

# The Pan-African Rabies Control Network (PARACON): A unified approach to eliminating canine rabies in Africa

Scott, T.P.<sup>a,b</sup>, Coetzer, A.<sup>a,b</sup>, de Balogh K<sup>c</sup>, Wright, N.<sup>a</sup>, and Nel, L.H.<sup>a,b</sup>.

## Author affiliations

<sup>a</sup>Department of Microbiology and Plant Pathology, Faculty of Natural and Agricultural Sciences, University of Pretoria, South Africa 0001

<sup>b</sup>Global Alliance for Rabies Control SA NPC, Erasmus Forum A434, Rigel Avenue, South Erasmus RAND, 0181 Pretoria, South Africa

<sup>c</sup>Food and Agricultural Organization of the United Nations, Rome, Italy

## Corresponding author

Professor Louis H Nel

Department of Microbiology and Plant Pathology, Faculty of Natural and Agricultural Sciences, University of Pretoria, South Africa 0001

Email: [louis.nel@rabiesalliance.org](mailto:louis.nel@rabiesalliance.org); [louis.nel@up.ac.za](mailto:louis.nel@up.ac.za)

## Abstract

Even though Africa has the highest per capita death rate from rabies of any continent, and rabies is almost entirely transmitted by the bites of rabid dogs, there has been no coordinated pan-African approach to controlling canine rabies. In order to attain an inclusive and unified network, the Pan-African Rabies Control Network (PARACON) was established in 2014. By following the 'One Health' concept, which involves close coordination between animal and human health sectors across national, regional and continental levels, PARACON will provide a platform to facilitate and promote coordinated and sustainable control strategies and programmes. Meetings will take place at regular intervals and will be centred on the involvement by key focal persons from the medical and veterinary sectors. The inaugural meeting was held in South Africa in June, 2015 and was focused around interactive discussions and workshops, whilst updating country representatives on the tools available to aid them in developing and implementing sustainable rabies intervention strategies. Experts from various global organizations, institutions and industry participated in the discussions and shared their experience and expertise. The workshops focused on the latest format of the Rabies Blueprint platform ([www.rabiesblueprint.com](http://www.rabiesblueprint.com)), which in the broadest sense assists with control and elimination campaigns, including educational and advocacy drives, improvement of surveillance and diagnosis and the systematic monitoring of progress. Together with the stepwise approach towards rabies elimination, the Blueprint is a planning tool to help countries free themselves from canine-transmitted rabies.

**Keywords:** PARACON, Africa, Rabies, Elimination, One Health, Global Alliance for Rabies Control

## 1. Introduction

Even though Africa has the highest per capita death rate from rabies of any continent, and rabies is transmitted to humans almost entirely by the bites of rabid dogs, there has been no coordinated pan-African approach to controlling canine rabies. Past regional networks have included the Southern and Eastern African Rabies Group (SEARG), the African Rabies Expert Bureau (AfroREB) and Rabies in West Africa (RIWA) (Table 1). While some countries were represented in more than one network, several others were not included at all. It was also common practice that delegates from either the medical or the veterinary sectors, but not both, attended regional meetings. The fragmented nature of rabies control networks in Africa has led to a lack of coordinated or progressive planning, and insufficient tangible progress has been made in recent years.

The concept of a unified pan-African network was initially proposed at the 11<sup>th</sup> SEARG meeting in Maputo, Mozambique in 2011. Subsequent discussions and proposals resulted in the new concept of a Pan-African Rabies Control Network (PARACON) in 2014, under the secretariat of the Global Alliance for Rabies Control (GARC). A key determinant for the success and viability of PARACON is to integrate all of the existing networks, as well as the other countries not included in any previous rabies control networks, under a single, unified umbrella (Table 1). The network came to fruition when the inaugural PARACON meeting was hosted in South Africa in 2015. In this article, we describe the structure of PARACON and the tools it provides its member countries for the elimination of canine rabies.

**Table 1:** Past networks for the laboratory diagnosis, surveillance and control of rabies in Africa, which have been incorporated into PARACON. (Note: Algeria, Egypt, Libya, Mauritania, Morocco, Tunisia and Western Sahara are part of the MEEREB network.)

Network	Origin, structure and activities	Member countries
Southern and Eastern African Rabies Group (SEARG)	An Anglophone group initially created in 1992 as the Southern African Rabies Group (SARG), later included eastern Africa to become SEARG in 1993 (primarily members from the veterinary sector). Biennial meetings focusing on improved surveillance and diagnostics, development of national control strategies. Also held training courses for diagnostics and laboratory proficiency testing	Botswana, Burundi <sup>a</sup> , Cameroon, Democratic Republic of Congo, Eritrea, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Madagascar, Mozambique, Namibia, Rwanda <sup>a</sup> , South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe
African Rabies Expert Bureau (AfroREB)	A Francophone group created in 2008 with a focus on Northern, Western and Central African countries (primarily members in the medical sector). Focus on rabies notifiability, improved epidemiology and laboratory surveillance.	Benin, Burkina Faso, Cameroon, Central African Republic, Gabon, Ivory Coast, Madagascar, Mali, Niger, Republic of Congo, Senegal, Togo
Rabies in West Africa (RIWA)	Sub-regional network with focus on Western African countries, created in 2012 as a CDC <sup>b</sup> initiative with similar goals to RITA <sup>c</sup> . One Health approach with open forum discussions to promote rabies awareness	Benin, Ghana, Ivory Coast, Liberia <sup>a</sup> , Nigeria, Senegal, Sierra Leone <sup>a</sup> , The Gambia, Togo
RESOLAB	West and Central Africa veterinary laboratory network initially created in 2007 for Avian Influenza. Rabies sub-network created in 2010. Focus on rabies surveillance in laboratory and field, harmonization of DFA <sup>d</sup> and proficiency testing, One Health approach.	Benin, Burkina Faso, Cape Verde, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Equatorial Guinea <sup>a</sup> , Gabon, Ghana, Guinea <sup>a</sup> , Guinea-Bissau, Ivory Coast, Liberia <sup>a</sup> , Mali, Niger, Nigeria, Republic of Congo, Sao Tome and Principe, Senegal, Sierra Leone <sup>a</sup> , The Gambia, Togo
Countries outside previous networks	Independent rabies intervention programmes.	Angola, Djibouti <sup>a</sup>

<sup>a</sup>No country representatives were able to participate in the first PARACON meeting.

<sup>b</sup>US Centers for Disease Control and Prevention.

<sup>c</sup>Rabies in the Americas.

<sup>d</sup>Direct fluorescent antibody test.

## 2. The global burden of rabies

Although rabies is entirely vaccine preventable, it remains a neglected zoonotic disease that results in an estimated 59 000 human deaths each year (Hampson et al., 2015). Although this number might not seem significant in comparison to other infectious diseases present in developing countries, rabies is clearly under-estimated with regards to the impact of this fatal disease on society. If the metric of the DALY (Disability Adjusted Life Years) score for rabies is considered, the severity of the disease becomes apparent (Lembo et al., 2010). Indeed, decision-tree models applied to the data from East Africa, and globally, indicate that the DALY burden for rabies exceeds that of neglected zoonotic diseases such as Onchocerciasis, Chagas disease, Dengue fever and leprosy (Coleman et al., 2004; Fevre et al., 2005; Knobel et al., 2005; Lembo et al., 2010).

Apart from the DALY score associated with rabies, the disease also has many underreported socio-economic impacts. Costs associated with travel to treatment facilities for bite wounds and potential rabies exposures are high, as victims typically have to travel long distances on more than one occasion. Secondly, due to the limited availability of post-exposure prophylaxis (PEP) in many countries, victims are typically unable to receive timely treatment, and the costs of PEP tend to be very high considering the low income profiles of rural communities in the developing world. Lastly, despite rabies not being viewed as a disease that affects economically important animals, livestock losses are valued at US\$279,546,173 per year in Africa, resulting in gross domestic product losses of US\$773,352,665 per year (Hampson et al., 2015; Sambo et al., 2013). This has a major impact on the livelihood of communities, especially in low and middle income countries (LMICs) where the burden of the disease tends to be highest. Therefore, the indirect burden associated with rabies accentuates the need to control and eliminate this disease in humans (Hampson et al., 2015). At the same time, the impact on the health and wellbeing of reservoir populations, particularly dogs, are tremendous and often forgotten. As a classical zoonosis, the number of cases in the animal reservoir far exceeds the number of human cases, often by several orders of magnitude (OIE, 2014).

The lack of recognition of the burden of rabies on the African and Asian continents results in the disease being widely neglected. There is continual pressure on governments to address a cohort of diseases, that in comparison to rabies may be considered more urgent or have more direct economic importance or perceived importance. Therefore, although human rabies can be prevented and the elimination of rabies in canine reservoirs is possible, the disease does not appear to draw enough attention to elicit interventions of the scale and intensity that will allow for eventual elimination. To overcome this, a unified approach on national and regional levels, with support from global human and animal health organisations, will be needed. Indeed, it should be emphasised that rabies is the ideal candidate to demonstrate the rationale and value of the One Health approach (Meslin and Briggs, 2013). The One Health approach exemplifies inter-sectoral communication and collaboration, where different disciplines combine their skills and resources towards a common, achievable goal (Day, 2011). As rabies is vaccine-preventable, with all of the required tools readily available, the One Health approach becomes key in implementing these tools in the most efficacious manner in order to control and eliminate rabies within a timely, yet realistic, period (Fooks et al., 2014; Meslin and Briggs, 2013).

In the spirit of the One Health approach, the co-ordination of veterinary sectors implementing mass dog vaccination campaigns and medical sectors treating dog bite wounds and administering post-

exposure prophylaxis is important (Fooks et al., 2014). Furthermore, the coordination between both sectors to follow up on dog-bites and investigate the exposures of other dogs/animals and humans as illustrated by Integrated Bite Case Management (IBCM) is key for enhancing effective rabies control. Without cross-talk between these sectors, responsibility is often shifted to the other sector and the efforts made by groups are lost. Alternatively, redundancies in certain aspects of rabies control are created, whilst other important aspects are left unattended.

The successes shown in South America by the Pan-American Health Organisation (PAHO) exemplified the need for a united approach to rabies control, not only on a national level, but also on a regional and continental level. The implementation of the “One Health” approach within each country in the PAHO region ensured the necessary resources and inter-sectoral collaboration required to successfully control rabies (Vigilato et al., 2013). This continental collaboration and unified approach fostered intracontinental collaboration between countries and attracted global attention, with support from a variety of international organisations and partners. However, in Africa, such a unified network and approach has been lacking.

### **3. The Pan-African Rabies Control Network**

As noted above, PARACON was built on the foundations set by previous regional networks within Africa, including the SEARG, the AfroREB and the RIWA (Table 1). These networks encompassed 35 of the 48 African countries (mainland and Madagascar). SEARG and RIWA represented 20 and 3 Anglophone countries in southern and eastern Africa and western Africa respectively, while AfroREB represented 15 Francophone countries in western and central Africa. The FAO West and Central Africa Veterinary Laboratory Network (RESOLAB) - originally established for Avian Influenza - addresses other transboundary diseases including rabies, and consists of laboratories from 13 West African and 7 Central African countries (FAO, n.d.). While some countries were represented in more than one of the above networks, several other nations were not included in any rabies control network. Also, it was common practice that delegates from either the medical or the veterinary sectors, most often not both, attended regional meetings in past years.

It is envisaged that PARACON will provide a platform to facilitate and promote coordinated and sustainable rabies control strategies and programmes towards the elimination of canine rabies in Africa. A pan-African approach encourages collaboration among countries to consolidate their efforts and effectively control rabies in a progressive and wide-ranging manner. Especially when a country has been declared canine rabies free, regional collaboration is essential in order to protect the country’s borders and ensure the maintenance of the rabies-free status (Vigilato et al., 2013). The pan-African network, with the support of industry, animal welfare NGO’s and the tripartite (World Health Organization (WHO), World Organisation for Animal Health (OIE) and Food and Agriculture Organization of the United Nations (FAO)) creates the capacity to influence governments and other decision-makers to commit to improved rabies control and elimination programmes within their country and region.

PARACON envisages scheduled meetings that are held in different member countries throughout Africa. The meetings will continue to be designed as working meetings solely with the intention to create practical approaches in an open environment for discussion, learning, information

dissemination and the sharing of experiences. The meetings will be based around workshops focussing on available tools that have been specifically designed to aid countries in the development and implementation of a successful rabies control strategy (see Section 4). Experienced facilitators at the workshops will aid the learning process and the further improvement of the available tools. The constant development and improvement of these tools is essential for providing the most relevant, up-to-date and useful tools possible.

All of the PARACON meetings will be centred around the One Health approach, as delegates from both the medical and veterinary sectors will be invited to participate at each meeting. The participation of delegates from each of the sectors will provide a platform where communication channels can be opened and affirmed within countries. As many delegates from the first PARACON meeting were unable to provide a name or the contact information of a counterpart in the other sector, this showed the importance of establishing inter-sectoral collaboration within countries.

PARACON will remain active during the periods between meetings in a variety of different ways. As communication is an essential aspect in a collaborative effort towards rabies control and elimination, PARACON will send out periodic emails with relevant information and the PARACON members have access to the active PARACON website (<https://paracon.rabiesalliance.org>), where they are invited to submit short news articles regarding any progress, initiatives, new developments, or any other information relevant to rabies control in their country or region. The PARACON website also provides visitors with a tool to directly contact the PARACON organisers in order to get specific assistance with regards to rabies control in their country. Under the auspices of GARC, PARACON is also actively involved in the development of new tools (refer to Section 4), with a specific focus on surveillance and education.

PARACON will serve as an African platform for several initiatives targeted towards aiding countries, or specific champions, in the establishment of effective rabies control programmes in order to get government buy-in and interest from local authorities. GARC and PARACON will provide, in collaboration with other organisations, country “stimulation packages” in a variety of different formats (see Section 4.2). It is envisaged that 3 types of packages are developed and countries to benefit from these packages will be selected based on data that has been reported, as well as initiatives planned around the Stepwise Approach towards Rabies Elimination (SARE) (see Section 5.1).

## **4. Tools**

### **4.1 Surveillance**

Surveillance is reliant on the active collection of suspected rabies case samples as well as their accurate diagnosis and the analysis of this data helps to determine a variety of key factors for rabies control and elimination strategies. It is vital that both positive and negative results are reported to the relevant authorities in order to establish “risk maps”, whilst also determining variables such as vaccination coverage and rabies prevalence in specific areas (Kaare et al., 2009).

The current gold standard for rabies diagnosis is the direct fluorescent antibody (DFA) test, which relies on detecting the presence of rabies and rabies-related viral antigens by means of a fluorescein

isothiocyanate (FITC) labelled antibody (Dean et al., 1996). Although the application of the DFA test in the hands of an experienced reader makes the test suitable for routine application, the accurate application of the test in the developing world remains limited due to various constraints such as limited infrastructure and the complexity of the test, among others (Dürr et al., 2008; Weyer and Blumberg, 2007). Because of the important role that post-mortem rabies diagnosis plays in disease management in animal populations (e.g. identifying disease outbreaks), as well as in risk assessment for the consideration of human prophylaxis, more appropriate diagnostic assays for use in low and middle income countries (LMICs) have been considered and developed (Dürr et al., 2008; McElhinney et al., 2008; Wacharapluesadee and Hemachudha, 2010). Among the rabies diagnostic assays that are potentially advantageous for low-resource settings, the direct, rapid immunohistochemical test (DRIT) has shown promise in all applications to date (Adawa et al., 2014; Ali et al., 2014; Coetzer et al., 2014; Dürr et al., 2008; Lembo et al., 2006; Madhusudana et al., 2012; NithinPrabhu et al., 2014; Saturday et al., 2009). Previous studies relying on the implementation of the DRIT have indicated that it has a diagnostic efficacy that is equal to that of the DFA, but is easier to interpret, quicker to perform and requires a lower capital investment (Coetzer et al., 2014; Dürr et al., 2008; Lembo et al., 2006).

PARACON is at the forefront of encouraging the implementation of the DRIT as a reliable and accurate diagnostic test aimed at improving rabies surveillance in African countries that do not routinely perform the DFA due to logistical and resource-oriented constraints. Typically, sample submission is poor due to the lack of reporting and sample collection, long distances and the transport of samples hindered by the lack of infrastructure, and the high costs associated with transporting potentially infectious materials. The primary aim in improving rabies sample submission and surveillance would be to set up decentralised veterinary laboratories in a more cost effective manner and provide training and equipment for sample collection in the field. In order to do this, PARACON aims to implement the DRIT as it requires cheaper infrastructure and a lower capital investment (Coetzer et al., 2014).

The DRIT will be implemented as an accurate, cost-effective diagnostic assay in countries where the routine implementation of the DFA is not feasible or is not currently practiced, thus encouraging rabies diagnosis in a country where there has previously been none. Despite the DRIT not being an OIE accredited test as yet, data has shown that the DRIT is still sensitive and specific enough to perform reliable diagnoses for routine surveillance in countries where the DFA is not implemented. Additionally, PARACON will facilitate the correspondence between the laboratories implementing the DRIT and the nearest OIE reference laboratory in order to validate the results obtained, as required by Stage 0 countries in the SARE (Refer to Section 5.1).

The DRIT will also be implemented in countries where the DFA is currently being used as the diagnostic assay of choice. The DRIT will be implemented in order to facilitate the process of decentralising laboratories, thus improving the turnover of results in areas where diagnosis and surveillance is typically lacking due to logistical constraints or the expense of the shipment of biological samples. In this scenario, all of the samples subjected to DRIT diagnosis would subsequently be confirmed by the DFA test at a central laboratory in a further effort to validate the DRIT. To date, GARC has driven the implementation of the DRIT in 3 such African countries - South Africa, Namibia and Mozambique - and as a result 20 diagnostic technicians have become proficient in rabies diagnosis using the DRIT. In comparison, 14 technicians in these countries are able to

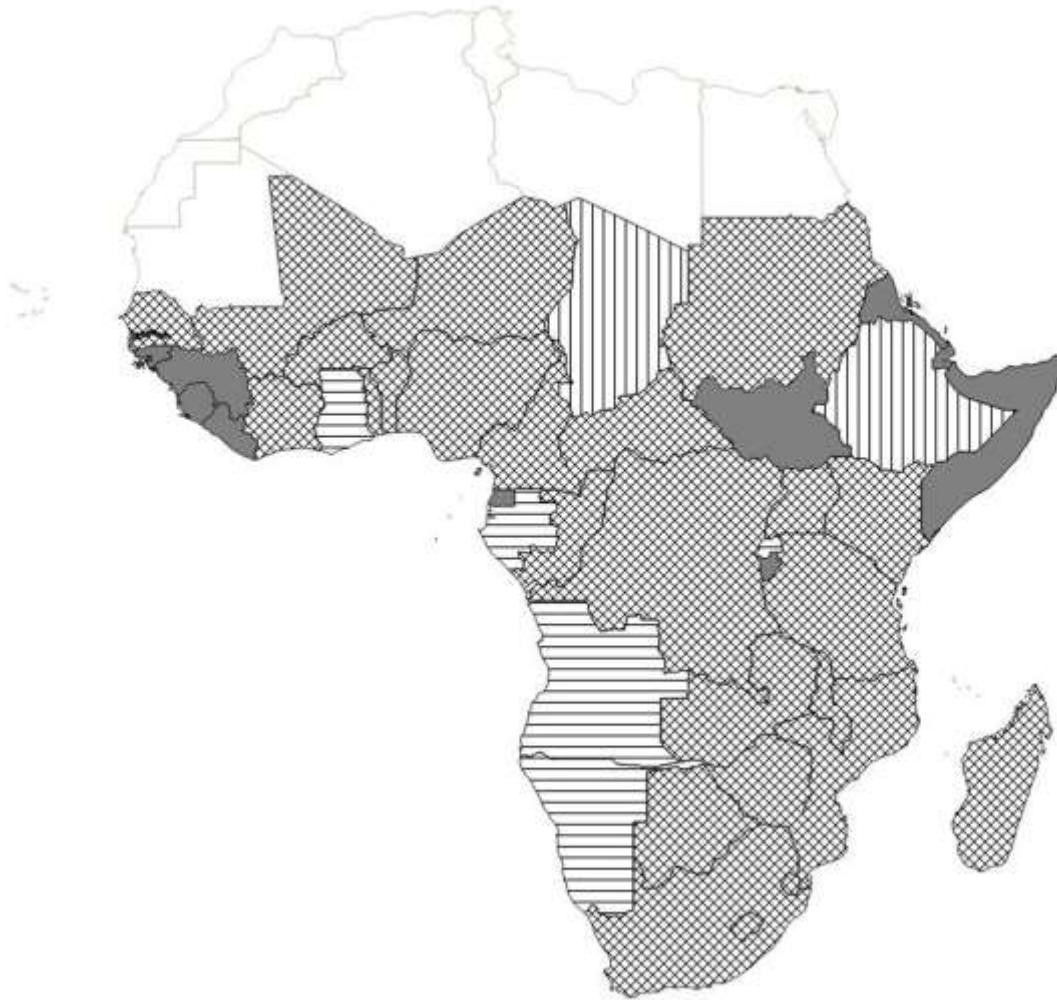
perform the DFA, based on information provided in the Country Reports (see below). The implementation of the DRIT will be expanded to other African countries through the dissemination of the stimulation packages (see Section 4.2), among others.

Timely reporting of the diagnostic results can pose several challenges to districts, regions and countries, yet it is essential in order to not only provide timely feedback for the provision of PEP, but also to assess progress, develop risk maps and highlight areas for future control events (Banyard et al., 2013). In order to facilitate data capture and reporting, Country Reports have been developed that are submitted as a pre-requisite for country representatives to attend each PARACON meeting. The Country Reports consist of a comprehensive set of questions regarding not only reported numbers, but also questions regarding policy, legislation and education. These reports have been designed to incorporate questions targeted towards the veterinary and medical sectors, with several overlapping questions to determine the level of inter-sectoral communication. The reports request specific rabies data regarding animal bites, confirmed and suspected rabies cases and PEP usage, among others. Data is requested for a 3 year period in order to ensure that there is overlap in reporting for the years between meetings. The data captured in the Country Reports will also benefit our continued elucidation of the true burden of rabies, including the cost of disease and cost of intervention through health economic analyses.

In order to facilitate the use and dissemination of the data gathered in the country reports, PARACON is in the process of developing an African rabies epidemiological bulletin where countries will be able to submit the information gathered into a single database on an annual basis. The data reported will be displayed on the online, freely accessible bulletin on the PARACON website. Countries will retain ownership of the data gathered and displayed on the bulletin. Rabies is a notifiable disease in many PARACON member countries, but there still are a number of countries where only animal or only human rabies are notifiable (Figure 1). Therefore, sector-specific data is only periodically, or not at all, reported to various international organizations and policy makers. One of the ambitions of PARACON will be to promote regular and accurate reporting, while preventing the unnecessary duplication of submitted data and eliminate the possibilities of redundancies and discrepancies in reporting as described previously (Nel, 2013). The bulletin will assist countries to monitor and evaluate progress towards rabies control and elimination in a quantitative manner. Additionally, the bulletin will be used as an advocacy tool to promote the successes of countries. Advocacy will aid in securing the commitment of stakeholders, decision-makers and governmental officials towards a progressive and effective rabies control strategy.

#### 4.2 Stimulation Packages

One of the key messages of PARACON focuses on the principle of taking the first steps towards an effective rabies control plan – i.e. to start small and build progress. Many countries do not currently have the support and interest to launch national rabies control and elimination strategies (13/33 countries; 42%), however, champions or interested parties are present that are able to begin a control programme in a community or region. Countries are able to build upon the successes of these small-scale pilot programmes to develop sustainable regional and national intervention strategies.



**Figure 1:** Rabies notifiability map in the PARACON countries. Horizontal lines depict countries where only animal rabies is notifiable. Vertical lines depict countries where only human rabies is notifiable. Cross-hatch lines depict countries where both human and animal rabies is notifiable. Countries in grey are PARACON countries where no data is available. White countries indicate non-PARACON countries.

In order to initiate or support rabies intervention strategies within African states, PARACON – through GARC and other international organisations such as the FAO, OIE, WHO and World Animal Protection (WAP) – is developing country stimulation packages in a variety of different formats. These country stimulation packages are aimed at providing essential materials to assist national programmes towards rabies control and elimination. The stimulation packages will be targeted at four different focus areas of a successful rabies intervention programme, namely advocacy, surveillance, education and vaccination campaigns.

The first category of stimulation package will be specifically provided to countries bordering those with existing successful national rabies intervention programmes. The first set of these have been built around the BMGF/WHO supported KZN project area and these stimulation packages are primarily funded by the WHO. This support will aid in the development of regional vaccination campaigns along the borders of the initiating country, thus reducing the possibility of the importation of rabies cases into the rabies-controlled or rabies-free country. The packages will include supplies such as rabies vaccines and syringes, as well as training by experts in dog



vaccination and surveillance. The stimulation packages will also provide equipment for animal handling and catching, including control poles and catching nets. This equipment is important as it promotes the humane capture and handling of animals during vaccination events, enforcing positive learning experiences for the animals (enabling return vaccination events) as well as community buy-in from the owners of the animals.

The second category of stimulation package will focus on education and advocacy. Country-specific media releases, presentations, educational flyers as well as suggested messages for radio and television broadcasts will be supplied in both a digital and hard-copy format. Potential World Rabies Day themes and activities will be provided, and close communications between the champions identified within each country and the global organisations involved will facilitate the progression and implementation of these advocacy materials. Educational materials such as the educational booklet (refer to section 5.2) will also be supplied in a variety of languages for distribution. As all of the materials are provided in digital format, it also allows countries to print and distribute the materials themselves. Additionally, Rabies Educator Certificate (REC) workshops will be promoted, where community leaders and champions identified in the country will run a short workshop in order to certify several individuals.

A third category of stimulation package will, apart from education and advocacy tools, also include a “DRIT starter kit”. This kit will supply all of the DRIT-specific reagents that are difficult to obtain, including the biotinylated polyclonal antibody preparation that has been shown to detect all of the currently circulating strains of rabies in Africa (Coetzer et al., 2014). The kit will provide sufficient reagents to perform 300 diagnoses, and will be implemented concurrently with a DRIT training programme facilitated by GARC. The DRIT starter kit has been designed to facilitate the decentralisation of laboratories and improve surveillance within a country, and not to replace the gold standard DFA, if that test is operational within the target country (Refer to section 4.1).

The various stimulation packages have been developed in order to help countries to “start small” and subsequently progress to implementing successful national rabies intervention programmes. The packages are not intended to bypass country authorities and will be implemented through national ministries or authorities. Additionally, these country stimulation packages have not been developed to fund pilot control programmes, but have been designed to stimulate countries to begin or enhance rabies control strategies towards elimination of canine rabies on a national, regional and continental level.

## **5. 1<sup>st</sup> PARACON meeting**

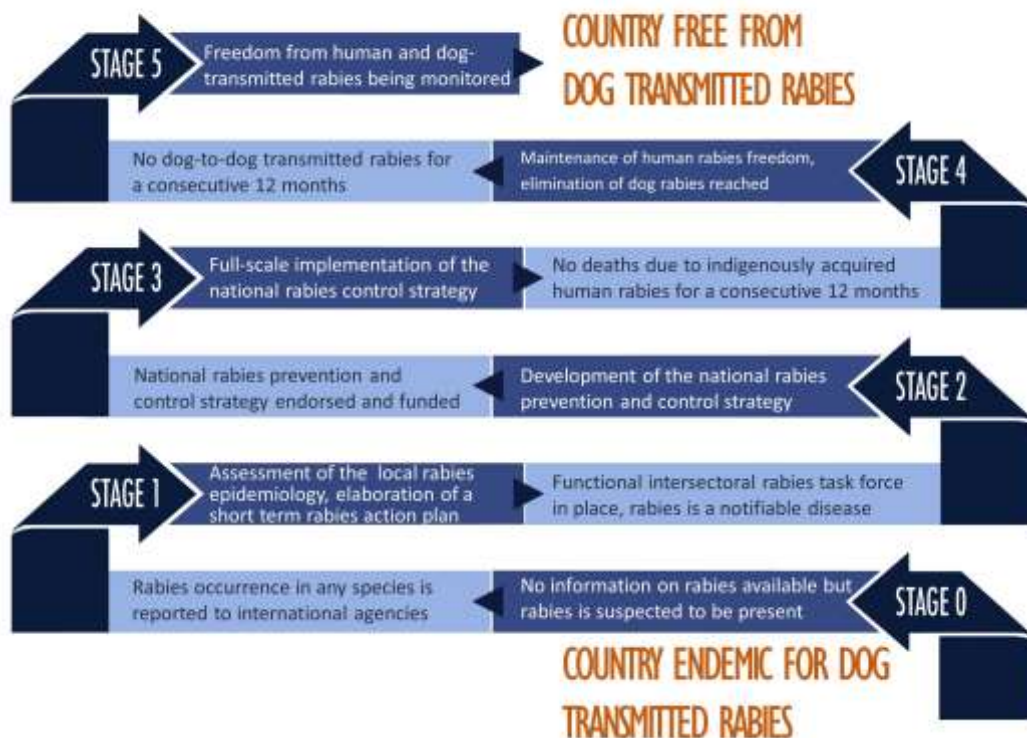
The first PARACON meeting was held in Gauteng, South Africa from 9-11 June 2015. It was considered that PARACON would primarily host all African countries of sub-Saharan Africa and would not include those countries of North Africa, who are incorporated into the Middle East and Eastern Europe Rabies Expert Bureau (MEEREB) (Table 1). The majority of the PARACON countries (33/48) attended the first meeting with at least one delegate from either the medical or the veterinary sector. Some countries had representatives from both sectors, demonstrating that progress has been made with regards to the One Health approach. Furthermore, the majority of the countries that were unable to participate at the inaugural meeting were those most affected by the Ebola

epidemic in West Africa (e.g. Liberia, Sierra Leone, and Guinea). However, appropriate contacts from these countries were identified and initial communications took place, showing promise for improved representation at the next PARACON meeting. The meeting was centred around interactive workshops as discussed in the sections below.

### 5.1 SARE workshop

A first draft of the Stepwise Approach for Rabies Elimination (SARE) was developed by the FAO and GARC in 2012 (FAO and GARC, 2012), after the benefits of the Progressive Control Pathway (PCP) for Foot and Mouth Disease control (FAO and OIE, 2004) was discussed and evaluated at the 11<sup>th</sup> SEARG meeting in Maputo, Mozambique in 2011. The SARE draft was further modified by integrating a monitoring and evaluation framework developed by GARC in the Philippines. In 2014 the SARE was integrated into the Rabies Blueprint (Global Alliance for Rabies Control, 2014).

The SARE provides countries with measurable stages to progress from Stage 0 to Stage 5 in their efforts towards becoming canine-rabies free. Countries typically begin at Stage 0, where little or no epidemiological understanding of, or control efforts for, rabies are in place. Once certain criteria have been achieved (for example making rabies a notifiable disease, improving surveillance, implementing control measures and maintaining them) countries then progress to the next stages, until they eventually reach Stage 5 – being canine-rabies free (Figure 2).



**Figure 2:** SARE keys to progress through each stage towards freedom from dog-mediated rabies. The Stepwise Approach to Rabies Elimination keys are indicated for each stage. Each country is required to complete the keys to each stage in order to progress to the next stage.

A workshop on the SARE was held at the first PARACON meeting in 2015, introducing countries to the concept of a stepwise approach to rabies control and elimination. In order to facilitate this process, a SARE Outputs form was developed by the FAO and GARC for the initial Asian Rabies Control Network (ARACON) network meeting in February 2015 (Global Alliance for Rabies Control, 2015). The SARE Outputs form was further refined and was used at the PARACON meeting in order for country representatives to perform self-assessments of their country's progress towards rabies control and elimination. The SARE Outputs form allows the calculation of the stage of the SARE that a country is currently at and not only accentuates the progress that countries have made towards rabies control, but also highlights the areas where more focus or attention is required in order to develop and implement a comprehensive and effective rabies intervention strategy. The development and application of the SARE Outputs form across ARACON and PARACON workshops demonstrates the resolve for a coordinated global approach towards rabies elimination.

At each subsequent PARACON meeting, the SARE stages for participating countries will be reassessed by using the SARE Outputs form that will continue to be developed to measure the progress of each country and to advocate for continued support from governmental authorities and intergovernmental organizations.

## 5.2 Educational Workshop

Due to the vital role that enhanced public awareness and education plays in rabies prevention, GARC recognized the need for a coordinated approach to rabies education. Based on this need the "GARC Education Platform" (GEP; <https://education.rabiesalliance.org>) was established as a freely accessible online platform and the first course - the Rabies Educator Certificate (REC) – was developed with a global audience in mind. The REC was developed as a free online course to qualify people to effectively disseminate accurate, life-saving information regarding rabies to at-risk communities throughout the world. Subsequent to passing (with  $\geq 85\%$  accuracy) a final assessment on the REC contents, participants become certified as rabies educators within their country. The REC was officially launched at the inaugural ARACON meeting, which was hosted by GARC in Bangkok, Thailand. Although the REC is freely available and self-paced, a REC-dedicated workshop was hosted at the PARACON meeting, during which the participants could access the online course without having to register. This opportunity allowed the participants to explore the online course contents that are available in both English and French. Briefly, the REC course work consists of five modules, which cover:

1. What is rabies and how do people and animals get the disease?
2. How to avoid dog bites and prevent rabies
3. Caring for animals
4. Understanding the role of a community educator in preventing dog bites and rabies in general
5. Communicating lifesaving information to other people

Subsequent to completing the REC workshop, all of the delegates were tasked with downloading the REC course work (in either French or English) onto their personal computers for later referral and study. By completing the REC workshop, all of the delegates were familiarized with the GEP website as well as the course work of the REC. The course facilitated the initial training of the first REC-

certified educators in Africa. A further objective was that these country representatives, upon returning home, would also identify others to complete the course, qualify as rabies educators, and contribute to rabies education and awareness activities. In order to ensure that future country representatives are actively involved in rabies and are knowledgeable in their field, PARACON requires that country representatives be REC certified in order to attend any future meetings. Additional free online educational courses are currently being developed in order to expand the GEP. The Animal Handlers and Vaccinators Educator Certificate (AHVEC) course was presented at the PARACON meeting and will be launched in 2015. This course has been developed to target professionals who have been trained as animal handlers or vaccinators, and provides material that ensures that the vaccination of animals is done rapidly, humanely and effectively. Other courses are also being developed and will be available on the GEP in the future. Several governmental programmes have shown interest in incorporating some of the proposed GEP courses into tertiary education curriculums, ensuring that all professionals are adequately informed and educated in rabies prevention and control.

Other educational materials were also presented during the first meeting, including an educational booklet developed by GARC in collaboration with Netcare (a private hospital company that has developed several educational booklets on various trauma issues). The educational booklet has been specifically designed to target children aged between 4 and 13 years to educate them in primary animal healthcare, dog bite prevention and rabies PEP. The booklet was designed in a manner to facilitate learning through visual aids to convey the message to illiterate individuals. The booklet is available on the GEP in a variety of different languages.

### 5.3 Blueprint workshop

The Rabies Blueprint ([www.rabiesblueprint.com](http://www.rabiesblueprint.com)) is a comprehensive web-based platform that has been specifically developed to aid governments and rabies champions to develop an effective national rabies control and elimination programme. The information provided covers all of the major aspects of rabies control, the potential challenges that may be faced, as well as several case studies of examples from other countries or regions. The Blueprint is thus a vital, comprehensive tool for rabies intervention programmes that was underutilized by African countries prior to the PARACON meeting.

The Rabies Blueprint has been separated into 3 distinct modules, depending on the specific requirements of the user. The 3 modules are the Fox rabies Blueprint, the Canine rabies Blueprint and the Rabies Surveillance Blueprint, with the latter two being the focus of the Blueprint workshop held at the inaugural PARACON meeting.

The workshop was aimed at introducing country representatives to the Blueprint as a tool for use in national rabies control programmes. Questionnaires were disseminated in order to assess the delegates' previous exposures to the Canine Rabies and Surveillance Blueprint, as well as their interest and feedback regarding this tool. Forty delegates completed Blueprint workshop feedback questionnaires at the meeting, of whom 28 (70%) had little to no previous exposure to the Canine Rabies Blueprint and its contents, and 32 (80%) had little to no experience regarding the newer Surveillance Blueprint tool. This clearly demonstrates that the lack of utilisation of these powerful tools is often due to the unfamiliarity with the product, and emphasises the importance of

promoting and disseminating these valuable tools. Thus, this workshop endeavoured to expose country representatives to specific tools and the means to develop and implement a successful national rabies control and elimination strategy.

## **6. Global trends and partnerships**

PARACON aims to set the trend globally by collaborating with, and establishing guidelines for, other regional rabies networks to follow and replicate. The standardisation of materials, elimination targets, requirements and procedures will ensure not only an effective regional network, but also a unified approach to global rabies control and elimination. Already, the Country Report templates developed to gather essential surveillance and epidemiological data have been shared amongst other regional networks, including MEEREB, West and Central African Laboratory Network RESOLAB, South Asian Association for Regional Cooperation (SAARC) and ASEAN. PARACON is also working in close collaboration with the WHO in order to develop the data gathered for use on the Global Health Observatory.

## **7. Towards canine rabies elimination in Africa**

The inauguration of PARACON has provided the necessary platform for countries to collaborate and co-ordinate both internally and with their neighbours towards effective and efficient rabies control programmes in Africa. The timing of the initiation of this network coincides with the availability of the necessary tools, research and biologics necessary to make progress in rabies endemic countries. With the successes shown in pilot control programmes in Africa and Asia (e.g. projects supported by BMGF/WHO and UBS Optimus/GARC in Chad, Philippines, South Africa and Tanzania) (International Coordinating Group (ICG), 2014), the time is right to capitalize on the momentum from these projects and the global drive towards rabies control and elimination.

The first PARACON meeting considered the prospects of eliminating canine-mediated human rabies by 2030 to be plausible. This target date has been set to align with the Sustainable Development Goals (United Nations Department of Economic and Social Affairs, 2014) and is an important means to affirm the commitments of different countries and organisations to rabies control and elimination. The support from the Tri-partite alliance, as well as animal welfare organisations and members of industry, lends the necessary weight behind this vision to make it an attainable and realistic achievement. In light of this, the World Rabies Day theme for 2015 is “End Rabies Together”, emphasising the importance of collaborative, effective and active regional networks that enable various endemic countries to work in a unified manner towards global canine-rabies elimination. The successes of the inaugural PARACON meeting will be an important contribution to the agenda for the global rabies meeting in Geneva (December 2015), which is organized by the tripartite and GARC.

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