



TECHNICAL ITEM II

Elimination of dog mediated human rabies by
2030 in Africa – national strategies, legal
framework, tools to track the progress.

Louis H Nel and Andre Coetzer
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Elimination of dog mediated human rabies by 2030 in Africa – national strategies, legal framework, tools to track the progress.

Louis H Nel and Andre Coetzer

Department of Biochemistry, Genetics and Microbiology, University of Pretoria and Global Alliance for Rabies Control, South Africa.

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Summary: Rabies became a seriously neglected disease in most African countries over the past several decades and today Africa bears 40% of the world's human rabies cases (estimated 24 000/year), with nearly 10 000 of these being children. Impoverished and marginalised rural communities are most at risk. This situation can be fully reversed but requires a robust multisectoral strategy and strong political commitment. Such an undertaking will not only prevent and eliminate human deaths from dog-mediated rabies, but also broadly strengthen animal and human public healthcare systems on a national scale through a modernised and systematic One Health (OH) approach. To assist with this ideal, the Global Strategic Plan (Zero by 30) was developed and armed with a Rabies Roadmap, tools, and methodologies which are amplified via the United Against Rabies (UAR) Forum. Supported by FAO, WOAAH and WHO (the Tripartite), the UAR Forum takes a multi-sectoral, OH approach bringing together governments, vaccine producers, researchers, NGOs and development partners. This arguably introduces the 4th revolution in the global combat of rabies. In the lead-up to this phase, Members in WOAAH Africa Region played an important role in the Bill and Melinda Gates Foundation/WHO projects aimed at demonstrating a key paradigm shift, i.e., that adequate vaccinations of dogs, supported by awareness of the disease and ensuring immunisation of animal bite victims, is the most effective tool to eliminate human deaths from dog-mediated rabies.

The UAR Forum engaged with more than 50 different member organisations from around the world – representing international organisations, governmental institutions, NGOs, academic, research institutions, and the private sector. The Rabies Roadmap designed by the UAR Forum is a Stepwise Approach towards Rabies Elimination (SARE) facilitated roadmap that allows for monitoring and evaluation of rabies control programmes, and development/refinement of country-specific work plans by linking countries to relevant tools and resources that can be used to implement work plan activities. The UAR Forum provides various technical resources to the Members to support their rabies control programmes. This “toolbox” covers, but is not limited to, tools that assist with; economic analyses, programmatic planning, the tracking of disease interventions (including vaccinations and the use of WOAAH vaccine bank), animal case surveillance (including diagnosis), human case surveillance and all the components of Integrated Bite Case Management (IBCM). Excellent modern educational tools and resources have been developed in recognition of the fact that rabies awareness in at-risk communities play such a vital role in improving health seeking behaviour and increasing dog vaccination coverage, among others.

In a promising start to a full engagement with Zero by 30, the early uptake from WOAAH Members have seen the wide-spread implementation of SARE assessments towards alignment with the Zero by 30 Rabies Roadmap. As a result, many Members in Africa Region have been able to strengthen their OH systems and national work plans. Commitment to robust national strategies would ultimately qualify Members for endorsement by WOAAH of their official control programmes for dog-mediated rabies, as was the case for Namibia in 2021. Although a hard task, the elimination of human deaths from dog-mediated rabies from Africa is possible and has never been more feasible than at the present moment.

INTRODUCTION

Rabies is one of the oldest infectious diseases known. It is an animal disease that is easily transmissible to humans – especially via domestic dogs, the main reservoir. Rabies deaths in humans is projected at 59 000 per year while rabies deaths in animals are several orders of magnitude higher [1]. Regular and effective vaccinations of dogs is the proven intervention to best protect dogs, other animals, and humans from rabies. If done at a high level of adequacy, the thorough and sustained vaccination of dogs will lead to the complete elimination of dog mediated rabies [2–5]. Therefore, although rabies is found all over the world (with a few rare exceptions), it has largely been eliminated or is well controlled in most developed countries [1,3]. However, elsewhere the disease is very much neglected and African and Asian countries carries the highest burden of rabies [1].

Africa suffers around 40% of the world's human rabies cases (estimated 24 000 every year), with nearly 10 000 of these being children. This tragedy is mostly associated with impoverished and marginalised rural communities. However, rabies is preventable, and this situation can be addressed and reversed. Such intervention will also benefit public health systems overall to the advancement of healthcare in general, and to assist national authorities in fulfilling their obligations through a modernised and systematic One Health (OH) approach [6,7].

It is against this backdrop that Zero by 30: the Global Strategic Plan to end human deaths from dog-mediated rabies (Zero by 30) was developed and armed with a Rabies Roadmap, tools, and methodologies amplified via the United Against Rabies (UAR) Forum, as will be elaborated in this report [7].

REPORT: AFRICA REGION AND THE ROADMAP TO RABIES ELIMINATION

The general state of rabies control across the Africa Region

Rabies control has been neglected for a number of decades across the African continent, in concert with inadequate economic growth and infrastructure development, among others. Robust modelling data still consistently estimate much higher cases of rabies in animals and humans than what is officially reported, due to inadequate surveillance and the lack of data reported to national authorities, the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH) [8]. However, global advocacy and a better understanding of the neglect of rabies have, over the past few years, started to break down the disconnect.

Africa has seen an upswing of initiatives such as rabies-specific networks (e.g., Pan African Rabies Control Network, PARACON, 2015 [9]), the development of the Global Strategic Plan - Zero by 30 (GSP, 2018 [6,10]), and the United Against Rabies Forum (UAR Forum, 2020 [7]). As such, a number of Members have been able to engage in the development of official national strategic plans (NSPs), many of them through the Stepwise Approach towards Rabies Elimination (SARE) [11–14] and the use of new tools to assist rabies control. These include the use of WOAH vaccine bank together with real-time tracking of vaccination to improve surveillance in general, with real-time tracking of rabies cases, bite cases, patients, and the provision of post exposure prophylaxis.

The Rabies Roadmap and its use in the Africa Region

Rabies is a typical example of a zoonotic infection which does not fit into the domain of one single agency being solely responsible for its control. Although there is an animal reservoir, mortality and morbidity affect human beings. Therefore, collaboration with other agencies is necessary for prevention and control efforts. Ministries responsible for animal health are focused on economically important animal diseases which affect livestock productivity. Since dogs are not livestock, canine rabies control and dog population management are often neglected. In most countries, multiple agencies deal with rabies, such as the ministries of health, agriculture/livestock and local governments (civic bodies). Countries typically follow an *ad hoc* approach and immunise a limited number of dogs with the available resources and therefore do not achieve and sustain the required level of immunisation coverage. Though this provides individual protection to the animal, it has no bearing on the epidemiology of the disease and does not achieve adequate results. In countries where there is no comprehensive national rabies control programme with planning, financial resources and intersectoral coordination, this remains a major impediment in the control and subsequent elimination of human rabies transmitted by dogs.

Zero by 30 is based on a country-centric approach towards rabies elimination, while coordinated support is provided by the international community to create national and regional rabies elimination strategies, build capacity, and strengthen both human and animal health systems. Countries develop and implement their own NSPs and international support can assist and accelerate progress towards rabies elimination within each country through tools, structures, resources, and experiences offered by the global rabies community, [6,10] and regional WOAHA-FAO-WHO networks. In line with this country-centric approach, WOAHA Members are encouraged to identify national contact point for rabies who should be responsible for setting a coordination, and monitoring mechanism for their NSPs.

Dog rabies endemic countries are inevitably at different progress points in terms of rabies control (i.e., some countries or regions may be nearing elimination, while others have yet to start local-level programmatic activities) [1,3]. From these different starting points, there are different approaches that could be followed to scale up rabies elimination efforts. One significant challenge is to clearly elucidate how countries can progress their efforts in terms of the steps that need to be taken and the tools and resources that are available via the global rabies community. In light of this, the UAR Forum developed the “Rabies Roadmap” [15] that enables rabies-endemic countries to (i) monitor and evaluate their rabies elimination by using the SARE as a means to assess the strengths and weaknesses of existing rabies control activities while also ensuring that countries align their efforts with *Zero by 30*; (ii) develop and customise a country-specific work plan based on their pre-defined Rabies Roadmap milestone (see below) and (iii) access the most relevant tools and resources that have been validated and made available through the UAR Forum, as per the needs identified in the country’s rabies elimination assessment and work plan.

Monitoring and Evaluation (M&E): With the target date for eliminating human deaths from dog-mediated rabies by 2030 fast approaching, rabies-endemic countries need to have clear milestones for their progress towards *Zero by 30*, especially when continued political buy-in and support is required towards ensuring sustainability. An efficient M&E system is necessary for assessing if intended goals are achieved, for identifying challenges and obstacles, and to adapt initiatives accordingly. M&E systems can enhance the implementation of rabies control programmes and increase their visibility and impact. In addition, the M&E results can help Members learn from experience and improve ongoing and future initiatives. The biennial WOAHA Africa Regional Conferences will provide Members a platform to discuss this challenge, especially at policy level. For this purpose, the SARE serves as a rabies-specific M&E tool. Undertaking the SARE guides the progress of Members and allows for an assessment of the strengths and weaknesses of their rabies control and elimination programmes with the outcome summarised as an overarching “SARE Stage”. This metric translates into a pre-defined Rabies Roadmap milestone (i.e., a broad situational description of the country’s rabies control efforts).

Country-specific workplans: In addition to the above, the SARE facilitates the development and customisation of a country-specific work plan based on their pre-defined Rabies Roadmap milestone. These SARE-derived work plans directly link the pending work plan activities with the most relevant tools and resources on the UAR Forum website [16], the Canine Rabies Blueprint [17] and other technical documents and resources developed by the UAR Forum partners (see next section).

Tools and resources in aid of rabies elimination in the Africa Region

Rabies Toolbox- The most advanced tools and resources needed to effectively execute the work plan activities (above section) have been collected and made available through the UAR Forum’s Rabies Toolbox. Most importantly, all the tools in the Rabies Toolbox have been evaluated using the Surveillance and Information Sharing Operational Tool for rabies (SISOT-R), an adaptation of the Surveillance and Information Sharing Operational Tool evaluation matrix developed by the Tripartite [18]. Thus, SISOT-R evaluates various rabies tools based on certain key criteria (accessibility, data collection and needs, data management and utility, data storage and protection, flexibility, ease of use, training needs and sustainability) [19].

The Rabies Toolbox is available on the UAR Forum website and consists of a variety of applications for planning and implementation of rabies control programmes and the user is guided to select the most appropriate tools based on their specific work plan and needs. The toolbox includes tools that assist with economic analyses, programmatic planning, tracking of disease interventions (including vaccinations), animal case surveillance (including diagnosis), human case surveillance and Integrated Bite Case Management (IBCM) [19].

WOAH vaccine bank

A key milestone on the Rabies Roadmap is the upscaling of dog vaccination campaigns for at-risk dog populations. WOAHA has therefore established a rabies vaccine bank to ensure timely and cost effective access to high quality vaccines [20]. Since 2012, WOAHA Rabies Vaccine Bank has supported Members with the implementation of dog vaccination campaigns, providing them high quality dog vaccines at an affordable price. Based on commitment and a robust work plan, Members can access WOAHA vaccine bank for mass dog vaccination campaigns and use relevant tools available in the UAR Forum toolbox to track and trace all vaccinations in real-time.

WOAHA, with financial support from developed nations and international organisations, has also donated rabies vaccines to various Members in the region. As mentioned, such donations are based on the merits of the strategy, the anticipated outcome and the commitment to succeed [20]. In 2022, almost 800,000 vaccine doses were delivered in Africa by WOAHA vaccine bank. These Members were Benin, Botswana, Côte d'Ivoire, Chad, Eswatini, Mozambique, Namibia, Nigeria, Togo and Zambia.

Mass dog vaccination

Members are encouraged to develop their own national strategic plan specific to their needs aiming at reduction of rabies risk through systematic, sustained mass dog vaccinations, human post-exposure prophylaxis, and public education. Implementation of strategic mass dog vaccination is the most cost-effective means of eliminating dog-mediated rabies. Members are encouraged to utilise any of the digital surveillance tools offered on the UAR's Rabies Toolbox to track and monitor their dog vaccination campaigns. This practice allows to demonstrate the judicious use of vaccine doses, and significantly enhances capacity to effectively monitor, direct the implementation, and determine the coverage of the dog vaccination campaigns. Monitoring of post dog vaccination campaigns can assist in assessing the success of the mass dog vaccination programme and are critical for evaluating the campaigns.

Oral rabies vaccines (ORV) have been successfully used to eliminate rabies in wildlife populations from western and central Europe and Canada [21–23]. Until recently, ORVs had not been used in the control and elimination of dog-transmitted rabies. A field trial in Namibia highlighted the important role that ORVs could play in vaccinating free-roaming dog populations who would otherwise not be parenterally vaccinated. The sole use of ORVs in the control of dog-mediated rabies is, however, not advised and ORVs should instead be used to supplement parenteral vaccination efforts to ensure an adequate vaccination coverage [24,25].

National Strategic Plans and the governance thereof:

Rabies elimination is not a short-term endeavour and relies on ongoing high-level political commitment and strategic planning over the course of multiple years. As a first step towards achieving this, rabies-endemic countries need to develop NSPs for the control and elimination of dog-mediated rabies as these documents are vital for galvanised political will and advocacy. This NSP will help the Members to develop a strategic framework to provide technical leadership, advocate with national health authorities, develop a consensus among major stakeholders for a comprehensive rabies elimination programme and to implement a national strategy for elimination of dog mediated human rabies considering the epidemiological situation, technical feasibility and sociocultural context. In aid of this, the UAR Forum developed a comprehensive NSP template that enables Members to easily create a NSP for their country [26]. While the development of a NSP for each Member that does not have one already should be undertaken without delay, special consideration should be given to the eventual funding and implementation thereof. The implementation of NSPs could be through a SARE-derived operational plan and Roadmap, ensuring intersectoral collaboration and resource sharing as per the UAR Forum guidance. The national contact points for rabies can oversee the implementation of NSP, coordination with other stakeholders and advocating rabies control programs at a national and regional level.

Chapters 1.6 and 8.14., of WOAHA *Terrestrial Animal Health Code (Terrestrial Code)* [37] stipulate procedures, requirements and recommendations for the endorsed official control programme for dog-mediated rabies for Members to progressively improve their rabies situation and eventually be able to make a self-declaration as a country free from dog-mediated rabies. Members may, on a voluntary basis, apply for endorsement of their official control programmes when they have implemented measures as per their NSPs. The implementation of the official control programmes are monitored annually through assessment of the Members work plan key performance indicators and timelines; a procedure adopted by the Members. WOAHA may withdraw the endorsement of an official control programme if there is evidence of non-compliance,

significant problems with the quality of the Veterinary Services or an increase in the incidence or distribution of dog mediated rabies that cannot be addressed by the programme.

Education and communities:

Education and rabies awareness in at-risk communities - community awareness plays a vital role in decreasing bite cases, improving health seeking behaviour, improving dog vaccination coverage and promoting responsible dog ownership [3,27–29]. Education on dog behaviour and bite prevention for both children and adults are an essential extension of rabies vaccination programmes and can decrease both the incidence of human rabies and the financial burden of treating dog bites. As such, communities must be made aware of the importance of practices such as dog vaccination, responsible dog ownership and proper washing of wounds after animal bite. Furthermore, since children are at high risk of getting bitten by dogs and subsequent rabies virus infection, it is important to educate children on dog bites and rabies. Therefore, Members could consider integrating rabies education on basic prevention and control measures in the formal education system as one of the methods of reaching large numbers of children [30]. Excellent educational tools and resources have been developed over recent years and some examples are given below.

OpenWHO produced the learning course “Rabies & One Health: From basics to cross-sectoral action to stop human rabies deaths”. This online course is free and provides an introduction to rabies and the importance of a One Health approach to succeed in rabies control and elimination. The course, which is self-guided and can be taken at any time, is suitable for anyone interested in learning about rabies – from the public to human and animal health practitioners, political decision makers, and campaigners [31].

The Global Alliance for Rabies Control (GARC) and partners developed an online education platform, which offers online certificate courses which are regularly updated. These courses are free and covers up-to-date and accurate information about rabies and its prevention. Currently, four different courses are on offer, each addressing a specific educational need in the realm of rabies control. The courses target: (i) The broad public and community educators; (ii) Veterinary technicians and vaccinators; (iii) Community leaders and coordinators and (iv) Human health professionals [32].

To elevate the capacity of professionals working in rabies programmes, Institut Pasteur developed a Customized On-Line Training Course (COLT) aimed at: (i) increasing awareness and communication about rabies in Africa; (ii) discussing problems and opportunities for rabies control in Africa; (iii) improving knowledge and practice on rabies epidemiological data – in particular rabies incidence; (iv) discussing the present situation of rabies prophylaxis in humans and proposing practical solutions to increase access to post-exposure prophylaxis; (v) increasing knowledge on dog rabies vaccination and approaches for dog population management; and (iv) promoting the One Health approach and dog vaccination to control rabies in Africa [33]. Since 2013, these COLT workshops have been held across Africa, viz. Senegal (2013), Cameroon (2016), Morocco (2019), and most recently in Côte d'Ivoire (2022) [33,34].

Most recently, Institut Pasteur brought together a spectrum of global rabies partners in creating the Rabies Massive Open Online Course (MOOC) [35]. This is a thorough and more in-depth course, covering various aspects of rabies including pathophysiology, epidemiology, vaccines, and elimination strategies. Among others this course shares the experiences and knowledge of international animal and human public health experts with a global audience and should in particular benefit those involved with rabies on some professional level.

Surveillance

The success of any elimination programme depends on accurate assessment of the disease incidence in animals and humans, monitoring dog bites and use of PEP, and an understanding of the epidemiological trends. These require a strong epidemiological surveillance mechanism and data sharing to be able to demonstrate the true burden of the disease and the impact of control interventions (or lack thereof). One of the basic requirement for a WOAHA endorsed official control programme for dog-mediated rabies is evidence of surveillance. Rabies surveillance, performed by the veterinary authority should justify the strategy chosen in accordance with Chapter 1.4., of the *Terrestrial Code* as being adequate to detect the presence of infection with rabies virus, given the prevailing epidemiological situation. Surveillance should also be in accordance with the rabies specific chapter 8.14. The requirements for the notification and provision of epidemiological information on rabies are stipulated in the *Terrestrial Code* Chapter 1.1. Infection with rabies virus is a WOAHA listed diseases and Members agreed on the obligation to regularly notify the occurrence of rabies through WAHIS¹. Despite being a

¹ World Animal Health Information System

notifiable disease in many Members in Africa, there is still under reporting of both animal and human rabies cases. In addition, the fact that rabies data span different ministries and is reported to different intergovernmental platforms (WOAH and WHO), could present a challenge to governments. Although modern day tools should greatly assist in improving surveillance and reporting the data to the requisite international platforms, this aspect needs to be resolved by Members.

Members could improve reporting through following these steps, (i) By promoting awareness and vigilance to ensure that rabies is recognised as a priority, human and animal rabies must be notifiable nationally. WOAHA and WHO have standard case definitions for rabies and these should be disseminated widely by the national veterinary and public health authorities. (ii) Surveillance data should be reported through appropriate country channels according to published protocols to facilitate timely data-sharing and analysis, when possible through existing national electronic surveillance or health management information systems for infectious disease reporting (iii) an uptake of tools and resources that promote the collection and automated reporting of the required data from the community-level and (iv) the use of OH surveillance platforms that collect and collate the data collected by the different sectors.

Diagnostics, laboratory capacity building and WOAHA standards

As elucidated above, science-based rabies surveillance is critical and laboratory capacity for the processing and accurate diagnosis of cases is a key component of the surveillance process. It is recommended that each country should have a national reference laboratory with the capacity to implement confirmatory testing for rabies using WOAHA-recommended techniques. However, when such expertise is lacking, support in terms of training and capacity building can be obtained from WOAHA Reference Laboratories for rabies. WOAHA *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (Terrestrial Manual)* (Chapter 3.1.18 [36]), describes all the diagnostic tests graded against six purposes, available and in use for the diagnosis of rabies. In addition, WOAHA Reference Laboratories provide scientific and technical assistance and expert advice on rabies diagnosis and control in keeping with *Terrestrial Code* (Chapter 8.14 [37]). To date, the Africa Region has only one WOAHA Reference Laboratory for rabies, Onderstepoort Veterinary Research (OVR) institute in South Africa. This Reference Laboratory supports various Members through diagnostic confirmation, research activities, diagnostic twinning programs, and capacity building in general. WOAHA has collaborated with OVR institute to provide technical support to some Members in east, central and southern Africa to improve their competence of the direct fluorescent antibody test (FAT) through bench training and the conduct of rabies proficiency tests.

Integration and coordination

In addition to the tools and resources mentioned above, the Rabies Roadmap also acts as a conduit that links work plan activities to external workshops/activities that aid in building the professional capacity and coordination that is needed to control and eliminate rabies.

WOAHA Performance of Veterinary Services (PVS) Pathway programme, PVS Evaluation with Rabies Specific Content (PVS-R) - The PVS-R tool helps in evaluation of Veterinary Services capacity helping Members improve their rabies prevention and control programmes via a systems approach and building capacity in the OH space. This program provides detailed Rabies-specific recommendation, assist the country in raising the profile of rabies as a key priority of the country and complement the SARE assessments.

Capacity building through a WOAHA Laboratory Twinning project, launched in 2021 between OVR institute and the Animal Health Institute (AHI) (former NAHDIC), Ethiopia aims at skills transfer on diagnostic tools and techniques, such as FAT, *direct rapid immunohistochemical test (dRIT)*, rabies tissue culture infection test and the polymerase chain reaction (PCR) technique. This agreement follows a similar and successful twinning project with NVRI in Nigeria (completed in 2012). WOAHA supported rabies laboratory twinning project is also ongoing between Friedrich-Loeffler-Institut (FLI) Germany and Central Veterinary Laboratory (CVL) Namibia.

National Bridging Workshop on Rabies - The IHR-PVS National Bridging Workshop with rabies-specific content led to the development of a National Bridging Workshop on Rabies (NBW-R) which is facilitated by WHO, WOAHA, FAO and FLI. This concept was piloted in Ghana in 2022 [38]. Briefly, the NBW-R pilot was a multi-day workshop that provided human and animal health services – together with other sectors and stakeholders – an opportunity to review the prevailing gaps in their rabies-specific intersectoral collaboration mechanisms. Thereafter, the participants identified SMART (specific, measurable, actionable, realistic, time-bound) activities that were captured in a country-specific One Health operational plan aimed at strengthening the inter-sectoral collaboration towards rabies elimination. One of the key steps is the establishment of a OH structure. Therefore, the implementation of the One Health operational plan will indeed assist in improving intersectoral collaboration and progress the rabies work plan.

One Health & rabies: The GSP and the tripartite has recommended establishing and strengthening intersectoral coordination between health, veterinary and various other departments for prevention and control of rabies. But despite the sincere efforts of many Members, effective coordination has not been established in most countries as the control of dog rabies has been accorded low priority. To prioritise rabies in the national agenda, human and animal rabies must be notifiable nationally. While the concept of OH is well understood, it is not necessarily clear as to how it can be operationalised. Often, different sectors have clear and different priorities – with interventions focussing primarily on each sector’s target (humans or animals respectively). While this siloed approach is often the case in Africa, the benefits of intersectoral collaboration in terms of rabies control is irrefutable as the control and elimination of the disease in the animals has a direct and measurable impact on human health. As such, establishing multisectoral collaboration channels and policies using rabies as a model would not only benefit ongoing rabies control interventions, but could also be used to operationalise OH by establishing pathways and mechanisms for other diseases to utilize.

Stepwise Approach towards Rabies Elimination

As described, the SARE is a most practical application that (i) allows for monitoring and evaluation of the rabies programme, (ii) guides the establishment of intersectoral OH coordination, (iii) assists in the development/refinement of country-specific work plans, (iv) links the most relevant tools according to the next steps identified, (v) compliments the NBW-R and (vi) forms the basis of the Rabies Roadmap designed by the UAR Forum. This SARE-based Rabies Roadmap is a detailed operational plan that allows for the practical and most effective execution of the NSP (with clear strategic objectives, endorsed by authorities and supported by a legal framework).

Where are Members in Africa along the Rabies Roadmap, the big picture

Most Members exercise some rabies control, but considerable effort will be needed to scale up programmes to the intensity required for the elimination of human deaths from dog-mediated rabies. Using SARE assessments from in-country workshops in Africa (23 Members) and those undertaken by Members during PARACON workshops (13 Members) [39,40], the Rabies Roadmap milestone for the majority of Members can be described. Of the 54 Members of Africa Region:

- 50% are at the Rabies Roadmap milestone that is defined as follows: “Dog-mediated rabies is endemic. The country is in the process of building an evidence-base in support of the development and implementation of rabies elimination initiatives at the national-level.”
- 15% are at the Rabies Roadmap milestone that is defined as follows: “Dog-mediated rabies is endemic. The country has built a strong case in support of rabies elimination and is in the process of initiating rabies elimination initiatives at the national level.
- 1% are at the Rabies Roadmap milestone that is defined as follows: “Rabies elimination initiatives are implemented at the national level, resulting in a notable decline in rabies cases in both animals and humans.”
- 35% have an “unknown” Rabies Roadmap milestones as they had never undertaken any form of SARE evaluation (e.g., in-country or at a regional-rabies network meeting) and have thus not entered into the Rabies Roadmap.

The role of Members towards Zero by 30

The year 2006 saw the first formal discussions among the rabies community to approach the Bill and Melinda Gates Foundation (BMGF) for support of rabies control and elimination (Southern and Eastern African Rabies Group meeting, SEARG, Windhoek, Namibia, 2006). The process of canvassing BMGF support then started in all earnest and in 2009 two Members viz. South Africa and Tanzania, were awarded substantial BMGF awards under administration of WHO. The third Member to be supported was the Philippines in Asia and the Pacific Region. This was an important achievement for the global rabies community, in elevating the plight of rabies as a Neglected Disease. Over the following decade, these projects achieved mixed success [4]. Critically however, the global rabies community were able to learn most valuable lessons from these projects and those formed the cornerstones of the next major phase in global rabies control and elimination. These projects were therefore invaluable in the lead-up to the development of a robust evidence-based global strategic plan for rabies elimination, *Zero by 30*.

Some notable experiences

There are many rabies control initiatives from Members, and it is not the intention, nor is it practical, to provide an exhaustive list here. Instead, it may have value to look at some examples (as lessons learned) where programmes excelled by focusing on key aspects that accelerated progress for them.

A focus on the tracking of dog vaccination with digital technology: Around 2016, the Namibian government embarked on a mission to reduce the incidence of both human and dog rabies cases in the Northern Communal Areas (NCA) of the country. During the pilot roll out phase of the work plan (2016–2018), traditional paper-based forms were used for data capture and management. Hamstrung by the inefficiencies of this practice, the team then decided to convert to, and implement, digital surveillance tools that facilitated the tracking of each vaccinated dog [41]. Since 2019, the vaccination campaign has relied on the use of this technology and the impact of this practice on the success rate of the campaign was demonstrable [41,42]. Given the proven value of the potential for data-driven decisions, additional digital surveillance tools (aimed at tracking animal and human rabies cases) are expected to be incorporated into the national programme of Namibia [43].

A focus on collaboration and partnership: With support from the Edgard Cooper Foundation, a strong collaborative effort between the Malawi government, VSF Netherlands (VSF NL), the Centre for Community Empowerment Initiatives (CCEI), and other partners was formed in the Northern Region of Malawi. The primary point of departure with this collaboration is that the rabies control/elimination programme could be sustained by government, even after the external partners have withdrawn, should that be the case. The vaccination team, consisting solely of governmental animal health professionals, vaccinated over 14,500 animals over the course of three months (and 37,000 over the course of 2022) [44]. The NGO Mission Rabies has also been active in another region of Malawi (Blantyre) for some years and the scale of these interventions is well appreciated in the rabies community [45,46].

A focus on strategic dog vaccination: Further to many excellent initiatives from Tanzania, the government of Zanzibar have in 2017 set a goal to position themselves for self-declaration of rabies freedom after some years of building rabies control capacity with the support of The World Society for the Protection of Animals (now World Animal Protection) [47]. As per the requirements of self-declaration, a diagnostic laboratory was established, and an active surveillance strategy implemented. It quickly became clear that rabies was unfortunately not as well controlled as originally thought. However, the government persisted by using digital surveillance tools to track each vaccinated dog and each rabies case in real-time, followed by multiple strategic disease intervention campaigns focused primarily on high-risk communities [47]. This data-driven strategic vaccination approach delivered encouraging results [48]. Active diagnostic surveillance has been maintained and the number of animal rabies cases across the island has declined by 62% since 2016 while there has been no human rabies case in Zanzibar since 2019.

The use of a temporary workforce during vaccination campaigns: A mass rabies vaccination and awareness campaign was undertaken in the Kisarawe district of Tanzania in May 2021. The project formed part of experiential learning for veterinary and human health university students and was implemented in collaboration with African One Health Universities Network (AFROHUN), FAO, WHO, the Tanzanian Ministry of Livestock and Fisheries, the Tanzanian Ministry of Health, the Local Government Authority, Ifakara Health Institute, and others. During the five-day campaign, the temporary workforce of students working under the supervision of qualified animal and human health professionals, vaccinated more than 1 500 dogs and cats (more than 50% of the targeted population) against rabies, with dog vaccination tracking being used to track each vaccinated animal and monitor the campaign progress in real time. This approach showcased the value of including a larger workforce during large-scale vaccination events, permitting that they have been adequately trained and prepared beforehand [49].

DISCUSSION AND CONCLUSION

Today the Africa Region bears a large proportion of the global rabies burden. However, several recent initiatives are in support of a turnaround of this situation, and we have already witnessed some exemplary demonstrations of the impact of these developments from Members. One of the biggest problems contributing to the neglect of rabies in the Region is the lack of robust surveillance data towards demonstrating the true burden of the disease and the success (or failure) of control interventions. Currently, as has been the case for many years, rabies surveillance and data reporting to the requisite regional and international platforms is inadequate. In addition, the fact that rabies data span different ministries and is reported to different intergovernmental platforms, present a challenge to governments. Modern day tools should greatly assist in improving this situation, but this issue should be seriously considered and resolved by Members, to ensure they meet their notification obligations.

Analogous to the four stages of the Industrial Revolution, we have now entered the 4th revolution in the global approach to rabies control and elimination. It can be demonstrated that the 1st rabies revolution only relied on animal control *per se*; the 2nd on the discovery of vaccines and the 3rd on the realisation that human rabies prevention in fact primarily relies on dog rabies control. The 4th rabies revolution has been introduced with the Zero by 30 and the supporting platform, the UAR Forum, representing a flagship initiative for the operationalisation of OH. The Zero by 30 was built around the scientific evidence that the control and elimination of rabies offers a significant cost benefit but requires efficient intersectoral collaboration and a robust NSP. Significantly, the effective execution of such a strategy will strengthen national health systems overall and establish a vigorous OH platform towards combatting other zoonoses, including those with pandemic potential.

The Zero by 30 and UAR Forum offers much weaponry to the rabies endemic world of today. Members can engage with the UAR Forum and its partners towards developing and refining the SARE-based Rabies Roadmap to develop a robust NSP that conforms to specified international standards and establishes the requisite intersectoral collaboration. Based on such a plan, Members can access WOAHP vaccine bank for mass dog vaccination campaigns and track and trace all vaccinations in real-time using GPS-based tools available through the UAR Forum. The SARE-based Rabies Roadmap also engages diagnostic surveillance, IBCM, community engagement and education, among others – and in so doing availing all the modern real-time case and patient tracking tools advocated and available through the UAR Forum. Critically, the strategy allows Members to review, measure progress, and modify the workplan through regular SARE re-assessment and the supportive use of the PVS-R and NBW-R. Integrating rabies in formal education system and utilizing educational platforms with certificate courses should provide much impetus to elevate community awareness and education.

The above describe fairly recent developments and it may be anticipated that roll-out will take some time. However, the early uptake from Members has been promising. Significant progress has been made with the implementation of SARE assessments towards alignment with the Rabies Roadmap. Many Members have in fact engaged with the SARE on various different levels and have been able to evaluate their national strategies based on the weaknesses and strengths identified in the process. This is a promising start to a full engagement with the Zero by 30. As far as the development of and commitment to robust national strategies, several Members have already embarked on this route and have to ensure compliance with the relevant WOAHP standards with regard to endorsement of the official rabies control programmes and subsequently undertake the procedures and processes for submission of an application to WOAHP, as was the case for Namibia in 2022.

The elimination of dog-mediated human rabies from African Member States is possible, just as it has been shown in various other parts of the world. Two major African projects under the BMGF/WHO flag were invaluable in shaping the Zero by 30 and since then several notable successes by African member states, as described, bears testimony.

In conclusion, the benefits of achieving the rabies elimination goal is (i) undeniable, with human and animal lives saved; (ii) a most cost-effective approach and (iii) far-reaching in strengthening health systems for both animal and human health. The path to rabies elimination is not an easy one, but as elucidated, has never been more feasible than at the present moment.

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