to controlling rabies in wildlife populations. Dr. Bhutia's determined efforts in the fight against rabies have culminated with the initiation of legislation necessary to declare Sikkim a rabies-free state, potentially placing Sikkim as the first state in India to reach this goal.

By Laura Baker, GARC, summarized from materials submitted with Thinlay N. Bhutia's nomination for a World Rabies Day MSD Animal Health Award. You can read more about the achievements of the SARAH program [here](#).



Dr. Thinlay Bhutia (front left) restrains dog during a vaccination campaign.

How Ethical Are Your Rabies Control Efforts?

Rabies control involves many ethical issues around free roaming animals, which may not be consciously considered during planning and implementation of rabies programmes. These issues can include obtaining consent from owners of free roaming dogs, provision of treatment for other diseases, preventing unnecessary pain and stress during the vaccination procedure, provision of accurate information to the community to enable them to take appropriate action, decisions around euthanasia, and many others.

The Alliance for Contraception in Cats & Dogs (ACC&D) recently hosted a *Think Tank on Ethical Decision-Making in Innovation for Animal Welfare* with the participation of philosophers, bioethicists, field practitioners, social workers, academics, and veterinarians. This think tank aimed to address the lack of existing ethical guidance in decision making while conducting field interventions on animals. It arose as a direct result of ACC&D's field projects, including one on contraceptive vaccines and one on identification of non-surgically sterilized dogs and cats, and it has wide-ranging relevance to any field intervention involving animals, including rabies control. Deepashree Balaram of GARC participated in the think tank, which was held from February 15-17 this year.

The think tank resulted in a number of recommendations and first steps towards different projects around this issue, including workshops around ethical decision making and moral dilemmas for animal shelter staff, an ethical decision making tool, and a guidance document for field veterinary research.

As an initial output, a list of [ethical questions and considerations](#) for field interventions has been published. This document contains much of value for all stakeholders in rabies control programmes, particularly those involved in community initiatives.

Contributed by Deepashree Balaram, Director of outreach for GARC. Access the full think tank report, a literature review on the subject, and much more is available on the [ACC&D website](#).



Think Tank participants: Photo credit ACC&D

NEWS FROM THE COMMUNITY

Uapikun Has A Question (Uapikun kukuetshitshemu)

A new resource to teach children how to be safe around dogs has been developed for use in First Nations communities of the Labrador region of Canada.

The book is the product of a collaboration between Dr. Hugh Whitney (retired Chief Veterinary Officer of Newfoundland and Labrador), the Labrador Institute (Memorial University) and a [larger initiative](#) to provide printed materials in the Innu language.

In the story, Uapikun is an inquisitive young girl from the Innu community of Sheshatshiu in central Labrador. She lives with her *nika* (mother), *nuta* (father) and *nukem* (grandmother), as well as her two dogs Maikan and Shikuan.

After school ends for the year, she takes the coastal boat with her *nuta* to the northern Labrador community of Natuashish, where her *nuta* was born. On the way, she is constantly asking her *nuta* questions, from where she will sleep to why icebergs float. Though she is used to the dogs in her hometown, she is anxious about meeting the new ones of Natuashish that she doesn't know and who don't know her. This gives her *nukumish* (uncle) an opportunity to teach Uapikun and her cousin how to be safe around dogs and how it is that dogs came to live with the Innu.

Published by the Labrador Institute (Memorial University) and beautifully illustrated by Vivid Communications (St. John's), this elementary school book supports the curriculum needs of Grades 2, 3 and 5 for injury prevention and safety. It is printed in the two dialects of Labrador Innu-aimun (Sheshatshiu and Mushuau), English and French, with adaptations for other languages and regions of Canada, and a video, under discussion. It serves as a companion to the previously published [Uapikun Learns About Rabies](#) (*Uapikun tshishkutamuakanu aueshish-akushunnu*) to help communities live in harmony with their dogs.

For information on purchasing or adapting this book, or a printable poster, contact [Dr. Hugh Whitney](#) (co-author) or [Dr. Martha MacDonald](#) (publisher).



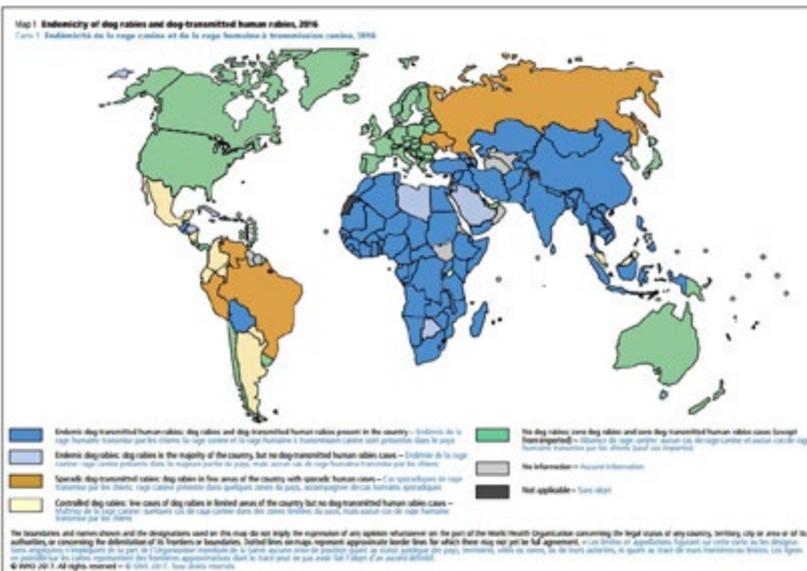
The Last Mile for Rabies Elimination in Latin America

There is no doubt that the regional program for rabies elimination across Latin America has been a success. Since the vision of an end to human deaths from rabies across the region was first conceived in 1983, human rabies case numbers have been falling at more or less the same rate ever since. Yet the last mile is always the hardest. No less than four different dates for the elimination of rabies have been set and each one missed. Why is this?

A [recent perspectives piece](#) written by the Pan American Health Organization (PAHO) provides valuable insights. Offered as lessons learned to benefit other regions starting on this journey, the authors candidly discuss what could have been done better.

One critical observation is that goals were set without a full appreciation of the vastly different capacities of countries to be able to deliver rabies control activities. Additional technical and financial support supplied to the trailing countries in recent years, particularly in Haiti, Guatemala and Bolivia, are improving the regional situation dramatically.

Unless consistent and sufficient canine vaccination scale efforts can be maintained and good programme monitoring and surveillance can provide the data to demonstrate the impact, rabies freedom will not be achieved. Many Latin American countries have long benefitted from dedicated rabies vaccine budgets and cost-saving vaccine procurement mechanisms, but others have struggled and access to vaccine for these countries needs to be formalised to benefit the whole region. High expenditure on human PEP is observed and should be expected even many years after the human cases have fallen to zero.



The global rabies situation in 2016. Latin America provides a model for rabies elimination that Africa and Asia can learn from. Reproduced with permission from WHO's Weekly Epidemiological Record, 17 Feb 2017, p77-78

SIRVERA, the surveillance database established by PAHO for the regional program has been an enduring symbol of collaborative efforts, but large data gaps persist. Collection and analysis of the data required to ensure that elimination of human cases can be documented requires additional effort and funding.

To some degree the rabies program has become a victim of its success. As cases have fallen, so too has awareness of the disease, which threatens the success achieved so far. In the last mile of elimination attempts there is no room for inefficiencies, and the authors point to several ways that limited resources could be spread further by examining the cost effectiveness of each segment of a program to make sure all are optimal. There are lessons learned from outside the region, such as the use of cost saving intradermal regimen for PEP and surveillance techniques that could be valuable.

Rabies currently remains in the [top three zoonotic diseases prioritises](#) by both Ministries of Health and Ministries of Agriculture across Latin America, and ways to integrate its control into that of other diseases to ensure sustainability are being explored.

The threat of emerging diseases is managed is quite different from endemic diseases, and in Latin America now (as in Europe and North America before) we are seeing the evidence that canine rabies has transitioned from endemicity to a re-emergence threat. Areas in Argentina, Brazil, Peru and Nicaragua without canine rabies for years have seen a few new cases in dogs in recent years. Canine rabies is now a re-emerging threat in some areas, particularly those bordering those few areas where endemic transmission persists. Reintroduction events necessitate rapid, emergency measures to ensure that re-establishment does not occur, but the main focus should remain on eliminating those last foci of endemic transmission to protect the whole region.

Capacity building, particularly in surveillance and rapid response, can clearly benefit the control of a large number of diseases. Together with a detailed understanding of the capacity strengthening priorities, the integration of canine rabies control into the *Plan of Action for the elimination of neglected infectious diseases and post-elimination actions 2016– 2022* should deliver the new impetus, and the resources, to reach rabies elimination across the whole region by 2022.

Contributed by Louise Taylor (GARC), Marco Vigilato (PAHO) and Victor del Rio Vilas (PAHO, and now University of Surrey, UK) based on PAHO data and the recent publications: "[Tribulations of the Last Mile: Sides from a Regional Program](#)" by Del Rio Vilas et al., *Front. Vet. Sci.* (2017) 4:4. and "[Building the road to a regional zoonoses strategy: A survey of zoonoses programmes in the Americas](#)" by Maxwell et al. *PLoS ONE* (2017) 2: 3: e0174175.

Collaboration Strengthens Canine Rabies Control in Guatemala

The Universidad del Valle of Guatemala (UVG), CDC-Central America Region Office, and the Centers for Disease Control and Prevention (CDC) have collaborated for several years to enhance surveillance and improve the current understanding of rabies risk in Guatemala. These collaborations have resulted in the coordination of a workshop for the Stepwise Approach to Rabies Elimination (SARE) in 2016, where the current rabies situation was analyzed by key program leaders. The SARE was conducted with the help of the Poxvirus and Rabies branch from the CDC and included two days of evaluation and a half day of presenting and discussing results.

One of the more prominent outcomes of the SARE was the creation of the National Rabies Working Group for Guatemala. The group now has monthly meetings to provide technical and scientific support to the National Zoonosis Program that is coordinating Guatemala's canine rabies control efforts. Following the SARE workshop, as a first step to help improve canine rabies control and elimination, a post-vaccination evaluation was conducted in several locations to determine if adequate rabies vaccination coverage was being reached in the free roaming dog population. For this survey, canine rabies vaccination practices and basic animal ownership characteristics among the community were assessed using a questionnaire that was given to dog owners bringing their dogs to the vaccination post. Vaccinated dogs were marked with a blue collar.



The collaborative team at the SARE workshop outside the central reference laboratory.



Capturing data during door-to-door surveys to assess dog vaccination coverages

The vaccinated population was estimated the day after each vaccination campaign in the study areas using the methods previously conducted and validated in Haiti by CDC. The methods included rapid community dog assessments and sight/re-sight surveys. For these surveys, CES-UVG staff (researchers and field technicians), veterinarian students from the National Veterinary School of San Carlos University, undergraduate students, and students from the veterinary masters program were trained in the field by the CDC staff.

The survey data was compared to the official dog population data used by the Ministry of Health for planning vaccination campaigns and calculating the vaccination coverage. The survey results estimated that the official vaccination coverage has historically been overestimated in the free roaming dog population. From the survey data, it was concluded that the campaign covered around 40% of the dog population in that area, compared to previous reports of >70% rabies vaccination coverage.

For follow-up purposes and to identify the reasons why dog owners do not take their dogs to the vaccination campaign, a door-to-door survey was conducted four weeks after the campaign, and the results revealed several different barriers for owners not taking their dogs to the campaigns. The main reason was poor communication and the lack of advertising about the vaccination campaign. With these results, the local health staff in charge of the vaccination campaigns decided to put in extra effort to reach the anticipated 70% coverage levels and went door-to-door vaccinating dogs in order to reach their goal.

In the follow up survey conducted by CES-UVG, it was also determined that despite these extra efforts, the campaign did not reach the 70% coverage required. This is mainly due to the underestimation of the actual dog population. The results were reported to the national zoonosis program, and discussions about how to implement the dog surveys before the next campaign are in process.

Currently, we are training more veterinary students, and expanding dog population surveys to four sites in different departments in the country: Zacapa, in the east, Sololá and Sacatepéquez, in the center, and Huehuetenango, in the highlands of the west, areas where the more recent human rabies cases were reported in the last half of 2016 and early 2017. The next steps will be to expand the pilot survey to several places around the country, train more veterinary and public health students, and the personnel of the zoonosis program, to conduct these surveys as a way to strengthen the canine rabies control efforts in Guatemala.

Contributed by David Moran from the Universidad del Valle of Guatemala, on behalf of the team.

Response to “A Better Way Forward for Rabies Control in India?”

Dr Andrea Britton, Dr Helen Byrnes, and Dr Thinlay Bhutia comment on a [GARC newsletter article](#) from the last issue which described the Tamil Nadu rabies intervention and cost-effectiveness modelling study by Fitzpatrick et al. in PNAS December 2016.

A quantitative modelling of the role of dog population vaccination using local India data is valuable and demonstrated the higher cost-effectiveness of a more comprehensive dog vaccination strategy that included vaccination of stray dogs (in comparison to the current baseline strategy based on providing PEP and vaccination of 34% of the owned dog population). The paper will be a useful resource for policy-makers planning rabies elimination in India, however, we'd like to draw attention to some elements of the paper.

Firstly, while the conclusions of the study were clearly reflected in the GARC newsletter, we are concerned that some ambiguities in the paper's abstract may have led to misperceptions about the results. It would be most unfortunate if the sentence “We found that highly feasible strategies focused on stray dogs, vaccinating as few as 7% of dogs annually, could very cost-effectively reduce human rabies deaths by 70% within 5 y, and a modest expansion to vaccinating 13% of stray dogs could cost-effectively reduce human rabies by almost 90%” was taken to mean that only 13% of dogs need to be vaccinated. In fact the paper argues that vaccination of an additional 7-13% of stray dogs, over and above the vaccinated owned dogs (34%) could effectively reduce human rabies by almost 90%. Some [news reports](#) of the study have already demonstrated confusion between the recommendations from the model for vaccination levels across the State and across the whole of India.

Secondly, it is important to note that the conclusions are based on modelling, and the assumptions contained in the model will affect the outcomes. Some of the assumptions need further examination. For example;

- The authors provide no comment on the methodology and consequent reliability of the 19th Livestock Census – 2012 used to estimate the stray dog population.
- The model assumes a closed population with perfect protection and lifelong immunity from rabies after one vaccination dose, with an assumed dog lifespan of 3 years. Roaming dog populations are not closed, particularly if there is high population turnover, however following the implementation of dog population management programs in Sikkim India, and in remote indigenous communities in Australia, the lifespan of roaming dogs is found to be often greater than three years.
- The model assumes that 4-person teams vaccinate a maximum of 120 dogs daily. In the 2016 state-wide vaccination program in Sikkim, 2-person teams vaccinated between 91-235 dogs per day depending on population density. This difference in dog catching and rabies vaccination numbers between Tamil Nadu and Sikkim has significant cost implications and is worth exploring further.

The assumptions of a model are critical to interpreting its findings. We welcome this analysis of rabies control in Tamil Nadu and suggest that recently-published data from the state of Sikkim could further improve model parameterisation. It is vital in India that policy makers do not reduce investments in relation to current levels of canine rabies vaccination and other interventions recommended in the global framework for dog-mediated human rabies elimination, but increase investments to reach additional stray dog vaccination targets.”

Dr Andrea Britton and Dr Helen Byrnes are Directors of Vets Beyond Borders, Australia and Dr Thinlay Bhutia, works with the SARAH program in Sikkim, India.

Applied Research “Towards Elimination of Dog Mediated Human Rabies”



In late 2015, a global goal of an end to human rabies mediated by dogs was set for 2030. Over the last few months, thirteen papers have been published as part of the research topic “[Towards Elimination of Dog Mediated Human Rabies](#)” in the *Journal Frontiers in Veterinary Science*. Comprising 8 original research articles, 4 perspective pieces, and 1 review, the collection brings together the experience and lessons learned from rabies control programmes small and large, research aimed at improving the design and cost effectiveness of rabies control programmes, and analysis of the resources needed to expand rabies control efforts if the global goal is to be reached.

Continued on page 11...

...*Applied Research* continued from page 10.

We have the tools necessary, but an overview by [Fahrion et al.](#) highlights the gaps that need to be filled in order that these can be used widely enough to achieve the 2030 elimination goal. This article also discusses possible solutions to the socio-political, organizational, technical and resource-linked problems that are being developed by many different stakeholders. It highlights the need for the type of applied research featured in all of the other papers - that aimed at supporting and guiding more effective rabies control efforts across the world.

Evidence that rabies can be locally eliminated is now building in a variety of settings, demonstrated here by [Byrnes et al.](#) from their first state-wide programme in Sikkim, India, successfully applied in a One Health approach. [Valenzuela et al.](#) describe how the elimination of human and animal rabies cases was achieved after just two years of implementing a more comprehensive program and calculate the costs involved. A larger scale program built almost from scratch across the whole of SE Tanzania is described by [Mpolya et al.](#) Here, comprehensive mass dog vaccination programs and the successful transition to intradermal PEP delivery reduced bite exposures and human deaths significantly, and elimination was achieved on Pemba Island. In all these cases the challenge of sustaining the programmes' progress in situations surrounded by rabies endemic areas is significant.

From any project there are lessons to be learned that can be used to support efforts elsewhere, but those described by [Vilas et al.](#) derived from the rabies control programs across Latin America and Caribbean are some of the most relevant for global elimination goals. One of the key messages is the need for regional strategies to recognize that countries can vary enormously in their capacity control rabies and plan accordingly.

If we are to reach the 2030 goal, then time and resources must not be wasted and several of the papers help to identify ways of designing more cost-efficient strategies. The availability of high-quality surveillance data to support control efforts is absolutely vital. [Scott et al.](#) describe a new rabies epidemiological bulletin for Africa that will start to address the huge knowledge gaps on this continent, enable better advocacy for rabies control to be initiated and provide timely analysis of progress. Effective surveillance at the local level requires sustainable community engagement, and [Brookes et al.](#) conclude that trust in authorities and the ability of veterinary services to respond to notifications are critical in achieving this.

All too often, the important job of assessing the vaccination coverages achieved in free-roaming dogs is neglected. A variety of methods to do this are tested in the paper by [Sambo et al.](#) Using a theoretical model approach, [Leung and Davis](#) evaluated vaccination needs in stray dogs when efforts are also addressed in vaccinating owned dogs. They showed that the most critical subpopulation to be vaccinated is the free-roaming owned dogs. By interviewing communities after vaccination programs in Bali, [Arief et al.](#) were able to suggest ways to refine the vaccination strategy (to focus more on the vaccination of free-roaming dogs) and identified the value that clearly identifying vaccinated dogs to the community could have in building community engagement.

The relative cost effectiveness of different strategies is always an important factor in the design of programs. [Mindekem et al.](#) find that based on their experiences in Chad, a One Health strategy, which combines canine vaccination with the provision of PEP, is more cost-effective in the long term than relying on PEP provision alone, and with ideal One Health communication across the sectors the highest cost-effectiveness can be reached.

Securing sufficient financial support to ensure that comprehensive vaccination plans can move forwards is frequently a stumbling block. [Welburn et al.](#), consider whether innovative finance mechanisms such as Development Impact Bonds could help to fill this funding gap. Such mechanisms would allow governments or external donors to pay for rabies elimination implementation only once satisfactory results have been achieved, with investors taking on the risks and therefore ensuring stricter management of program delivery.

The capacity and funding needs to deliver elimination at the global level are estimated in a paper by [Wallace et al.](#) It draws on multiple datasets to calculate how veterinary capacity, vaccine production and investment must be increased to meet the anticipated needs based on the current situation in each country. The paper, like each on in this issue hopes to stimulate and inform the necessary discussion on global and regional strategic planning, resource mobilization, and continuous execution of rabies virus elimination that will be necessary to reach the 2030 goal.

Contributed by Louise Taylor (GARC), Salome Dürr (University of Bern, Switzerland), Anna Fahrion (WHO), and Lea Knopf (WHO) who jointly edited the research topic. When the collection is finalized, it will be published as an ebook which will be free to download.



Recent Research April 2017

A round-up of recent research relevant to GARC's mission. Also see the article **Applied Research "Towards Elimination of Dog Mediated Human Rabies"** on page 10.

Human Vaccination

[Pre-exposure rabies prophylaxis: a systematic review](#). A review of literature and field data concludes that PrEP is safe and immunogenic, and can be co-administered with other vaccinations. Simpler regimens are effective and booster intervals could be extended up to 10 years. However, currently PrEP campaigns would not be cost-effective in most situations and PrEP should not distract from other rabies control efforts.

[Injecting rabies immunoglobulin \(RIG\) into wounds only: A significant saving of lives and costly RIG](#). Under conditions where RIG was extremely scarce, available eRIG was used in 269 patients as an emergency response and only for local infiltration of severe bite wounds by suspected rabid dogs. This was followed by intra-dermal rabies vaccination. A subgroup of 26 patients later identified as severely bitten by laboratory confirmed rabid dogs were followed for more than one year and all were found to be alive.

[Barriers to innovation in human rabies prophylaxis and treatment: A causal analysis of insights from key opinion leaders and literature](#). A literature review and 23 semi-structured interviews with key opinion leaders identified barriers to innovation in human rabies medication and their root causes. The results stress the existence of barriers beyond the limited return on investment and explain why innovation is lagging behind that for lower burden NTDs. A re-orientation is necessary to meet unmet societal and medical needs.

[Safety, tolerability and efficacy of intradermal rabies immunization with DebioJect™](#). Trial comparing rabies vaccination by (i) intradermal route using DebioJect™ (IDJ) devices, (ii) intradermal route using standard (Mantoux) method with classical needles (IDS), and intramuscular route with classical needles (IM). All participants were effectively immunized and no serious adverse events were recorded. The DebioJect™ device requires very little training to use and reliably delivers vaccine into the dermis. Significant decreases of pain at needle insertion and at vaccine injection were reported with IDJ compared to IDS and IM.

[Knowledge, attitudes and practices regarding rabies risk in community members and healthcare professionals: Pétienville, Haiti, 2013](#). A knowledge, attitudes and practices survey of 550 community members and 116 health professionals in Pétienville, Haiti assessed the perception of rabies in these populations. Despite awareness of rabies in dogs and transmission routes, only 37% of participants sought medical treatment, and only 38% of respondents had vaccinated their dogs. Fewer than 15% of healthcare professionals had ever received training on rabies prevention and 77% did not know where to procure rabies vaccine for bite victims.

Advocacy

[Vision 2030: Dog-mediated human rabies-free India: Action must begin now](#). At the 18th national conference of rabies organized by Association for Prevention and Control of Rabies in India (APCRI), it was resolved to support and work towards the global goal by ensuring a dog-mediated human rabies-free India by 2030. The conference called for a reassessment of the burden of rabies in India, for rabies to be made a notifiable disease, and a relaunching of the National Rabies Control Programme incorporating a clear one health action plan, road map, and task force.

[Rabies: Still a silent killer targeting the poor](#). Commentary suggesting achieving the 2030 global goal is far from certain and that efforts to expand access to human PEP are still badly needed. Such efforts have reduced the human rabies cases in Thailand to less than 10 during the last decade.

[Rationale and support for a One Health program for canine vaccination as the most cost-effective means of controlling zoonotic rabies in endemic settings](#). A review of data concludes that widespread dog vaccination is now warranted. PEP is effective in preventing human deaths, but is comparatively expensive and has little impact on the canine reservoir. Indiscriminate culling of the dog population is expensive and generally ineffective. Case studies illustrate how mass canine rabies vaccination has effectively reduced both canine and human rabies to minimal levels and can decrease the rabies economic burden by reducing expenditures on PEP.

Mass Dog Vaccination

[Barriers to dog rabies vaccination during an urban rabies outbreak: Qualitative findings from Arequipa, Peru](#). Canine rabies was reintroduced to the city of Arequipa, Peru in March 2015. Despite mass dog vaccination campaigns, transmission continues in this complex urban environment, due to low dog vaccination coverage. Focus group discussions identified the reasons for this will help design better campaigns. Participants described low awareness about rabies

Continued on page 13...

...*Recent Research* continued from page 12.

and vaccination campaigns, mistrust of the campaign, being unable to handle their dogs, and low vaccination point accessibility in peri-urban areas.

[Lyssaviruses and rabies: current conundrums, concerns, contradictions and controversies](#). Review that summarises progress in rabies control to date, and suggests ways forward. These include a more harmonized approach to viral taxonomy, enhanced de-centralized laboratory-based surveillance, focal pathogen discovery and characterization, applied pathobiological research for therapeutics, improved estimates of canine populations at risk, actual production of required vaccines and related biologics, strategies to maximize prevention but minimize unnecessary human prophylaxis, and a long-term, realistic plan for sustained global program support to achieve disease elimination.

Epidemiology

[The history of rabies in the Western Hemisphere](#), and [Successful strategies implemented towards the elimination of canine rabies in the Western Hemisphere](#). A complementary pair of reviews. The first compiles historical and phylogenetic evidence of the origins and subsequent dynamics of rabies in the Western Hemisphere, from prior to the arrival of the first European colonizers to the present day, including host shifts to wildlife reservoirs. The second analyses the successes and challenges of control attempts, including the impact of societal attitudes, economic disparity, and the threats from 'hotspots' of remaining infection and dog-derived RABLV lineages. Complete elimination of canine rabies requires permanent funding, with governments and people committed to make it a reality.

[One Health strategies for rabies control in rural areas of China](#). An opinion piece that argues rabies is a re-emerging disease in China, and that more focus on provision of PEP is needed. Virus strains derived from wildlife reservoirs are a threat and a greater understanding of rabies in wildlife and stray dogs is needed to improve control strategies.

Diagnosis

[An inter-laboratory proficiency testing exercise for rabies diagnosis in Latin America and the Caribbean](#). Despite DFA being a critical capacity in the control of rabies, there is not a standardized protocol in the region. The first inter-laboratory proficiency exercise of national rabies laboratories in LAC countries indicated large variability in the laboratories throughput, equipment used, protocols availability, quality control standards and biosafety requirements.

[Enhanced diagnosis of rabies and molecular evidence for the transboundary spread of the disease in Mozambique](#). Knowledge of the epidemiology of rabies in Mozambique is limited by sample submission, constrained diagnostic capabilities and a lack of molecular epidemiological research. The direct, rapid immunohistochemical test (DRIT) was tested as an alternative to the DFA. Of 29 rabies samples, 15 were DRIT-negative, which was confirmed by DFA and real-time PCR. The DRIT-positive results (14/29) were confirmed and sequenced. Phylogenetic analyses suggested that multiple instances of cross-border transmission may occur.

Upcoming Conferences

The [8th International Conference on Emerging Zoonoses](#), will be held in Manhattan, Kansas, from May 7 – 10, 2017.

CISTM15, the [15th Conference of the International Society of Travel Medicine](#) will be held in Barcelona, Spain, 14-18 May 2017 and will include a workshop entitled "**Rabies Prevention Strategy**".

[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>