



**Global Alliance
for Rabies
Control**

The newsletter of The Global Alliance for Rabies Control

RABID BYTES

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EDITORIAL

Where Do We Go From Here?

The GARC newsletter generally concentrates on rabies news, but this month the implications of the US elections are at the forefront of many people's minds. Love him or loathe him, Trump's success represents an overthrow of the establishment and a period of uncertainty. How will his ascent to the presidency affect the world order? And—of course—what impact will this have on support for international aid and global rabies prevention efforts?

The whole non-profit sector is wondering what will happen next but, as [Nonprofit Quarterly](#) points out, "It is hard to see what parts of the rhetoric of the campaign will be brought forth, but we do have some control over how we will carry on."

The answer to the question "where do we go from here?" is onwards and upwards. As a community committed to rabies prevention, we need to deepen our resolve, strengthen our links with like-minded organisations, and continue to push our advocacy efforts to make sure policy makers understand the importance and value of rabies prevention.

And with that in mind, in this issue we report on new developments in rabies control, including: an update to the Stepwise Approach to Rabies Elimination; a summary of the Rabies In The Americas conference in Brazil; promising research assessing the thermo-stability of an existing rabies vaccine; the winners of the World Rabies Day MSD Awards, and much more.

In the next issue we'll give you a full report on the 10th World Rabies Day but today we can tell you that a fantastic 302 events were registered in 55 different countries, with increases in the number of events registered in 5 of the 7 regions. If you took part in an event, please do share your photos and experiences on the event's unique page on our website or on Facebook and Twitter.

As always, we love to hear from you. If you have comments, suggestions or would like to submit an article for the newsletter, please get in touch.

NEWS FROM GARC AND WRD

"Rabies Control Tackled Locally and Advanced Globally" Explored at 27th RITA Meeting

The annual Rabies in the Americas (RITA) conference was held on October 23-28th in Belem, Brazil in the heart (and the heat!) of the Amazon region, coinciding with the 80th anniversary of the Instituto Evandro Chagas, Brazil's public health surveillance agency. First started 27 years ago in Atlanta, GA, this meeting continues to bring together veterinarians, public health officials, academics and students to present and discuss the latest research on rabies and how to control and prevent its spread in domestic animals and wildlife in the Americas. The warm hospitality of the Brazilian people was evident throughout the meeting, especially during the evening receptions, the gala dinner and the fundraising auction where traditional Brazilian musical festivities and dancing were the highlights.



Continued on page 2...

...RITA 2016 continued from page 1.

Along with the President of RITA, Dr. Ivanete Kotait of the Vencofarma Laboratory of Brazil, participants at the opening ceremonies included senior representatives from many of the Brazilian public health organizations and government departments. Inclusion of and collaboration between multiple government and regional public health organizations across all health sectors (veterinary and human) is essential for achieving rabies elimination in the region, and gathering these senior ministers at the event indicated a strong commitment regionally to rabies control efforts.

Each year, RITA draws accomplished rabies researchers from around the world to participate, but this meeting also provides many opportunities for young scientists to present their work. Winner of the annual George Baer Latin American Investigator Award, Julio Benavides spoke on the “Spatial Expansions and Travelling Waves of Rabies in Vampire Bats in Peru” and described how his research is predicting patterns of spread of bat rabies into Western Peru and discussed the opportunities he has had to test control strategies.

Other research presentations explored issues such as the control of rabies arising from bat bites, treating those exposed to the virus, the immune response in humans, as well as the evaluation of control and surveillance efforts. Amongst many important new findings, some of those shared were:

- Using a bite case management program significantly improved human health outcomes after potential exposures in Haiti.
- A lower cost anti-RABV monoclonal antibody cocktail has been tested that could be used as a replacement for RIG during PEP.
- Development of sensitive surveillance methods focused on targeted approaches such as active case-finding should be more effective than random sampling during the final stages of elimination.
- The recent re-emergence of canine rabies cases in Southern Peru has raised concerns amongst the medical and public health communities.

The meeting was capped by a thought-provoking webinar which was broadcast to hundreds of viewers not attending the meeting in person. Presentations were focused on: the role of serology in assessing an animal's vaccine status after a potential rabies exposure; the use of an inexpensive microscope from paper for dRIT diagnosis; using a smart phone app to assess vaccination coverage in dogs; the value of oral rabies vaccine (ORV) for dogs and taking stock of all the resources needed to achieve the goal of global elimination by 2030. The last session explored immunizing high-risk indigenous populations with PrEP prior to exposures; the development of potential anti-viral medications for rabies; and the increasing success rates of intensive-care treatment for rabies patients.

The conference proceedings ended with a presentation on the 2017 RITA to be held in Calgary Canada. The University of Calgary Faculty of Veterinary Medicine will be host, along with its partners, Alberta Agriculture and Forestry dept., the Canadian Food Inspection, and Canadian Public Health Agencies.

As the Americas region comes closer and closer to reaching complete elimination of canine rabies, there is increasing need to share and transfer the knowledge and lessons learned along the way to other countries in Africa and Asia who continue to struggle with a high burden of human cases. By continuing to set an example of successful international collaboration amongst rabies experts, the RITA meeting can help to inform rabies control efforts not just in the Americas region, but around the world.

Contributed by Laura Baker, who represented GARC with Louise Taylor at the meeting



GARC’s Ilocos Norte Project Receives National Award



GARC’s Communities Against Rabies Exposure (CARE) project site in Ilocos Norte received an award for being one of the Best Local Government Unit Rabies Program Implementers in the Philippines during the national celebration of the World Rabies Day on September 28th in Quezon City. GARC’s Community Education Officer, Eunice Charis Mendoza and Field Veterinarian, Dianne Licuan received the award on behalf of Dr. Loida Valenzuela, the Provincial Veterinarian of Ilocos Norte, who was not able to attend the event.

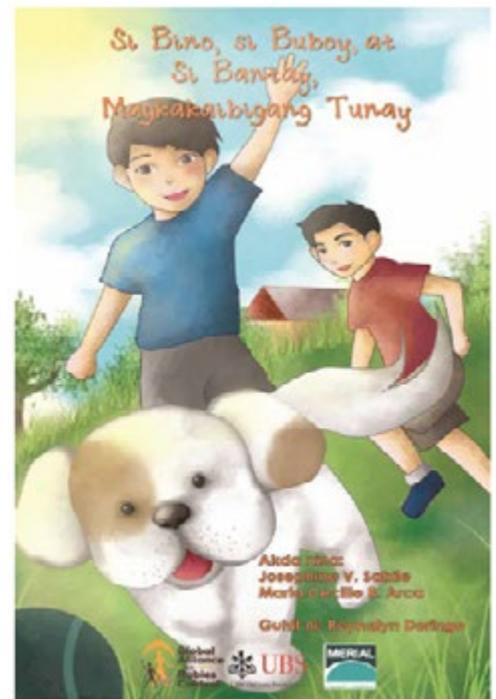
Also receiving awards were Dr Manuel Carlos of Marikina City and Dr Stella Lapiz the Provincial Veterinarian of Bohol Province – both areas where GARC has collaborated on rabies control projects with the local government.

The National WRD celebration also saw the launching of the rabies mascot, Super Bantay (Guard Dog) and the declaration of three more areas as rabies-free: the Municipality of Romblon and Municipality of San Jose in Romblon Province; and Pan De Acuzar and Botog Islands in the Municipality of Concepcion, Iloilo Province.

It gives GARC great pleasure to receive this award, to join in the recognition of all those who have contributed to the rabies control efforts across the Philippines, and to recognize how much closer these efforts have lead us towards a rabies free Philippines.

The event also gave GARC the opportunity to formally present 10,000 copies of a GARC rabies prevention storybook to the National Rabies Prevention and Control Committee, to the Department of Interior and Local Government, and Provincial, City, Municipal Veterinarians League of the Philippines. The book focuses on how children should properly take care of their pets, the importance of telling their parents when bitten by a dog or other animals and also discusses animal bite prevention and management.

The storybooks, kindly reproduced by Merial, will be distributed to the day care centers and elementary schools in the GARC CARE Project sites and to other high risk rabies areas in the country. An [animation of the storybook](#) has also been aired on the Knowledge Channel across the Philippines.

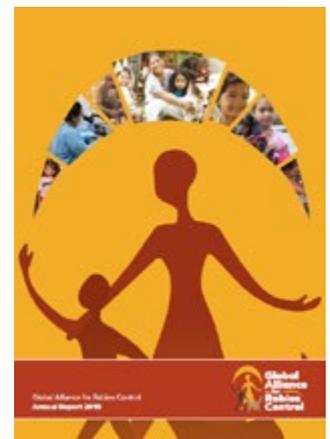


Contributed by Sarah Jayme, country representative for the Philippines, GARC

2015 GARC Annual Report – a Very Productive Year

We’re pleased to share our 2015 Annual Report, which provides an opportunity to reflect on the major achievements in rabies prevention and control that happened over the year, including:

- The global rabies meeting and agreement on the elimination of deaths by 2030
- The publication of a revised estimate of the global burden of rabies - an annual burden of 59,000 deaths and USD 8.6 billion
- The launch of the End Rabies Now multi-partner campaign, calling for an end to human deaths from dog-transmitted rabies by 2030
- The inaugural meeting of the Pan-African Rabies Control Network, with representatives from 33 African countries



We have also created a short video to take you through the 2015 highlights – [available here](#). You can download the full annual report on our website [here](#).

Congratulations to the Recipients of the World Rabies Day MSD Animal Health Awards

GARC is honoured to recognise outstanding contributions to rabies prevention with the first World Rabies Day MSD Animal Health Awards. Every awardee received USD 1,200 (or equivalent in kind), a certificate and an award plaque. The award winners are listed here:

Individual Category Awardees

Dr. Thinlay Bhutia (Asia), leader of the Sikkim Anti-Rabies and Animal Health Program (SARAH) in India, has worked to end local dog culling and implement stray-dog and rabies-control efforts that have reduced the street dog populations and reduce the incidence of rabies.

Dr Agnes Korir(Sub-Saharan Africa) founded the Sharon Live On Foundation following the death from rabies of her seven-year old daughter and has supplied over 270,000 vaccinations to dogs in Kenya.

Professor Kastriot Korro(Middle East, North Africa, Central Asia & Europe) represents the National Focal Point for wildlife diseases for Albania, and continues to sustain community awareness against rabies in people and domestic and wild animals, efforts he has engaged in since 1996.

Dr. Sergio Recuenco-Cabrera(Americas) is an advocate for controlling vampire bat-associated rabies in the Amazon while working within the CDC, Rabies in the Americas and subsidiary meetings, Pan American Health Organization, the Peruvian Ministry of Health (MOH) and National Institutes of Health (NIH).

The idea behind the awards was to draw more attention to the positive work being done to bring us closer to the goal of eliminating human deaths by canine rabies in 2030. To accomplish this, GARC teamed up with veterinary pharmaceutical manufacturer MSD Animal Health to launch these awards for the 10th World Rabies Day. The eight award winners were chosen by a panel of judges from the CDC, FAO, OIE, WHO, MSD and GARC, along with voting by MSD employees.

It is hoped that by highlighting the work of these winners and nominees, more emphasis can be placed on the sustained progress that happens daily in communities around the world. Additionally, knowing there are dedicated individuals who continue to accomplish so much is a source of inspiration for us all, and we hope that you'll send in more great nominations for next year's awards. View more information about the winners and the shortlisted nominees and the great work they're doing, [here](#).

Submitted by Deepa Balaram and Laura Baker, GARC

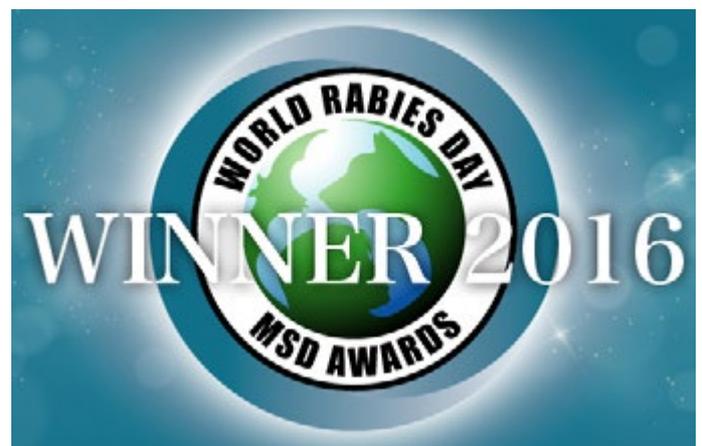
Organisation Category Awardees

Visakha Society for Protection And Care of Animals (Asia) advocates for and implements humane alternatives to culling street dogs in the state of Andhra Pradesh.

Liberia Animal Welfare & Conservation Society (LAWCS, Sub-Saharan Africa) provides education and outreach support for rabies awareness and dog bite prevention in Liberian schools and communities, while also running no-cost, dog-rabies vaccination campaigns.

Kurdistan Organization for Animal Rights Protection(KOARP, Middle East, North Africa, Central Asia & Europe) focuses its work on rabies prevention and animal welfare through volunteer-run veterinary services for stray animals, while also working to reform stray-dog-control laws.

Zach Jones Memorial Fund (ZJMF, Americas) was launched to promote rabies awareness and research after Connie and Larry Jones lost their only child, Zach, at 16 years of age to rabies after a bat bite in 2006.



Helping Countries to Help Themselves: the Updated SARE Tool

As the fight against rabies continues to evolve and adapt, so must the tools that are used to win that fight.

With the global drive towards canine-mediated human rabies elimination by 2030 on the tongues of everybody in the rabies field these days, there is a lot of attention focused on this achievable goal. Yet, many countries face a challenging task ahead of them because most rabies-endemic countries in Africa and Asia are still in the early stages of this fight. As many publications, presentations and speeches before this have highlighted, the global community is making every effort to help these countries to initiate effective and sustainable control programmes, whilst also encouraging more advanced countries to showcase their efforts and share their experiences as they reach their elimination targets.

The ever-present dilemma of the cycle of neglect has hindered any substantial progress historically; however, with the support from the global community and the tools that have been developed in more recent years, it is now possible to break this cycle. One such tool in identifying the means to break the cycle of neglect is the Stepwise Approach towards Rabies Elimination (SARE) tool that has been incorporated into the Blueprint for Rabies Control (<http://rabiesblueprint.org>). The SARE tool enables countries to perform self-assessments of their own unique rabies situation and creates a score based on specific achievements that each country has completed. Thus, a score from stage 0–5 is provided at a glance, giving an immediate overview of the progress the country has made towards being free from canine rabies. With a more in-depth analysis of the outputs, the tool highlights the exact activities that have been completed as well as those that are pending. By using these pending activities as guidelines for the next steps needed to achieve elimination, countries are able to easily and effectively identify areas of concern or target areas for further attention.

The SARE tool is now more than 2-years old, and although some minor revisions have been made, some of the questions were either unclear or vague, expecting users to have an in-depth knowledge of the SARE concept and an understanding of the processes that have been developed. In light of this, GARC in collaboration with the FAO and other partners has worked tirelessly over the past months to revise and improve upon the SARE tool.

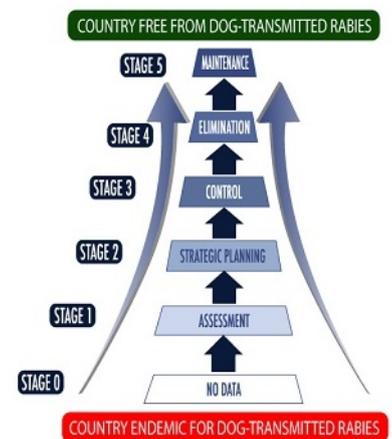
Revisions and updates to the tool:

- Clarified instructions to users
- Locked access until instructions are read
- Revision of activities in each stage
- Improved and revised SARE diagram
- Automatic scoring of stage
- Direct links to Blueprint for Rabies Control
- Addition of activities to clarify progression
- Progression on activities revised
- Improved Dog-population management (DPM) criteria
- Improved Information, Education and Communication (IEC) criteria
- Improved language and clarity on questions

The newest version of the SARE tool has already been pre-tested in the Philippines and subsequently beta-tested at a Philippines sub-national meeting. Furthermore, the revised tool was launched at the GARC-WAP joint rabies elimination planning workshop that was held in South Africa from 25-26 October 2016. Delegates found that using and interpreting the tool was far easier than before, with the majority of delegates being able to complete the assessment with little help or clarification from the facilitators.

Although the tool has been substantially improved, there will always be ways to better the tool for use in various situations. Because of this, a dedicated team of experts from around the world continue to work on the SARE tool to ensure that it provides easy-to-use, accurate and much needed guidance to rabies-endemic countries to help them reach their globally accepted goal of canine-mediated human rabies elimination by the year 2030. More information about the SARE can be found [here](#) and the updated SARE tool will be incorporated into the blueprint shortly.

Submitted by Terence Scott and Andre Coetzer, GARC and members of the Pan-African Rabies Control Network (PARACON) Steering Committee



World Rabies Day 2016 Celebration in the Philippines: Towards Rabies-free by 2020

September is always an action-packed month for the GARC team in the Philippines, who—together with our partners—mark this month for the annual nationwide celebration of World Rabies Day (WRD) on September 28. The Philippines is among the seven Southeast Asian countries where canine rabies is still highly endemic, and so the World Rabies Day celebration presents an opportunity to educate and involve Filipinos in the shared goal to ultimately eliminate rabies in the country by the year 2020.



An educational program on rabies awareness and bite prevention at Yakap Daycare Center, led by the AFPVD in Camp Aguinaldo, Quezon City. Whilst the children learned through play, their parents watched a rabies awareness video and were encouraged to bring their pets for vaccination.

CARE project sites in the Philippines. National partner agencies such as the Department of Education (DepEd) and Department of Interior and Local Government released national memorandums encouraging schools and local governments nationwide to conduct their own WRD activities.

GARC also teamed up with the Philippine Information Agency (PIA), DepEd, and the Armed Forces of the Philippines Veterinary Dispensary (AFPVD) to boost the promotion of WRD through multi-media platforms. PIA facilitated television interviews and a text or SMS blast that was sent to approximately 8,800 subscribers across the country, while DepEd posted key messages on rabies on their official Facebook page. A first this year was a WRD video advertised on the electronic billboard along a major freeway around Manila in coordination with the AFPVD.

The team also supported local government partners by providing banner tarpaulins to those who registered their events. Just recently, we presented WRD updates during the Animal Health and Welfare Forum attended by around a hundred local government veterinarians and professors from veterinary schools. A number of people approached us at the event and thanked us for the banners and IEC materials we sent. Hearing their stories firsthand about how we contributed to their WRD celebration truly was the highlight of our day.

Our project partners in Sorsogon and Ilocos Norte were equally busy with WRD events. More than 800 students from pre-school to the high school level along with around 200 teachers and parents participated in a series of information and education activities held in both areas. These include the Star Holiday Encampment in coordination with the Girl Scouts of the Philippines in Sorsogon and the Children's Festival, One Health Quiz Bee, and the Folk/Modern Media Competition in Ilocos Norte. Similar to the national government award, the province of Ilocos Norte also recognized the individual local governments and groups who excelled in implementing the rabies prevention and control program in their respective localities.

We would like to extend a huge thank you to our local partners for these events, for their commitment, and for their active involvement. With the increased awareness and knowledge of rabies, we expect that more people will get involved in the WRD activities in the coming years.

Contributed by Dane Medina, communications officer for GARC's Philippines office

From the national government down to the villages, the number of people who participate in the celebration keeps growing each year. For 2016, more than 80 event organizers participated in the WRD celebration with over 90 events registered on the GARC website, a substantial increase from 66 events in 2014 and 76 in 2015. These events include routine free mass dog vaccinations, spay and neuter services, and community/school lectures, but some partners organized pet-and-owner fun runs, school-based competitions, dog shows, radio and television interviews, and rabies summits.

At the national level, the Declaration of Rabies-free Zones has always been a highlight of the WRD celebration. Since 2008, 38 areas have already been declared rabies-free through this joint endeavor of the Department of Health and Department of Agriculture. Thirty-eight local government units were also recognized as the Best Rabies Program Implementers including Ilocos Norte, which is one of the



Over 150 Grade 1 to 6 students representing the 26 school districts of Ilocos Norte competed in a One Health Provincial Quiz Bee answering questions on Rabies, Dengue, and Helminthiasis.

Journalism Students Experience Rabies Control in Action

For the last few months, the GARC Philippines team has been working with a group of development communications students from the University of the Philippines Los Baños. The students were invited to document the Communities Against Rabies Exposure (CARE) projects in Ilocos Norte and Sorsogon.

The students accompanied the barangay health workers and vaccination teams to remote villages to vaccinate dogs. Here they observed rabies control in practice and interviewed traditional healers (Tandoks), teachers, children and community members about their experiences of rabies and the rabies control programmes.

The opportunity allowed the students to learn the technicalities and practices of journalism, and consider the ethics of interviewing. It also provided them with an experience of the culture in these more remote areas of the Philippines and a deeper understanding of the need for rabies control and the projects themselves.

Summing up her visit in a testimonial, Ariana Alcala said: "This fieldwork will be one of the most memorable for me because it let me see how collective action of community members can make a big difference... Moreover, their success stories gave me hope that if Ilocos Norte can be a rabies-free region, our community can also be."

The students are currently finalising their articles and video documentaries, so look out for more stories coming out of this collaboration in the next newsletter.

Submitted by Louise Taylor, GARC Scientific Director



Ma'am Marilou Ofiana, a master teacher and a district science curriculum coordinator, willingly shared stories on how her students participate in rabies-based lessons and how they applied the lessons outside their classroom.



The journalism students enjoy a photo opportunity with children at a day care center in Laoag City, Ilocos Norte.

NEWS FROM THE COMMUNITY

Could More People Survive Rabies?

A [recent article](#) by Mani et al. discusses a new trend in India: within the last 6 years, there have been six survivors of clinical rabies contracted from dogs. The authors attribute this upward trend in survival to increased access to conventional critical care facilities and more doctors trying to save rabies patients. Many of the Indian survivors have been left with severe neurological complications, but these patients survived none the less, a situation undocumented in India before 2010.

Ever since Jeanna Giese, a 15 year old girl bitten by a bat was treated for and [survived clinical rabies](#) in Milwaukee in 2004, there has been heightened interest in developing a reliable cure for rabies. The early optimism over the so-called Milwaukee protocol has not been followed by a high success rate, and despite alterations to the protocol during [48 further attempts](#) to treat rabies with it, just 7 additional survivors are known. The protocol is [highly controversial](#), in part because most of the survivors are not fully documented. However, data from the survivors along with those who survive longer before dying can provide [data about clinical rabies](#) that can be learned from to develop better therapies.

Reviews published in [late 2015](#) and [last month](#) list a total of 19 documented survivors from 1970 onwards, noting that many had partial or delayed pre- or post-exposure vaccination against rabies prior to symptoms developing. Those with bat-associated rabies and those with robust early immune reactions may also have better survival prospects.

Finally, a [recent report](#) describes a patient with a history of a bite from a dog infected with rabies who recently survived after only relatively simple hospital treatment in a hospital in Ghana. This case is one of presumptive rabies, as laboratory diagnosis was not available in this setting, but the symptoms, including hydrophobia and photophobia, were highly characteristic of rabies.

In resource poor settings, where rabies is woefully underreported, diagnoses of rabies are rarely confirmed in laboratories, and people clinically diagnosed with rabies are generally sent home to die, is it possible that more, undocumented survivors exist?

These cases are extremely rare and do not affect the general conclusion that rabies is an almost universally fatal disease. However, as access to well-equipped medical facilities improves across African and Asia and the expertise of medical personnel in treating rabies improves, we should expect more rabies survivors with better outcomes. Studying these patients will allow us to learn from them, and thus improve our understanding of what interventions could potentially lead to successful recovery from clinical rabies.

Written by Louise Taylor, Scientific Director, GARC

Rapid Diagnostic Tests Show Great Promise, but also Unacceptable Inconsistency

Rabies diagnostics tests that are cheap and easy to use could hugely benefit rabies control efforts, providing confirmation of animal cases to help save lives and refine control strategies to better protect communities. The gold standard test, the fluorescent antibody test (FAT) requires laboratory equipment, trained staff, and temperature-sensitive reagents, limiting their application. In contrast, recently developed rapid immunodiagnostic tests for rabies diagnosis promise testing outside the laboratory, require virtually no equipment and minimal training, and produce a result in minutes. Such tests are available on the market now, but do they work? Two recently published papers demonstrate both the promise and the current inadequacies of these tests.

A study, published in [PLOS Neglected Tropical Diseases](#) this month, evaluated the Anigen Rapid Rabies Test® with

48 samples in a field laboratory (in N'Djamena, Chad) and 73 samples in an international reference laboratory (Institute Pasteur, Paris, France). In the reference laboratory in France, the test produced a specificity of 93.3% and sensitivity of 95.3% compared to the gold standard FAT test. In the field laboratory, the rapid test yielded a higher reliability than the FAT test (though here the FAT did not follow the gold standard methodology exactly) particularly on fresh and decomposed samples. The study concluded that the test performed excellently in terms of both ease of use and the reliability of the results. Importantly, these authors omitted a dilution step from the manufacturer's protocol.

However, a [second study](#), published in the same journal in June tested six commercially available rapid rabies tests (including the Anigen Rapid Rabies Test®) in a controlled laboratory setting. Over 80 (naturally and lab-infected) animal brain samples were tested at the Friedrich-Loeffler-Institute in Germany, a WHO Collaborating Centre for Rabies Surveillance and Research and 20 naturally-infected animal brain samples were tested at the OIE Rabies Reference Laboratory, in Onderstepoort Veterinary Institute, South Africa. Each brain sample was tested by each rapid test kit and also by the gold standard FAT.

The second study concluded that the tests did not give reproducibly accurate results. While all six tests showed good specificity (i.e., they did not come up with "false positives"), but none demonstrated good sensitivity across the different sample sets. Overall, more than half of all positive samples (i.e., those with positive FAT and PCR results) yielded "false negative" LFD results. Some LFD tests did better than others, and in some cases specific batches of the same test did better than others, but



Rapid rabies diagnostic tests. The control (C) line shows the test is valid, and the test (T) line a positive rabies result. Image from Lechenne et al. (2016) in PLOS NTDs.

overall the results were disappointing.

These authors suggest that commercially available rabies LFDs cannot be recommended for routine diagnosis and surveillance at this time. However, acknowledging the great potential for these tests, they also state that the study "is not meant to discredit the use of LFDs for rabies diagnosis but rather to encourage producers to substantially improve and assure the quality of their products".

Both studies demonstrated the ability to recover virus RNA from the test strips for genetic analysis by PCR, which means that the tests could be used as a vehicle to ship viral RNA to reference laboratories for further laboratory confirmation of the diagnosis and for genetically characterising the viruses, which could be extremely valuable to epidemiological investigations.

The authors of the first study suggest that their omission of the dilution step could have contributed to their more consistent results, but clearly more assessment of these tests' reliability and refinement of their instructions for use will be needed before they can fulfil their potential. Further validation is currently ongoing in pilot field studies in Chad, Mali and Ivory Coast and is expected to provide a large data set over the next two years.

Written by Louise Taylor, based on Lechenne et al. (2016) "[Validation of a Rapid Rabies Diagnostic Tool for Field Surveillance in Developing Countries](#)" and Eggerbauer et al. (2016) "[Evaluation of Six Commercially Available Rapid Immunochromatographic Tests for the Diagnosis of Rabies in Brain Material](#)" both published in [PLOS NTDs](#).

“Your Child Will Be Dead Before the End of the Day”

Karachi in Pakistan is a mega city of nearly 20 million people. It has sprawling homes surrounded by high walls and fragrant flower hedges. Chauffeur-driven cars take ladies to elegant shopping malls and tea parties and bring home their children from elite schools. It is not uncommon to see armed guards escort them while on road.

And then there are shantytowns, surrounded by mounds of garbage; dilapidated buses lurch over potholed roads. Men, hurrying towards mosques to catch the early morning prayer, stop to buy fruits and vegetables piled on rickety pushcarts. Packs of mangy dogs roam the streets, scrounging for food out of garbage dumps. A group of boys is playing football. One of them playfully aims a stone at a bitch guarding her litter of puppies. She growls, he stones her. She is angry and approaches him menacingly. Other boys join in the stone pelting till the mother lunges at the boy, nips his calf and draws blood.

Emergency Departments in Karachi’s three major hospitals report over 100 dog bites a day, but most victims stay home and literally rub salt into the wound. “Better this, than get fourteen injections into the abdomen. Never let water touch a dog bite wound,” quips the grandmother. Others may find it tedious to reach a hospital where the doctor would only clean the injury with antiseptic solution and apply a bandage; there is no concept of infiltrating immunoglobulin. If there is vaccine, the doctor may inject it into the arm or into the thigh. Further advice may be given, depending upon the doctor’s knowledge and aptitude and practice; often both are pathetic.



Raising awareness about rabies amongst school children

Unfortunately, we continue to see victims of rabies encephalitis from medical centers whose physicians have not received proper training, or lack vaccines or RIG. I have watched helplessly, time and again, the agony of parents, imploring me to save their child who is gasping and choking before their eyes. That same child, who was playing football, just a few weeks back, will be dead before the end of the day.

Ever since GARC initiated WRD, Indus Hospital, supported by other societies has launched a blitz of awareness and instruction campaigns. For WRD 2016, we reached out to tens of thousands of individuals, through a massive drive via television, radio, newspapers and magazines, visits to schools, board games, billboards, walks and street announcements through a megaphone, and freely distributed flyers, posters and teaching aids to health care workers. Through unrelenting advocacy, NIH Pakistan has finally discontinued the production of the odious sheep brain vaccine and is now importing a low cost Vero cell vaccine.

Sadly, the local government has still not woken up to the tragic situation. It is the poor and the homeless street children, sidewalk vendors and such lesser mortals that fall victim to this incurable disease. Periodic dog-killing campaigns will never contain stray dog population. Only concerted efforts of civil society, physicians, city government and veterinarians, approached in a scientific manner will reduce the scourge of rabies.

Contributed by Dr. Naseem Salahuddin, Head of the Dept. of Medicine and Infectious Disease, The Indus Hospital, Karachi



Dr Salahuddin being interviewed for WRD 2016

The Indus Hospital (TIH) was established in 2007 to provide free but quality health care in various disciplines of medicine. We opened a dog-bite-management center, equipped it with a wound wash area complete with disinfectants, eRIG and vaccine. We have trained, and continue to train, nurses and doctors through video and slide presentations on hands-on training for post-exposure prophylaxis (PEP). TIH has earned a reputation for proper care and was awarded the status of Training Center for the entire province of Sindh (pop. 35 million). Doctors and paramedics arrive from different parts of the city and province to acquire training and return to practice in their parent institution. At least five other PEP centers in the city are functioning satisfactorily and have taken the load off existing centers.

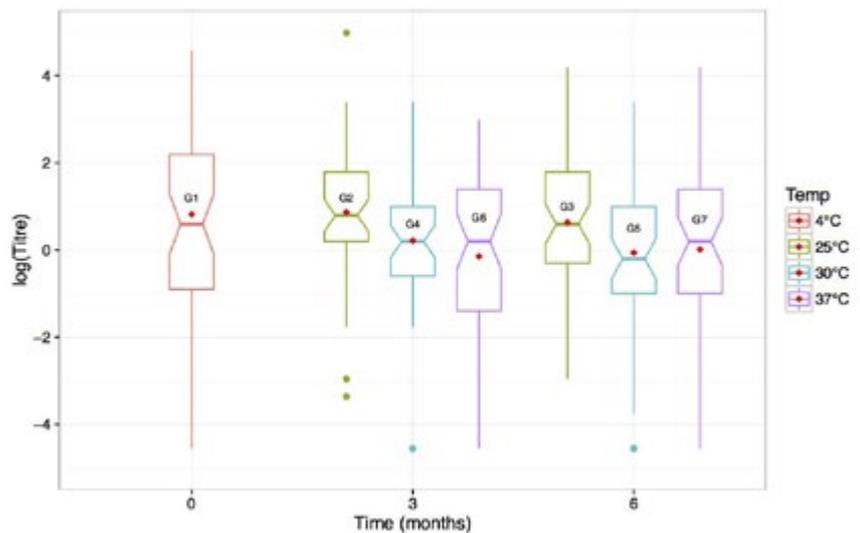
Thermotolerant Vaccines: A Game Changer?

The Serengeti Health Initiative (SHI)—cofounded by Washington State University and Lincoln Park Zoo (Chicago)—has, since 2003, been controlling rabies through the implementation of annual mass dog rabies vaccination campaigns in remote villages in northern Tanzania. The effectiveness of campaigns such as these, and the epidemiological features that make elimination feasible (*e.g.*, effective vaccines are available; domestic dogs, not wildlife, are the reservoir of infection; and rabies has a relatively low R_0 (the number of secondary infections produced from a primary case)) have led the World Health Organization (WHO), together with the Food & Agricultural Organization (FAO) and the World Organization for Animal Health (OIE), to recognize canine-mediated human rabies as a global health priority and to unite in a tripartite commitment to its global elimination by 2030. Whether this commitment is met with success will, in part, be determined by vaccine delivery programs being able to overcome the logistical problems associated with ramping up from the small to the regional scale.

One constraint that poses a particular problem is the difficulty of achieving vaccination coverage of 70% of the dog population *consistently* across the vast and remote rural landscapes that characterize much of sub-Saharan Africa and Asia. With the elimination of rabies critically dependent on *contiguous* vaccination coverage, even small pockets of low coverage (*e.g.*, involving < 0.5% of the dog population) will cause significant delay. Consequently, if the large, coalescent, disease-free zones necessary for regional elimination are to be created, it will be essential to overcome this constraint.

One factor hampering the delivery of sufficient quantities of rabies vaccines to hard-to-reach areas is the lack of electrical power needed to maintain the cold-chain. As a result the transport and storage of vaccines in remote locations is compromised. Consequently entire communities are, at best, dependent on donor-funded team-led vaccination campaigns or, at worst, receive no rabies control at all. Moreover, in those communities that are fortunate enough to be targeted, the inability to store vaccines in these locations means that any new dogs that enter the population such as puppies must remain unvaccinated until the next campaign event passes through. When this immigration of unvaccinated dogs is coupled with a high mortality rate (life expectancy of dogs in rabies endemic countries < 3 years), the result is the proportion of immunized dogs decreasing steadily following each campaign. If coverage falls below a critical threshold then R_0 will become greater than 1, and, if virus enters the population, rabies will be sustained.

A potential solution to this problem of how vaccines can be delivered to and stored in remote areas is *thermotolerance*—the ability of a vaccine to retain its potency following storage at temperatures in excess of the cold-chain (4°C). Indeed, thermotolerance has been cited as a critical aspect of the successful campaigns to eliminate both rinderpest and small pox because it empowered local communities to coordinate and deliver their own campaigns using vaccines safely stored for extended periods outside of the cold-chain, greatly increasing the reach of both campaigns. If rabies vaccines can also be shown to be thermotolerant, this could have an equally transformative effect on the global elimination of canine-mediated rabies.



Legend:

A boxplot showing the range of (2log) day-28 titres produced by vaccine stored at elevated temperatures for zero (cold-chain), three or six months (red diamond = 2log titre mean; G1 – 7 = treatment groups 1 – 7).

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To this end, in 2015–16, [a collaborative project between WSU and MSD Animal Health](#) began investigating whether the commonly-used canine rabies vaccine Nobivac® Rabies had thermotolerant properties. The first phase of this trial, which investigated the effect that various levels of non cold-chain storage had on the potency of the vaccine, indicated that this vaccine retained its efficacy following storage at 25°C for six months and 30°C for three months. These results are extremely exciting as they provide the first evidence that this vaccine can be safely used following extended storage in conditions well outside of the cold-chain. Further, the results suggest that more cost-effective delivery strategies, potentially involving communities managing and implementing their own campaigns, can be developed. If successful these developments could transform how mass dog rabies vaccination is delivered to hard-to-reach communities where rabies remains stubbornly endemic. Given the tripartite agreement for global elimination of rabies, these developments will be particularly timely.

Submitted by Felix Lankester, Clinical Assistant Professor, [Paul G. Allen School for Global Animal Health](#), Washington State University. The study "[Thermotolerance of an inactivated rabies vaccine for dogs](#)" has just been published in *Vaccine*.



RECENT RESEARCH- November 2016

Genetic Epidemiology

[Host-pathogen evolutionary signatures reveal dynamics and future invasions of vampire bat rabies](#). Host and virus genetic information is used to understand the geographic spread of vampire bat rabies virus (VBRV) in Peru. Virus can spread between apparently isolated host populations via dispersing male bats. Predictions of viral spread through northern Peru that were validated by livestock rabies mortality data, and predictions made for that the virus could reach the Pacific coast by 2020.

[Elucidating the phylodynamics of endemic rabies virus in eastern Africa using whole-genome sequencing](#). The first whole-genome phylogenetic analysis of rabies virus in East Africa, revealed long-distance dispersal within Tanzania, which could be attributed to human-mediated movement, and multiple persistent, co-circulating lineages within single districts, despite on-going mass dog vaccination campaigns. The data indicate that successful rabies control in Tanzania could be established at a national level, but some coordination with neighbouring countries may be required to limit transboundary movements.

[Phylogenetic analysis of rabies virus isolated from canids in North and Northeast Brazil](#). Molecular characterization of 102 rabies virus isolates from dogs and *Cerdocyon thous* from various states in North and Northeast Brazil between 2006 and 2012 was completed. Two distinct genetic lineages, one associated with canids and one with bats, were found and within the canid cluster, two distinct sublineages circulate among dogs and *Cerdocyon thous*, with interspecific infection observed among the canid viruses.

Human Rabies and Biologicals

[Ineffectiveness of rabies vaccination alone for post-exposure protection against rabies infection in animal models](#). Various animals were challenged with wild-type rabies virus, followed by vaccination with either rabies vaccines commercially available or experimental PIKA rabies vaccines. 100% of animals given traditional rabies vaccines plus RIG survived, 80% of animals survived with RIG alone, but animals receiving traditional rabies vaccines alone showed extremely low survival rates, not significantly different from unvaccinated controls. The experimental vaccine alone protected 40-80% of animals.

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[Two decades of pharmacovigilance and clinical experience with highly purified rabies immunoglobulin F\(ab'\)₂ fragments](#). An overview of clinical experience with a highly purified preparation of F(ab')₂ fragments from equine rabies immunoglobulin (FavirabTM) in rabies PEP and reported adverse events concludes it is safe and effective. The general safety profile of F(ab')₂ pERIG is discussed, as are the occurrence of rare anaphylactic reactions and suspected intervention failure.

[Human Rabies: A 2016 Update](#). A new review of human rabies infections and treatment options concludes that the Milwaukee protocol is ineffective and that novel therapeutic approaches may depend on a better understanding of basic mechanisms underlying the disease.

Animal Vaccines

[Thermotolerance of an inactivated rabies vaccine for dogs](#). This study provides the first robust data that the antibody response of dogs vaccinated with Nobivac[®] Rabies vaccine stored for several months at high temperatures (up to 30°C) is not inferior to that of dogs vaccinated with vaccine stored under recommended cold-chain conditions (2-8°C). See full article for more.

Diagnostics

[Validation of a Rapid Rabies Diagnostic Tool for Field Surveillance in Developing Countries](#). A rapid immunodiagnostic test (RIDT) was compared to the standard FAT with genetic detection of viral RNA. The RIDT performed excellently and results were reliable but changes to the standard protocol are suggested, and further validation is needed. (See separate article in this newsletter.)

[Rabies vaccine response measurement is assay dependent](#). Enzyme-linked immunosorbent assay (ELISA) and serum neutralisation tests on serum to determine protective antibody levels were compared across a time series. Similar vaccine equivalency conclusions were made using either method, however vaccination-regimen equivalency varied by test method used. Protective antibody cut-off levels should be determined for each test independently.

Control Strategies

[The SARE tool for rabies control: Current experience in Ethiopia](#). The Stepwise Approach towards Rabies Elimination (SARE) tool provides a standard mechanism for countries to assess their rabies situation and measure progress in eliminating the disease. Ethiopia undertook a self-assessment using the SARE tool which identified a number of critical gaps and strengths in the current rabies control efforts, and enabled key criteria to be prioritized, thereby accelerating the National Strategy.

[A mixed methods approach to assess animal vaccination programmes](#): the case of rabies control in Bamako, Mali. A mixed method approach, combining quantitative and qualitative tools across different sectoral issues, was developed to evaluate effectiveness of the intervention. The final effectiveness levels were 33% and 28%, with vaccination coverages of 27% and 20%, and a lack of information about the campaign was identified as a critical factor. Qualitative data provide an explanatory framework for deeper insight into improving the intervention design while involving all stakeholders.

Upcoming Conferences

The [One Health EcoHealth 2016](#) conference will bring together the global One Health and EcoHealth communities in Melbourne, Australia, from December 4th to 7th.

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