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Review Article

The World Organization for Animal Health (OIE)'s engagement towards Rabies Elimination in Africa

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Abstract

This review article highlights the role of the World Organisation for Animal Health (OIE) towards dog-mediated rabies elimination in Africa. It provides a brief description of rabies and its global impact on humans and the role of the OIE in the elimination of dog-mediated human rabies by 2030. In addition, it addresses the OIE international standards on rabies, the *Performance of Veterinary Services* (PVS) Pathway as a tool to assess the quality of Veterinary Services, the partnership with other international organizations under the "One Health" umbrella as applied in the elimination of dog-mediated human rabies, the rabies vaccine bank, the training of OIE national Focal Points, and laboratory twinning projects as a means to enhance capacity in the fight against dog-mediated human rabies in Africa. The article concludes by presenting specific pilot projects being undertaken by the OIE in Africa - as proof of concept - in view of scaling up activities in the African continent.

Keywords: Rabies, Vaccine Bank, Africa, OIE

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Introduction

Rabies is one of the most deadly zoonoses. It is listed among the World Organisation for Animal Health's (OIE) diseases under the category "multiple species diseases, infections and infestations" (1). It is estimated that approximately 60,000 people worldwide die each year because of rabies, mostly children in developing countries of Asia and Africa (2,3).

Globally, the vast majority of human cases, more than 95%, are caused by exposure to rabid dog bites. Other mammals, particularly members of the Orders Carnivora and Chiroptera, also present a risk for human and animal infections. Over 99% of human deaths caused by rabies occur in Africa and Asia where dog rabies is poorly controlled. The disease mainly affects poor rural communities where access to appropriate post-exposure prophylaxis (PEP) is limited or non-existent (3–6).

In contrast with many other diseases, the tools needed to eliminate rabies already exist. Elimination of dog-mediated human rabies is perfectly feasible by vaccinating dogs with good quality vaccines, in combination with other tools such as public education, promoting responsible dog ownership, and by ensuring appropriate human post-exposure prophylaxis (4,7). Vaccinating 70% of the dog population in high risk areas is recommended as a way of breaking the transmission cycle and eliminating dog-mediated rabies (4,7).

Materials and methods

OIE's approach to rabies control and elimination

The OIE is an intergovernmental organization created in 1924 with the objective of improving animal health, animal welfare and veterinary public health worldwide. With its 182 Member Countries, as of 2019, and a global network of Reference Laboratories, Collaborating Centres and international experts, the OIE is deeply committed to the global fight against rabies. Through the adoption of science-based international standards, guidelines and recommendations, the OIE promotes the development of safe and effective tests for the diagnosis, production of high quality veterinary vaccines, control, elimination and where possible, eradication of rabies. The OIE further supports its Member Countries in policy advice, strategy design and technical assistance through training courses.

The courses are directed at OIE national Focal Points for Animal Disease Notification, Wildlife and Communication to increase their knowledge of rabies, their reporting on the rabies situation in domestic animals and wildlife, and the appropriate communication of risks for rabies infection in their respective countries. Using the OIE laboratory twinning programme, the OIE supports the improvement of the capability and access of Member Countries to rabies diagnosis, scientific expertise and support to proficiency testing. To further enhance control and elimination of rabies, the OIE has set up a Rabies Vaccine Bank for dog vaccination.

Control is defined by Dowdle (1998) as a reduction in the incidence, prevalence, morbidity or mortality of an infectious disease to a locally acceptable level; elimination as reduction to zero of the incidence of disease or infection in a defined geographical area; and eradication as permanent reduction to zero of the worldwide incidence of infection (8).

In the specific case of rabies, the aim of elimination is to reduce the incidence of

human rabies cases to zero, in whatever geographical area, without necessary being able to fully eradicate the disease in the domestic animal host or in wildlife reservoirs.

Standards

As indicated above, the OIE adopts science-based international standards, guidelines and recommendations. It is noteworthy that all the 54 African Member Countries participate actively in the transparent standards setting process which culminates in their annual adoption during the OIE World Assembly of Delegates. The current standards on rabies in the 28th edition of the OIE Terrestrial Animal Health Code (9) and in the 8th edition of the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (10) are indicated in Table 1.

As requested by the OIE Specialist Commissions and the Member Countries, the OIE worked with international experts to update the rabies-related OIE international standards using the latest scientific evidence in support of the 2030 dog-mediated human rabies elimination goal. The main purpose of this revision was to have provisions to better support Member Countries in implementing the prevention and control strategies of rabies in dogs, aiming at the elimination of dog-mediated human rabies at the source of infection, while preserving safe commercial and non-commercial movement of animals. The Terrestrial Code chapter adopted in 2019 includes definition of a dog-mediated case, recognition of zoning and rabies-specific surveillance recommendations. It also includes a specific article on OIE endorsed official control programme for dog-mediated rabies aiming at recognising the technical quality of the national control programme to progressively control the disease and eventually be able to make a self-declaration as free from dog-mediated rabies. Having the OIE endorsement of the official control programme would also support the national public health authorities obtain the WHO official validation of zero human deaths from rabies. This international recognition would be a major incentive for countries to continue their elimination efforts and for decision makers to invest in rabies elimination. The adoption of the first list of Member Countries having an OIE endorsed control programme is expected during the Word Assembly of OIE Delegates in May 2021.

Results

Performance of Veterinary Services (PVS)

Through the OIE PVS pathway (11) , the OIE has been able to support many African governments to identify their overarching needs in terms of enhancing the delivery of veterinary services, upon which hinges rabies control. Important considerations in this regard are “critical competencies” (CC) of Veterinary Services pertaining to the professional and technical staffing and competencies of the Veterinary Services *viz* (CC.I.1.), operational resources and funding (CC.I.12–15), veterinary laboratory diagnosis (CC.II.1.), epidemiological surveillance and early detection (CC.II.5.), emergency response (CC.II.6.), disease prevention, control and eradication (CC.II.7.), animal welfare (CC.II.13.), communication (CC.III.1.), the participation of producers and other interested parties in joint programmes (CC.III.6.) and veterinary legislation (CC.IV.1-2.), the latter both in terms of adoption and law enforcement. To date this

information is available for 52 African countries, in many cases through several subsequent PVS Pathway mission reports and formats, as conducted since 2006 (12).

One Health (OH) Approach

Working with the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) under the Tripartite One Health approach, the OIE is united in a common goal along with other partners such as the Global Alliance for Rabies Control (GARC) to eliminate dog-mediated human rabies (13).

Together, the Tripartite provides strategic and technical guidance and is building advocacy around rabies prevention to ensure a more consistent and sustained commitment underpinned by strong health and veterinary systems.

To further address the issue of elimination of dog-mediated rabies, the Tripartite with the support of GARC organised a Global Conference on Dog-mediated Human Rabies Elimination in Geneva (Switzerland), in December 2015. Discussions at the conference led to the elaboration of the Global Framework for the Elimination of Dog-Mediated Human Rabies with a strategic vision of zero human deaths from dog-mediated rabies in participating countries by 2030 (14). To rally the global veterinary fraternity to support the Global Framework for the elimination of dog-mediated human rabies, the OIE World Assembly of Delegates during its 84th General Session held from 22 to 27 May 2016 in Paris (France) adopted resolution nr. 26 entitled *"Global elimination of dog-mediated rabies"* and acknowledged that controlling the disease in dogs remains the most cost-effective way to prevent rabies in humans (15).

The Global Framework has five pillars for rabies elimination (STOP-R) that include aspects of socio-cultural, technical, organisational, political, and resource mobilisation. The Framework also defines the critical factors that are required for the successful implementation of the elimination of dog-mediated human rabies.

The participants at the Geneva conference also recognised the need to agree on a business plan for rabies elimination. The business plan, developed in 2018 by the Tripartite and GARC, uses the Global Framework to define the goals, objectives, anticipated challenges and strategy to create the appropriate environment for countries to achieve zero human rabies deaths from dogs by 2030. The aim is to empower national entities to develop national elimination plans, and define their own needs, strategies and resource requirements.

OIE Rabies Vaccine Bank

In a bid to speed up the elimination of dog-mediated human rabies, the OIE established a Rabies Vaccine Bank in 2012, initially with the financial support of the European Union, followed by additional support received notably from Australia, France and Germany. The OIE Rabies Vaccine Bank, which is a virtual vaccine bank, guarantees the availability of high-quality vaccines that comply with the OIE's international standards (16). The vaccines are provided rapidly and at minimal cost, since the interested and eligible suppliers compete through an international call for tender selection process.

Table 1: The OIE standards on rabies

Standard	Chapter	Description
OIE Terrestrial Animal Health Code	Chapter 1.1	Provides a description of notification of all OIE listed notifiable diseases, infestations and infections, and provisions of epidemiological information. Under the OIE listing, rabies is classified under the multiple species diseases, infections and infestations category.
	Chapter 1.4	Provides a description of animal health surveillance as a tool to monitor disease trends, to facilitate the control of disease or infection, to provide data for use in risk analysis, for animal or public health purposes, and to substantiate the rationale for sanitary measures. The objectives of this chapter are to: *a)* provide guidance to the type of outputs that a surveillance system should generate; and *b)* provide recommendations to assess the quality of surveillance systems.
	Chapter 5.11	Provides a model veterinary certificate for international movement of dogs, cats and ferrets originating from countries considered infected with rabies.
	Chapter 7.7	Provides recommendations on how to deal with stray and feral dogs, which pose serious human health, animal health and animal welfare problems and which have a socio-economic, environmental, political and religious impact in many countries. Human health, including the prevention of zoonotic diseases, notably rabies, is a priority. Dog population management is an integral part of rabies control programmes.
	Chapter 8.14	The chapter describes infection with rabies. The aim of this chapter is to mitigate the risk of rabies to human and animal health and to prevent the international spread of the disease.
OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals	Chapter 3.1.17	The chapter provides diagnostic techniques for the identification of rabies including sample collection, shipping of samples and vaccine production requirements.

One of the intentions is that the vaccines acquired through the OIE Rabies Vaccine Bank act as a trigger for the implementation of mass dog vaccination

campaigns in countries because the vaccines are lowly priced and are delivered in large quantities to the countries' port of entry. Using the OIE Rabies Vaccine Bank usually is an attraction to donors who in turn may provide more support essential to any effective national rabies elimination strategies. After 7 years of operation (2012 – October 2019), the OIE Rabies Vaccine Bank has already delivered 22.6 million vaccine doses to 33 countries, principally in Asia and Africa with the support of the European Union, Australia, Germany, France, Canada and Japan.

The purchase of the rabies vaccines through OIE Rabies Vaccine Bank is conducted through either of the following three channels: (i) by the OIE with financial support from donors in which case the vaccines and their transport are paid for by the OIE; (ii) by an international organisation (e.g. WHO); or (iii) by a Member Country who has been granted access (Direct Purchase) to the OIE Vaccine Bank by the OIE Director General.

A significant portion (85.8%, i.e 19.4million) of the 22.6 million doses cited above were deliveries made to Asia. Around 6.5 million doses were delivered directly by the OIE to 23 Member Countries to aid their national vaccination programmes. An additional 16.2 million doses were ordered by countries or international organisations. Of these, as per October 2019, 15.3million doses of rabies vaccines were purchased by WHO through the OIE Rabies Vaccine Bank for delivery to the Philippines, Pakistan, South Africa, Tanzania, and Central African Republic.

This model guarantees the availability of high quality vaccines complying with OIE intergovernmental Standards, their smooth delivery on the ground, as well as a price obtained after a global competition between potential providers.

In Africa, the beneficiary countries so far include Benin, Burkina Faso, Côte d'Ivoire, Eritrea, Gambia, Ghana, Kenya, Lesotho, Mali, Namibia, Senegal, Togo Tunisia and Zimbabwe through purchases managed by the OIE thanks to donor support; Tanzania through FAO support; Chad and Mali through purchases supported by the Swiss Tropical and Public Health Institute; and Central African Republic, South Africa and Tanzania through WHO support, part of which was funded by the Bill & Melinda Gates Foundation (BMGF) project. Indeed, in the framework of the Tripartite Alliance (WHO, OIE, FAO) on rabies control, the WHO has decided to place its procurement orders for canine vaccines through the OIE Rabies Vaccine Bank.

Besides the donor support, individual countries have purchased vaccines through the OIE Rabies Vaccine Bank. The case in point are Asia Member Countries namely Singapore, Malaysia and the Philippines. The Philippines case is of interest because the vaccines, initially provided through the WHO support, are now being repaid by the Philippines government's national budget through the WHO that was acting as an intermediary. In Africa, Burkina-Faso and Ghana have used the Direct Purchase mechanism and paid directly to the vaccine manufacturer.

Through the framework of the Global Strategic Plan for Dog-mediated Human Rabies Elimination by 2030 whose implementation started in 2018, there is a potential to increase future direct purchases from individual OIE Member Countries. The OIE will support access to the Rabies Vaccine Bank by individual countries if their request is supported by a national strategy and a comprehensive and structured Rabies control programme. This information is regularly provided to the OIE Member Countries through their OIE Delegates attending the OIE General Sessions and the OIE Regional Commission meetings.

To enhance the visibility of the OIE Rabies Vaccine Bank, the OIE, on the occasion of World Rabies Day 2016, released a video and infographics to explain the operation of the Vaccine Bank (17).

Capacity building

The needs of OIE Member Countries in pursuing the objective to eliminate rabies are not limited to the provision of the vaccine only. Countries also need support during the development of their national rabies elimination strategies. Such support includes areas of risk communication and awareness raising, planning, implementation and evaluation of the vaccination campaigns, and dog population management.

Hence, in addition to the contribution of the OIE Rabies Vaccine Bank, and to a limited extent in the framework of specific projects supported by some donors, the OIE contributes to activities such as training of staff responsible for canine vaccination, producing educational materials and creating media campaigns promoting responsible dog ownership. The OIE has also conducted specific training workshops in Africa related to rabies control (18–21).

These workshops held in Kenya, Tunisia and Mali have enhanced the participants' skills in risk communication, traditional media and social media communication, hierarchical decision-making as well as dog capture and stray dog management in the control and elimination of rabies. The OIE will continue providing training, guidance and technical support in future development and tailoring of regional and national plans, including promoting of existing tools to enhance capacity for the control and elimination of rabies.

Laboratory twinning

Establishment of an appropriate level of laboratory capacity is also important in achieving elimination of dog-mediated rabies. In Africa, the OIE has supported laboratory twinning agreements, notably between one of the OIE Reference Laboratories for rabies, based at the Onderstepoort Veterinary Institute (ARC-OVI) in Pretoria (Republic of South Africa) and the National Veterinary Research Institute (NVRI) in Vom (Nigeria).

The twinning project which started in 2010 and ran up to 2012 saw the exchange of personnel between the two laboratories to enhance diagnostic capabilities for rabies at the NVRI. This has now enabled the NVRI to participate in an annual international proficiency test for rabies, which is coordinated by the French Agency for Food, Environmental and Occupational Health & Safety (ANSES), an OIE Reference Laboratory for rabies. The twinning programme has also enabled NVRI to attain

ISO 17025 accreditation, enhance its regional capacity for rabies testing and increase sample submissions.

Other Projects

i. Namibia

With support of the Government of Namibia, the *"Technical Support for Namibia in Eliminating Rabies in Dogs"* project funded by the Federal Republic of Germany was launched in March 2016 in the Oshona region (Figure 1), with dog vaccination campaigns targeting elimination of dog-mediated human rabies in the Northern Communal Areas (NCA).

This first (pilot) phase of the project which lasted one year enabled the Veterinary Services of Namibia vaccinate 31,000 dogs and 2,980 cats with vaccine procured through the OIE Rabies Vaccine Bank. In addition, an awareness campaign on dog-mediated human rabies was carried out under the project, reaching 43,969 children in 119 of 137 schools from 11 constituencies of the Oshana region.

The second phase of the project was launched in April 2017 and ran up to May 2018 focusing on controlling rabies in 8 regions of the NCA.

A total of 450,000 doses of rabies vaccines were successfully procured from the OIE Rabies Vaccine Bank, thus furthering mass dog vaccination efforts in Oshona Region of northern Namibia with a total of 172,770 dogs and 19,245 cats vaccinated as of December 2018.

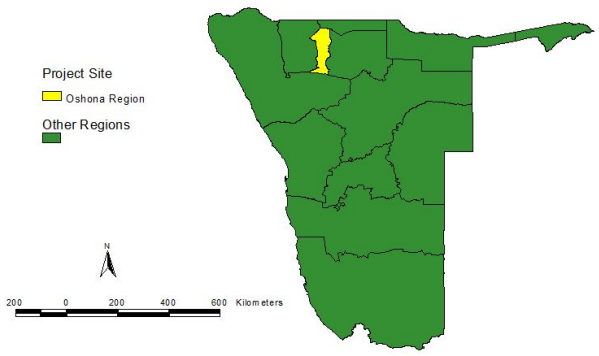

Figure 1: Map of Namibia showing the Oshona region in yellow where the pilot rabies vaccination of dogs was carried out.

ii. Kenya

The *"Strengthening Veterinary Services in Developing Countries"* project with a rabies control component (SVSDC+R) funded by the European Union commenced in December 2015 and ran up to December 2019. In Kenya the project assisted the relevant competent authorities establish the National and County Rabies Elimination Coordination Committees (NRECC and CRECC, respectively) and launch a rabies campaign website (http://www.rabiesfreekenya.com). In addition, a toll-free line for the reporting of dog bites was commissioned and a total of 800,000 doses of rabies vaccines were delivered to Kenya from the OIE Rabies Vaccine Bank between January 2016 and October 2019. As of October 2019, a total of 210,000dogs were vaccinated in Siaya County and active rabies surveillance and dog ecology studies were undertaken in Siaya, Machakos and Makueni counties (Figure 2).

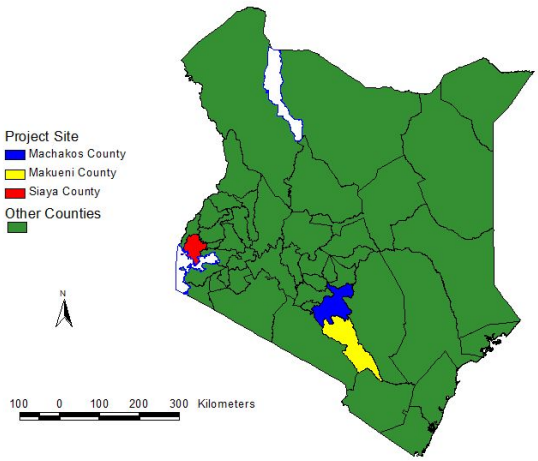

Figure 2: Map of Kenya showing the SVSDC+R project sites in red, blue and yellow.

iii. North Africa

Between March 2017 and October 2019, the SVSDC+R project delivered 800,000 doses of rabies vaccine to Tunisia through the OIE Rabies Vaccine Bank. These were used in a vaccination campaign that was launched shortly after the receipt of the first lot of vaccines. A workshop to train dog vaccination teams in dog handling, capture and vaccination in the field was held in May 2017 (20). A second one was held in September 2017 to review the Tunisian rabies control strategy.

In 2019, Algeria also benefited from a total of 400.000 doses of rabies vaccine from the OIE Rabies Vaccine Bank.

In July 2019, under the One Health umbrella , a regional consultation on Rabies control in North Africa was held in Tunisia to promote collaboration between the Veterinary, the Public Health and the Local Government authorities. Additionally, the meeting aimed at increasing the political will and promoting the elimination of dog-mediated rabies in humans in the Maghreb region. Particular attention was given to aligning policies and strategies between Algeria, Morocco and Tunisia

World Rabies Day (WRD)

Each year, on the 28th of September, the international community comes together to promote the fight against rabies. World Rabies Day (WRD) is a day of action and awareness raising and offers opportunities for individuals, institutions and governments to join the global movement in the fight against rabies. Every year the OIE promotes the participation of its Member Countries in WRD and also coordinates activities with the Tripartite (FAO/OIE/WHO), such as joint communication messages. In 2016, the main theme for the OIE WRD was “Educate, Vaccinate, Eliminate”, “Zero by 2030” in 2017, ” Share the Message, Save a Life” in 2018, and in 2019 “Vaccinate to Eliminate” a clear reference to the goal of eliminating dog-mediated human rabies by 2030 (22).

Conclusion

In order to fight rabies with the objective of eliminating dog-mediated human rabies by 2030, it is important that national governments support the development of public awareness campaigns and the education of target communities to participate in these campaigns.

Improving surveillance (and post-vaccination monitoring/surveillance), as currently implemented by the Zoonotic Disease Unit (ZDU) in Kenya as part of the SVSDC+R project, is also an important pillar that supports the understanding of trends and guides action in rabies elimination. Substantial evidence from modelling studies and empirical data indicate that vaccination of 70% of dogs will

be sufficient to eliminate canine rabies (4,7). This target threshold applies to dog populations across a wide range of settings in Asia and Africa regardless of dog density or ownership patterns (23–28). Improving access to affordable and efficacious dog vaccines and human post-exposure prophylaxis vaccines through regional vaccine banks are therefore of paramount importance to the successful control of rabies.

Finally, the One Health approach is crucial and the OIE will continue to work with the Tripartite to raise global and regional awareness.

Author contribution

All the authors contributed equally to the manuscript.

Declaration of Interest

There authors report no conflict of interest.

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