



DRIVING PROGRESS TOWARDS RABIES ELIMINATION

New WHO recommendations on human rabies immunization
and results of Gavi's Learning Agenda on rabies

&
2nd international meeting of the Pan-African
Rabies Control Network (PARACON)

Meeting Report
12–14 September 2018,
Johannesburg, South Africa

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ACRONYMS & ABBREVIATIONS

AFR	WHO African Region
ARACON	Asian Rabies Control Network
AVC	Animal Handling and Vaccination Certificate
CCC	Community Coordinator for Rabies Certificate
CDC	Centres for Disease Control and Prevention
GDL	GARC Data Logger (GDL)
COLT	Customised online training and onsite training course
CSRS	Centre Suisse de Recherches Scientifiques en Côte d'Ivoire
dFA	direct fluorescent antibody test
DHIS	District Health Information Software
DPM	Dog Population Management
DRIT	direct-rapid immunohistochemical test
EAC	East African Community
ECTS	European Credit Transfer and Accumulation System
EPI	Expanded Program on Immunisation
eRIG	equine rabies immunoglobulin
FAO	Food and Agriculture Association of the United Nations
hRIG	human rabies immunoglobulin
IBCM	integrated bite case management
ID	intradermal
IM	Intramuscular
IPC	Institut Pasteur du Cambodge
JEE	Joint Evaluation Exercise
KAP	Knowledge, Attitude, Practices survey
KPI	Key Performance Indicators
MOU	Memorandum of Understanding
NGO	Non-Governmental Organisation
NTD	neglected tropical disease
NTV	nerve tissue vaccine
OIE	World Organisation for Animal Health
OVD	oral vaccination for dogs
PARACON	Pan-African Rabies Control Network
PEP	post-exposure prophylaxis
PQ	pre-qualified
PWARE	Practical Workplan towards Achieving Rabies Elimination
RAG	South African National Rabies Advisory Group
REB	Rabies Epidemiological Bulletin
REC	Rabies Educator Certificate
RHC	Rabies Healthcare Certificate
RIG	rabies immunoglobulin
RMAb	Rabies Monoclonal Antibody
SADC	Southern African Development Community
SAGE	Strategic Advisory Group of Experts on Immunization
SARE	Stepwise Approach towards Rabies Elimination
SDG	Sustainable Development Goals
UAR	United Against Rabies
USAID	United States Agency for International Development
VAWZ	Veterinarians for Animal Welfare Zimbabwe
VIS	Vaccine Investment Strategy
WAHIS	World Animal Health Information System
WAP	World Animal Protection
WHO	World Health Organization
WRD	World Rabies Day
ZNSPCA	Zimbabwe Society for the Prevention of Cruelty to Animals

SESSION 1: OPENING

Opening remarks WHO and GARC

Presented by: L. Nel & B. Abela-Ridder

- “To reach the 2030 goal we need to do better and do things differently “
- What does it mean to prioritise rabies? What should we prioritise rabies over? Rabies should be elevated to the same level as the other transboundary animal diseases to provide a more rational/practical approach from the perspective of the Animal Health Sectors and Governments. Effective surveillance and diagnosis will continue to build the case for rabies burden and the cost of this disease. Vaccination of dogs is the agreed upon approach to prevent human rabies and elimination of the disease, but timely Post-Exposure Prophylaxis (PEP) is also important to prevent human deaths. This requires the education of communities and professionals and the availability of vaccine, and ideally rabies immunoglobulin (RIG).
- Rabies control is a public good and every failure is a tragedy. Governments should be accountable for rabies deaths given its preventable nature. We need to start thinking differently if we are going to have any hope of reaching the 2030 target for the elimination of canine-mediated human rabies.
- GARC and WHO are working across sectors and disciplines to network, share experiences, measure outcomes and impacts and integrate these into a larger system to eliminate rabies.
- We need to build surveillance and generate data to convince policy makers to include rabies in the health systems and ensure equitable access to rabies prevention to make a difference in the lives of people. No one sector can do this alone and efforts need to be additive and coordinated across ministries, civil society, academia, welfare and pharma.
- We need to collaborate and strengthen networks to provide support for countries now and in the future.

Scene setting & meeting overview: Objectives, expected outcomes, working methods

Presented by: L. Nel

If we can bring the different aspects together, we will have a tree that thrives and produces the fruits of success. It requires many elements and a large degree of cooperation, but this is achievable.

Presented by: B. Abela-Ridder

Neglected tropical diseases are a proxy for disadvantage. They are preventable, yet prevalent, affect populations with little voice, do not travel widely, carry stigma and discrimination, cause morbidity and mortality. Data and research are limited. It is our ethical obligation to prevent rabies through awareness, dog vaccination and timely care of bite victims.

The objectives of the meeting are as follows:

- Disseminate new WHO recommendations on human rabies immunization and rabies control tools.
- Discuss results of the GAVI Learning Agenda on rabies and progress made on rabies control programmes.
- Determine needs and next steps to reach “Zero-by-30” – the Global Strategic Plan to end human deaths from dog-transmitted rabies by 2030.

The expected outcomes of the meeting (progress, need, next steps for impact) are as follows:

- Country workplans and country and regional strategies to reach “zero-by-30” including coordination across different sectors (showcase learnings from GAVI projects).
- Replicate learnings to increase impact.
- Uptake of new WHO position on rabies immunization and next steps on implementation.
- Provide a clear pathway for reporting rabies data in countries and to WHO to measure progress and target action.
- Identify country needs, planning and support as well as the next steps to reach “Zero-by-30”.
- Build advocacy and support network between countries and in regions to support elimination of rabies.

Presented by: L. Diawarra

Dr. Diawarra is the new WHO rabies focal point for WHO African Region (AFR). Country focal points for rabies in 47 countries are being re-established. We need to mobilise all local resources, sectors, and organizations to work together to strengthen our activities.

SESSION 2: THE NEW WHO POSITION ON HUMAN RABIES IMMUNIZATION

Objective: *Way forward to increase uptake of immunization policy changes*

Key changes, potential public health impact in countries

Presented by: L. Knopf

The SAGE working group consisted of 12 selected experts who collaborated from 2016 to 2017 to identify relevant questions and provide recommendations based on existing evidence. The group identified questions on the use of PrEP and PEP, where new scientific evidence could inform a proposed revision of the global policy on rabies biologicals use. To develop recommendations, the group reviewed published, grey literature and programmatic experiences of countries on rabies vaccine and RIG. Important issues included identifying a shortened schedule and reducing the number of doses need for PEP while maintaining immunogenicity and clinical protection. Previously approved intramuscular PEP regimens consisted of up to 5 clinic visits over 28 days and required 4 to 5 vaccine vials (depending on the regimen), resulting in a huge financial burden. The SAGE WG considered several regimens for potential recommendation and concluded on the PEP regimen consisting of 2-2-2 doses given in the deltoid region intradermally on day 0, 3 and 7. Convincing evidence supports its effectiveness and immunogenicity being equivalent to that of previous regimens. Data for this regimen was provided by the Institut Pasteur du Cambodge (IPC), which retrospectively assessed data from approximately 3000 patients. The importance of ID administration was stressed by the working group, as it is always more cost-effective, particularly in high-volume clinics.

Evidence regarding use of RIG was also reviewed to determine if the current recommendations for RIG infiltration can be made more cost-effective while remaining efficacious. Studies have shown that in some countries, only human RIG was considered acceptable (and not eRIG), but because of the high cost, was rarely used. Scientific evidence suggests that eRIG and hRIG are clinically equivalent, and that there is little added value in injecting the remainder of RIG intramuscularly. Moreover, given the high cost and unavailability of RIG, few patients currently receive it, so its use was prioritized further to highlight specific patient groups/characteristics in which RIG is essential. In April 2017, the proposed recommendations were presented to, and approved by SAGE. The updated WHO position paper on rabies vaccines was released in April 2018.

The final recommendations are summarized in the table below:

	2010	2018
PEP regimen duration	3-4 weeks 4-5 visits	1-2 weeks 3-4 visits
Vaccine savings PEP	ID: 0.8 ml IM: 5 ml	ID: -20% (0.6 ml) IM: -20% (4 ml)
RIG infiltration mode	Wound + distant IM	Wound only - 40% RIG vials - 80% RIG volume/ person
RIG allocation	All category III exposures	High risk cat. III exposures - 60 to 90% need RIG

http://www.who.int/rabies/resources/who_wer9316/en/

Highlights from the SAGE working group on rabies

Presented by: L. Blumberg

Rabies is preventable by vaccinating dogs, wound management and PEP and Pre-exposure Prophylaxis. PrEP is recommended for individuals at high risk of rabies virus exposure including those with occupational risks, travellers and individuals in highly endemic settings with limited PEP access. The updated WHO guidelines recommend a PrEP schedule consisting of a 2-site ID vaccination or a 1-site intramuscular vaccination on days 0 and 7, with boosters to ensure sufficient antibody titres. There should be wider use of the ID schedule, which is equivalent in terms of prevention, and is cost and dose sparing. This results in improved compliance and improved PEP access. Going forward in an African setting, there is a need for shorter regimens as well as heat stable vaccines. It is vital that people understand that wound washing and care is high efficacious and very important for patients, particularly those without access to PEP

Presented by: M. Tejiokem

Only 3% of category III dog bite victims receive Rabies immunoglobulin (RIG) due to both the expense and the global shortage of RIG products. RIG administration is complicated, requiring dilution, patient weight and wound site(s) to be factored in. Our objective was to use existing evidence to reduce RIG cost and facilitate usage by practitioners. Current recommendations of wound washing and timely vaccine injection save the lives of up to 99% of severely exposed patients in some settings. Priority of RIG usage is given to high risk category bite cases, especially deep or multiple wounds, wounds around the neck or face, and victims with severe immunodeficiency. The dose calculation of RIG has not changed. ERIG is considered a clinically equivalent alternative to costly and scarce hRIG, with no skin testing required. Excellent results are achieved by injecting the maximum possible dose of immunoglobulin in or around the wound only (whilst avoiding compartment syndrome). Provided there is appropriate aseptic retention, the remainder of the dose can be used for other patients, resulting in efficient and effective use of RIG. The use of monoclonal antibody products instead of RIG is recommended as a suggested avenue by WHO, which would allow the production of a standardized-quality product and reduce costs. India has a monoclonal antibody product on the market which is showing good efficacy and WHO recommends monitoring this as ideally a cocktail of antibodies should be targeted.

Feasibility and needs for changes to the rabies immunization practice

Presented by: M. Tetchi

The GAVI Learning Agenda aimed at determining the impact and burden of rabies in animals and humans in Central and West Africa in 2017. Mali, Chad and Cote d'Ivoire were chosen due to high rabies fatalities each year. We initially made use of IM PEP regimen but realised it was necessary to change to ID administration. Health care workers were trained, anti-rabies clinics were appropriately equipped, and a multi-disciplinary approach was implemented. Despite initial hesitation from patients, ID vaccination was piloted. We engaged with the community to increase rabies awareness and share information on PEP. The anti-rabies clinic health workers interacted with at-risk groups to convey necessary information. Awareness was particularly targeted towards school teachers who could further teach the children. The GAVI project offered free ID vaccination (Thai Red Cross regimen) to rabies exposed people, but only after explaining the procedure and obtaining consent. The provision of vaccine at no cost to the victim resulted in a higher compliance and reduced misconceptions amongst patients that the ID route was less effective. There were challenges ensuring that patients completed the PEP regimen due to many patients expressing time constraints for returning to the clinic, however overall ID vaccination had a good uptake. Côte d'Ivoire plans to adapt its national SOPs to include the new ID PEP regimen

Insights from the panel discussion

- Provide evidence of the advantages of ID schedules to national (regulatory) committees. This could be done using pilot studies. Governments and the global community are requesting increased access to PEP.

ID PEP is clearly the way forward as it is cost-effective and dose sparing ID. Perceived barriers include off-label use and doubts regarding correct ID vaccine administration.

- Clinics in India experienced vaccine stock-out problems using IM PEP due to the size of the country and volume of patients. They switched to ID PEP due to its cost- and dose sparing nature, allowing them to cater for all patients.
- More heat stable vaccines would be useful, but no great progress has been made in this regard. However, there have been many publications on canine thermo-tolerant or- stable vaccines.
- Shared experiences and advice on HIV positive, immunocompromised individuals (low CD4 cell counts or severely immunocompromised) and PEP: In visibly or documented immunocompromised patients, the response to vaccine is much lower and may not have the desirable effect. Testing for HIV in patients before administering PEP is unnecessary. PEP should include vigorous wound washing, 4-5 sessions of vaccine ID or IM and RIG, even if the person has been vaccinated previously.
- Several countries expressed that their ministries of health are not yet fully aware about the new WHO position on rabies and opportunities of ID vaccine use. The role of the WHO is to support the governments in making the case for switching the policy.
- Mozambique faces an increase in rabies cases, so the ministry of health has started implementing the new guidelines of WHO in pilot areas. We are finding that one of the challenges is the training of health care staff, but we are in the process of piloting this.
- Egypt already implemented a pilot study with training healthcare providers on ID PEP, but until the study is complete, national SOPs contain old recommendations. An important factor was the cost (to the government) for RIG and 5 vaccine injections. We are already using ID for other diseases (e.g. BCG) and are therefore using it to extrapolate this process for rabies should be feasible, although the staff administering PEP work at different locations than those involved in routine vaccination
- Manufacturers should include ID and updated PEP recommendations on package inserts. WHO assured that countries can allow off-label use to protect clinicians until the labels have been changed.

SESSION 3: OPERATIONAL PROGRAMME DELIVERY

Objective: Strengthening vaccine delivery mechanisms at community, country, regional levels

Session 3a: Human rabies vaccine and immunoglobins – Insights from the surveys on PEP procurement, distribution and delivery

Global overview: Human rabies vaccine and immunoglobulin use monitoring, reporting and forecasting

Presented by: L. Knopf on behalf N. Sreenivasan

WHO in collaboration with the US-CDC performed a survey in 23 countries of Asia and Africa. Most African countries make use of the IM regimens whereas most Asian countries assessed make use of the ID route. Only 26% of countries use WHO pre-qualified (PQ) vaccines as these are costly and not always available. Although some countries provide vaccine at no cost to the patient, stocks are usually limited, and patients are required to purchase vaccine from private pharmacies, resulting in catastrophic out-of-pocket expenses. Countries with a national rabies programme plan and budget better, resulting in better accessibility to biologicals. Countries use different pathways to distribute vaccine and RIG by sharing of logistics with EPI programmes at centralised or non-centralised levels. Monitoring of vaccine and RIG use is carried out to some extent but this is often not uniform, even in the same country, and data is not transmitted to a national level where it could impact planning. Procurement of rabies biologicals is more challenging than that of routine vaccines. The Gavi Learning Agenda showed that there are many challenges, but also opportunities for rabies programmes to learn from other services and disease programmes including EPI, standardized monitoring and forecasting. Due to global shortages of PQ vaccine producers are encouraged to apply for WHO PQ and strengthen advocacy for ID administration.

Project site experience of vaccine delivery and country wide scale up of access

Presented by: A. Narayana

Rabies cases in India contribute to one third of the global rabies burden with an estimated 20,000 deaths each year. In 2006, ID rabies vaccination was implemented throughout the country. The WHO-APCRI Indian Rabies Survey took place from May 2017 to January 2018 in seven states and two islands, which looked at the logistics of rabies biologicals in government and the private sector, market mapping and landscaping of rabies biologicals and the development of a background policy paper on rabies vaccine. India counts 6 vaccine manufacturers (1 in public sector and 5 in private sector). State Governments procure rabies biologicals annually based on the consumption levels of the current year with an additional 10% buffer. The occurrence of vaccine stock-outs was occasional in the government sector (14%) and never occurred in the private sector. The stock outs of RIG in the government sector were more frequent (43%) than that for vaccines (14%). Procurement and delivery of rabies biologicals vary grossly between states.

In conclusion, the logistics & cold chain are robust, the production levels of rabies biologicals in the public sector are low and there are frequent shortages of anti-retrovirals and RIG. State governments often face resource challenges to procure rabies vaccines which are considered secondary vaccines.

Recommendations to scale up access to rabies biologicals country wide would benefit from a reassessment of production regulation, pricing, domestic distribution, export & usage of rabies vaccines and RIG/rabies monoclonal antibodies. Ideally rabies vaccines and RIGs/ RMAbs should be obtained by the central government and provided to state governments as grant-in-aid under the National Rabies Control Programme. Medical facilities should provide PEP free of cost to patients. Vaccine and RIG procurement, distribution and delivery mechanisms could be further improved by universal delivery mechanism similar to Universal Immunization Programme vaccines by the central government.

How does PEP distribution work in a decentralized country, future plans drawn from the survey

Presented by: J. Changalucha

Rabies transitioned from a Ministry of Health role to a local government responsibility in 2011. Supply chain and vaccine procurement in Tanzania is organized through the Medical Stores Department at the Ministry of Health. Distribution models were guided by programme needs, with active involvement from the private sector. Challenges with the existing system include: PEP has to be purchased using other funds (there are cost limits to rabies vaccine access, budget dependent), primary health facilities need to request vaccine form the National Essential Medicines List and Standard Treatment Guidelines, and there is no funding from central government. Immunization is a free service in public hospitals and clinics under Tanzania's current health policy, with PEP partly embedded within the routine vaccination system and the responsibility of both public and private sectors. There has been a decrease in imported vaccine into the country due to budget constraints. An IM PEP regimen is predominantly used; however, the ID vaccination route was piloted as part of the Bill and Melinda Gates/WHO rabies project from 2011 to 2015 (and new districts in 2018). Training took place at 4 primary health facilities per district allowing for a successful shift. This improved decentralisation of PEP through the provision of free ID PEP. Mobile phone-based surveillance was used to integrate sectors, monitor PEP demand and logistics. Distribution is on demand, and stock was reordered only when it reached approximately 10%. Shortage of rabies vaccine was due to procurement and requisition challenges. Even with improved provision, 34% of patients attended a clinic outside their home district (same region) and 10% had to visit at least 2 clinics to get PEP. Free provision to patients increased compliance and reduced delays to PEP, however, currently patients typically pay more than \$10 per dose which is a major obstacle for prompt PEP provision. It has been hypothesised that the extensive EPI infrastructure could accelerate wide spread PEP supply.

In conclusion: cost remains a major barrier for obtaining PEP, both for patients and local governments due to the lack of a central budget; countrywide training on administration of ID is still required; the ID route reduces cost to bite victims by 50%; there is a lack of experience in effective management of vaccine stocks; RIG is currently unavailable.

Insights from the panel discussion

- Experiences and comparison of monoclonal antibodies to RIG: Monoclonal antibodies are less expensive in India and have almost completely replaced hRIG.
- No contraindication of the ID route if the patient is receiving chloroquine for malaria treatment: There have been only single anecdotal incidences where the co-administration of chloroquine caused a presumed ID PrEP failure. Therefore, experts recommend to preferably shift PrEP before/after intake of chloroquine, but PEP should never be withheld.

Distribution pathways are enormously diverse. WHO advised that there are upcoming publications to address country interests in recommendations for rabies biologics distribution mechanisms.

3b: Planning and delivery of mass dog vaccination - Tools and mechanisms available, country experience

Needs assessment for rabies control through mass dog vaccination using the GDREP

Presented by: E. Pieracci

For rabies elimination to be successful, we first need to know the following:

- What infrastructure do we need?
- How many dogs do we have?
- How much vaccine do we need?
- How much will the vaccine cost?
- How many vaccinators will we need?
- How much will this cost?

The GDREP (The Global Dog Rabies Elimination Pathway) tool, developed by the CDC, incorporates information from multiple sources to help countries plan and cost mass dog vaccination campaigns through different phases of elimination. The database was developed using human population estimates, human: dog ratios, vaccination coverage rates from previously published studies, OIE veterinary workforce capacity data, and the human development index for every country in the world. The GDREP was broken down into 3 vaccination phases over a 13-year timeline to meet the 2030 goal. Assumptions:

- 13 years would be enough time for even the least developed rabies control programmes to achieve elimination by 2030 if they fully committed to this achievement.
- all countries would demonstrate improved vaccination coverage rates each year, and not regress at any point during their elimination efforts. Phase 1: workforce training, vaccination rate of less than 18%. Phase 2: scale-up vaccination programmes, coverage grows from 18-70% over several years. Phase 3: 70% vaccination coverage maintained for 5-7 years. This phase is crucial to determine if rabies has been eliminated.

Countries can input numbers of vaccinators available, timeframe of campaign, phase of elimination, and other details. The tool then calculates a cost estimate to conduct the vaccination campaigns. The GDREP tool is initially auto-populated as most countries don't have starting data, however, as country-specific data improves countries can input this to refine the estimate (e.g. from pilots, dog population census etc.). Based on the input data, the GDREP will show the country how long the programme can run with current resources. The GDREP was designed to highlight to high-level stakeholders the financial commitment required for rabies vaccination and can be shared with partners to initiate discussions about sustained funding. The GDREP is available online and can be used in conjunction with SARE or national workshops.

OIE rabies vaccine bank

Presented by: V. Kallo

The OIE dog vaccine bank is based on a multi-donor approach and allows African and Asian countries to access affordable, good quality vaccines in a timely manner. Countries requesting vaccine are required to address their request, including details of vaccination campaign plans, to the OIE Director General. Côte d'Ivoire requested vaccines from OIE in March 2018 to carry out 2 pilot studies. OIE responded within 2 days and vaccines were delivered on the 28th May, with 37 000 vaccines supplied over 3 months. The campaign was

launched on 28th September, with multiple sectors of the community engaged to encourage active community participation. The community was mobilised in pilot areas where we could efficiently boost vaccination coverage, with various sectors (veterinarians, teachers, law enforcement) necessary to implement vaccination.

Using the GARC Data Logger (GDL) to track and monitor animal vaccination to control an ongoing rabies outbreak

Presented by: K. Noor

Zanzibar implemented a strategic mass dog vaccination across Unguja island, focussing on rabies endemic areas with frequent outbreaks. Previous vaccination campaigns, relying on a good network of animal health technicians, had allowed capacity building in this area between 2009 and 2015. The GARC Data Logger (GDL) allowed tracking of canine vaccinations. Approximately 5300 dogs were vaccinated by a team of 13 staff members, increasing vaccine coverage to 61%. To date, only 5 rabies positive cases have been detected in 2018.

The next steps include ongoing vaccination, training of animal professionals using animal handling equipment within the community, as well as bite prevention and promotion of responsible dog ownership in communities.

Innovative dog vaccination campaign delivery

Presented by: A. Naude on behalf of Dr. L. Gwenhure

Dog vaccination campaigns in Zimbabwe have been ongoing since the 1950's but have been restricted to fix-point vaccination campaigns due to limited governmental funding. Consequently, urban areas were neglected which became evident in 2010 when a rabies outbreak was detected. The outbreak continued until 2017 due in part to the limited availability of vaccine and the lack of a multi-sectoral approach by the Department of veterinary services. The government, GARC and animal welfare organisations (ZNSPCA and VAWZ) teamed up in February 2018 and started vaccination campaigns. Vaccination areas were identified through strategic planning by the Department of Veterinary Services, with the aim of creating buffer areas around the city boundaries to prevent rabies cases from entering Harare. Although incidence reduced within Harare, rabies cases still occurred. When cases were detected, ring-vaccination was implemented immediately to prevent further spread. The team consisted of 10 people, including 4 vaccinators, all of whom had completed the GARC educational courses and training. Animal vaccine and equipment were provided by GARC and WAP, including a GDL device, which allowed the vaccination of 5841 dogs to date. We currently have 18,000 doses of vaccine remaining which we plan on using for WRD and a national governmental vaccination campaign in October/November.

The oral vaccination of dogs against rabies (OVD): an additional tool for your toolbox?

Presented by: A. Vos

Oral vaccination is an additional tool for dog rabies control.

Several reasons have been identified to explain the difficulty in achieving high dog vaccination coverage:

- There is a lack of awareness
- A shortage in financial and/or human resources
- High turnover-rate of dog population
- Charging a vaccination-fee
- Poor quality of vaccine
- Vaccines are not always handled or applied properly
- Poor immune responsiveness of the vaccinated dog
- Inaccessibility of a large fraction of the dog population (free-roaming dogs)

Free-roaming dogs need to be included in vaccination campaigns but are often inaccessible when using central point or moving campaigns. OVD does not require dogs to be caught, which is costly and requires specialised equipment and trained personnel. Oral vaccine baiting of foxes in Europe between 1983 and 2015 resulted in a dramatic decline in fox-mediated rabies, with Europe aiming to declare freedom by 2020. The use of OVD as a supplementary tool in dog vaccination campaigns in Istanbul, Turkey, increased vaccine coverage from 60% to 80%. In South and South-East Asia only 9% of the dogs could be vaccinated parenterally. Central point

vaccination strategies did not reach enough dogs, and while catch and release vaccination strategies had higher rates, the OVD strategy reached a higher proportion of dogs, whilst making dogs friendlier and easier to revaccinate. It is important to determine the levels of recovered bait, or bait not absorbed as all oral rabies vaccines are based on live viruses. Collection of the capsule if the dog spits this out will limit the risk of the human contact with the vaccine. While the use of both parenteral and OVD as part of a vaccination strategy is more expensive than only using 0.1ml vaccine from the vial, vaccine is only a fraction of the total campaign cost. Most of the costs are towards human resources and logistics. OVD achieved a higher coverage per hour, reducing the time and expenses for other resources.

Studies have shown that 70% of the bait vaccinated dogs had sufficient antibody titres.

Highlight from the discussion:

- The GDL device: The person vaccinating is the same person taking data or you can team up with a person who logs the data whilst you vaccinate
- Different oral vaccines are licenced for wildlife use only., There are currently no licenced products specifically for dogs.
- Oral bait vaccination can be used as a supplementary tool to parenteral vaccination thereby increasing herd immunity to levels required to interrupt the transmission cycle at the source.
- Training is required to ensure that individual dogs are targeted with oral vaccine baits
- Animals that have been vaccinated orally do not get a certificate; this approach is merely to increase herd immunity
- There is a difference in immune response between the two types of vaccines, but licencing requires that the same standards are met and that the animal is protected just as with a parenteral vaccine.
- Safety concerns for humans: So far only 2 cases and 2 adverse events have been reported from the 8 million bait vaccines that have been deposited for wildlife. There are ongoing studies to determine the risk before making the vaccine licenced for use in dogs. Awareness campaigns, e.g. in schools in the baiting area, is needed to ensure the people/children are aware of baiting programmes

3c) Dog population management and animal welfare – Moving forward with eliminating mass culling and improving dog population management (DPM) in Africa

The benefit of DPM and animal welfare

Presented by: T. Williams

Animals are sentient beings and deserve the 5 freedoms. Africa needs to adhere to the Red Collar campaign and end mass culling of dogs. If there are 100 million dogs on this continent – where are they? Are they owned, free roaming, or ownerless? If we remove stray dogs, what would our rabies situation be? How would we do that? How do we deal with controlled breeding? By 2050, the human population is likely to double, as will the dog population as they live in tandem with us. It is therefore important to develop programmatic strategies with a holistic sustainable long-term approach for rabies elimination. Zanzibar and KwaZulu-Natal in South Africa were near elimination, but due to lack of government commitment the disease re-emerged. The real dog issues: is the dog the symptom or the problem? Are humans responsible for the dog problem? Is the dog a private or community problem? Is government responsible for dog health? The dog population management blueprint provides education on behavioural change, towards primary healthcare for both dogs and humans. We need to ensure there is legislation for dog ownership, improved waste management and city council involvement. These issues need to be considered in addition to vaccination. We need to have rabies conversations in the policy areas, amongst key stakeholders and engage the regional level. Improving the welfare of dogs to support rabies elimination is a key priority for World Animal Protection and we are currently running a global campaign (Better Lives 4 Dogs) to achieve this. We have outlined our approach in our newly published resource entitled 'Humane Dog Management: Better lives for dogs and communities'. We will continue to collaborate with key institutions and communities across Africa to achieve our common vision of a canine rabies free Africa.

How culling is not an effective method to control rabies or reduce dog populations

Presented by: E. Pieracci

Many countries use culling as a means of dog population control, with approximately 20 million dogs culled each year worldwide. Without the removal of food resources and implementation of responsible dog ownership practices, new dogs will simply move into the community following culling of the local population. . Indiscriminate culling of dogs, that includes owned and vaccinated dogs, is counter-productive to rabies vaccination campaigns because this reduces the overall herd immunity created by vaccination efforts.

However, alternative options to manage dog populations have limitations, including the requirement for veterinary expertise and responsible ownership, the lack of testing and licensing for many tools and the cost and feasibility of reaching enough dogs to have a measurable reduction in the population. The carrying capacity (the number of dogs that can survive in a population) is dependent on food, water and shelter resources available. Access to street food has been associated with both increased dog bites and rabies in several countries but restricting street food for dogs and cleaning of waste and street garbage requires changing human behavior which is challenging. Improving sanitation services has associated costs and communities need to be educated to not feed street dogs, which may be difficult if this is a culturally acceptable practice.

Other dog population management tools include community education, enacting legislation for dog confinement, humane euthanasia of unowned dogs, and promotion of responsible dog ownership. The best dog population management practices are dependent on the setting they will be used in and need to take into account cultural considerations, available resources, relationship with dogs, the composition of the dog population (free roaming, Male:Female etc.), and local animal health infrastructure.

Highlights from the discussion:

- Indiscriminate culling increases susceptibility to outbreaks, especially if vaccination has been conducted in that area
- An intersectoral approach with a rabies taskforce was used in Sierra Leone: A KAP survey and dog population census was conducted and tools and systems developed to disseminate messages on animal welfare and responsible dog ownership.
- Kenya banned the use of strychnine and developed humane guidelines for dog population management
- Free roaming dogs fed by the community are more used to humans making them easier to vaccinate
- Dogs in rural areas are mostly hunting and herding dogs. Conventional dog population methods of confinement and food management may aggravate the situation, and other means may need to be considered.
- Targeted removal of aggressive dogs can reduce the negative perception of dogs and change community attitudes

SESSION 4: EDUCATION, AWARENESS AND HEALTH SEEKING BEHAVIOUR

Objective: *Building rabies awareness in at-risk communities, make use of technologies and World Rabies Day (WRD)*

GARC Education Platform (GEP)

Presented by: A. Coetzer

The GARC Education Platform is a free online education website with 4 courses currently available. The Rabies Educator Certificate (REC) is the gateway course, providing training for participants to convey lifesaving information to the community about rabies. The courses are available in French, English and Spanish, and to date there are 4564 graduates globally. The course can be facilitated through offline programs if there is enough interest. Eg. KwaZulu-Natal for their community health workers, Lesotho, Zimbabwe, Mozambique. The Animal Handling and Vaccination Certificate (AVC) was developed for animal healthcare professionals to promote safe and effective methods for handling and vaccinating dogs. This has been incorporated into the South African veterinary curriculum. The Community Coordinator for Rabies Certificate (CCC) is an extension for REC graduates, focussing on participants becoming more active members in their communities.

Liberia is building upon their Ebola outbreak experience and extending training to include rabies education for their community health volunteers. The Rabies Healthcare Certificate (RHC) is based on WHO's new position on rabies to ensure experts are up to date with the latest information. GARC is currently in the beta test phase to validate course work and the course will be available in English soon.

Institut Pasteur and partners e-learning courses

Presented by: H. Bourhy

The Customized Online Training and onsite Training course (COLT), applied to rabies control and elimination, provides a unique opportunity to integrate experience and knowledge between international rabies experts and students.

The course provides high quality education to young talent in public health in developing countries and includes mentoring by the teaching team before, during and after the workshop. COLT builds a regional/continental community and workshops include practical training on rabies, and emphasizes the need for multidisciplinary approaches, intersectoral cooperation and the addressing of critical components of the rabies situation in developing countries. The workshop targets Masters' students and professionals of the animal and human public health sectors. COLT introduces content, quizzes, feedback and group activities prior to 2 weeks of face-to-face contact time where participants can apply their knowledge practically. Participants need to undergo pre-registration followed by pre-selection using a web tool and teleconference. Registration and courses are free of charge for those selected. Successful participants receive a diploma worth 8 ECTS master credits. Budget permitting, the next COLT will be held in Morocco in French in 2019. Previous COLT trainings have taken place in Dakar, Cambodia, Cameroun, Iran, training 90 participants from 40 countries.

Engagement of local leaders to create awareness on rabies and impact on health seeking behaviour

Presented by: M. Lechenne on behalf of Chad

Chad, with its many remote areas, identified a need adapt their communication for rabies. Under the Gavi project, teams distributed a leaflet with a free hotline to ask questions on rabies or bite cases. The hotline was used extensively and received over 300 calls with 82% of these regarding bite cases. The hotline overcame geographical barriers and confirmed both a lack of rabies awareness and lack of access to veterinary and health government services. Village chiefs, cultural chiefs, traditional healers and teachers were then engaged in awareness and information channelling, as results revealed that they were more trusted in the community than health and veterinary professionals. Local project committee members were appointed from the community and were given the responsibility for mobilization of the programme and selection of effective dog vaccination points. The Gavi project in West Africa included training and dissemination workshops in which these key stakeholders were involved.

Additionally, teachers were trained with the GARC REC in pilot areas of Cote d'Ivoire and children initiated public plays to spread messages on rabies.

The multi-country project team made use of community participation assessment tools.

Bite prevention and rabies awareness in school children

Presented by: A. Naude

The ZNSPCA has made use of the children's rabies prevention (want to be a friend) booklet to raise awareness. 83% of rabies cases in Harare were due to dog exposure and 87% of these rabies positive dogs were owned. Public education on bite prevention and responsible pet ownership is equally as important as mass vaccination. Children were educated using the booklets whilst parents and young adults visited the dog vaccination point where they are educated on rabies, bite prevention and pet ownership. Sessions were regularly organised with school headmasters and teachers to educate children on bite prevention, using a balanced approach to avoid making children fearful of animals. Educational ministers and inspectors have significant power in the community and were involved in bite prevention education.

Example of engaging community health workers in rabies prevention

Presented by: K. Le Roux

Community health workers are an incredible resource to facilitate cooperation of communities and promote rabies awareness, resulting in people that will seek treatment, support vaccination drives, and report suspected animals. In KwaZulu-Natal, South Africa, there are 154 staff in the veterinary services, compared to 13 000 health workers, taking care of 50-60 households each. We need to understand how to use the existing workforce for the needs in each area. Surveillance links to health facilities for treatment, which leads to awareness and education, which in turn increases mobilization. Awareness leads to better surveillance and improved case detection. Mr Le Roux expressed: 'In our experience, the numbers are directly related to the education in these areas. 85% of the people in KwaZulu-Natal know what the disease is and how to respond to it. Community health workers are well placed to mobilize communities for upcoming dog vaccination campaigns. The Red Cross has 1500 caregivers in KwaZulu-Natal who are willing to train their people and mobilize the community. The REC is facilitated by GARC and done offline in classroom settings. However, it is difficult to train 13000 people using the REC, so we need to begin training the trainers improve our capacity for training people on the ground.

World Rabies Day 2018: Share a message, save a life

Presented by: C. Schepers

World Rabies Day (WRD) development was supported by GARC's Partners for Rabies Prevention as they recognised its potential to have a global impact. GARC coordinates WRD by amplifying the campaign's reach through the provision of a central event platform, providing resources to support events across the world, promoting messages through key rabies stakeholders and promoting the implementation of specific activities to highlight issues. This year's theme is "Rabies: Share the message. Save a life." Over the last decade, more than 1,700 registered events have been held across the world and shared with others in the global rabies community. Events in canine rabies endemic countries, particularly in Africa and Asia, have increased over time. Whilst the number of registered events gives an indication of the success of the campaign, it does not reflect the true picture of outreach to communities as the WRD outreach may be wider than recorded. Beyond the individual events, WRD has gained the support of governments and international agencies that recognise its value in supporting existing rabies control initiatives and advocating for improvements. The global adoption of 2030 as the goal for the elimination of dog-mediated rabies has led to even greater opportunities for WRD by bringing the attention of policy makers and donors to the ongoing elimination efforts in rabies-endemic countries. Some of the impacts that are made through WRD include the showcasing of the country's work in progressing along the Stepwise Approach towards Rabies Elimination scale. WRD can be used to encourage medical and veterinary sectors to work together and encourage professional and community networks to spread rabies prevention messages. This important day can be used to attract international media, donor countries and institutions, and international NGO's for capacity building. WRD is also an opportunity to celebrate successful rabies prevention projects and recognize the people who run them. GARC provides a social media toolkit which aims to share basic rabies prevention messages, provide calls to action and share progress.

Insights from the panel discussion:

- Organisations like Red Cross or World Vision increase community resilience through education and awareness.
 - o World Vision is an organisation focussing on health and food security with community driven programmes to improve child wellbeing. There is a great opportunity to engage active health workers to train, develop programmes and create key messages around rabies.
 - o Red Cross volunteers are present in many communities, understand the South African setting and have long-standing experience to educate, create awareness and facilitate rabies education.
- Registering a WRD event is an opportunity to celebrate individual efforts and share experiences

- It is essential to bring traditional healers, as well as community and religious leaders on board, as they will increase community ownership of rabies programmes. Liberia involved traditional healers in trainings and gave them a role assisting with triage in communities.
- The WHO rabies laboratory manual has been revised, now encompassing more than 40 chapters in two volumes and will be online at the end of the year

SESSION 5: ONE HEALTH (OH) COLLABORATION

Objective: Implementing effective One Health strategies in communities, countries, regions

Introduction to Integrated Bite Case Management (IBCM)

Presented by: E. Pieracci

Many countries have a human rabies surveillance system, but it is implemented too late to impact patients presenting to health clinics. Following a report of an animal bite, the animal can be found and assessed for symptoms of rabies. This information can be relayed to the human health sector and help inform the decision to continue or discontinue PEP.

IBCM uses a One Health approach: Suspect bite cases are reported through animal bite surveillance which initiates an animal rabies surveillance investigation then generates a PEP recommendation. Strengthening intervention-based surveillance systems through improved bite reporting, investigation of every suspect rabid animal, and informed PEP recommendations, saves lives and money associated with the use of unnecessary PEP.

IBCM has 6 components:

- Reporting of bites from health centers and community health workers to animal rabies surveillance officers.
- A bite investigation includes: A) animal rabies investigation (completed by the animal health worker) and B) the victim bite investigation (completed by the human healthcare workers). This can consist of a passive approach, where reports of rabid dogs are reported from the community or bites are reported from health centers; or an active approach where bite victims are actively sought out in hospitals/clinics.
- Safe animal capture needs supplies and training and must be done humanely.
- Animals need to be assessed for signs of rabies.
- If the animal is showing signs of rabies, it should be humanely euthanized as it is a risk to the community, and brain samples should be submitted for testing.
- If it is not showing signs, it should be quarantined for 10 days. In an endemic setting, initiation of PEP should not be delayed, but can be discontinued if the dog is healthy on day 10 as it was not shedding virus at the time of the bite.
- Laboratory confirmation, preferably in the form of the WHO and OIE gold standards, the DFA or DRIT.

Increased dog vaccination results in fewer human deaths, but if IBCM is simultaneously applied the reduction in cases is accelerated. No single strategy alone will work as dog vaccination takes time and must be sustained over a minimum of 5-7 years.

There are many benefits from increased surveillance and IBCM:

- Removal of identified rabid animals from the community will decrease animal and human exposures
- Reduction of unnecessary PEP results in improved PEP availability for bite victims and cost-savings to government and citizens
- Aids in the identification of additional bite victims.
- Demonstration of IBCM can be showcased to donors to improve rabies funding.

Opportunities of One Health communication for effective rabies prevention

Presented by: R. Ngandolo - Chad

Chad included politicians as part of the One Health approach. Rabies surveillance began in 2000 with the training of technicians to use the fluorescent antibody test for rabies diagnosis. This triggered more interest in rabies in the population and led to prioritising care of bite victims and veterinary assessment of biting dogs. Politicians helped with mitigating conflict or involving law enforcement where necessary. Chad tested the One Health approach in a nomadic environment, using joint vaccination campaigns to save resources and received government backing for these campaigns.

The Gavi project initiated a demographic study of the dog population, followed by a mass vaccination campaign. This led to recommendations to extend the tools across the country and work with other platforms such as PARACON. To expand rabies efforts, the situation was presented to the Mayor last June which resulted in a successful opportunity to raise advocacy for rabies elimination with the media and the national assembly. Support was received from the MP from the Moundou area, where dogs are considered important animals, who then communicated the One-Health campaign to political colleagues. We need to keep in mind the key, convincing messages for decision makers when activities are designed and think of who to target in the political system. Chad also had success in engaging local business to improve resource mobilization. Three companies were approached and asked to contribute 10 000 vaccine doses per year.

Presented by: A. Traore - Mali

As neglected zoonoses receive some government coverage, we were able to implement a rabies programme to vaccinate and evaluate dog management in different areas. From estimates of dog demographics, it was determined that there was approximately 1 dog per 120 people. During 3 years of the programme, we determined that culling practices were largely occurring in rural areas. In Bamako, a more urban area, people sought PEP following a dog scratch, and the owner of the implicated dog were required to pay the vaccination fee, which was often more than their salary (\$80). Mali created multisectoral platforms that brought together 20 ministry departments, including the Ministries of Health, Agriculture, Fisheries, and legal departments. More than 500 meetings were held in 2006-2018, and in 2016 our team was contacted about implementing the One Health approach in Mali. The platform was created with one of the donors that fund Ebola and Rift Valley Fever projects, with contribution from the OIE Evaluation of Performance of Veterinary Services and WHO International Health Regulations. The platform is currently hosted at the Prime Ministers' office.

The Gavi project allowed Mali to provide free vaccinations to people and provided an opportunity for a One Health approach which has catalysed several activities in both human and animal sectors.

Experience with Joint Evaluation Exercise (JEE) and impact on rabies programmes

Presented by: S.A. Ohene

The Joint External Evaluation (JEE) assesses 19 technical areas and provides a basis for national action plans to strengthen International Health Regulations (IHR) core capacities¹. The JEE requires that the country can provide documents demonstrating their capacity to deal with rabies and an external team is brought in to aid the country's internal team. The process creates an opportunity for various sectors to identify areas that need a support and subsequently, a plan is developed to address gaps in public health security. Technical areas were discussed using a One-Health approach during the Ghana Rabies Control and Prevention Work Plan Workshop held in February 2017, took place where these technical areas were discussed in a One-Health approach. These areas created an opportunity to sit down and work together. A follow up JEE workshop was held to develop a rabies control and prevention workplan. Integrated disease surveillance and response technical guidelines and manuals were developed and made available at district level. The One Health technical working group developed an outline on Ghana's One Health policies and are now meeting with the various ministries to get high level support for these approaches. Additionally, a national action plan meeting was established in July 2018 to map national hotspots of zoonotic disease and an MOU was adopted to formalise the sharing of data, expertise, specimens, intervention protocols and information mechanisms between the Animal and Human

¹ <http://www.who.int/ihr/procedures/mission-reports/en/>

Health Sectors. Furthermore, the surveillance plan for priority zoonotic diseases in accordance with the One Health guidelines was finalized. SOP's for the sharing and reporting of data were also optimised and then later tested using simulation exercises. The JEE was a stepping stone for Ghana for the collaboration between sectors and sharing of information and has resulted in rabies being recognised by human health, animal health and environmental sectors as a prioritised zoonotic disease.

Importance of a dedicated rabies taskforce that works under the One Health taskforce

Presented by: K. Perrett

The presence of a One Health taskforce in KwaZulu-Natal, South Africa resulted in a massive decline in rabies from 2007 – 2014. Animal vaccination and human PEP were tracked and found to be inversely proportional. Despite having a taskforce, there was a major increase in rabies from 2015-2016, which resulted in a much closer collaboration between taskforce members. A rabies taskforce is a necessity, but other factors are required for success. The South African National Rabies Advisory Group (RAG), consisting of representatives from various departments and provinces makes up the rabies taskforce in South Africa. They are an ADVISORY group only, and not responsible for programme implementation. South Africa is comprised of 9 provinces, each with their own veterinary and health services that largely work independently of each other. Provinces are further divided into district councils where vets and technicians fall under the Department of Agriculture. Bite cases are reported to local environment practitioners, not to the health sector. The chain of command in a federal country with different administrative levels is challenging without smooth collaboration. RAG strengthens interaction by focussing on how One Health is organised across administrative levels, and as such, has become a conduit for other zoonotic diseases such as brucellosis. Some of the local RAG functions include vaccination, the REC, animal identification and stock theft awareness campaigns, and the mapping of positive and negative diagnosed rabies cases daily. Valuable lessons learned over the years include:

- Less talk and more action;
- explore multiple avenues for help (e.g. Red Cross, Rotary, Industry) to better share information and awareness through public education;
- ongoing awareness campaigns are required, even if there are few cases.
- Some dog food companies in South Africa are in the process of putting rabies warnings and vaccination advocacy on dog food packages to achieve ongoing awareness.

Insights from the panel discussion

- IBCM in an endemic, resource constraint setting can be challenging, as follow up of every suspect bite case/suspect dog might not be feasible from start. Timely communication across sectors is key and can save lives. This can start with simple means such as direct phone calls or WhatsApp groups, before scaling up to comprehensive field investigations.
- A country can request a JEE evaluation through the WHO country office, who in turn need to engage the ministries. JEE missions have great potential to move away from working in silos and to engage civil society
- Mali established a platform at the Prime Minister office and is in the process of appointing focal persons for the 5 zoonotic diseases
- Many people in the African setting may not have the means to pay for their dog's vaccination and feed
- Obtaining samples for post mortem rabies diagnosis in humans faces cultural obstacles and requires permission of the victim's family, and awareness raising in communities about rabies and the necessity of diagnosis
- Ethiopia progressed with its national strategy implementation and established a taskforce at the grassroot level thereby linking key actors.

SESSION 6: SURVEILLANCE, DATA COLLECTION AND REPORTING AND RABIES EPIDEMIOLOGICAL BULLETIN WORKSHOP

Objective: *Harmonized data collection and management, reporting channels, monitoring & Evaluation*

Country reporting to global level, standardization of indicators, measure progress of rabies elimination, channel and harmonize national data reporting

Presented by: B. Abela-Ridder

Rabies data can be used as advocacy for funding to eliminate the disease in a country. Data documents the size of the problem, focus countries where to respond, and measure change over time. Data displayed publicly by WHO needs to be official and endorsed by the country. Ministry Focal points are essential to check and approve the data. Current data exhibited on the WHO Global Health Observatory (GHO)² shows that rabies country data are miserably underreported. WHO and OIE are the mandated organisations to collect, store and disseminate human/animal health data.

The WHO GHO shows aggregated data that can be displayed along with other health-related and socio-economic data. Countries can use these data to map rabies against other diseases and add layers such as poverty levels. To avoid duplication of reporting is working with PARACON, using the REB, to generate reports which countries can submit to the WHO and OIE. Data submitted to WHO, OIE or PARACON should be the same.

Countries should be adding rabies to their own health surveillance systems in their countries; WHO can support countries in building the rabies shell for their DHIS2 or other system.

The following are the minimum key human and animal rabies indicators for national reporting ideally with disaggregated as described in Annex 2:

- Number of human rabies cases reported (clinical and lab diagnosed, but also probable cases)
- Number of animal bite cases reported
- Number of people who receive PEP
- Number of dog rabies cases reported
- Number of rabies cases reported in animals other than dogs
- Estimated dog population
- Estimated dog vaccination coverage

It is important to make sure health staff in the country apply congruent categories, such as age groups or types of exposures by which species. Reporting dog bites, their severity and PEP use supports forecasting of rabies biologics and appropriate budgeting. By reporting the number of dog rabies cases (positive vs negative), countries can show where surveillance is taking place and if the system is working. A dog population estimate will help to indicate dog vaccine needs. If countries do not have a dog population estimate, the capture-recapture method can be used to determine dog population in pilot areas

Presented by: A. Britton

WHO and OIE are responsible for the dissemination of disease information to the rest of the world and are mandated to collect and store human and animal health data. The OIE has no country offices but has a delegate responsible for disease reporting in each country. The OIE is mandated to promote international animal health and welfare standards. The process for setting standards takes a minimum of 2 years and individuals need to speak to their OIE country delegate if they wish to feed into this process. Standards get passed through a resolution by vote before they are accepted, and reviewed standards are reported to the Delegate Assembly in May each year. Guidelines for diagnostics and surveillance are available online³. The OIE proposed in the updated standards to countries to endorse national control programmes for rabies. OIE is currently in the process of waiting for country comments on evolving international standards, including rabies.

² WHO Global Health Observatory, rabies <http://apps.who.int/gho/data/node.main.NTDRABIES?lang=en>

³ <http://www.oie.int/standard-setting/overview/>

It is important to understand that disease notification and data reporting is especially important as you reach the final phases of elimination. WAHIS is a secure online notification system with a purpose of being a global and sensitive early reporting system and the repository of animal health data. The OIE makes use of the WAHIS alert App which provides an alert when a zoonotic disease has been identified in the area. An updated version, the WAHIS+ system, will be launched in May 2019 with added features. The updated system will be user friendly, intuitive and time-efficient.

Introduction to the Rabies Epidemiological Bulletin

Presented by: T. Scott

The Rabies Epidemiological Bulletin (REB) enables countries to gather data and efficiently disseminate it to stakeholders. There is a large volume of varying data from multiple sources which can be difficult to manage. The REB allows data to be standardized and analysed in a more ordered fashion. Data drives the decision-making process and requires both reporting and feedback. How can we tell that actions are effective and having an impact if there is no data to show this? The REB uses a dedicated One Health approach, linking human and animal health reporting. There are 7 indicators required for the WHO, and data collected from vaccinators, community health workers and health facilities can be harmonized at a sub-national level and contained in the REB. On a national level, it can link the Ministry of Agriculture and the Ministry of Health and regional data can be used for advocacy and raising awareness. This system is not designed to be a reporting database but rather to assist countries with surveillance and in country data collection. Current features include graphs and tables, pivot tables and visual outputs based on the indicators that WHO requires and custom indicators that the countries require. Countries can change the way the data is presented and map the information (e.g. to drive vaccination campaigns). The system facilitates generation of reports with the information entered. Aggregated national, clinic, and individual patient level data can be automatically generated into presentable data.

Impact of surveillance, data collection and reporting on programmes

Presented by: A. Mwatondo

Kenya's Zoonotic Disease Unit is in collaboration with the Ministry of Health and Ministry of Fisheries. Our Rabies elimination strategy was initiated from 2014 and will run until 2030. Our strategies include vaccination, PEP, public education and awareness, and enhanced surveillance in both humans and animals. We started in 5 pilot counties in Western and Eastern Kenya, then moved to the surrounding counties. Kenya first made use of the SARE tool to determine our priorities. We implemented a toll-free number, hospital-based surveillance, a dog cohort study, community surveillance, contact tracing and sample collection of suspect animals as part of the programme and the Gavi learning agenda studies. Most dogs showing rabies symptoms are killed by the community with some brought to vets for testing. Key findings from two of the pilot counties, Makueni and Siaya, included:

- Passive surveillance has severe under-reporting for bites; there is a high positivity of samples from dogs tested for rabies, low access to and compliance with PEP, yet few human rabies cases were detected.
- The two cases from Siaya were detected in the health care facilities, but it was too late to save the victims
- It is key to look at in-patients; many diseases present with similar symptoms to rabies.
- Record keeping at health facilities needs improvement – critical data were missed by aggregate reporting.
- Training is needed among health care workers to improve suspicion for rabies and knowledge of the WHO position on rabies vaccine and immunoglobulins
- High dog population turnover rate requires that vaccination is sustained
- Surveillance and reporting provide data to demonstrate progress towards elimination and improves allocation of funding to rabies
- Rethink surveillance, what is required to find the rabies information needed. Some dog bites reported to the hospital, but more work has to be done at the community level

How to improve quality of data for monitoring progress of rabies programmes

Presented by: R. Athingo

In 2016, Namibia implemented its national control strategy in pilot areas (7 regions up north where most of the rabies endemic cycles occur). Key points that were considered were:

- The main objective of dog vaccination should be geared towards elimination of dog-mediated human rabies; a 70% dog vaccination coverage is sufficient
- Mass vaccination of dogs is the most successful and sustainable method for control and possibly elimination of dog-mediated human rabies.
- Planning should be informed by the rabies strategy document.
- An implementation plan, including an action plan (what, where, when and how) should be formulated prior to programme implementation
- Start with realistic implementable activities that help achieve the objective
- A pre-campaign assessment should be performed, implemented and then measured using a post-campaign assessment to determine progress.

Data collection should be informed by what rabies activities will be undertaken – capacity building (training of staff); education and awareness (community meetings and school talks); stakeholder identification and engagements. Countries need to understand the epidemiological situation of rabies in their country for better planning. Good quality data is also important for the understanding on the burdens to the health sector, including the cost of PEP, the burden to victims of dog bites, as well as the understanding of the target groups when disseminating rabies messages. This information allows a country to forecast for required vaccine, number of vaccination centres, number and composition of teams, transport, equipment and materials required.

Ways to ensure quality include:

- The use of a well-structured data collection tool such as questionnaires and data logging devices.
- Data collectors and interviewers should also be trained to obtain the correct and relevant data in an efficient manner.
- Ensure legislation is in place, including rabies as a notifiable disease, and compulsory reporting by the public and private sectors.
- Collect more data through KAP surveys.
- Ensure a rabies investigation protocol is in place.
- Provide a toll-free centre service where the public can report.
- Have a central, national database available.

In Namibia's experience, cell phones were not sustainable, especially financially, therefore the country made use of paper-based questionnaires.

The high level of education and awareness in the country has resulted in community reporting of most animals that act strangely. It was also important to identify rabies strains circulating, as the country experiences problems with sylvatic rabies. A sero-survey was also implemented to establish the level of protection against rabies in the vaccinated dog population.

Data needs to be used to update national strategies and better target the activities according to changes in epidemiology. The government and donors want to know if the messaging is working.

Insights from the panel discussion & agreement on indicators and process

- Reporting systems are present at either country, regional or global level, but there is still a need for capacity building and refinements
- Countries agreed on the key indicators for reporting as proposed
- There are many countries with good surveillance systems where data is being collected effectively, but rabies data is being neglected due to the disease being neglected
- The veterinary sector is supposed to report to OIE, and the health sector to WHO. Efforts are underway to integrate data at a global/regional level so that both sectors receive both reports in real-time

- Frequently surveillance is conducted in selected areas of countries with cases reported due to better surveillance rather than a higher case number. Governments may indicate where the data was obtained from if data is patchy.
- Countries can use the sudden rise of cases as advocacy, to demonstrate that surveillance is detecting cases and a response is required
- Countries already using a DHIS2 systems for other diseases can build the Rabies Epidemiological Bulletin (REB) shell into their own surveillance system
- It is important to have a rabies taskforce that includes the community healthcare workers of both animal and human health sectors.
- Kenya uses the same 'One Health community workers' for both animal and human surveillance
- Data analysis should be targeted to the audience you want to address and convince.
- Finding negative tested dogs still shows improved surveillance, but is important to map negative test results
- Post vaccination monitoring:
 - Use external visible marking at the start to reach a maximum of unvaccinated dogs
 - Serology can serve as a (costly) tool to monitor quality of vaccinators' work, in a pilot setting, but devices such as the GDL or other devices with a GPS component can be used as an alternative
 - Once the system is established it is a waste of resources to do serological tests
 - Sero-surveys can help to make sure your vaccination strategy still works after several years, particularly in the final phase when reaching elimination and where outbreaks are residual rather than new

SESSION 7: NATIONAL PROGRAMMES AND STRATEGIES FOR RABIES ELIMINATION, SARE WORKSHOP

Objective: Energizing effective rabies elimination strategies in countries, SARE, national stakeholder consultations

The concept of the SARE in developing and monitoring national strategies

Presented by: A. Coetzer

Several countries already have national strategies to overcome rabies, but only a few are in the process of eliminating canine-mediated rabies. The SARE is a self-assessment tool that was designed to demonstrate country progress and provide practical guidance for countries to expand rabies programmes. The tool is based on yes / no activities that provide measurable, incremental chronological steps which are grouped into 7 bigger components. The progress for every component is assessed, an a SARE score is calculated, allowing the country to identify past achievements and current gaps in rabies control... It also provides a summary of activities which have and have not yet been completed. Completed activities can be used for advocacy. The new component to the SARE tool, the Practical Workplan towards Achieving Rabies Elimination (PWARE), automatically creates a work plan with objectives and key performance indicators (KPI's) for all the activities that have not yet been completed. The content is not prescriptive and can be refined by the country and provides suggested content in the form of a monitoring and evaluation framework. The SARE has undergone various revisions by the FAO, WHO, OIE, CDC and WAP to become more useful and applicable.

In country implementation of SARE-PWARE tool (inter-ministerial stakeholder consultation workshops) to start national programmes

Presented by E. Zanamwe

Many West African countries don't have a clear rabies elimination strategy. Workshops and rabies stakeholder meetings have been implemented in West Africa to overcome this and provide a starting point for national programmes. Five One Health stakeholder meetings have taken place in collaboration with the tripartite and USAID (Guinea, Cote d'Ivoire, Ghana, Liberia, Senegal). Multisectoral action plans were developed using the

SARE and PWARE with gaps and challenges identified during the assessment. Since then Ghana's national plan has finalised and Guinea's and Senegal's national strategies have been updated. Meetings were arranged between the various sectors and authorities to increase buy in from stakeholders.

To reach the "zero-by-30 goal", a regional approach is required and can include organisations such as World Vision and Red Cross. However, without data, donors will not be convinced. Furthermore, the FAO, GARC and CDC model should be extended to develop a cooperative model between other countries. The FAO is piloting the EMPRES-I platform which is a real-time disease reporting tool. It allows for country specific disease priorities and the visualisation or mapping of multiple disease outbreaks. The international frameworks linking public health and veterinary services for integrated health systems are already in place, we just need to capitalise on them.

Showcase of developing of a national rabies strategy based on the SARE-PWARE: Liberia

Presented by: L. Andrews

The SARE-PWARE workshop was conducted in Liberia in May 2018. Human rabies is part of the IDSR, and the guidelines and governance manual of the one health platform. The central veterinary laboratory was equipped and trained for animal rabies diagnosis with support from FAO and Swiss-TPH. Our first rabies samples were diagnosed in 2018. A One Health meeting with stakeholders from FAO, national and international CDC, Ministries of Agriculture and Health, and national disaster management resulted in the development of a realistic, short-term plan. The SARE measured progress, acknowledged successful activities and identified gaps and areas for improvement. Liberia's SARE score increased from 0,5 to 1,5 since 2017. Based on inputs from stakeholder's present at the meeting, we realised that it was essential to improve our action plan to update the work plan. An estimated \$4 million is needed annually to eliminate rabies over the coming years. The next steps for Liberia include the validation of a national action plan; advocacy for support of planned activities; dog population and KAP surveys; increase public awareness on rabies prevention and control (including WRD); annual dog vaccinations and continued surveillance.

Showcase of developing a national rabies strategy based on the SARE-PWARE: Cote d'Ivoire

Presented by: M. Tetchi

Côte d'Ivoire prioritised 5 zoonoses of which rabies is second on the list. A workshop was launched in collaboration with FAO, USAID, CDC and GARC to further prioritise rabies, during which ministries, sectors and authorities developed a national strategy. A prior SARE assessment revealed that more than 70% of the actions were still pending. Establishing official platforms for the exchange of data was identified as a necessity. The strategic plan was used to estimate the budget and identify the technical activities that need to be implemented. A special working group was established to draft the narrative and to provide a cost estimate using a multisectoral approach. With assistance from the Centre Suisse de Recherches Scientifiques, a project partner in the Gavi learning agenda studies, we equipped a laboratory to analyse both human and animal samples. 94% of biting dogs in Cote d'Ivoire were rabies positive. Based on WHO recommendations, training on intradermal vaccination was implemented at healthcare facilities. Cote d'Ivoire will finalise its strategy by the end of 2018. An emergency fund specifically for rabies has also been discussed. Two workshops were held to increase reach and drive the program forward. Tools such as SARE-PWARE helped develop the national strategy. The next step is the validation of the program by highest Government officials, a delicate and critical process, with the aim of inviting stakeholders and Ministers to sign the document on WRD this year.

Insights from the panel discussion

- Obtaining endorsement of the national rabies strategy and its programmatic activities can be challenging. Involvement of the right stakeholders from the start and at all administrative levels, regular communication of achievements as well as challenges and targeting advocacy events for officials have worked well in Ghana, Mali and Côte d'Ivoire
- Experiences on what tools worked well and how to get national strategies and work plans validated should be shared between countries

- There is a lot of expertise available in African countries that could be used more widely and there are examples of successful South-South collaborations for capacity building. e.g. Malian experts helped Liberia to establish their laboratory diagnosis and field testing and the OIE reference laboratory in South Africa supports Southern African countries in epidemiology or laboratory diagnostics
- Catalytic co-funding by external donors to start implementation of national strategies is still considered an important step. Successful countries started small with realistic, achievable goals, and scaled up
- The national rabies strategy is developed by technical people while the ones deciding on the budget are usually finance people. Adapt your communication and advocacy approach to convince them
- We should learn from other successful and well-resourced programmes, such as malaria or tuberculosis, and replicate their policies, implementation plans and the key steps that led to rubber-stamped budgets
- Domestic ownership sustains programmes, strategies and funding
- Full transparency on plans, their implementation and achievements, but also challenges are key to the Government as well as domestic or international donors
- The importance of political people and (sub)regional economic organizations, such as African Union, East African Community (EAC) and Southern African Development Community (SADC), is recognized to capitalize on the work done by countries and international organizations. So far, their engagement has been limited but we will continue to keep them updated

Technical brief – overview:

Presented by: A. Coetzer

A technical brief is no more than a 2-page document that can be presented to high-level Government representatives to introduce your workplan. The technical brief ideally summarizes key data and information and entices high level individuals to continue reading your workplan.

Context

- 2-3 sentences
- Explains rabies at the global then regional then national level.

Goal

- Short reference to particularly the SDG 3, linked to end human deaths from dog-mediated rabies by 2030.

Objectives

- Summary of SARE activities or key outputs of other assessments
- Prevention of human rabies deaths, awareness, focus on dog vaccination, dog population management

Justification

- The reasoning needs to be country specific and should relate to each of the objectives and relatable to the reader.

Methodology

- Set and justify realistic time frames for the workplan
- Have phases that explain there will be progress behind this – certain activities will need to take place.

Expected impact

- Each Minister or Ministry will want to see their implication and contributions to this list to justify continuing budget allocation and to keep being involved.
- Numbers talk, not percentages. Ministries need to see how they contribute to the larger picture and how they make an impact.

Budget

- The full and detailed budget should be placed in the appendix.
- Before you show numbers, you show the justification why prevention is better (cost versus saving work), prepare them not to be surprised before you show numbers on impact and costs associated.

Recap

- Positive message at the end of technical brief, repeat year of elimination, after the budget.

A working group discussed the proposed outline of the technical brief and commented:

- Technical assistance and advisors should be involved as they have knowledge on methodologies for such documents Cited facts need to be correct, indicate that there were several consultations held and how people came to agreements that resulted in this document.
- Your Commissioner and Director need to be informed about content and be present to show your commitment when creating and presenting such a technical brief.
- FAO, OIE and WHO are in contact with the ministries or high-level veterinary services in country or regional offices of these organizations can facilitate higher-level support/contact
- When trying to get One Health together, try to speak to Ministries and Chief Directors and present with counterparts as a group to advocate.
- The outline needs more elaboration and needs to be adaptable to country needs

SESSION 8: GLOBAL AND REGIONAL STRATEGIES, UNITED AGAINST RABIES

Objective: *Country, region and partner engagement to reach Zero by 30*

United Against Rabies collaboration, Global Strategic Plan “Zero by 30”, ‘End Rabies now’

Presented by: B. Abela-Ridder on behalf of UAR with comments from FAO, OIE, GARC

If we preach One Health collaboration, then we should be the example ourselves. In 2015, WHO and OIE convened a global meeting with all countries and rabies partners, including private sector, civil society and academia, who agreed on the Zero by 30 goal. Goal 3.3. of the 2030 Agenda for SDGs, adopted by the Member States of the United Nations in 2015, commits the WHO and FAO to work with countries towards ending epidemics of NTDs by 2030, including dog-mediated human rabies. In 2016, the Member Countries of the OIE adopted the Resolution, which recommended that the OIE, in partnership with WHO, FAO and other interested parties, sustain its commitment to the elimination of dog-mediated rabies.

Subsequently UAR elaborated the Global Strategic Plan⁴ to build advocacy and to help countries get from A to Z. The interventions to reach this goal were based on existing tools and are country- focussed. Investing in rabies elimination is a public good and a model for One Health. Rabies elimination contributes to global goals and can be used to strengthen health systems. Logistics to get vaccines to the district level and training on proper wound washing and administration of RIG are needed. Building capacity in rural areas to enable people to identify rabies cases and recognize and respond to outbreaks will build a platform for the community to work from. Capacity building amongst your healthcare workers will ensure they do their job properly. If we can show One Health is possible through rabies, we can make rabies a model for other diseases. We need to show governments the link of rabies elimination to larger goals, like poverty reduction. The global strategic plan is catalytic, but not supposed to replace strategies and responsibilities of individual countries. It is there to help with supporting regional networks, channelling and coalescing efforts, aiding surveillance platforms and helping to show progress. Partnerships are essential to reach a goal. The last mile will be the most challenging. This meeting is an example of what we are trying to do in terms of tools for education, epidemiological surveillance, and tracking success. These tools are available to help countries to obtain support to build programmes.

The UAR helps channel and bring efforts together. It is a community of practice that is pulling in different specialties to improve our reach and to unify our response to rabies. The involved organisations have different responsibilities to bolster the work, but these responsibilities are unilateral and correlated to give structure and coordination to rabies elimination. We are trying to ensure a coordinated response from the tripartite plus GARC. Our impact will be measured by zero human deaths. The 3 main objectives are:

- Effectively use vaccines, medicines, tools and technologies
- Generation, innovation, and measuring impact
- To sustain commitment and resources

Significant funding is spent on rabies and we need to show that prevention is better than cure Rabies is more than just a financial burden. UAR bolsters countries to implement their own national plans through: Fostering political will; building local capacity; adapting global policy to local contexts; inspiring and driving regional and

⁴ <http://www.who.int/rabies/resources/9789241513838/en/>

global elimination. Global policies uptake will drive countries into a more cost effective and time-sparing way of eliminating rabies. Tools such as the SARE are available, to help countries assess their current rabies situation and what resources are needed to move forward. From an external perspective, it is good to see the countries outputs to analyse the smaller elements and see where UAR can assist.

OIE comment:

UAR has pledged its commitment and technical support to assist and accompany rabies endemic country efforts to end human deaths from dog-mediated rabies by 2030.

This pledge is a commitment for collaboration and calls upon national governments to take an active and important step forward towards the achievement of UN SDG Goal 3.3, by endorsing the pledge statement and committing their country to take part in the fight against this important neglected disease. It would be ideal if both ministries could sign the pledge in a One Health context.

Regional rabies control networks: Alignment with the UAR strategic plan

Presented by: L. Nel

PRP and GARC wanted to trigger progress in highly endemic dog rabies areas. PRP considered the WRD, SARE, and GEP but did not yet have delivery platforms developed and thus PARACON was created. In 2015, the inaugural PARACON meeting took place with representatives of 33 sub-Saharan African countries. PARACON is a network with supporters from corporate and civil society and aims to unify countries of the region and promote a One Health approach. It creates a platform to show successes, discuss lessons learned and challenges experienced and promote the implementation of tools and educational initiatives. The success of PARACON encouraged us to create the Asian rabies control network, ARACON, using the same strategies and approaches. In April 2018, MERACON was initiated and took place using the same working approach as PARACON. These networks serve as advocacy platforms and provide a supportive environment where practical workshops are utilised to determine needs and evaluate methods. Tools and expertise include regional network meetings, in country trainings and lab twinning projects.

Insights from the Breakout sessions

Group 1: Monitoring dog vaccination programmes

- Ensure a 70% vaccination coverage of dogs.
- Ensure a good quality vaccine is used, and maintain the cold chain
- Monitor and reward high quality of work by vaccinators to build incentive,
- Awareness is key to encourage dog owners bring their dogs to vaccination campaigns.
- If owners are nomadic, use the door to door technique; if you are in a community or village, make use of a central point (be aware of risk of transmission of other diseases); if settlements are scattered then mobile vaccination points may be useful. Depending on the setting, door to door vaccination costs \$5 per dog whereas costs for central point approach are less than \$2.
- Determine how many dogs are present in a community to measure the performance of the campaign. Collar the vaccinated dogs or provide vaccination certificates as an incentive for owners to bring their dogs.
- Rabies control isn't about (expensive) post vaccination serology. Focus limited resources on vaccinating sufficient animals.
- Dog vaccination campaigns are an effective way to engage communities and educate them on rabies.
- Include contact details of district response personnel (for sample collection, medical/veterinary advice) on the vaccination certificates or communicate at the vaccination point to circulate this information in communities and improve surveillance.

Group 2: Surveillance

- In countries where rabies is highly endemic, efforts should target suspicious animals, rather than wasting effort finding animals at low risk IBCM is a good way to get samples
- In areas where rabies is less prevalent, efforts can include sampling from road kill Intersectoral communication at the local level and community awareness are key to surveillance
- Start implementing actionable items that don't require funding first
- Good surveillance will provide If you have good surveillance you will know what is going on and target the support you and communities need.
- Report back: If the biting animal reported tests positive, this engages local people. It can be used to demonstrate that people need to seek treatment. Rapid diagnostic testing can be a good tool to convey rabies risk of a suspect bite.
- A free hotline can provide advice, advise people where vaccine is available and allow people to report bite cases.
- Training of staff is critical, e.g. for case definitions, IBCM programs, sample collection, outbreak response
- Recording of key information for a sample is very important; the central veterinary laboratories doing confirmatory testing need this information for the national level reports.
- Financial incentives to increase sample submission is risky, as it may result in the submission of non-suspect and unnecessarily killed dogs. Community awareness and vaccine availability is a strong incentive if communities recognize the dangers of rabies.
- Borders are porous, even for islands. Engage your immigration authorities as part of your One Health taskforce.
- Biting animal observation data must feed into surveillance results. Côte d'Ivoire put a lot of dogs under observation and if they died/survived, they were considered positives/negatives.

Group 3: Roll out of new WHO recommendations on rabies immunization

- NTV vaccines in Ethiopia need to be phased out and transitioned to intradermal vaccination.
- Selected countries have started rolling out new recommendations through the implementation of pilot studies, supported by Gavi's learning agenda on rabies.
- South Africa is also planning on doing PrEP studies. Other countries have other steps to consider before scaling up.
- National authorities usually need to give authorisation for policy changes, which can be a lengthy procedure. WHO could help reduce delays or accelerate the process for countries.
- Training is important in countries where studies have already been conducted. Countries can use nurses trained in ID BCG administration to train others in ID rabies vaccine administration.
- Challenges include stock shortages of biologics.

Group 4: Dog population management (DPM)

- DPM is part of rabies control, but the level at which this is implemented, and methods used will differ between countries.
- Sterilisation (spay/neuter) is slow and expensive, but predominantly used until a low-cost contraceptive can be developed.
- . A One Health focus is needed for DPM, involving education, communication, veterinary services, information, and health sectors.
- Dogs are important to most societies and we need to promote this to communities and understand the local dog ownership culture and habits.
- Insights from KAP studies will provide guidance on dog management
- A behavioural change is needed for DPM: improved sanitation and general waste management is cheap and engages the community and the municipality.
- There is a lot to learn from other disease control programmes that we can apply to rabies
- Clarify who is responsible for DPM in your country

SESSION 9: SUMMARY OF MEETING OUTCOMES & PARTNER COMMITMENT, CLOSING

Presented by: B. Abela-Ridder & L. Nel

- **What we have learned**
 - ID vaccination is cost and dose sparing
 - Indiscriminate dog culling is not a solution, and should be replaced with other means of dog population management
 - Improved sanitation is important, even for managing dog populations and rabies
 - Education and awareness are critical to programme success
 - While oral baits should not replace parenteral vaccines, they are useful as a supplementary tool with which to improve dog vaccination coverages

- **What works**
 - Tools are available to assist in the development of rabies programmes and national strategies, including the REB, GDL, SARE, GDREP, JEE, OIE vaccine bank, PVS pathway, WHO and OIE guidelines, National stakeholder consultation kits.
 - One Health workers (e.g. Red Cross) can be a useful resource in communities

- **What is needed**
 - ID administration pilot studies in countries, following WHO guidelines
 - Learn from existing opportunities to roll out rabies programmes e.g. EPI
 - Appropriate palliative care is important, as outlined in the updated WHO guidelines
 - One Health collaboration through all administrative levels is important, through to local and community level
 - Improved methods of vaccine delivery
 - Surveillance needs to be improved and scaled up to provide data and build advocacy
 - IBCM should be implemented where possible

- **Next steps**
 - WHO will communicate with Ministries of Health to request their backing for countries to implement new WHO guidelines and finalise One Health local focal points in the next few months
 - NTV's need to be phased out and a transition made to WHO recommendations WHO will put more emphasis on palliative care and follow up with an official brief to Ministries of Health
 - Countries should develop/update national plans for rabies using available data

Closure of meeting

By WHO and GARC

Countries are at the centre of dog-mediated rabies elimination goals and are driving global progress and the effort that countries have put in is giving international organisations the motivation to move forward. Rabies has been neglected for too long and needs to be given more priority. Rabies has been neglected for a long time and needs to be elevated.

With the continued efforts from countries and the global community, we can continue to progress towards our shared goal of zero human deaths by dog-mediated rabies by 2030.

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ANNEX 2. KEY RABIES DATA INDICATORS TO BE REPORTED TO WHO

Human-related data elements

Human rabies cases	
Full indicator name:	Number of human rabies cases reported
Data type:	Count
Definition:	Total number, clinical or lab diagnosed
Disaggregation:	<ul style="list-style-type: none"> - Male; female; unknown - Age groups (<5y; 5-14y; 15-over); age unknown/other age distribution - Dog-transmitted; bat-transmitted; transmitted by other animal; unknown - (clinical diagnosis; laboratory diagnosis; unknown)

Animal bites in humans	
Full indicator name:	Number of reported animal bite cases in humans
Data type:	Count
Definition:	Bites by warm blooded animals (excluding snake bites)
Disaggregation:	<ul style="list-style-type: none"> - Bite by Dog; Bite by cat; Bite by bat; bite by wildlife; bite by livestock; bite by unknown animal - Male; female; unknown - Wound categories: Cat I; Cat II; Cat III; unknown - Age groups (<5y; 5-14y; 15-over); age unknown/other age distribution

People receiving PEP	
Full indicator name:	Number of people receiving post-exposure prophylaxis (PEP)
Data type:	Count
Definition:	PEP is defined for this variable as wound care and at least 1 dose of rabies vaccine
Limitation	Patients may attend different health facilities (double counts).
Disaggregation:	<ul style="list-style-type: none"> - Male; female; unknown - Age groups (<5y; 5-14y; 15-over); age unknown/other age distribution - (Wound categories: Cat I; Cat II; Cat III; unknown)

Animal-related data elements

Dog population	
Full indicator name:	Estimated dog population
Data type:	Count
Definition:	The best evidence based estimation of (national) dog population; a proxy is the human:dog ratio if known
Disaggregation:	- (owned; unowned)

Dog rabies cases	
Full indicator name:	Number of dog rabies cases reported
Data type:	Count
Definition:	Total number, clinical or lab diagnosed
Disaggregation:	- (clinically diagnosed; lab diagnosed; unknown)

Rabies cases other animals	
Full indicator name:	Number of rabies cases reported in other species than dogs
Data type:	Count
Definition:	Total number, clinical or lab diagnosed
Disaggregation:	- Cat; Bat; Livestock; Wildlife - (clinically diagnosed; lab diagnosed; unknown)

Dog vaccination coverage	
Full indicator name:	Percentage of dogs that received rabies vaccine
Data type:	Percentage
Definition:	The best evidence-based estimation of dog rabies vaccination coverage in the country as percentage
Disaggregation:	- (owned; unowned; unknown)

