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Rabies control program in Colombia: A One Health assessment

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Abstract

Introduction: In Colombia, despite the notable decrease in rabies cases, the primary prevention of the disease remains a challenge, particularly in rural areas where non-vaccinated infected cats are the main transmitters to humans. The objective of this study was to evaluate the level of implementation of One Health in the rabies program in Colombia, through a validated methodology of thirteen criteria.
Methods: Structured surveys directed at stakeholders from official sectors such as agriculture, health, environment, private sector and academia were carried out. The results were categorized into high (66%-100%), moderate (34%-65%), and low (0%-33%) scores.
Results: The findings highlight the need for more integrated management plans, improved training and workforce awareness on ´One Health´soft skills and enhanced wildlife epidemiological surveillance.
Discussion: Overall, these results underscore the importance of greater transdisciplinary and multidisciplinary planning and collaboration, as well as better pooling of resources (human, financial, technical platforms and knowledge) in the rabies program.

Keywords: Evaluation, Colombia, collaboration, *Lyssavirus*, One Health, Rabies

Programa de control de la rabia en Colombia: Una evaluación de Una Salud

Resumen

Introducción: En Colombia, a pesar de la notable disminución de los casos de rabia, la prevención primaria de la enfermedad sigue siendo un reto, sobre todo en las zonas rurales, donde los gatos infectados no vacunados son los principales transmisores a los humanos. El objetivo de este estudio fue evaluar el nivel de implementación de Una Sola Salud en el programa contra la rabia en Colombia, a través de metodología validada de trece criterios.
Métodos: Se realizaron encuestas estructuradas dirigidas a las partes interesadas de sectores oficiales como la agricultura, la salud, el medio ambiente, el sector privado y la academia. Los resultados se clasificaron en puntuaciones altas (66%-100%), moderadas (34%-65%) y bajas (0%-33%).
Resultados: Los resultados ponen de relieve la necesidad de planes de gestión más integrados, de mejorar la formación y la concienciación del personal en materia de salud y de mejorar la vigilancia epidemiológica de la fauna salvaje.
Discusión: En general, estos resultados subrayan la importancia de una mayor planificación y colaboración transdisciplinar y multidisciplinar, así como de una mejor puesta en común de recursos (humanos, financieros, plataformas técnicas y conocimientos) en el programa contra la rabia.

Palabras clave: Evaluación, Colombia, colaboración, *Lyssavirus*, Una Salud, Rabia

Introduction

Colombia has been developing rabies control activities for over 60 years. The success of the rabies control program is evidenced by the reduction of human rabies transmitted by dogs in the last three decades. In the last 20 years, human rabies transmitted by rabies-infected non-vaccinated cats has become a public health issue, indicating the need for multisectoral and multidisciplinary collaboration, recognizing that the health of humans, domestic animals, and the ecosystem are interconnected. One Health aims to mobilize multiple sectors, disciplines, and communities at different levels of society to work together and promote sustainable human well-being[1]. The implementation of the ´One Health´ framework for the management of zoonotic diseases has proven challenging in Latin American countries due to barriers encountered in the implementation process, such as the lack of participation of policymakers, limited funding, and resistance to interdisciplinary collaboration[2-5].

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There is an urgent need for a formal evaluation of the implementation of ´One Health´ to ensure the end of deaths and long-term benefits for affected rural populations. Here, we propose a formal evaluation of the implementation of the national rabies program within the framework of One Health in Colombia[3,6]. This study evaluated the implementation of the ´One Health´ approach in the rabies program in Colombia through a score given by various governmental and non-governmental stakeholders[4].

Materials and methods

A survey was conducted with the participation of various public and private entities that have focused their work on research, surveillance, control and prevention of rabies disease. A table was created for the survey, listing various evaluation criteria for the implementation of ´One Health´[4]. An invitation to participate in the survey was extended in 2021 to government actors, institutions related to human and animal health, the environmental sector, private sector and public health and virology researchers. They were selected based on their experience to control and prevent the disease in the country.

According to Gruel[4] the 13 criteria were divided into three general groups: governance, partnerships, and resources (as seen in Figure 1).

Each criterion has scores ranging from 1 (minimum) to 4 (maximum). In Figure 2 we described the best possible score in each criterion.

To minimize bias, virtual meetings with participants were held to clarify existing doubts. Finally, the invitees submitted their respective responses, and the scoring methodology proposed for the operationalization of the rabies control program in Colombia was used. These attributes are observed in Figure 1, and the key criteria for the successful implementation of ´One Health´ initiatives were shared with each survey participant, considering the categories observed in Figure 2.

Results

Through the socialization of the thirteen variables, five actors from the official sector (human and animal health) and researchers with recognized leadership in the ´One Health´ approach provided a score based on their experiences and key criteria, which have three categories (Governance, Partnerships, and Resources).

The results were divided into three groups: high (H), moderate (M), and low (L). In the H group, criteria with a percentage of 66% to 100% were classified. The criteria classified in this group (see Figure 2 for reference) were: 2-4-5-6-10-12-13, with the "Governance" criterion having the highest average of 90%, followed by "Support Infrastructure" with 80%. In the M group, with a percentage of 34% to 65%, the following criteria were present (see reference in Figure 2): 1-3-7-8-9-11, where "Recognition of the role of OH health professionals" scored 60%. Finally, in the L group, with a percentage of 0% to 32%, no criteria were found.

The results of the scoring of the thirteen criteria show that the high group having the "Governance" criterion at 90%, followed by the "Supporting infrastructures" criterion with 80% and finally, in the moderate group the recognition of the role of "one health professionals" which scored 60%. No criteria were found scored less than 33%.

Discussion

This research is the first exploratory study that was carried out to know the state of implementation of ´One Health´ in

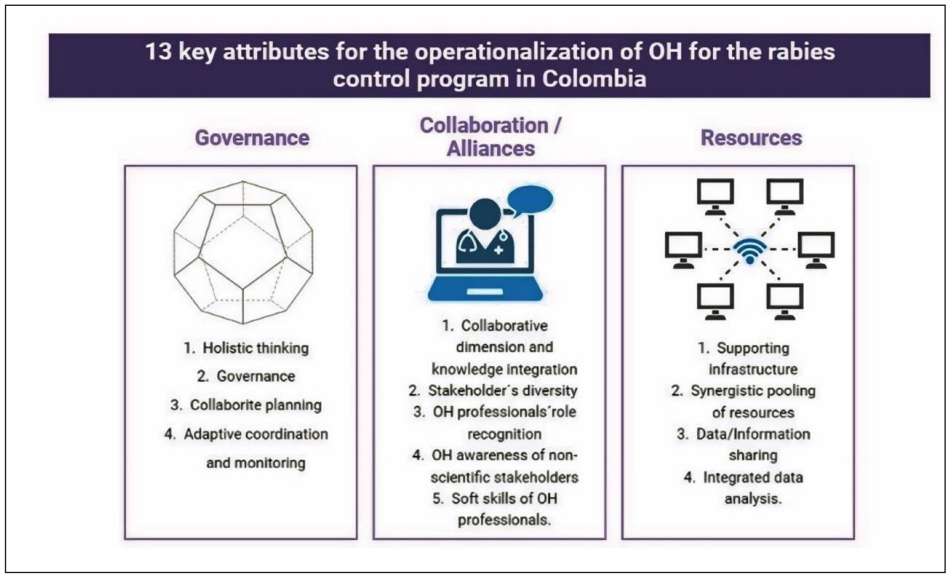

Figure 1. Key attributes for One Health operationalization.

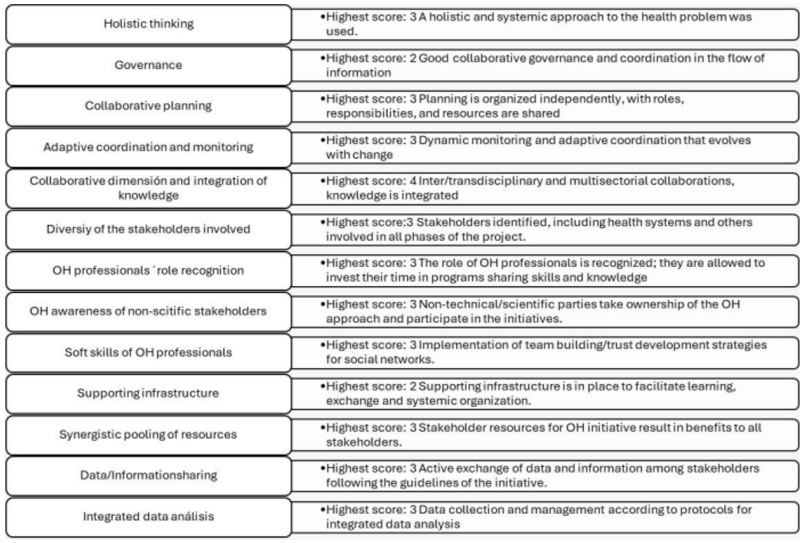

Figure 2. Criteria for the successful implementation of ´One Health´.

Colombia with respect to the National Rabies program. This survey was conducted with two sectors in charge of the Program: animal health and human health, as well as the contributions of researchers to the academic world, providing a first step for evaluating the implementation of the ´One Health´ approach in the country. The discussion on the importance of the approach and its correct implementation in a country with great biodiversity and huge social disparities like Colombia is still necessary[7]. The findings indicate the need for more integrated management plans, improved training and workforce awareness on ´One Health´soft skills and enhanced wildlife epidemiological surveillance. These results underscore the importance of greater transdisciplinary and multidisciplinary planning and collaboration, as well as better pooling of resources (human, finantial, technical platforms and knowledge) in the rabies program. It was surprising that there were no criteria with values from 0% to 32%; however, this does not mean there are no restrictions or limitations in implementing the approach in the country. One of the main limitations of the present study was the lack of response from the environmental sector. Likewise, the authors did not invite organizations from communities to fill out the survey and participate in the study.

When talking about the ´One Health´ approach, many authors refer to the importance of working across various sectors to mitigate not only economic but also health impacts in countries where the disease is still present[8,9,10]. Rabies is a zoonosis that continues to cause loss of life in countries where there are more significant social and cultural gaps such as multidimensional poverty, limited access to healthcare systems, high concentration of canines and felines, unfavorable housing and work conditions, and limited access to information on rabies prevention and control, which increase the likelihood of the population being affected by this disease and continue to generate approximately 59,000 human deaths[11]. Within the One Health approach, rabies has been "the best-documented example"[1,6,9,12]. Collaboration between sectors is essential to prevent and/or control emerging and/or reemerging zoonotic diseases. The plan proposed by the Sustainable Development Goals cannot be effectively and correctly implemented without understanding the importance of the ´One Health´ concept and its correct application and understanding by various sectors (not just health), recognizing that it is not just one species affected by the virus, but it affects the entire population, and therefore prevention will not be sufficient if coordinated work is not done properly between the different sectors[12,13].

Regarding the rabies virus in Colombia and its impact, it is crucial to highlight that the efforts made to prevent and control the virus have been historically recognized; however, various events have led to the decentralization of health services and policies that create access barriers[14], weak governance, and multiple factors leading to a lack of organization between sectors and an information system that has been affected[3]. Another key point for understanding the rabies virus and its impact in Colombia is the result obtained in the survey conducted with various invited actors, generating significant results to close gaps that arise when controlling and preventing the virus[4]. "Governance" scored the highest among the criteria, reflecting significant advances in the fight against the virus, with cities like Bogotá having over two decades without cases. However, while there are plans and processes, adequate coordination of these regulations is not always followed, creating gaps in the ongoing work around the virus[3]. Additionally, the second-highest scoring criterion was "Support Infrastructure," demonstrating that information exchange, learning, and systemic organization have improved, but informational gaps and the use of classical information means still exist, preventing complete data exchange[4]. Although there were no criteria with low percentages, it is notable the lack of greater articulation between the various sectors involved in human-animal-ecosystem health, indi-

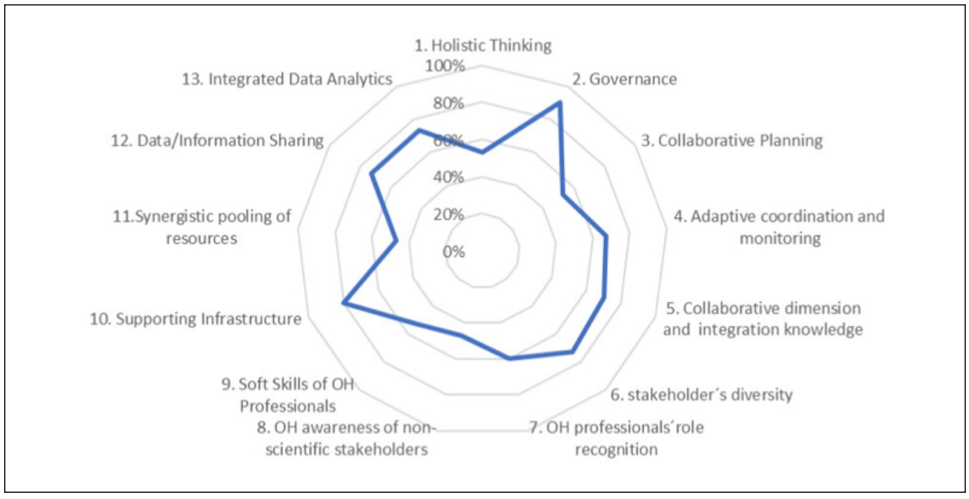

Figure 3. Radar diagram of the score obtained in the rabies program in Colombia

cating that it is possible to improve awareness work on the importance of the approach in Colombia[3]. Another relevant criterion was "Diversity of parties" with a score of 73%, leading to the understanding that many actors (not only institutional) work interrelatedly concerning the human-animal-ecosystem balance. However, many of the parties involved in the fight to control the virus are directly involved with the Colombian health system, and sectors such as social and cultural are always involved in the fight and decision-making for rabies prevention and control, recognizing that these sectors have tacit knowledge about the virus[3]. For this reason, working under the ´One Health´ approach (human-animal-environmental health) in Colombia is closely related to the context of populations, helping to understand and determine that social, cultural, political, and economic interactions are vital to ensure that the measures chosen for the control and prevention of rabies are effective. Rabies, like other endemic and neglected diseases, requires tran-sdisciplinary approaches to address not only technical challenges but also gaps in cultural barriers to preventive measures[3,13,14].

Many actors in the country have been involved in implementing ´One Health´; however, all these efforts are fragmented, determining challenges for developing standards and guidelines for implementing ´One Health´, considering that zoonotic diseases require efficient, effective measures and rapid actions that will be possible if consensus is reached among all involved actors with frequent communication for the proper formulation of policies, decision-making, program implementation, and continuous care[4,15,16].

According to the epidemiological bulletin of the National Institute of Health - INS of the 38th epidemiological week of the year 2022[17], the last report of human rabies occurred in 2020 in the rural area of Department of Huila, which generated alert in the entities responsible for human and animal health, being the cat the main transmitter of this virus. It is in these cases where the lack of an adequate implementation of the ´One Health´ approach in Colombia and the large existing gaps between the public and private sectors continue to represent a risk for civil society, animals and therefore, the environment[18].

Education as a pillar and fundamental tool in the fight for rabies control and prevention is a main topic in the ´One Health´ approach, this tool allows to identify cultural beliefs and behaviors of civil society that serve to create strategies to raise awareness about changes in attitudes and practices to prevent transmission of the virus, as well as what is exposed in the article by Meriño and his team[18], which applied the KAP (knowledge, attitudes and practices) in a Colombian municipality where pets such as dogs and cats have direct and indirect access to wildlife. This study found that most of the people surveyed were aware of the risk posed by the rabies virus and which were some of its transmission routes, most of the households had at least one cat that was free to roam in areas outside their home, also, many inhabitants indicated that they allowed animals in street conditions to enter their homes[18]. Although rabies has largely decreased in recent decades, rabies of wild origin has proven to be a constant threat not only to animals, but also to humans[18], since 2012 cats have been the cause of transmitting the virus to humans mainly in Valle, Cundinamarca and Huila[18], contributing to the need for greater integration of control and prevention measures considering those specific challenges posed by the participation of cats in the transmission of the virus, such efforts should focus on responsible pet ownership, greater vaccination coverage in rural areas and areas of difficult access, as well as effective measures to reduce the incidence of presentation of the virus, understanding that education is an important factor in raising awareness of civil society for the prevention and control of rabies[18.] Between 2003 and 2012, the rural area in the country played a key role in the report of aggressive cats with the particularity that they were not vaccinated against rabies or their vaccination status was unknown[19] . For this reason, vaccination of cats is the main source of prevention and hence the approach and response that has been included in the public health surveillance system in Colombia, the abandonment of animals in rural areas, poor

ownership and lack of concern about the care of ecosystems has led to cats coming into greater contact with bats, attacking them and then generating the infection to humans[19].

Another fundamental aspect in the fight against the control and prevention of rabies virus in Colombia is the issuance of Resolution 00009028 of July 23, 2024 "*Whereby sanitary measures for the prevention and control of rabies of wild origin in Colombia are established and other provisions are issued*"[20]. The Resolution seeks to establish the sanitary measures for the prevention and control of rabies of wild origin, which must be adopted measures such as mandatory cyclical vaccination in production species such as bovine and buffalo in areas at risk of presentation of rabies of wild origin, strategic vaccination in animals where the Colombian Agricultural Institute - ICA determines it after the presentation of an outbreak and education activities aimed at the community. A very relevant point of the Resolution is presented in Article 8, indicating that the control of hematophagous bats, specifically *Desmodus rotundus*, will be given only in outbreaks of the virus in accordance with the guidelines of the Ministry of Environment and Sustainable Development[20].

The progress that the country has had in the face of research for the control and prevention of the virus was observed in the results exposed in the Rabies in The Americas (RITA) 2023, carried out in Colombia, for example, Cediel et al[21] indicate that continuing education not only for civil society but for professionals is an important factor to control and prevent the virus, this is demonstrated in spaces such as the RITA, where the successes but also the failures that have been presented throughout the history of the fight against rabies are exposed, the knowledge gaps in the face of post-exposure treatment generate that, attacks or injuries are underestimated and the primary care that is required is not provided[21]. Another key finding from RITA 2023, was presented by Carreño et al.,[22] stating that intermediate hosts such as cats are a serious public health problem, and in addition to the current population growth, large and serious losses of biodiversity are being generated and thus, the degradation of ecosystems resulting in an imbalance in the human-animal-environment interface, which led to the creation of research focused on the rabies virus in wildlife. In this sense, a pilot cooperation plan was launched between the National Institute of Health - INS and the Institute National Biodiversity (Alexander von Humboldt Institute), in order to strengthen the surveillance of the rabies virus within the One Health approach and make the appropriate decisions against the fight against the virus[22.] This study aimed to evaluate the extent to which the One Health approach can be implemented in managing rabies in Colombia using a structured survey based on the previously described and validated criteria, for which the participation of various stakeholders who have contributed to rabies control through their work was of great importance. Prevention and control of the rabies virus must remain a goal in all humans, animal and environmental health work plans to achieve fewer humans affected by the virus.

Although this study focused on a group of actors, it would be prudent to extend this research to other sectors, including communities. It is recommended that veterinary medicine students, professionals in human, animal, and environmental health and all sectors continue the application of correct and appropriate implementation of the ´One Health´ approach to control and prevent the rabies virus and other zoonotic pathogens in the human-animal-environment interface. Priority should be place at joining efforts to prevent and control wild, articulating efforts for an integrated surveillance in animals and in bitten humans in risk areas where the reservoir is present. Authors demonstrate the great need for long-term management plans, better communication, and multisectoral and interdisciplinary coordination between academia, public and private entities, and the community, better epidemiological surveillance focused on the human health-animal health-environmental health triad[3,4]. Likewise, better pooling of resources (human, finantial, technical platforms and knowledge) in the rabies program should be placed.

Ethical considerations

Protection of people and animals. Not applicable.

Protection of vulnerable populations. Not applicable.

Confidentiality. Not applicable.

Privacy. Not applicable.

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Conflicts of interest. All authors declared that there are no conflicts of interest.

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Authors´ contribution. Made substantial contributions to conception and design of the study and performed data analysis and interpretation: NC, DR, DS, JR. Performed data acquisition, as well as provided technical and material support: NC, DR. All authors contributed to read and approved the version of the submitted manuscript.

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