

EDITORIAL

An End to Human Rabies Deaths - The Time is Now!

Delegates from around the world gathered in Geneva on 10-11th December 2015 for a landmark meeting, entitled “[Global elimination of dog-mediated human rabies: The time is now](#)”. The meeting had 4 objectives:

- Disseminate results of the proof of concept for the elimination of dog-mediated rabies;
- Build support and the case for investment to progress towards dog-mediated rabies elimination;
- Promote a One Health inter-sectoral collaboration approach;
- Shape the forward vision agenda with shared purpose for the elimination of dog-transmitted human rabies.



It was hosted by WHO and OIE with the support of FAO and GARC. Delegates included key representatives of Ministries of Health, Veterinary Services and national rabies coordinating bodies, rabies experts from the veterinary and the human health sectors and international organisations, policy-makers, non-governmental organisations, donors and the private sector.

In her [welcoming address](#), Dr Margaret Chan, the director-general of the WHO, started with a very simple message: “Rabies belongs in the history books. This event will help put it there.”

The meeting showcased a series of demonstration projects, in particular those coordinated by the WHO and funded by the BMGF in South Africa, Tanzania and the Philippines, which also form the core of evidence in the [Rationale for investing in the global elimination of dog-mediated human rabies](#), released on World Rabies Day 2015. Time and time again the data presented showed that dog vaccination can effectively reduce rabies cases in dogs, and that human deaths are tightly linked to the number of cases of rabies in dogs.

Rabies programme managers elaborated on the critical components of elimination programmes including mass dog vaccination, dog bite prevention, One Health collaborations and education of at risk communities. Presentations also detailed how OIE and WHO rabies vaccine banks have enabled countries improved access to high quality vaccines at an affordable price to support their efforts towards elimination, and are set to be integrated into future strategies against canine rabies.

The need for cross border collaborations and the value of rabies control ‘champions’ was demonstrated many times over, and regional networks will be key to achieving sustainable progress. There were strong calls for regional control plans to be developed and strengthened and in this context GARC’s Canine Rabies Control Blueprint and the Stepwise Approach Towards Rabies Elimination (SARE) were recognized as valuable tools to support countries in planning, implementing and assessing progress towards elimination.

The increase in rabies awareness due to the past 9 years of [World Rabies Day](#) was highlighted and that this work will be amplified by the new [End Rabies Now](#) campaign which aims to build the political and financial support to end human deaths.

Time for questions and feedback from delegates allowed productive engagement and discussion which was captured to feed into the meeting outcomes.

The meeting clearly demonstrated the current momentum in rabies control, and highlighted the evidence that

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...**Editorial** continued from page 1.

canine rabies elimination is feasible, equitable and that dog vaccination is the only long term solution to end human rabies deaths. All the international institutions are aligned with a clear multi-sectoral approach. One very concrete outcome of the meeting was agreement on a [new global framework to eliminate rabies](#), to achieve the strategic vision of Zero deaths from dog mediated rabies by 2030 worldwide.

The meeting was a significant milestone, but as Dr Bernard Vallat, director-general of the OIE, and several others made clear throughout the meeting, the extent to which we as a global community are able to achieve this strategic vision depends on what each and every delegate does next to capitalize on recent achievements.

Prof Louis Nel, Executive Director of GARC said, “We have come a long way in the past few years in finding a global consensus for rabies control and elimination. Backed by the recently launched End Rabies Now campaign, the prospects for maximising our cumulative efforts have never been more promising. Now is the time to grasp a unique opportunity to ensure that we eliminate human deaths from canine rabies by 2030”.

The conference [website](#) and [Twitter feed](#) give further information on the conference and access to all the supporting materials.

Written by Louise Taylor, GARC

NEWS FROM GARC AND WRD

A Picture Speaks a Thousand Words

To celebrate the theme of WRD 2015 “End Rabies Together”, PANAFTOSA-PAHO/WHO and its partner organizations of the Panamerican World Rabies Day Initiative, which includes GARC, conducted a photo contest for photos of activities, events, and programs that contribute to the goal of eliminating rabies in the Americas.

A panel of judges from 6 of the partner organizations considered over 100 photos and finally made a selection of the three best. The winning photographs were announced and showcased at the [Global Meeting on Rabies Elimination](#) in Geneva in early December.

GARC is delighted to congratulate the first prize winner Edgar Vilca Carhuapoma, from Huamanga-Ayacucho, Perú for his beautiful photograph of a dog being vaccinated against rabies.



Second place went to Rocio Milagros Lopez Saenz de Lively, of Breña-Lima in Perú for their photo of dogs being brought to a community vaccination event in the Municipality of Breña.



Finally, the third place was awarded to Juan José Martinez, from Ciudad Juarez Chihuahua, in México, for his photograph of a proud dog owner outside an anti-rabies vaccination centre.

The photographs all clearly demonstrated the twin themes of the message “End Rabies Together”: the critical importance of a One Health Approach to protecting human health through dog vaccination, and the need for community engagement to end the problem of canine rabies.



The Partners of the PanAmerican World Rabies Day Initiative 2015 were PAHO/WHO, World Veterinary Association, GARC, American Veterinary Medical Association, African Veterinary Association, World Animal Protection, Canadian Veterinary Medical Association, North American Veterinary Community, The World Small Animal Veterinary Association and Asociación Panamericana de Ciencias Veterinarias.

The End Rabies Now Campaign Launches

The End Rabies Now campaign was officially launched on Wednesday 24th February at the British Houses of Parliament in London.

The launch event was co-hosted by Lord Trees and Lord Crisp. Lord Trees is the former President of the Royal College of Veterinary Surgeons and Lord Crisp is the former Chief Executive of the UK's National Health Service and is co-chair of the All-Party Parliamentary Group on Global Health.

The End Rabies Now campaign is calling for an end to human deaths from dog-mediated rabies by 2030. Campaign partners will support advocacy efforts to persuade countries, policy makers and donors of the feasibility, merit and value of investing in rabies elimination strategies.

The 2030 target is achievable if national governments and international donor community and agencies make a commitment to allocate funding specifically for dog vaccinations in endemic areas. More than 99% of human rabies is transmitted by dogs, and vaccinating dogs is the most effective way of eliminating human deaths from rabies.

Speaking at the launch, Lord Trees said, "50 years ago as a student I learnt that the key to controlling human rabies is controlling dog rabies. It is time we got on with it and vaccinated dogs to eliminate this terrible human disease which every year kills four times as many people as the Ebola outbreak of 2014."

The guest speaker at the launch was the writer and explorer, Major Levison Wood, known for his ground-breaking and highly acclaimed TV documentaries, "Walking the Nile" and "Walking the Himalayas". He told the audience: "It makes sense to focus on prevention. If you are some-one living in remote and impoverished communities, prevention is effectively the only cure. That is why I think the End Rabies Now campaign is so important. I would urge you all to support the appeal for more dog vaccinations."



Prof. Louis Nel, the Executive Director of the Global Alliance for Rabies Control said, "This horrible disease is fully preventable and completely unnecessary. It is our social responsibility to end the ongoing and tragic neglect of this disease right now. Dog rabies belongs to the history books."

Also speaking at the event, Steve McIvor, CEO at World Animal Protection, said: "Mass killing dogs in response to rabies is often done in inhumane ways and is ineffective. There is no evidence to show that mass killing of dogs reduces their numbers in the long term, or has an effect on rabies transmission."

The campaign is coordinated by the Global Alliance for Rabies Control (GARC). Campaign partners include the World Health Organization (WHO), the World Organisation for Animal Health (OIE), the Food and Agriculture Organization of the UN (FAO) and World Animal Protection.

A full list of partners can be found here: <https://endrabiesnow.org/supporters>.

A major loss was felt in the GARC community with the recent passings of two prominent rabies researchers: [Dr. Shampur Madhusudana](#) (December 2, 2015) of India's National Institute of Mental Health and Neurosciences and [Dr. Makonnen Fekadu](#) (January 4, 2016), an Ethiopian native formerly of the US Centers for Disease Control. These two men made significant contributions to our current understanding of rabies and were deeply motivated to reach their common goal of a rabies-free world. For further information about their research and their lives, please click the links above, or visit the GARC website news section.



Guest Speaker Major Levison Wood with Prof. Louis Nel, GARC

How Bad is Surveillance for Human Rabies?

Two recent publications demonstrate widespread underreporting of human rabies cases, but a new WHO initiative will help to improve the situation.

It is generally accepted that for most canine rabies endemic countries, surveillance data on human deaths are poor. Underreporting is widespread because data collection occurs largely in urban hospitals, if at all. With rabies being a fatal disease of poor rural communities, many victims never report to healthcare facilities or return home to die when no treatment is available.

Without reliable and complete data on human cases it is difficult to argue for the resources needed to control canine rabies. To overcome this problem, modelling has been used to estimate the likely number of human deaths. However without accurate surveillance data, it is impossible to be sure if these estimates are correct, or monitor progress towards rabies control and elimination. With this in mind, two recent publications have attempted to collate data to give an indication of how extensive underreporting is.

A study, [published in Acta Tropica](#) by GARC and partners, collated publically available data from online international health and rabies surveillance databases and the published literature. Two main approaches have been used—regular passive surveillance that relies on reporting of cases as they occur and much more intensive active surveillance that involves community-based searches for cases. The difference is profound, and active surveillance can reveal up to 100-times higher numbers of cases compared to passive surveillance. However, the intensive nature of active surveillance studies makes them very rare.

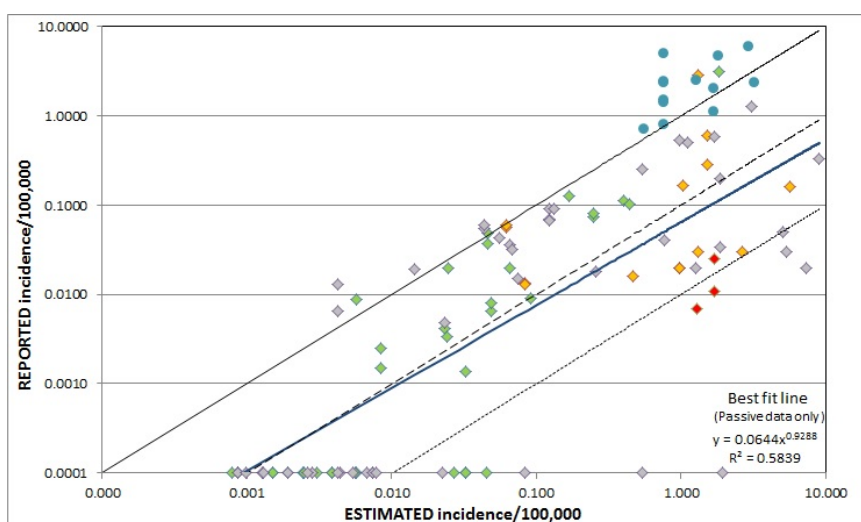
The study also cited published estimates of the human rabies burden in the literature. The two main sources of country estimates were 1) the Hampson and Partners for Rabies Prevention study from 2015 and 2) the most recent Global Burden of Disease model estimates from 2013. Whilst these modelled estimates varied due to their reliance on different methods and large extrapolations from limited data, both pointed to tens of thousands of human rabies deaths per year globally.

Estimates from these models for each country allow us to assess how poor the data for reported human rabies cases could be. Active surveillance data is close to these estimates (as they were inputs to the models), but the regular passive surveillance data falls well below, on average around 10% and sometimes only 1% of the estimated case numbers.

The WHO [Weekly Epidemiological Record](#) recently published an overview of human rabies surveillance data submitted to them by countries or confirmed through their networks, as well as more publically available data. Again these were shown next to estimated case numbers from the models. From this analysis, we can see that many countries have not recently reported data to WHO, and for those that do, the numbers are several-fold lower than the estimates.

In the near future, human rabies surveillance data will be included in the WHO's Global Health Observatory. This will re-establish a global database of human rabies surveillance data for the first time since WHO's RabNet was closed in 2011. It will provide a much needed overview of the global human rabies situation, which will become critical as plans for global elimination progress. Clearly, surveillance

data will be inadequate for accurate monitoring in the first instance, and more active surveillance techniques are necessary to increase the completeness of surveillance data. However, surveillance data generally only improve once they become necessary for tracking progress towards control and elimination goals, and this encouraging step will bring us closer to reliable routine reporting of surveillance data for human rabies.



Written by Louise Taylor, based on the publications: [Difficulties in estimating the human burden of canine rabies](#), published Dec 2015 in Acta Tropica, and [Human rabies transmitted by dogs: current status of global data, 2015](#) published in January 2016 in WHO's Weekly Epidemiological Record.

Rabies Control in the SDG Era

In September 2015, the 193 countries of the United Nations formally adopted the 2030 Agenda for Sustainable Development, which lays out aspirations for what the world should look like in 2030. Building on the Millennium Development Goals (MDGs) which focussed primarily on decreasing poverty and improving health in the developing world, the new Sustainable Development Goals (SDGs) reach far wider, encompassing economic development, education, justice, peace and environmental sustainability. The scope is ambitious: the goals address more problems, there are goals to end (not just reduce) poverty and hunger, and the emphasis on equality makes the goals relevant to developed and developing countries alike. A strong emphasis on monitoring, evaluation and accountability is also built into the SDGs, which with 17 goals and 169 targets will be a huge task.

Most relevant for rabies control is [SDG 3](#) “ensure healthy lives and promote well-being for all at all ages”, and within it *SDG Target 3.3 “By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, waterborne diseases and other communicable diseases”*.

However, consistent with the interconnections captured by the SDGs, progress towards several other goals (e.g. those related to poverty, inequality, education, and infrastructure) could indirectly benefit rabies control.

In December 2015, The World Health Organization, outlined its contribution to the SDGs, in its publication [Health in 2015: from MDGs to SDGs](#). Rabies is addressed alongside other NTDs, for which the WHO sees the key strategic priority as high quality universal health coverage (defined as *ensuring that all people can use the promotive, preventive, curative, rehabilitative and palliative health services they need, of sufficient quality to be effective, while also ensuring that the use of these services does not expose the user to financial hardship*). NTD indicators are being developed to allow assessment of how well health care is reaching neglected populations.

At the recently concluded WHO Executive Board meeting, a number of participating member states created a [draft resolution](#) on Health in the 2030 Agenda for Sustainable Development (EB138/CONF./8) in which they also stress the need for Universal Health Coverage, and call for all member states inter alia to ‘*strengthen the linkages between veterinary, medical and environmental communities with a special attention to emerging and re-emerging diseases, along with the emergence of antimicrobial resistant pathogens in a way that enables strengthened and improved surveillance, research, preventive measures and training to ensure or to build capacities to address these threats*’.

The draft resolution emphasises co-ordinated intersectoral action, using existing mechanisms to the greatest extent possible, toward the achievement of the SDGs. For rabies, the WHO/FAO/OIE Tripartite partnership with GARC is just such a mechanism, and the [strategic framework](#) agreed at recent the [Global Meeting on the Elimination of Dog Mediated Human Rabies](#), provides the details for achieving the vision of an end to human deaths by 2030.

Other existing mechanisms are relevant to a coordinated effort towards rabies control. One is the [Global Health Security Agenda](#) (GHSA), a global partnership that lends support to countries to improve their capacity to prevent, detect and respond to infectious disease threats. In a number of countries the GHSA is being used to strengthen both human and veterinary laboratory and field surveillance for rabies, and capacity building in the use of surveillance software such as [DHIS2](#) would benefit the control of many diseases.

A key goal for achieving the new SDGs is SDG17: “*Strengthen the means of implementation and revitalize the global partnership for sustainable development*”. Many partners have a role to play in promoting universal health care and realising the benefits of rabies- and other disease control efforts for all neglected populations.

It is unlikely that the global community will have additional new monies for meeting the SDGs in 2016. But if member states at the WHA agree to better direct existing resources, including through increased global coherence and collaboration in policies for rabies, which would be almost as good. We will keep you posted on the developments.

Contributed by Spring Gombe, a policy consultant at GARC, and Louise Taylor of GARC. The United Nations’ [Sustainable Development Knowledge Platform](#) provides accessible information on all the goals and targets, together with the report ‘[Transforming our World: The 2030 Agenda for Sustainable Development](#)’. There was also a commentary on NTDs in the SDGs published last month in the [Lancet](#). More information on the GHSA is available [here](#).

THE GLOBAL GOALS For Sustainable Development



Webinar Broadcasts 2nd International Rabies Symposium from RITA on Human Rabies Prevention and Treatment

On October 9, 2015, as a part of the Rabies in the Americas (RITA) conference, Dr. Charles Rupprecht, Professor (adjunct) at the Wistar Institute, and Peter Costa, Associate Executive Director, One Health Commission, hosted a team of international rabies experts from academia and private and public health institutions to speak at the Symposium on Human Rabies Prevention and Treatment. This symposium provided a forum for discussing current and future directions in the fields of human rabies surveillance, diagnosis, prevention, and treatment, in the context of One Health. The presentations were broadcast globally as a webinar, providing continuous education credits and extending the benefits of the international conference in real time to many public health professionals around the globe.



Image courtesy of Ms. Nancy DiFalco.

Dr. Rupprecht, the outgoing President of the RITA international steering committee, opened the symposium with a brief summary of the current knowledge of rabies pathobiology, epidemiology, epizootiology and expanded on the existing state of human rabies prevention tools. He emphasized the critical need for evaluation and implementation of shorter, lower-dose prophylactic regimens (including alternative routes of administration), as well as the importance of escalating the development of affordable, efficacious novel biologics (particularly via emerging local producers in developing countries) within the next decade.

The intricacies of public health challenges in rabies prevention and animal management as well as effective approaches to overcome them were discussed using practical examples from the field by Dr. Jennifer House, a State Public Health Veterinarian from Colorado.

Dr. Robin Lewis, Deputy Director of the Office of Vaccine Research and Review at the United States Food and Drug Administration, presented on benefits, drawbacks, and limitations of human rabies vaccines and potency assays used for their evaluation. Dr. Lewis reported on ongoing studies and future strategies that were agreed upon during a recent EPAA rabies working group workshop. An ELISA-based potency assay that measures the rabies virus G glycoprotein was suggested as the most promising alternative to the current NIH potency test.

Two major directions for the future development of rabies laboratory diagnostic technologies were elaborated on by Dr. Richard Franka, Director of the OIE Reference Laboratory for Rabies at the Centers for Disease Control and Prevention (CDC). First, there is a critical need for rapid, low-tech field tests with high specificity and sensitivity, such as the direct rapid immunohistochemistry test (DRIT) and lateral flow assays, to be validated and distributed widely in canine rabies-endemic countries to promote continuous enhanced surveillance and rapid laboratory-based PEP decision-making. Second, high-throughput technologies for detection of viral RNAs, other indicators of infection, and rabies-virus-specific antibodies are essential for enhanced characterization of pathogen distribution, monitoring for variants potentially not neutralized by commercially available biologics, vaccination status confirmation, and early identification of human rabies cases.

The uneasy path of trial and error in human rabies experimental treatment approaches was eloquently summarized by Dr. Rodney Willoughby, of the Children's Hospital of Wisconsin. Dr. Willoughby emphasized that the time is right for randomized clinical trials to properly evaluate various biological drug, thermal, pharmacological, immunotherapeutic, and molecular-biology-standardized strategies for human rabies treatment.

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The Animal Handler and Vaccinator Education Certificate

The GARC Education Platform is proud to announce the launch of its first profession-specific course - the Animal Handler and Vaccinator Education Certificate (AHVEC).

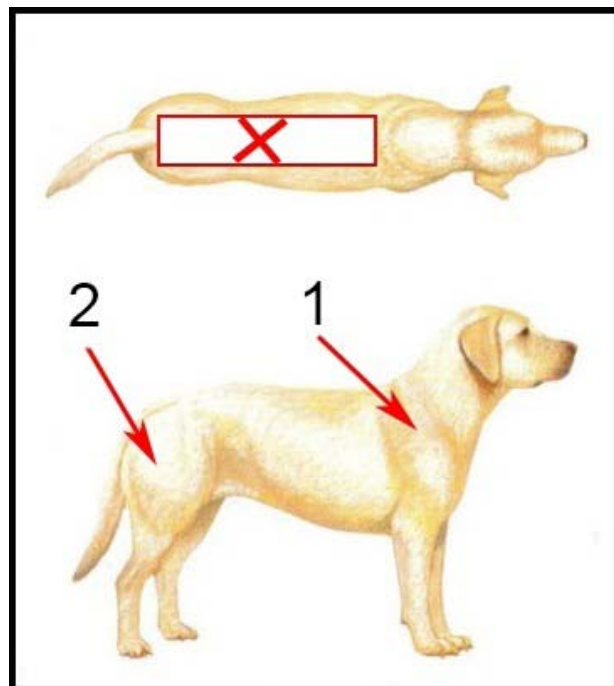


Due to the fundamental role that dogs play in spreading rabies, the regular vaccination of dogs against the disease is extremely important. Good animal handling and the proper administration of vaccine are essential techniques that need to be learnt by all professionals actively involved with dog handling and vaccinating, ensuring the safety and wellbeing of the handler and animal alike.

The AHVEC course has been designed as an introduction to dog handling and vaccination that can precede an actual physical training program. It requires participants to have already completed the Rabies Educator Certificate to enable handlers and vaccinators to communicate with community members and dog owners effectively about rabies control. The course should be followed by physical training under the guided supervision of a professional. Alternatively, trained professionals who wish to refresh their knowledge and remain up-to-date regarding new techniques and tools on dog handling and vaccination will benefit from the AHVEC.

The new course can be accessed by going to the online GARC Education Platform (<https://education.rabiesalliance.org>), and entering the enrolment key that is obtained upon completing the Rabies Educator Certificate (REC). Participants that have already completed the REC course, and wish to enroll for the AHVEC, can contact education@rabiesalliance.org.

We hope that you will enjoy the new course and that you will be able to benefit from the knowledge provided on the GARC Education Platform.



...*Rabies Symposium* continued from page 6.

Dr. Zhen Fu, discussed the role of virus-neutralizing antibodies in clearing rabies virus from the CNS and their potential use as a part of therapy.

The Symposium on Human Rabies Prevention and Treatment uniquely combined the most recent developments and innovations in the field with practical approaches for rabies prevention readily transferrable to every village, town, or city where rabies remains a daily scare.

Overall, 855 participants from 52 countries from Africa, Asia, Europe, and North and South America attended the symposium either in person (60 participants) or online (795 participants). In addition, 353 participants have viewed the archived recording. Afterwards, 94.7% of attendees confirmed that the webinar significantly contributed to their professional knowledge, and 94.4% indicated their interest in attending more rabies webinars.

Given the success of this webinar, the global nature of rabies and the challenges of attending international conferences for most public health professionals, globally broadcasted symposiums may be the future of rabies conferencing and we, the organizing committee, will do our best to make it happen again in 2016.

Contributed by Richard Franka (CDC), Peter Costa (One Health Commission) and Charles Rupprecht (Wistar Institute). More information about the presenters and abstracts are available on the [One Health Commission website](http://OneHealthCommission.org), and you can view the webinar recording using this [link](#). The organizers wish to thank the webinar sponsors: Colorado State University, Grifols, Kedrion Biopharma and Merial.

NEWS FROM THE COMMUNITY

Customized Online and Onsite Training (COLT) for Rabies Control Officers



In low and middle-income countries, it can be difficult to deliver adequate training for people working in disease control. However, with around 60,000 deaths estimated globally from rabies each year due to the inaccessibility of post-exposure prophylaxis, inadequate or absent dog rabies control programs, and lack of governmental financial support, there is much need for innovative methods to deliver appropriate education to these areas.

Many e-training programmes are based on participatory learning models in which participants share their understanding and monitor their theoretical knowledge through discussion, questioning and interaction with mentors via the internet. The current most popular e-learning systems for resource-poor settings are massive online open courses (MOOCs) which have been used by tens of thousands of students around the globe. However, this format is not well suited for specific practical training needs, such as the management of neglected zoonotic disease and rabies.

To improve the knowledge of health professionals in rabies enzootic countries, the Institut Pasteur used customized online training (COLT), which focuses on small sets of trainees and is designed for situations where direct training of specific skills by experts is needed. With this approach, it is feasible to tailor training to each individual trainee in a way that would be impractical in a system designed for mass audiences.

In Collaboration with WHO, the University of Lausanne, Switzerland, The HSET foundation, the EU funded FP7 PREDEMICS program and the International network of Institut Pasteur, and with the active participation of FAO and GARC we first organized a [COLT course on the control and surveillance of rabies](#) in Dakar, Senegal, in December 2013. The same COLT approach was recently used with success for a second session of this training program on the control and surveillance of rabies organized first online and with the practical training in Phnom Penh, Cambodia, in November 2015.



We designed the workshop for physicians, veterinarians, public health officers and specialists in infectious diseases, virology and/or epidemiology. The course was advertised through a website and by participating international organisations and regional networks. Trainees were selected on the strength of their curriculum vitae, letter of motivation and three letters of recommendation. Twenty participants working in national and regional veterinary stations, hospitals, ministries or research institutes in 10 Eastern and Asian countries were selected and encouraged to start online pre-workshop activities. These activities lasted for about two months and required about 70 hours of individual work, followed by a second online evaluation.



Those who successfully completed these online pre-workshop activities, were admitted to the workshop activities held in Phnom Penh, Cambodia over a period of ten days. Round tables, discussions and practical training activities were given at the Institut Pasteur of Cambodia, at the Calmette Hospital in Phnom Penh and during 2 days in a small Cambodian village for field studies. A mix of international and local experts lead the training activities to ensure the support of the host country and to ensure that debates between participants were informed by a thorough understanding of the local situation in the field.

During the year following the course, discussions on the online forum will continued between the participants and the trainers. These discussions concerning practical disease management issues that arise during the participants' work illustrate the value of the mentoring provided before, during and after the workshop.

Contributed by Hervé Bourhy of the Institut Pasteur, Paris, on behalf of all the partners involved in the workshop. There is a paper published on the approach in the [Bulletin of the WHO](#).

The SARAH Program Stops Rabies in Sikkim, India

The Sikkim Anti-Rabies and Animal Health (SARAH) program is a state-wide animal birth control (ABC) and anti-rabies (AR) program initiated in 2005. This rabies program is the first government-sanctioned initiative involving animal welfare and public health sectors in India. It is a collaborative project between the Department of Animal Health, Livestock, Fishery & Veterinary Services (Government of Sikkim), France-based NGO Fondation Brigitte Bardot (FBB), Australia-based NGO Vets Beyond Borders (VBB) and the Sikkim Society for Prevention of Cruelty of Animals (SSPCA). The achievements and benefits of this state-wide ABC/AR and animal welfare program are now widely accepted in Sikkim.

The program started in 2005 in Gangtok, the main city of Sikkim, in response to community requests to stop dog culling. Building to villages and monasteries and finally reaching the whole state, the program has been very successful



*Dogs being transported for sterilization and vaccination.
Photo: Vets Beyond Borders*

at eliminating dog-mediated rabies, with no human deaths from rabies since 2006. Sikkim aims to continue to be free of dog-mediated rabies and also sylvatic rabies with the support of program champions and the government. This program is a great example of starting small, proving success to the stakeholders, and rapidly scaling up to a state-wide program that could help guide the rest of India to eliminate dog-mediated human rabies.

From the outset, the SARAH program sought co-operation from stakeholders including government veterinary and para-veterinary staff in field stations, police, heads of panchayats (village councils), community leaders, the Forestry Department, army and paramilitary forces, and the Department of Health.

Careful attention to the various stakeholders has directly enabled the program's success.

Key activities of SARAH

Key activities fall into four main groups:

1. Dog population control through surgical sterilisation

Over 37,500 sterilizations since the inception of SARAH have had an overwhelming, positive impact. There is now a smaller, manageable street dog population in Sikkim and fewer stray puppies in distress. There is less fighting amongst stray dogs particularly in the breeding season, and the majority are healthy and friendly.

2. Annual mass anti-rabies vaccination program

The mass dog vaccination campaign teams aim to visit every household throughout Sikkim over a four-week period. Even remote villages with no road access are visited by foot to vaccinate dogs and deworm puppies. We have achieved at least 70% vaccination coverage and in East Sikkim have achieved 80% coverage. Vaccinated dogs in the border regions provide a buffer zone against rabies re-introduction from neighbouring rabies-endemic areas.

3. Provision of medical, surgical and hospital care to sick and injured domestic animals and wildlife.

SARAH primarily works with stray animals in distress but also treats many pet animals as referral cases when needing complex surgical procedures, chemotherapy (for treatment of contagious venereal tumours) and advanced diagnostic services including X-ray, ultrasound and clinical pathology.

4. Animal welfare and rabies advocacy & training

Public support is the cornerstone of a successful programme. Accordingly, SARAH works to increase public awareness of rabies, distemper (which may be confused with rabies), dog behaviour and animal welfare. Radio, television, newspapers, public meetings, school visits and World Rabies Day activities are used to reach the public. Community education programs have drawn upon local values of animal sentience.

Training of animal health personnel and field officers is also important so that better care can be delivered to stray animals. Training occurs at all levels, including animal first aid, dog catching, veterinary nursing, and surgical and medical skills for veterinary interns. The VBB's VetTrain program has helped build these capacities in Sikkim, West Bengal and other states in India.



Surgical sterilization. Photo Vets Beyond Borders

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How Can We Increase the Effectiveness of Mass Dog Vaccination Campaigns?

Mass dog vaccination is widely acknowledged as the most effective means of controlling canine rabies. Annual vaccination campaigns should aim to reach >70% of the dog population in order to achieve eventual elimination of rabies from an area, and this target coverage has repeatedly been shown to be attainable. But, how long does it take to achieve elimination?

While high vaccination coverage is clearly important, other factors, such as gaps in coverage, dog movement patterns, and local rabies awareness, could also influence control efforts. Identifying these factors is crucial for the design of effective elimination programmes.

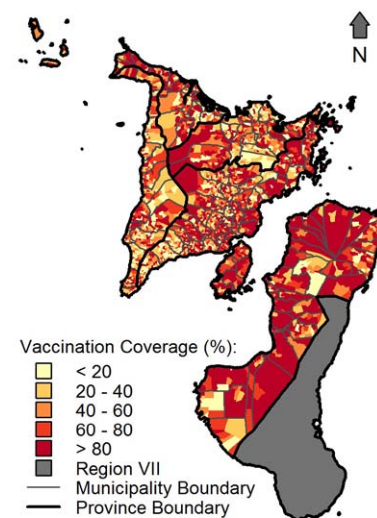
Annual dog vaccination campaigns are ongoing in Region VI of the Philippines (Western Visayas) as part of a rabies elimination demonstration project coordinated by WHO and funded by the Gates Foundation. A household survey in the region (conducted by the Philippines Department of Health with logistical support from the Animal Welfare Coalition and the University of Glasgow) collected data on vaccination coverage and on how often and how far people moved their dogs. These data suggest that the 2010-2012 campaigns were very successful – average coverages achieved each year exceeded 70% of the dog population. However, there was evidence of considerable spatial variation in this coverage, which could prevent elimination by allowing the virus to persist in poorly vaccinated areas. Dogs moved frequently with their owners, particularly between nearby villages or municipalities, but with a surprising number of movements occurring over much longer distances – hundreds of dogs are estimated to arrive in the region annually from other countries.

In a recent study, we examined the effects of uneven vaccination coverage and dog movements on the chances of rabies elimination in Region VI using a model of rabies transmission. The model simulated rabies spread in the region, incorporating realistic patterns of vaccination coverage and dog movement derived from the survey. These simulations suggested that, despite the high overall vaccination coverage, the probability of rabies elimination was much lower than if the same average coverage had been applied equally everywhere. Three more similarly variable campaigns could be required to eliminate rabies from the region with high probability; a doubling of vaccination effort that would likely have been unnecessary had coverage been even.

An exploration of potential improvements to the campaigns suggested that halving the variation in coverage in future campaigns without increasing overall coverage would eliminate rabies more rapidly than a 10% increase in overall coverage. Model outputs also suggested that dog movements (even at higher rates than those observed in Region VI) do not have negative impacts on campaign effectiveness whilst rabies remains endemic.

These results provide practical suggestions to reduce the time taken for mass dog vaccination campaigns to eliminate endemic rabies. To ensure rapid elimination, reduce programme costs and minimise the risk of further human and canine rabies casualties, a homogeneously high coverage across the control area is necessary. However, uneven coverage is likely to be a common problem in rabies control programmes. Gaps in coverage, even at the village/neighbourhood level, can harbour disease, so ensuring that vaccination is easily accessible to all is critical. Human-mediated dog movements do not appear to reduce campaign effectiveness in an endemic rabies setting, so imposing restrictions on dog movements would be an unnecessary drain on limited resources prior to elimination. However, given the estimated high frequency of long-distance dog movements, measures to prevent reintroduction into rabies-free areas will be required post-elimination.

Contributed by Elaine Ferguson of the University of Glasgow, the lead author of the study. The paper 'Heterogeneity in the spread and control of infectious disease: consequences for the elimination of canine rabies' was published in [Scientific Reports](#) in December 2015.



Pattern of vaccination coverage extrapolated for Region VI following the 2012 campaign.

...SARAH continued from page 9.

Introduction of legislation to support a rabies-free Sikkim.

In 2015, the Sikkim Government became the first state in India to issue a notification that rabies is a reportable/notifiable disease in both human and animals. To further support the control of rabies, the legislation requires: (a) compulsory registration and identification of pet dogs and cats; (b) compulsory, annual rabies vaccination of all dogs and cats; and (c) rabies vaccination and permanent identification of dogs and cats brought into Sikkim. Compliance with these laws is high.

The SARAH program continues to gain the support of the government and other stakeholders through ongoing meetings and reporting. It has been approved as a division of the Sikkim Government, ensuring that the program will continue permanently. Any suspect rabies outbreaks, (infrequent and usually in the border regions in winter when food is scarce) are responded to rapidly and investigated thoroughly with both animal and human health sectors working together.

Contributed on behalf of the SARAH team by Dr Helen Byrnes, SARAH Program Manager and Director of Vets Beyond Borders. Further details on the SARAH program are available on the Vets Beyond Borders website [here](#). Acknowledgement must be given to Fondation Brigitte Bardot for their wonderful support since the inception of SARAH.



Recent Research February 2016

Human Case Management

[Caring for rabies patients in developing countries - the neglected importance of palliative care.](#) Advice on how clinicians in resource-limited settings can make best use of essential drugs to assist rabies patients and their families. Furious rabies management should aim to alleviate thirst, anxiety and epileptic fits using infusions, diazepam or midazolam and antipyretic drugs. Respiratory failure must be avoided, especially if the family take the patient home alive.

Mass Dog Vaccination

[Incentives Increase Participation in Mass Dog Rabies Vaccination Clinics and Methods of Coverage Estimation Are Assessed to Be Accurate.](#) Incentives (dog collars and owner wristbands) effectively increased owner participation in mass dog rabies vaccination clinics and reduced vaccination costs-per-dog by \$0.47. Survey techniques to determine coverage were also compared and vaccination coverage found to be below the 70% threshold for elimination.

[Operational performance and analysis of two rabies vaccination campaigns in N'Djamena, Chad.](#) Two consecutive mass dog vaccination campaigns in N'Djamena in 2012 and 2013 reached >70% coverage despite a dynamic and largely free-roaming dog population. Public awareness was found to be key and monthly reported rabies cases in dogs decreased by > 90% within one year.

[Why has canine rabies remained endemic in the Kilosa district of Tanzania?](#) Lessons learnt and the way forward. Despite knowledge about rabies, a KAP survey revealed that only 20.4 % of villagers knew how rabies is controlled in dogs and 71 % were not aware of dog vaccination campaigns, explaining the finding that only 24.4% of dog were vaccinated.

[Vaccinate-assess-move method of mass canine rabies vaccination utilising mobile technology data collection in Ranchi, India.](#) Following a catch-vaccinate-release programme in Ranchi, India, a bespoke smartphone 'Mission Rabies' application was used to GPS capture the location of all vaccinated dogs and dogs sighted on post vaccination surveys. Where coverage was below 70 %, catching teams were re-deployed to vaccinate more dogs and increased the coverage achieved.

[Factors associated with dog rabies immunisation status in Bamako, Mali.](#) A cross-sectional survey in Bamako, Mali found that 45% of dogs were reported as vaccinated at least once, but less than half of these had a valid vaccination card. Dogs were mostly not vaccinated due to cost and the study concludes that vaccination should not cost more than 0.2 €. Overall, 24% of dogs had antibody titres ≥ 0.25 IU/ml, but all animals had titres ≥ 0.25 IU/ml after booster vaccination.

[Heterogeneity in the spread and control of infectious disease: consequences for the elimination of canine rabies.](#) Uneven vaccination coverage was found to have significantly delayed the elimination of canine rabies in the Visayas, Philippines. In contrast, relatively high human-mediated dog movements did not reduce elimination probability, but contribute to a reintroduction risk after elimination.

PEP Provision

[Worldwide rabies deaths prevention-A focus on the current inadequacies in postexposure prophylaxis of animal bite victims.](#) Commentary suggesting that provision of modern PEP to remote areas of developing countries is needed to avert the bulk of human deaths from rabies.

[Animal Bite and Deficiencies in Rabies Post-Exposure Prophylaxis in Tehran, Iran.](#) The majority of cases had received only three of the 5 recommended PEP doses and where rabies immunoglobulin was indicated it was usually not, or only partially, delivered.

[Pattern of animal bites and post exposure prophylaxis in rabies: A five year study in a tertiary care unit in Sri Lanka.](#) There were 19 661 cases of animal exposure presented over 5 years, with 89% bites, and 37% major bites and 62% were major bites, a significant proportion from cats. PEP vaccine and REG costs totalled 24,795,888.00 Sri Lankan rupees (190,737.60US\$) over the 5 years.

[Current Status and Development of Vaccines and Other Biologics for Human Rabies Prevention.](#) Timely and appropriate administration of modern biologics virtually assures survivorship, even after severe exposures to rabies, however this is often prohibitively costly. Development of recombinant, sub-unit and other novel methods are underway to improve the availability of safe, effective and more affordable rabies biologics.

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Surveillance

[Establishment of a Canine Rabies Burden in Haiti through the Implementation of a Novel Surveillance Program](#). In 2013, Haiti initiated a community-based animal rabies surveillance program of active community bite investigation and passive animal rabies investigation. Up to December 2014, 778 rabies suspect animals were 70 cases were lab-confirmed and an additional 36 cases clinically diagnosed, an 18-fold increase in reporting of rabid animals.

[Evidence of two distinct phylogenetic lineages of dog rabies virus circulating in Cambodia](#). Analysis of 149 rabies virus complete sequences from Cambodia in 1998-2011. The Cambodian sequences fell mostly into clade SEA1 (also found in Thailand, Laos and Vietnam) and a few in SEA2 (also from Laos). The third clade SEA3 found in the region was not detected. in Cambodian isolates studies here.

[Human Rabies in India: An Audit from a Rabies Diagnostic Laboratory](#). Retrospective analysis of clinical samples from 128 patients with suspected rabies, from 11 states in India, showed that antemortem confirmation of rabies by a combination of laboratory diagnostic assays (detection of viral RNA in CSF, skin and saliva, and neutralizing antibodies in CSF) could be achieved in 40.6%.

[Rabies in a Dog Imported from Egypt with a Falsified Rabies Vaccination Certificate - Virginia, 2015](#). In June 2015, an adult female dog picked up from the streets of Cairo, Egypt, and shipped by a U.S. animal rescue organization to the US, with an intentionally falsified vaccination certificate was confirmed to have rabies.

[Molecular and mathematical modeling analyses of inter-island transmission of rabies into a previously rabies-free island in the Philippines](#). Phylogenetic analysis and mathematical modeling demonstrate that there was a time lag of several months to a year between rabies introductions (into Tablas Island from Luzon) and initial case detection. Transmission chains following inter-island virus transmission were also observed, due to low vaccination coverages.

[Epidemiology, Impact and Control of Rabies in Nepal: A Systematic Review](#). A review of literature and available national data revealed around 100 livestock and 10-100 human deaths per year are reported, with about 1,000 livestock and 35,000 humans reported to receive PEP, and serious underreporting likely. Rabies control efforts remained focalized, of short duration and not harmonized, with veterinary and human health authority coordination limited.

[Surveillance of Canine Rabies in the Central African Republic: Impact on Human Health and Molecular Epidemiology](#). Of 966 exposed persons, 632 received a post-exposure rabies vaccination and no rabies-related human deaths were confirmed. Of 82 samples from suspected rabid dogs tested, 69 were confirmed positive, most owned although unvaccinated. There was a strong spatiotemporal correlation between reported human exposures and detection of rabid dogs.

Upcoming Conferences

The 17th International Congress on Infectious Diseases (ICID) will be held in Hyderabad, India. March 2-5, 2016. For more details go to www.isid.org/icid/

“One Health for the Real World: zoonoses, ecosystems and wellbeing” A symposium at the Zoological Society of London on March 17-18th, see [here](#) for more details.

The 3rd International Conference on Rabies in West Africa (RIWA) will be held in Accra, Ghana from March 23-26th. The [website](#) has more details.

The 6th Northern European Conference on Travel Medicine (NECTM6) will be held in London, 1-4 June 2016. For more details go to their [website](#).

APCRICON 2016, the 18th Annual National Conference of the Association for the Prevention and Control of Rabies in India will be held on 9th & 10th July in Bengluru. More details soon at rabies.org.in.

The 4th Antivirals Congress 2016 will be held from 18-21 September 2016, in Sitges, Barcelona, Spain. More information is available [here](#).

The 41st World Small Animal Veterinary Association Congress is taking place September 27-30, 2016 in Cartagena, Colombia. See the [website](#) for further details.

The editors of the GARC newsletter are Louise Taylor and Laura Baker. Layout design by Pete Else. If you have news items or information of interest to those working to defeat rabies, please contact newsletter@rabiesalliance.org.