



Combating rabies outbreaks in Vietnam: High time to enforce restrictions on dog meat farming, a key source of transmission

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ABSTRACT

In Vietnam, farming dogs for meat is not illegal but is increasingly marginalized as dog meat consumption comes under heightened social scrutiny. This loosely regulated practice likely increases the risk of rabies transmission to humans. At a time when human-wildlife conflict has become a major discussion point for global health, stray dogs escaping or being deliberately released from dog farms is a cause for serious concern. The first half of 2024 saw a significant spike in the incidence of human rabies cases, occurring in not just rural hot spots but also urban conurbations. Bites from rabid feral dogs are the primary source of infection, the distribution of which often clusters in the vicinity of battery farms or slaughterhouses that have recently downscaled or closed their business. Addressing this risk requires pursuing a One Health strategy that focuses on catching and euthanizing rabid dogs, vaccinating healthy dogs, implementing safety measures during dog slaughtering, and regulating dog meat trade. By robust enforcement of this comprehensive plan, it is hoped to prevent rabies outbreaks and protect public health. Hanoi is already taking the lead in introducing measures to avert a rabies crisis in the Vietnamese capital.

Introduction and background

Rabies is a zoonotic disease caused by a negative-sense, single-stranded RNA virus of the genus *Lyssavirus* (*Rhabdoviridae* family; Baltimore group V) that has an affinity to the central nervous system. The virus has a broad host range, with both domestic and wild animals providing environmental reservoirs of infection. It spreads via saliva, usually through bites, scratches, or direct contact with mucosa (e.g., eyes, mouth, or open wounds) [1]. The incubation period is usually 2–3 months, depending on viral entry location and load [2]. Rabies in humans begins with influenza-like symptoms like tiredness, myalgia, headache, and vomiting, then acute neurologic symptoms like wide eyes, agitation, frothing at the mouth, and fear of water, wind, and light, and finally, coma and death if untreated. Once clinical symptoms appear, rabies is almost always fatal. Yet, it is preventable through intradermal or intramuscular vaccination either prior to or immediately after exposure (post-exposure prophylaxis; PEP) [1,2].

Burden of rabies globally and in Vietnam

Rabies remains a global health threat, causing nearly 60,000 deaths annually, primarily in Asia [3]. Dogs are the main source of transmission

to humans, accounting for up to 99% of cases [4]. Although eradication is unlikely due to the prevalence of animal hosts, a One Health approach targeting both people and dogs is crucial for prevention [5]. Despite a long-available vaccine, rabies is underdiagnosed, underreported, and underfunded, especially in resource-limited areas where knowledge and testing capacity are limited [6,7]. Along with poor health care infrastructure, this leads to higher mortality rates in rural communities [8]. Most human infections result from bites by unvaccinated or unknown vaccination status dogs, highlighting the need for widespread dog vaccination [9]. Stray dogs are a major reservoir and vector, particularly in low-income countries in Africa and Asia [9,10], emphasizing the importance of dog-directed interventions in rabies control and prevention [11].

In Vietnam, rabies is endemic and enzootic. Patients with encephalitis from dog bites are rarely hospitalized; therefore, deaths may go unnoticed [12]. Approximately 100 Vietnamese die from rabies each year, and over 400,000 dog and cat bite cases must be vaccinated [13]. Notably, the first months of 2024 saw a widespread rise in dog attacks, especially in cities, and rabies cases, all of whom died [14]. This is long before rabies' peak season in August and September [13]. The Ministry of Health reported 44 human deaths from 102 rabies outbreaks in 29 provinces and cities in Vietnam as of May, a 30% increase from 2023.

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Spatial distribution of rabies in Vietnam

There are significant spatial patterns in the occurrence of rabies in Vietnam. Cases tend to cluster in specific geographic areas, often correlating with factors such as dog population density, vaccination coverage, and human interaction with stray dogs [15,16]. A systematic review highlighted that the incidence of rabies nationally ranged from 1.7 to 117.2 cases per 100,000 population, with an average of 429 cases reported monthly between 2011 and 2015 [16]. This suggests that certain regions experience higher rates of rabies, likely due to the presence of unvaccinated dog populations and inadequate public health interventions. Historic public health records show that most dog bite victims live in the Central or Northern Highlands, far from a government health facility, and may not seek treatment over concerns regarding the perceived cost.

Rabies transmission is heavily influenced by the movement of unvaccinated dogs and the density of stray dog populations [17]. Notably, Vietnam has a significant population of stray and unvaccinated dogs, especially in rural and remote regions where control measures to capture or limit the movement of animals are compromised by the challenging terrain. Some provinces reported only a 10% rate of vaccination of total dogs and cats [18]. Due to their ability to spread rabies to both humans and animals, stray dogs in Vietnam are more prone to cause rabies outbreaks [19]. Identifying rabies hotspots helps prioritize vaccination and public health measures. Investigating the spatial distribution of rabies incidents can help health authorities focus on vaccination and information programs to minimize the disease and protect public health.

Dog vaccination and rabies awareness campaigns in Vietnam

Vietnam has several rabies prevention and control programs. Foremost of these are mandatory dog vaccination programs. The government's national rabies control and prevention program, which was created after 1996 Directive No. 92/TTg to boost national rabies control, guides dog rabies legislation. This funds dog rabies vaccinations; however, it has been criticized as insufficient, especially in rural areas where the need is often greater [10]. The economic impact of canine rabies in Vietnam from 2005 to 2014 showed that dog immunization is much less expensive than human PEP [20]. These point to the fact that Vietnam must expand its financial commitment to dog vaccination programs to reach over 70% of at-risk dogs, mostly free-roaming ones, to eliminate rabies [20]. This would stop rabies transmission in a specific local community, safeguarding humans and animals.

Regarding awareness campaigns, health care workers and veterinarians receive rabies prevention and control training. This ensures stakeholders are well-informed and equipped to handle cases [6,15]. Public awareness campaigns on avoiding rabid animals and obtaining medical assistance, if exposed are crucial. Similarly, community outreach also tries to boost rabies awareness and vaccination rates [6]. In other countries, these campaigns are often supported by both government and international resources, recognizing the need for comprehensive rabies control. In Vietnam, a particular focus on ethnic minority groups from poor households in remote mountainous areas is required as these communities have difficulty receiving rabies information if not translated into their local language. The resulting reduced knowledge and awareness leads to less willingness to pay for dog vaccination, especially if financial resources are limited, consequently increasing rabies risk [6].

Cultural and socioeconomic factors impacting rabies in Vietnam

Dogs in Vietnamese society

In Vietnam, the relationship between people and dogs is complex, with dogs bred for multiple purposes encompassing cultural, economic, and social dimensions. Many households keep dogs as pets for companionship and emotional support, enhancing family life through loyalty



Figure 1. Caged dogs on a battery farm in Vietnam showing the cramped conditions in which animals intended for market or slaughterhouse are kept when transported (courtesy of Soi Dog Foundation, reproduced with permission. First published in: <https://asiatimes.com/2017/11/not-every-mans-best-friend-vietnam/>).

and social interaction, which also encourages physical activity among family members, especially children [21,22]. In addition, dogs serve as protectors of homes and livestock, particularly in rural areas, deterring intruders and providing security [23,24]. Culturally, in some regions of Vietnam, dogs hold cultural significance and are associated with traditional practices. Certain breeds may be raised for specific cultural events or rituals, reflecting the deep-rooted traditions surrounding dog ownership. Economically, the dog meat trade is a notable economic activity in Vietnam, where dogs are raised specifically for consumption [24]. This practice is controversial and has drawn criticism from animal rights groups, but it remains a part of the culinary culture in certain areas. The economic implications of this trade can be significant, providing income for farmers and vendors involved in the dog meat market. In addition, it is not uncommon for a companion, guard, or working dog to be slaughtered. In a community, households take turns to supply dogs for food [20]. Responsible ownership is crucial to mitigate health risks, particularly for a zoonotic disease like rabies.

Dog farming as a risk factor

The practice of slaughtering dogs for human consumption poses a potential risk for rabies transmission, as has been shown by studies in West Africa [25,26]. Therefore, when dogs are farmed for meat, the risk of rabies transmission to humans is increased. This applies particularly to those people handling dogs in what typically amounts to cramped battery farm conditions. The presence of rabies antigen in the brain tissues of dogs slaughtered for human consumption was recently recognized as a risk factor for potential rabies transmission [27]. Focusing on safety measures during dog trading and slaughtering in countries where dog meat consumption is customary is crucial for rabies control and prevention [15]. The lack of government policies regulating dog meat trade in wet markets can contribute to the potential for rabies outbreaks.

The true extent to which dog meat is eaten in Vietnam is not known, partly because people are not open to discussing this custom for fear of condemnation. Yet, the annual estimate of dogs killed to eat runs into millions [15,28]. Certainly, the general trend in recent years of growing meat consumption in the country implies that the demand for dog meat remains high [28]. Indeed, some large-scale farms regularly maintain 1,500 dogs in overcrowded conditions (Figure 1), collectively selling up to 4 tons of dog meat every month [29]. The cultural acceptance of dog meat in Vietnam further supports the notion that, despite being driven increasingly underground, dog meat consumption is still common.

Although vaccination campaigns are conducted sporadically [6], the primary focus has fallen on pet dogs that typically are co-domiciled with and cared for by their owners, with an almost total lack of interest being shown by industrial breeding facilities. There were instances when hundreds of dogs died due to infectious diseases, including rabies; still,

no vaccinations were administered to surviving animals on the affected farms [29]. Efforts have been made to perform a random sampling of dogs purchased wholesale immediately prior to their slaughter to determine the proportion with rabies [30]. Although this provides limited information on virus transmission epidemiology under battery farm conditions, it likely accelerates the slaughtering of those dogs identified to have rabies.

Socioeconomic factors associated with voluntary rabies control measures

Socioeconomic factors strongly influence public perception toward non-mandatory rabies control measures, affecting vaccination campaigns and rabies management. Cultural perspectives, particularly in rural areas where dogs are often viewed as “watch” or “guard” dogs rather than pets, can influence vaccination motivation [6]. Financial constraints also pose a significant barrier, as many families, especially in rural areas with limited resources, may prioritize basic needs over pet immunization [31]. This can lead to lower vaccination rates and increased rabies risk. Furthermore, access to veterinary services is often limited in rural communities, creating disparities in rabies prevention compared with urban areas with greater access to health care facilities [31]. Educational levels also influence rabies awareness, with higher education correlating with better knowledge of prevention strategies [6].

Government policies and funding for vaccination programs are essential for expanding the reach and success of rabies control initiatives [32]. Critically, community engagement is vital, as programs that actively involve local populations, particularly by leveraging the influence of community leaders and local networks, have proven more effective in increasing vaccination participation and knowledge [33]. Addressing these socioeconomic determinants through targeted interventions and educational initiatives is crucial to improving rabies management and reducing disease incidence in Vietnam.

Focus on dog farming: a major public health threat in Vietnam

In seeking to address the impact of dog farming on the issue of rabies control in these contexts, there are several key challenges to consider. First, Vietnam lacks regulations regarding rearing dogs for meat. Canids, including domesticated dogs, are not considered livestock and, therefore, are not included under the Veterinary Husbandry Law. This makes it difficult to control their breeding, transportation, and slaughter. However, attempts are being made in other Asian countries with substantial dog meat consumption. Notably, in January 2024, the National Assembly of South Korea banned the breeding and slaughter of dogs for consumption, starting in 2027, following a 3-year grace period. In Vietnam, if such a policy were to be enacted knock-on issues in disease control and enforcement would be anticipated. Currently, authorities struggle to track the number and condition of dogs kept on smallholder farms due to a lack of cooperation by owners, while commercial dog farms refuse to vaccinate their animals, each of which raises the risk of rabies outbreaks [16].

Second, the improper waste management of slaughtered dog carcasses is also a matter of concern. Municipal solid waste is known to be a determinant in controlling canine rabies [34]. Battery dog farms generate large volumes of waste, which local authorities lack the technology, facilities, and framework to handle, thereby exacerbating the risk of cross-infection if there is a case of rabies on a farm. Although rabies is transmitted primarily through the saliva of infected animals, their bodily fluids may accumulate in the surrounding environment, including waste products that could attract other animals, such as stray dogs or wildlife. These animals may come into contact with contaminated feces or urine, leading to potential exposure to the virus [34].

Third, inconsistent slaughter practices also provide the potential for rabies transmission [16]. Unlike the slaughtering of pigs, which is legally required to take place under controlled conditions, dog slaughter is unlicensed and unregulated, raising concerns about hygiene and humane

treatment. To ensure the effectiveness of his recent directive to combat rabies, Prime Minister Phạm Minh Chính of Vietnam is being urged to take immediate action to stop the annual trafficking and slaughter of 6 million dogs and cats for their meat. Humane Society International has warned that the country’s dog and cat meat exports will irreversibly undermine provincial authorities’ efforts to increase canine vaccination rates [35].

One Health approach to intervention

As a member of the Association of Southeast Asian Nations (ASEAN), Vietnam follows the ASEAN Rabies Elimination Strategy (ARES) that was established in 2014 with an initial goal of eliminating rabies by 2020. This was subsequently revised in line with a global strategic plan to end human deaths from dog-mediated rabies by 2030 [36]. Despite considerable progress, rabies remains a significant public health issue in the ASEAN region. There is an imperative for high-level collaboration between agencies operating within three different branches of the Vietnamese government to achieve an effective national rabies control program involving the Ministry of Health (population awareness, education, and PEP in humans), the Ministry of Agriculture and Rural Development (veterinary services for mass vaccination of dogs and surveillance or monitoring programs in wild animals), and the Ministry of Home Affairs (dog population management and landfill management).

Nationally, Vietnam’s rabies control efforts are guided by a One Health framework, emphasizing collaboration between human, animal, and environmental health sectors [15,19]. This approach is evident in the response to recent outbreaks, where health authorities, veterinary services, and local communities work together on surveillance, rapid response, and public education. This integrated strategy includes active monitoring and quarantine of suspected rabid animals, vaccination drives, health care worker training, and ensuring access to rabies vaccines and human rabies immunoglobulin [37]. In high-risk municipalities, preventive and control measures may be as direct as knocking “door-to-door” to vaccinate pet dogs on the spot, along with responsible dog ownership initiatives and stray dog management [38], including those originating from farms. Public awareness is heightened through risk communication strategies, utilizing social media and community engagement to educate residents about rabies prevention and encourage prompt reporting of potential exposures [38].

Following this, the authorities of capital Hanoi are taking a multi-faceted approach to eliminate the dog meat trade in the city [39]. Key components of this initiative include:

- **Strict enforcement:** Illegal trading, transportation, slaughter, and sale of dogs will be monitored and fined, with mobile inspection teams deployed to intercept live dog transport;
- **Increased vaccination:** Authorities aim to achieve a companion dog rabies vaccination rate above 90% through coordinated efforts between veterinary services and health officials; and
- **Public awareness:** Extensive campaigns will utilize mass media to educate the public about rabies, responsible pet ownership, and the risks associated with dog meat consumption.

This comprehensive strategy reflects a commitment to safeguarding public health and shifting cultural norms around dog meat consumption in Hanoi. The historic presence of rabies in slaughterhouse dogs underscores the urgency of these measures [15].

Plotting a way forward

Farming dogs for meat is still legal in Vietnam [35]. However, there has been a recent crackdown by a national government that is mindful to balance public opinion at home and abroad. Although currently, this stops short of criminalizing the practice, it is increasingly marginalized. Farms are no longer licensed to breed and sell dogs in bulk commercially, and no municipality will now allow authorized slaughterhouses

to kill dogs. An unforeseen consequence of this tightening of attitude appears to be to make dog farming more clandestine. Moreover, some farms going out of business might inadvertently have led to the deliberate release or abandonment of probably hungry, aggressive, and potentially rabid feral animals. Is this now linked to the increase in rabies cases nationwide?

The current surge in reported rabies cases in Vietnam serves as a reminder to exercise extreme caution when encountering stray dogs, including avoiding attempting to handle an animal displaying any of the signs of rabies infection. Importantly, it also highlights the culturally sensitive issue of dog meat farming as a contributing factor in tackling the disease at its primary source, infected dogs, and may help to explain the slow progress towards achieving zero rabies cases in the country. The recently announced initiative by Hanoi authorities to restrict the dog meat trade aligns with broader principles of public health interventions. By addressing rabies risks associated with dog farming, Hanoi is taking a proactive stance to safeguard the well-being of its residents and promoting ethical practices in line with contemporary global standards.

Conclusion

In summary, primarily drawing on qualitative descriptors from authoritative new reports and official sources, we raise awareness of the rabies crisis in Vietnam. We highlight the specific challenges encountered in the region and offer recommendations predicated on preventive and control measures that have met with success in other countries. In particular, we advocate for the adoption of a One Health strategy based on quantitative epidemiological data that would illustrate the temporal and spatial threat to individual health and public health safety posed by this globally prevalent disease.

Declarations of competing interest

The authors have no competing interests to declare.

CRediT authorship contribution statement

Nguyen Khoi Quan: Data curation, Formal analysis, Writing – review & editing. **Andrew W. Taylor-Robinson:** Conceptualization, Data curation, Formal analysis, Writing – original draft, Writing – review & editing.

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Data availability statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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