

**ISSN 2597- 6052**DOI: <https://doi.org/10.56338/mppki.v7i5.5167>**MPPKI****Media Publikasi Promosi Kesehatan Indonesia**  
*The Indonesian Journal of Health Promotion***Review Articles****Open Access****Managing Rabies Cases with a One Health Approach in Various Countries:  
Literature Review****Salma Sabira<sup>1\*</sup>, Helda<sup>2</sup>, Gustia Arminda Siregar<sup>3</sup>, Qonita Nur Salamah<sup>4</sup>**<sup>1,2,3,4</sup>Department of Epidemiology, Faculty of Public Health, Universitas Indonesia\*Corresponding Author: [salmasbr18@gmail.com](mailto:salmasbr18@gmail.com)**ABSTRACT**

**Introduction:** More people die from rabies than from other zoonotic diseases worldwide each year, with an estimated 60,000 deaths attributable to the disease. The management of rabies epidemics in humans and animals is the main goal of the One Health approach's implementation. Reducing the risk of animal-to-human rabies transmission not only lessens the requirement for post-exposure vaccinations but also lessens the financial burden of rabies management in people.

**Objective:** This review aims to provide a general overview and comparison of rabies control programs in various countries using the One Health approach.

**Method:** PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) is used in the literature review. Using the Science Direct, Scopus, and Pubmed databases covering the years 2012–2022, look up library resources.

**Result:** The results of the literature search with the keywords control, one health approach, and rabies were screened again according to the predetermined inclusion criteria and the publication time range of 2012–2022 until 10 suitable journals were obtained. With financial assistance from the European Union, a number of European nations initiated oral rabies vaccination (ORV) programs in foxes. The vaccine was given in bait form, effectively controlling vulpine rabies. The creation of ORV demonstrates that oral rabies vaccination for wildlife in Serbia was effective and was marked by a rise in the use of vaccine bait as well as an increase in the animal's immunological response. Consequently, until 2018, fewer instances of rabies were documented.

**Conclusion:** With multisectoral support from partners in the government and non-government sectors, implementing One Health is one of the best ways to reduce rabies and guarantee community engagement and knowledge.

**Keywords:** Control; One Health Approach; Rabies

## INTRODUCTION

An estimated 60,000 human deaths occur due to rabies globally each year, greater than deaths from other zoonotic diseases (1). Rabies is caused by lyssavirus infection. The disease was named after Lyssa, who was said to be "the spirit of madness," "insanity," and "greek fury," clearly evoking the horror of death from rabies. Rabies is spread through bites and scratches from infected animals (2). Rabies is clinically defined as restless awareness, figments of imagination, hyperactivity and phobia of water (malignant rabies), or paralysis and coma (paralytic rabies), which leads to death soon and surely (3).

According to the most recent 2018 European Union Zoonoses Report, bats are a major source of rabies in Europe (4). According to reports, the Asian subcontinent accounts for anything between 0 and 55% of all dog rabies cases worldwide (5). Rabies is endemic to almost all of the mainland, with the exception of islands like Australia and Antarctica, where there haven't been any documented occurrences of dog-related rabies (6). Although many nations in Asia, Europe, North and South America have declared themselves free of rabies, several nations in Asia and Africa continue experience rabies outbreaks. In addition to being quite prevalent in Nepal, Myanmar, Bhutan, Thailand, and India, rabies is also highly common in Bangladesh and India (7).

At the moment, there are a number of areas that need to be strengthened, including surveillance, public advocacy and awareness, professional education, collaboration between sectors, strategic mass dog and human vaccination, increasing the availability of free PEP throughout the province, specimen referral, laboratory testing capacity, dog population control, and outbreak response and investigation (8). The One Health initiative acknowledges the connection between animal and environmental health as well as human health. The management of rabies epidemics in humans and animals is the main goal of the One Health approach's implementation. Reducing the risk of animal-to-human rabies transmission not only lessens the requirement for post-exposure vaccinations but also lessens the financial burden of rabies management in people (9). In underdeveloped nations with limited resources, the One Health strategy is also recognized as an economical way to fight rabies (10). The One Health approach has been successfully implemented for a number of years in several nations, and it has shown promise in the fight against zoonoses. Sri Lanka, Bangladesh and Buthan were able to reduce the number of rabies deaths over time using a One Health approach (11). A One Health approach to rabies elimination is concentrated on a cross-disciplinary primary of numerous organizations, including representatives from the government and the private industries (such as., vaccine vendors, policy-makers, researchers, veterinarians, and health care professionals), with a holistic goal of eliminating rabies in humans (12,13). Therefore, this review aims to provide a general overview and comparison of rabies control programs in various countries using the One Health approach, it can be used to evaluate and offer strategies for reducing the global and Indonesian rabies burden.

## METHOD

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) approach was employed in this literature review research, which goes through four stages: identification, screening, and feasibility of the data received. Preparing article reports by collecting databases of accredited journals via Science Direct, Scopus, and PubMed. The articles taken into the database are journal publications from the last 10 years, and the keywords used when searching are control, one health approach, and rabies. The types of studies used are all types of journals and articles that discuss rabies control using a One Health approach. The inclusion criteria at the start of the database search were English-language journals, articles with full text open access, publication time in the 2012–2022 range, in the field of One Health, Zoonotic Disease. Meanwhile, the exclusion criteria include literature in forms other than journals, dissertations, theses, and duplicate titles that will be excluded in this research. Journals or articles that discuss other zoonoses will also be excluded from this research search.

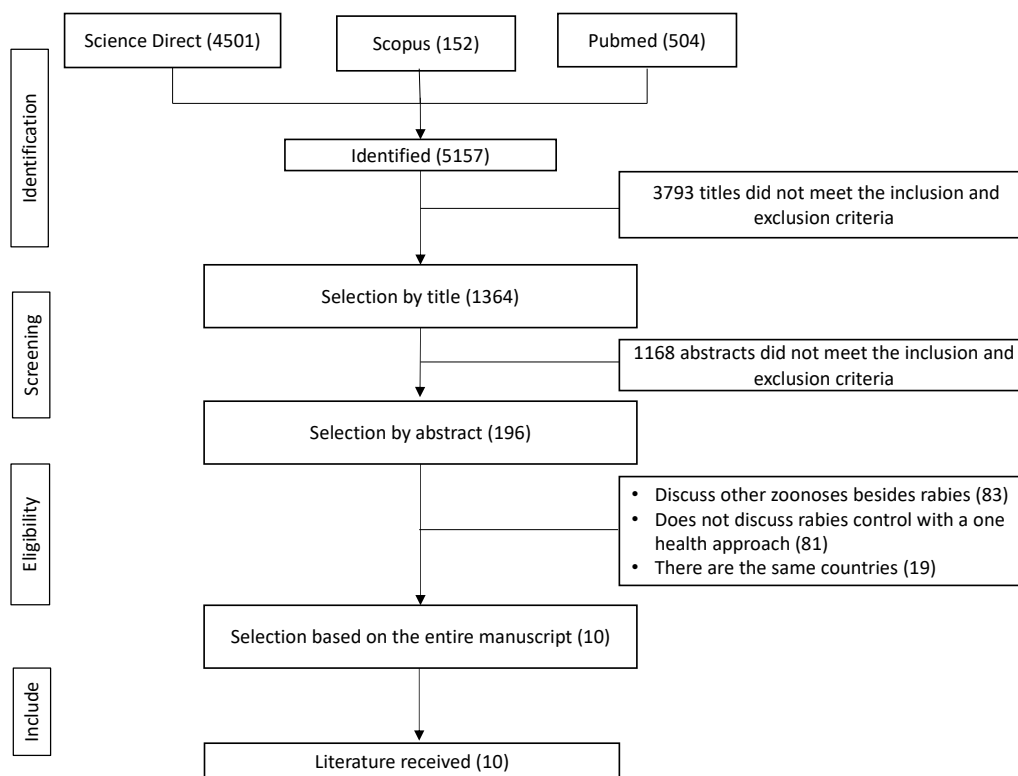


Figure 1. Literature Search Flow

RESULTS

Based on the results of literature searches with keywords Control, One Health Approach, and Rabies, screening is done again according to the predetermined inclusion criteria and the publication time range of 2012–2022, until 10 journals are found that are suitable for further review. The results of the critical review of articles in this study were then extracted to provide a brief review using a table that includes the author's name, article title, country of research, and research results.

Table 1. Literature search results

No	Author	Article Title	Country	Implementation
1	(Kanankege et al., 2022)	Identifying high-risk areas for dog-mediated rabies using Bayesian spatial regression	Thailand	<ul style="list-style-type: none"> <li>- Rabies diagnostic services are offered by nine regional Livestock Development Department laboratories and one laboratory owned by the Queen Saovabha Memorial Institute. Trained veterinarians who are in charge of identifying, disclosing, and managing the disease are dispersed throughout the region</li> <li>- Encourage farmers and animal owners to report illness incidences via a smartphone application</li> <li>- An educational <i>campaign</i> conducted by the Thai government recommends reporting dog bites, treating wounds immediately afterward, seeking medical help for PEP in a timely manner, confining and monitoring suspected animals for 10 days if alive, and sending their carcasses to the nearest laboratory facility that meets the requirements for testing for rabies</li> </ul>
2	(Stankov S et al., 2021)	History of Rabies Incidence and Rabies Control in Serbia in Support of the Zero by	Serbia	<ul style="list-style-type: none"> <li>- The enactment of the "Law on Protection Against Livestock Infections and Measures for Control of These Infections," the imposition of high taxes on dogs kept solely as pets (as opposed to livestock keepers) in order to control the number</li> </ul>

		2030 Campaign to Eliminate Dog-Mediated Human Rabies		<ul style="list-style-type: none"> <li>of dogs, as well as the capture and culling of dogs, and the vaccination of dogs suspected of having rabies</li> <li>- Lead a long-term initiative to vaccinate foxes and other wild carnivores against rabies by oral vaccine, working with the Directorate of Veterinary Medicine to track the efficacy of vaccination programs</li> </ul>
3	(Acharya et al., 2020)	One-health approach: A best possible way to control rabies	Nepal	<ul style="list-style-type: none"> <li>- The Ministry of Health and Population of Nepal's Epidemiology and Disease Control Division has coordinated with governmental, nongovernmental, and private partner groups to carry out a number of measures to protect themselves, including crucial vaccination of dogs and cats, raising public awareness, and developing the skills of medical professionals</li> <li>- A widespread rabies vaccination effort, managed by the Department of Animal Husbandry Services' Animal Disease Investigation and Control Division, in conjunction with public education, dog and cat population control</li> <li>- Give human intradermal rabies vaccination programs a priority in order to reduce the expense of administering a complete PEP vaccination</li> </ul>
4	(Miao Faming et al., 2022)	Neglected challenges in the control of animal rabies in China	China	<ul style="list-style-type: none"> <li>- Dog registration and vaccination by a veterinarian.</li> <li>- Mass education and strict administration to reduce the population of unregistered dogs</li> <li>- Surveillance of non-RABV lyssaviruses (bats)</li> <li>- Development of a "harmonious society" with the basic principles of nature, society, and humanity</li> </ul>
5	(Andriamandimby et al., 2013)	Surveillance and control of rabies in La Reunion, Mayotte, and Madagascar	Reunion, Mayotte, Madagascar	<ul style="list-style-type: none"> <li>- In Mayotte and La Reunion The Ministry of Agriculture, the Ministry of Health, and their separate agencies conduct epidemiological monitoring for rabies in humans and animals. For every patient who has been exposed, clinicians do a risk assessment. Based on the bite type, epidemiological information, and general guidelines, they choose whether to provide PEP. A countrywide network of accredited antirabies medical institutions dispersed throughout the area provides primary healthcare management for individuals needing PEP.</li> <li>- In Madagascar, one national laboratory is authorized for the diagnosis of rabies. Rabies surveillance and notification is a national program spearheaded and approved by the Ministry of Health and the Madagascar Ethics Committee</li> </ul>
6	(Yale G et al., 2021)	Review of Oral Rabies Vaccination of Dogs and Its Application in India	India	ORV Campaign. Mass dog vaccination with 3 strategies: capture-vaccinate-release (CVR), tactical point (SP) and also door-to-door (DDV)
7	(Leon B et al., 2021)	Rabies in Costa Rica – Next Steps Towards Controlling Bat-Borne Rabies After its Elimination in Dogs	Costa Rica	<ul style="list-style-type: none"> <li>- Establishment of a national animal rabies monitoring and control program</li> <li>- Massive dog vaccination along the border of Costa Rica and Nicaragua</li> </ul>
8	(Cerne D et al., 2021)	The Successful Elimination of Sylvatic Rabies Using Oral Vaccination of Foxes in Slovenia	Slovenia	Effective collaboration between Slovenia's veterinary and human health services, as evidenced by the establishment and continuous enhancement of laboratory diagnostic capabilities for detecting the rabies virus and the tracking of the success of mandated dog vaccination programs, ORV programs, post-exposure prophylactic measures, and knowledge-raising initiatives

9	(Robardet E et al., 2016)	Rabies in the Baltic States: Decoding a Process of Control and Elimination	Baltic States (Estonia, Latvia, Lithuania)	<ul style="list-style-type: none"> <li>- Large-scale wildlife ORV campaigns in Estonia, Latvia, and Lithuania</li> <li>- The Lysvulpen and Fuchsoral vaccines are the two forms of vaccinations used in Latvia. Latvia assesses vaccination coverage in raccoon dogs and red foxes using two different ELISA equipment types: Bio-Rad and BioPro.</li> <li>- Rabies surveillance and ORV monitoring</li> </ul>
10	(Vega S et al., 2021)	Tackling the Threat of Rabies Reintroduction in Europe	Spanish	<ul style="list-style-type: none"> <li>- The three pillars of rabies prevention include expanding access to massive canine vaccinations, expanding public education and awareness, and expanding access to vaccines and other treatments.</li> <li>- A greater understanding of the import and trading of animals from endemic regions, as well as travel to and with pets.</li> <li>- Oral vaccine financing scheme</li> </ul>

Based on the table 1 above, the author chose journals that discussed Rabies control in each country. In Asia there are Thailand, China, Nepal and India, in Europe there are the Baltic States, Serbia, Spain and Slovenia, in America there is Costa Rica and in Africa there are the regions of La Reunion, Mayotte and Madagascar. Of the 10 journals, 2 journals specifically discuss oral vaccines in animals as an effective control to achieve the elimination of rabies. 8 other journals discuss the course of Rabies and how these countries control Rabies using the one health approach which is being and has been implemented in each country.

## DISCUSSION

Between 2005 and 2014, 24,919 animals throughout Europe particularly in the Baltics were diagnosed with rabies. Raccoon dogs and red foxes accounted for 70–80% of all positive instances that were discovered (about 35% of foxes and 48% of raccoon dogs in Estonia, 40% of foxes and 30% of raccoon dogs in Latvia, and 31% of foxes and 40% of raccoon dogs in Lithuania) (14). Almost the same as Serbia and Slovenia, enzootic fox rabies still exists on the territory of Serbia (an average of 192 laboratory-confirmed rabies cases annually in 2001–2006), between 1973 and 2013, red foxes served as the primary reservoir for the rabies virus that caused sylvatic rabies, which occasionally spread to domestic animals (15,16). Moreover, 113 occurrences of rabies in dogs of which 18 were stray dogs and two cases each in cats and horses were documented in Spain between 1978 and 2020, according to rabies surveillance statistics. 39 bats and one fox in Spain's wildlife were found to have rabies (4).

Oral rabies vaccination (ORV) campaigns were successfully implemented in a number of European nations with financial help from the European Union. The vaccine was given to foxes in the form of bait, and the disease eliminated vulpine rabies (17). The creation of ORV demonstrates the effectiveness of oral rabies vaccination for Serbian wildlife, which was marked by a rise in the use of vaccine baits and an increase in the vaccine's immunological response. Consequently, until 2018, there were fewer cases of rabies reported (16,18). In addition to regular monitoring for rabies in land animals, the Directorate of Veterinary Medicine of the Ministry of Agriculture, Forestry, and Water Management of the Republic of Serbia began conducting rabies examinations in bats in 2006. Not a single bat examined tested positive for lyssavirus; however, Serbia is still carrying out the Zero by 30 campaign from the WHO for the rabies elimination stage (19,20).

The eradication of sylvatic rabies in red foxes took place in Slovenia over the course of 31 years (59 ORV campaigns), although in other countries, sylvatic rabies was successfully eradicated by ORV in a mere three-year period. The geographic location, epidemiological state, and cross-border collaboration in ORV campaigns of each nation are important elements that influence when to eradicate rabies with ORV. The beginning of the ORV campaign in Croatia had a significant final impact on the achievement of rabies extermination in Slovenia, even though coordinated ORV efforts with neighboring nations including Austria, Hungary, and Italy started in Slovenia with the first ORV (21–23). Different epidemiological situations in Europe are the main risk factors for rabies, namely illegal animal imports, travel to endemic areas, differences in dog vaccination programs, and wildlife rabies. Although legislative measures to manage rabies have been put in place, stronger laws still need to be upheld in order to increase public awareness of the possible risk of rabies and stop the disease from spreading to European nations that are now free of the disease (24,25).

In Asia and Africa, dogs are the most important carriers of rabies (HPR). Regionally, the highest expenditure occurs in Asia (\$1.4 billion per year), reflecting the high demand for PEP in regions where dog rabies is not yet under control (Andriamandimby et al., 2013). The fundamental ideas of nature, society, and humanity are being utilized by China to create a "harmonious society," which can be used to prevent and control rabies (26). Similar to Thailand, in that it is pushing for the reporting of dog bites, prompt wound care following the bite, prompt medical attention for PEP, confine and watch suspected animals for ten days to verify that they are still alive and well, and send the body

parts to the nearer laboratory facility certified to run tests for rabies (27). In an effort to reduce the expense of administering a full PEP immunization, the Nepalese government gave priority to a human intradermal rabies vaccination program in 2019. Through the one health approach, the steps implemented in Nepal include systematic data collection and compilation, coordination and data exchange between animal, human, and environmental health sectors, efficient and effective monitoring, increasing awareness, and strengthening laboratory capacity (5,28). While Bangladesh has a distinct framework for the control of infectious diseases based on an organized health strategy and an ambitious national health policy, India faces issues akin to those of Nepal (11,29).

For over 50 years, the oral rabies vaccination (ORV) has been a fundamental method of eradicating rabies viruses from wildlife species across the globe. It has been suggested for use in dogs for the past 30 years. Global organizations like WOA and WHO presently strongly advocate the operational evaluation of ORV in dogs in rabies-endemic environments as a supplement to parenteral therapies (30,31). Every year, over 10,000 dogs in the Goa region of India receive vaccinations through door-to-door (DD) and catch-vaccinate-release (CVR) programs, with a coverage rate of 70%. Goa had a decrease in canine rabies cases from 78 in 2017 to 4 in 2019, and a decrease in human cases from 17 in 2014 to 0 in 2018–2019 because to vaccinations with DD and CVR and awareness efforts (32,33).

In Latin America, vampire bats are the main cause of rabies in humans and animals, causing the death of unvaccinated livestock every year (6,34,35). The current management practice is to reduce bat populations; culling also reduces bite rates. Human bites can be reduced by using “bat-proof” houses to prevent mosquitoes from entering and by using mosquito nets to protect against bats in the house (19,36). More targeted control methods include capturing vampire bats and coating the animals with Vaseline containing an anticoagulant such as Warfarin. The bats are then released and, through joint care, spread an anticoagulant throughout the colony, causing the deaths of its members. The disadvantage of this approach is that it often includes other bat species that have been round-treated and destroyed. Rabies in vampire bats continues, and new strategies are needed that can successfully reduce the incidence of disease transmission without further extermination of bats (37).

## CONCLUSION

According to the explanation above, the use of ORVs in rabies control has the potential to allow for the rapid development of high-coverage operations to reach free-ranging reservoir populations in multiple nations. Fox rabies control techniques do not work against bats and may not work against raccoon dogs. This is because different baits are frequently necessary to entice various mammals to accept the vaccine-containing substance. Implementing One Health is one of the most promising approach toward controlling rabies and ensure community engagement and knowledge, with multisectoral support from government and non-governmental partners.

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## REFERENCES

1. Fooks AR, Banyard AC, Horton DL, Johnson N, McElhinney LM, Jackson AC. Current status of rabies and prospects for elimination. *Lancet*. 2014 Oct 11;384(9951):1389–99.
2. de Melo GD, Hellert J, Gupta R, Corti D, Bourhy H. Monoclonal antibodies against rabies: current uses in prophylaxis and in therapy. *Curr Opin Virol*. 2022 Apr;53:101204.
3. Davis BM, Rall GF, Schnell MJ. Everything You Always Wanted to Know About Rabies Virus (But Were Afraid to Ask). *Annu Rev Virol*. 2015 Nov;2(1):451–71.
4. Vega S, Lorenzo-Rebenaque L, Marin C, Domingo R, Fariñas F. Tackling the Threat of Rabies Reintroduction in Europe. *Front Vet Sci*. 2020;7:613712.
5. Acharya KP, Acharya N, Phuyal S, Upadhyaya M, Lasee S. One-health approach: A best possible way to control rabies. *One Health*. 2020 Dec;10:100161.
6. Kohl C, Kurth A. European bats as carriers of viruses with zoonotic potential. *Viruses*. 2014 Aug 13;6(8):3110–28.
7. Rupprecht CE, Mani RS, Mshelbwala PP, Recuenco SE, Ward MP. Rabies in the Tropics. *Curr Trop Med Rep*. 2022;9(1):28–39.
8. Steele SG, Toribio JA, Booy R, Mor SM. What makes an effective One Health clinical practitioner? Opinions of Australian One Health experts. *One Health [Internet]*. 2019;8. Available from: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85074145757&doi=10.1016%2fj.onehlt.2019.100108&partnerID=40&md5=5bf6943879ee920c06fe938abedfd9f7>
9. Savadogo M, Zangré H, Nana SD, Ilboudo AK, Dahourou LD, Ilboudo SG, et al. Adoption of the One Health approach to improve zoonosis control in low-income countries: Insights from the case of rabies management in Burkina Faso. *International Journal of One Health*. 2021;7(2):182–9.

10. Pantha S, Subedi D, Poudel U, Subedi S, Kaphle K, Dhakal S. Review of rabies in Nepal. *One Health*. 2020 Dec;10:100155.
11. Acharya KP, Subedi D, Wilson RT. Rabies control in South Asia requires a One Health approach. *One Health*. 2021 Jun;12:100215.
12. Baum SE, Machalaba C, Daszak P, Salerno RH, Karesh WB. Evaluating one health: Are we demonstrating effectiveness? *One Health*. 2017 Jun;3:5–10.
13. Duong V, Tarantola A, Ong S, Mey C, Choeung R, Ly S, et al. Laboratory diagnostics in dog-mediated rabies: an overview of performance and a proposed strategy for various settings. *Int J Infect Dis*. 2016 May;46:107–14.
14. Robardet E, Picard-Meyer E, Dobroštana M, Jaceviciene I, Mähar K, Muižniece Z, et al. Rabies in the Baltic States: Decoding a Process of Control and Elimination. *PLoS Negl Trop Dis*. 2016 Feb;10(2):e0004432.
15. Černe D, Hostnik P, Toplak I. The Successful Elimination of Sylvatic Rabies Using Oral Vaccination of Foxes in Slovenia. *Viruses*. 2021 Mar 4;13(3):405.
16. Stankov S, Lalošević D, Fooks AR. History of Rabies Incidence and Rabies Control in Serbia in Support of the Zero by 2030 Campaign to Eliminate Dog-Mediated Human Rabies. *Viruses*. 2021 Dec 31;14(1):75.
17. Stahl JP, Gautret P, Ribadeau-Dumas F, Strady C, Le Moal G, Souala F, et al. Update on human rabies in a dog- and fox-rabies-free country. *Med Mal Infect*. 2014 Jul;44(7):292–301.
18. Clark R, Taylor A, Garcia F, Krone T, Brown HE. Recognizing the Role of Skunks in Human and Animal Rabies Exposures in the Southwest. *Vector-Borne and Zoonotic Diseases*. 2015;15(8):494–501.
19. Calisher CH, Ellison JA. The other rabies viruses: The emergence and importance of lyssaviruses from bats and other vertebrates. *Travel Med Infect Dis*. 2012 Mar;10(2):69–79.
20. Shipley R, Wright E, Selden D, Wu G, Aegerter J, Fooks AR, et al. Bats and Viruses: Emergence of Novel Lyssaviruses and Association of Bats with Viral Zoonoses in the EU. *Trop Med Infect Dis*. 2019 Feb 7;4(1):31.
21. Canali M, Aragrande M, Angheben A, Capelli G, Drigo M, Gobbi F, et al. Epidemiologic-economic models and the One Health paradigm: echinococcosis and leishmaniasis, case studies in Veneto region, Northeastern Italy. *One Health [Internet]*. 2020;9. Available from: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85078306895&doi=10.1016%2fj.onehlt.2019.100115&partnerID=40&md5=1af954150604ab3ee73bdd59094a6c8f>
22. Finnegan CJ, Brookes SM, Johnson N, Smith J, Mansfield KL, Keene VL, et al. Rabies in North America and Europe. *J R Soc Med*. 2002 Jan;95(1):9–13.
23. Kung NY, Field HE, McLaughlin A, Edson D, Taylor M. Flying-foxes in the Australian urban environment—community attitudes and opinions. *One Health*. 2015 Dec;1:24–30.
24. Dundarova H, Ivanova-Aleksandrova N, Bednarikova S, Georgieva I, Kirov K, Miteva K, et al. Phylogeographic Aspects of Bat Lyssaviruses in Europe: A Review. *Pathogens*. 2023 Aug 27;12(9):1089.
25. Mahadevan A, Suja MS, Mani RS, Shankar SK. Perspectives in Diagnosis and Treatment of Rabies Viral Encephalitis: Insights from Pathogenesis. *Neurotherapeutics*. 2016 Jul;13(3):477–92.
26. Miao F, Li N, Yang J, Chen T, Liu Y, Zhang S, et al. Neglected challenges in the control of animal rabies in China. *One Health*. 2021 Jun;12:100212.
27. Kanankege KST, Errecaborde KM, Wiratsudakul A, Wongnak P, Yoopattananawong C, Thanapongtharm W, et al. Identifying high-risk areas for dog-mediated rabies using Bayesian spatial regression. *One Health*. 2022 Dec;15:100411.
28. Subedi D, Gautam A, Sapkota D, Subedi S, Sharma S, Abdulkareem M, et al. Knowledge and perception of veterinary students on One Health: A first nationwide multi-institutional survey in Nepal. *International Journal of One Health*. 2022;8(1):34–42.
29. Acharya KP, Karki S, Shrestha K, Kaphle K. One health approach in Nepal: Scope, opportunities and challenges. *One Health*. 2019 Dec;8:100101.
30. Maki J, Guiot AL, Aubert M, Brochier B, Cliquet F, Hanlon CA, et al. Oral vaccination of wildlife using a vaccinia-rabies-glycoprotein recombinant virus vaccine (RABORAL V-RG®): a global review. *Vet Res*. 2017 Sep 22;48(1):57.
31. Sparrow E, Torvaldsen S, Newall AT, Wood JG, Sheikh M, Kiény MP, et al. Recent advances in the development of monoclonal antibodies for rabies post exposure prophylaxis: A review of the current status of the clinical development pipeline. *Vaccine*. 2019 Oct 3;37 Suppl 1:A132–9.
32. Yale G, Lopes M, Isloor S, Head JR, Mazeri S, Gamble L, et al. Review of Oral Rabies Vaccination of Dogs and Its Application in India. *Viruses*. 2022 Jan 14;14(1):155.
33. Yasobant S, Bruchhausen W, Saxena D, Falkenberg T. One health collaboration for a resilient health system in India: Learnings from global initiatives. *One Health*. 2019 Dec;8:100096.
34. Benavides JA, Valderrama W, Recuenco S, Uieda W, Suzán G, Avila-Flores R, et al. Defining New Pathways to Manage the Ongoing Emergence of Bat Rabies in Latin America. *Viruses*. 2020 Sep 8;12(9):1002.
35. Palomares Velosa JE, Riaño Sánchez S, Martínez Marín A, Cediell Becerra NM. Prevention of exposure to zoonoses in rural Latin America: Social ecological factors in a diverse regional context. *One Health*. 2022 Dec;15:100444.
36. Vercauteren KC, Ellis C, Chipman R, DeLiberto TJ, Shwiff SA, Slate D. Rabies in North America: A Model of the One Health Approach. *Wildlife Diseases*. 2012;
37. Johnson N, Aréchiga-Ceballos N, Aguilar-Setien A. Vampire bat rabies: ecology, epidemiology and control. *Viruses*. 2014 Apr 29;6(5):1911–28.