

PERSPECTIVE OPEN ACCESS

Bushmeat Consumption and the Risk of Zoonotic Tick-Borne Pathogen Infections in Ghana: An Increasing Risk to Public Health

Christopher Nii Laryea Tawiah-Mensah | Danielle Ladzekpo | Seth Offei Addo 

Parasitology Department, Noguchi Memorial Institute for Medical Research, University of Ghana, Accra, Ghana

Correspondence: Seth Offei Addo (sethaddo40@gmail.com)

Received: 31 March 2025 | **Revised:** 29 May 2025 | **Accepted:** 21 July 2025

Funding: The authors received no specific funding for this work.

Keywords: bushmeat | Ghana | public health | ticks | zoonoses

ABSTRACT

Consuming bushmeat is a widely accepted tradition in Ghana and other West African countries, where it is a vital source of income and protein for many rural populations. However, there are considerable risks associated with this behavior, especially when it comes to zoonotic tick-borne infections. Zoonotic tick-borne pathogens are common in wildlife and can spread to people when they handle or eat inadequately prepared bushmeat. This article addresses the growing threat of zoonotic tick-borne infections associated with consuming bushmeat in Ghana, which is made worse by factors including deforestation, climate change, and more frequent interactions between people and wildlife. Public health risks are heightened due to limited knowledge and awareness of tick-borne infections and inadequate food safety standards, particularly in rural areas where consuming bushmeat is widespread. To mitigate the risks of zoonotic tick-borne pathogen transmission, this perspective advocates for urgent public health interventions, including stricter regulations on bushmeat handling and sales, enhanced wildlife surveillance, and increased public health education on the dangers of zoonotic diseases.

1 | Introduction

Majority of emerging human pathogens are zoonotic, meaning they spread from animal to human and vice versa [1]. It has been reported that almost two-thirds of emerging infectious diseases are caused by zoonoses, and most zoonoses originate from wildlife [2]. Furthermore, it has been suggested that human-wildlife interactions are increasing due to habitat fragmentation and deforestation, which heightens the likelihood of zoonotic pathogens infecting human populations [3]. Despite the risk posed by interactions with wildlife, bushmeat, which is the meat of wild animals hunted for food, remains a popular food source in many West African communities, where they are considered a delicacy [4]. In addition to being a vital source

of nutrition, particularly in rural regions [5], the bushmeat trade exposes individuals to zoonotic infections through frequent interaction with wildlife [6]. Zoonotic tick-borne pathogens can spill over from wildlife to human populations through the trade and consumption of bushmeat. The majority of ticks are ectoparasites of wild animals, with about 10% of tick species feeding on domestic animals [7]. Wild animals are important reservoirs for numerous tick-borne pathogens, serving as a source of infection for domestic animals and humans through tick infestation [8]. When skinning and slaughtering wild animals, hunters and traders sometimes come into close contact with ticks and could become infected with zoonotic pathogens [9]. Furthermore, after dropping off wildlife, ticks can bite people or infest domestic animals, potentially transmitting zoonotic

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2025 The Author(s). *Public Health Challenges* published by John Wiley & Sons Ltd.

pathogens [7]. In Ghana, tick species have been reported to infest various wild animals [10, 11]. It is important to note that some of these tick species, including *Amblyomma variegatum* and *Rhipicephalus sanguineus*, have been reported to infest livestock, especially cattle. *A. variegatum* is the predominant tick species infesting cattle in Ghana, and this species has been identified to harbor zoonotic pathogens, including *Rickettsia africae*, *Coxiella burnetii*, and Crimean–Congo hemorrhagic fever virus (CCHFV) [12–14]. Because cattle are often sent out to graze, there is an increased chance of interactions with wild animals, leading to the exchange of ticks and tick-borne pathogens. This is more so as a study in Ghana has reported cattle to be infected with the zoonotic pathogen *Anaplasma capra* [15], which infects humans, livestock, and wild animals worldwide [16–18]. Grasscutter, a large rodent that is frequently hunted and sold in Ghanaian bushmeat markets, is also host to tick-borne pathogens [19]. A study has reported *Ixodes aulacodi* infesting sampled grasscutters to be infected with parasites and bacteria [20]. Because *I. aulacodi* is a vector for zoonotic tick-borne pathogens, there is an increased risk of transmission, especially because efforts have been made to breed grasscutter populations locally using wild-caught ones [21]. In Ghana, there is limited knowledge of the role of wild animals in the spread of ticks and zoonotic tick-borne pathogens. With the increasing demand for bushmeat [22], there is an increased risk to public health and a need to adopt preventive measures. This article examines how the consumption of bushmeat contributes to the spread of zoonotic tick-borne pathogens in Ghana, looks at the consequences for public health, and offers solutions to lower this rising risk.

1.1 | Bushmeat and the Risk of Zoonotic Tick-Borne Pathogens in Ghana

Due to the migratory patterns of wildlife, wild animals are responsible for the transmission of numerous zoonotic pathogens both domestically and internationally [23]. Tick exposure can occur when hunters or consumers handle wildlife carcasses, and pathogens can persist on the meat when inappropriate cooking methods are used. As a result of habitat encroachment and the need for bushmeat, human-wildlife interaction has risen, increasing the risk of zoonotic spillovers [24], including zoonotic tick-borne pathogens [25]. In various Ghanaian communities, bushmeat has a significant socioeconomic impact. Bushmeat sales occur on the side of the road, frequently in erratic locations, and include a dynamic, mobile, and opportunistic vendor presence. Although hunters are usually found in rural areas, they are increasingly serving urban consumers who can pay higher costs and make stops along highways to acquire animals [26]. Nevertheless, bushmeat preparation and processing are frequently carried out in unregulated environments. Wild animals often consumed as bushmeat in Ghana include, but are not limited to, grasscutter, African giant rat, African civet, bushbuck, red-flanked duiker, African brush-tailed porcupine, and royal antelope [10]. It is important to note that wild animals consumed as bushmeat in Ghana have been found infested with diverse tick species [10]. Some of these tick species have been reported to infest livestock and harbor zoonotic pathogens [12, 13, 27, 28]. Because livestock and wild animals in Ghana are infested with similar tick species, there is an increased likelihood of zoonotic pathogen exchange and risk to public health (Figure 1).

1.2 | Contributing Factors to Increased Risk

In Ghana, land-use changes and deforestation have changed wildlife habitats, causing animals to seek food and shelter closer to human settlements. Human-wildlife-livestock interactions are more common as a result of this habitat overlap. Wildlife displacement and ecosystem disruption have been caused by mining operations, agricultural development, and forest fragmentation [29, 30]. Consequently, ticks that were once confined to wildlife zones now have closer contact with humans and livestock, increasing the risk of zoonotic pathogen transmission. Another significant factor is climate change. The geographic distribution and life cycle of ticks are changing due to climate change, which allows them to thrive in new locations [31, 32]. The lengthening of the tick-breeding season due to warmer temperatures and altered rainfall patterns is raising the possibility of human-tick interactions [33]. Because it raises the risk of zoonotic tick-borne pathogen transmission, this condition is especially worrisome in Ghana's bushmeat-eating regions. Cultural practices and food security also influence the risk of zoonotic tick-borne pathogen infections. Bushmeat consumption has been incorporated into the traditional customs of many Ghanaian communities. However, unsustainable hunting methods and heightened exposure to zoonotic infections have resulted from the growing demand for bushmeat, which has been made worse by food instability in rural areas. Food safety procedures are usually insufficient to stop transmission, and hunters and consumers are typically unaware of the health risks associated with ticks and tick-borne pathogens [34].

1.3 | Public Health Implications

In Ghana, eating bushmeat poses serious health risks, especially when it comes to zoonotic tick-borne pathogens. In remote regions with little access to medical care, zoonotic disease epidemics can have catastrophic consequences for local populations. Failure to implement proper precautions during bushmeat handling could result in undetected zoonotic infections and untreated cases of tick-borne diseases. It is challenging to determine the complete scope of the public health threat caused by zoonotic infections due to the absence of thorough epidemiological data and the underreporting of tick-borne diseases [35]. This problem calls for an integrated approach that incorporates community education, wildlife conservation initiatives, and public health interventions.

1.4 | Strategies for Risk Mitigation

Reducing the negative effects of bushmeat consumption on public health requires increasing knowledge of the dangers of zoonotic tick-borne infections. Education campaigns should focus on rural areas, stressing the dangers of tick bites and the significance of using safe methods for handling and cooking bushmeat [36, 37]. Programs for monitoring wildlife and vectors must be strengthened to discover zoonotic tick-borne infections early. Areas at high risk of transmission can be identified with the aid of routine monitoring of tick vectors and wildlife populations. Additionally, more efficient tracking of zoonotic disease outbreaks will be possible with the establishment of integrated

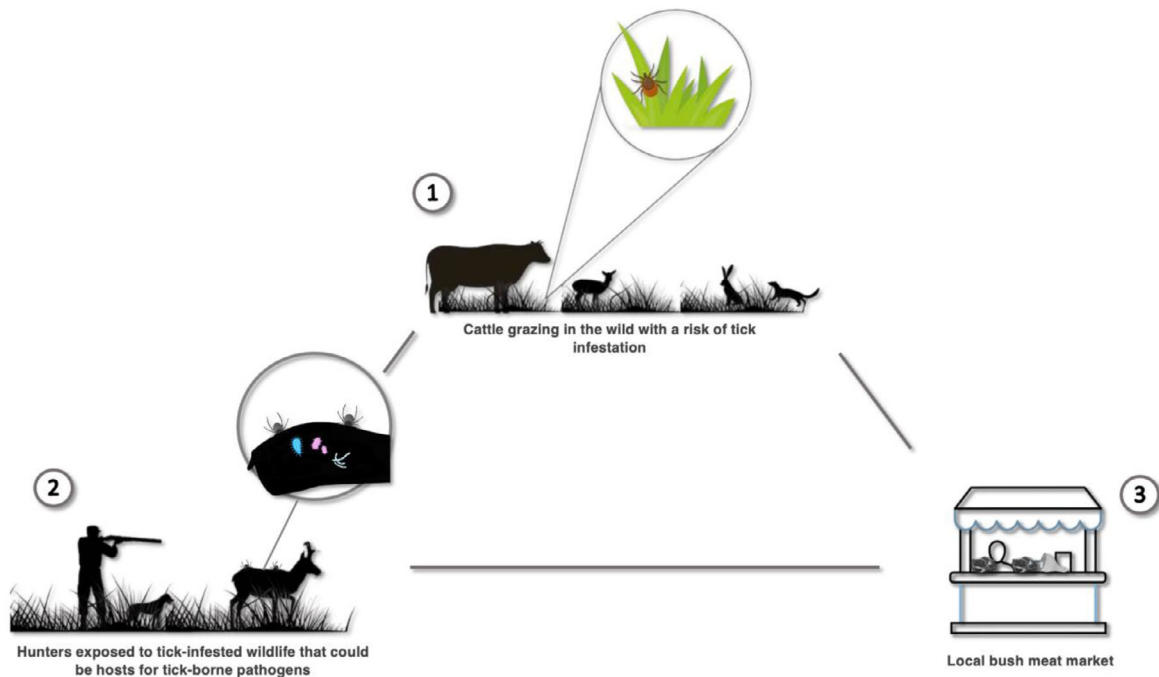


FIGURE 1 | An illustrative view of human-wildlife-livestock interaction. (1) Transhumance, the most common method of cattle farming in Ghana, exposes grazing cattle to tick infestation in the wild. (2) During hunting, hunters are exposed to tick bites, and the wild animals they gun down may serve as hosts for tick-borne pathogens. (3) Bush meat is often undercooked in the bush before being sold to the local bush markets.

surveillance systems that connect data on human and animal health [38]. Reducing dependence on bushmeat as the main food source and encouraging sustainable hunting methods can help lower the risk of zoonotic infection. The demand for bushmeat and interactions between people and wildlife can be decreased by promoting the creation of alternate sources of income for hunters and assisting with agricultural methods that improve food security. These alternate sources can include activities that give a steady income and lessen dependency on hunting, such as growing cash crops like cocoa, rearing and domesticating desirable animal species, and aquaculture [39]. To reduce direct contact with ticks and diseased wildlife, laws controlling the hunting, trading, and consumption of bushmeat should also be tightened. The risk of zoonotic infections can be considerably decreased by wearing protective gear when hunting and by using safe bushmeat preparation methods. Lastly, to detect and control emerging zoonotic diseases in Ghana, funding for research on tick-borne pathogens and the creation of diagnostic tools would be essential.

2 | Conclusion

Consuming bushmeat is a significant aspect of Ghanaian culture and the local economy. However, it also poses an increasing concern to public health since it may spread zoonotic tick-borne pathogens. The probability of zoonotic infections is increasing along with the frequency of human-wildlife-tick contacts due to habitat encroachment and environmental changes. Mitigating the risk of zoonotic tick-borne pathogens in Ghana requires strengthened public health measures, including enhanced wildlife monitoring, targeted education programs, and stricter regulatory enforcement. These initiatives are essential to

safeguard the health of people and animals as the demand for bushmeat rises.

Author Contributions

Christopher Nii Laryea Tawiah-Mensah: investigation, writing – review and editing. **Danielle Ladzekpo:** investigation, writing – review and editing. **Seth Offei Addo:** conceptualization, writing – original draft, investigation.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

No new data were generated for this article.

References

1. L. H. Taylor, S. M. Latham, and M. E. J. Woolhouse, “Risk Factors for Human Disease Emergence,” *Philosophical Transactions of the Royal Society B: Biological Sciences* 356, no. 1411 (2001): 983–989, <https://doi.org/10.1098/rstb.2001.0888>.
2. K. E. Jones, N. G. Patel, M. A. Levy, et al., “Global Trends in Emerging Infectious Diseases,” *Nature* 451, no. 7181 (2008): 990–993, <https://doi.org/10.1038/nature06536>.
3. K. A. Murray, N. Preston, T. Allen, C. Zambrana-Torrel, P. R. Hosseini, and P. Daszak, “Global Biogeography of Human Infectious Diseases,” *Proceedings of the National Academy of Sciences of the United States of America* 112, no. 41 (2015): 12746–12751, <https://doi.org/10.1073/pnas.1507442112>.

4. L. Luiselli, E. M. Hema, G. H. Segniabeto, et al., "Bushmeat Consumption in Large Urban Centres in West Africa," *ORYX* 54, no. 5 (2020): 731–734, <https://doi.org/10.1017/S0030605318000893>.
5. J. S. Brashares, C. D. Golden, K. Z. Weinbaum, C. B. Barrett, and G. V. Okello, "Economic and Geographic Drivers of Wildlife Consumption in Rural Africa," *Proceedings of the National Academy of Sciences of the United States of America* 108, no. 34 (2011): 13931–13936, <https://doi.org/10.1073/pnas.1011526108>.
6. S. Friant, S. B. Paige, and T. L. Goldberg, "Drivers of Bushmeat Hunting and Perceptions of Zoonoses in Nigerian Hunting Communities," *PLoS Neglected Tropical Diseases* 9, no. 5 (2015): e0003792, <https://doi.org/10.1371/journal.pntd.0003792>.
7. F. Jongejan and G. Uilenberg, "The Global Importance of Ticks," *Parasitology* 129 Suppl (2004): S3–S14.
8. D. R. Liyanaarachchi, R. S. Rajakaruna, A. W. Dikkumbura, and R. P. V. J. Rajapakse, "Ticks Infesting Wild and Domestic Animals and Humans of Sri Lanka With New Host Records," *Acta Tropica* 142 (2015): 64–70, <https://doi.org/10.1016/j.actatropica.2014.11.001>.
9. N. D. Wolfe, P. Daszak, A. M. Kilpatrick, and D. S. Burke, "Bushmeat Hunting, Deforestation, and Prediction of Zoonotic Disease," *Emerging Infectious Diseases* 11, no. 12 (2005): 1822–1827, <https://doi.org/10.3201/eid1112.040789>.
10. Y. Ntiama-Baidu, C. Carr-Saunders, B. E. Matthews, P. M. Preston, and A. R. Walker, "An Updated List of the Ticks of Ghana and an Assessment of the Distribution of the Ticks of Ghanaian Wild Mammals in Different Vegetation Zones," *Bulletin of Entomological Research* 94, no. 3 (2004): 245–260, <https://doi.org/10.1079/ber2004302>.
11. Y. Ntiama-Baidu, C. Carr-Saunders, B. E. Trueman, P. M. Preston, and A. R. Walker, "Ticks Associated With Wild Mammals in Ghana," *Bulletin of Entomological Research* 95, no. 03 (2005): 205–219, <https://doi.org/10.1079/BER2004352>.
12. S. O. Addo, R. E. Bentil, C. A. Addae, et al., "Molecular Identification of Crimean-Congo Haemorrhagic Fever Virus in Hyalomma Rufipes and Amblyomma variegatum in the Upper East Region of Ghana," *Archives of Virology* 169, no. 3 (2024): 62, <https://doi.org/10.1007/s00705-024-05983-y>.
13. S. O. Addo, R. E. Bentil, B. O. A. Baako, et al., "Occurrence of Rickettsia spp. And Coxiella burnetii in Ixodid Ticks in Kassena-Nankana, Ghana," *Experimental and Applied Acarology* 90, no. 1–2 (2023): 137–153, <https://doi.org/10.1007/s10493-023-00808-0>.
14. S. Amoah, N. M. Unicorn, E. T. Kyeremateng, et al., "Ticks and Tick-Borne Pathogens in Selected Abattoirs and a Slaughter Slab in Kumasi, Ghana," *Veterinary Medicine and Science* 10, no. 5 (2024): e70030, <https://doi.org/10.1002/vms3.70030>.
15. S. O. Addo, R. E. Bentil, K. N. Yartey, et al., "First Molecular Identification of Multiple Tick-Borne Pathogens in Livestock Within Kassena-Nankana, Ghana," *Animal Diseases* 3, no. 1 (2023), <https://doi.org/10.1186/s44149-022-00064-6>.
16. S. Amer, S. Kim, Y. Yun, and K. J. Na, "Novel Variants of the Newly Emerged Anaplasma capra From Korean Water Deer (Hydropotes inermis argyropus) in South Korea," *Parasites and Vectors* 12, no. 1 (2019): 1–9, <https://doi.org/10.1186/s13071-019-3622-5>.
17. H. Li, Y. C. Zheng, L. Ma, et al., "Human Infection With a Novel Tick-Borne Anaplasma Species in China: A Surveillance Study," *Lancet Infectious Diseases* 15, no. 6 (2015): 663–670, [https://doi.org/10.1016/S1473-3099\(15\)70051-4](https://doi.org/10.1016/S1473-3099(15)70051-4).
18. Y. Peng, K. Wang, S. Zhao, et al., "Detection and Phylogenetic Characterization of Anaplasma capra: An Emerging Pathogen in Sheep and Goats in China," *Frontiers in Cellular and Infection Microbiology* 8 (2018): 1–7, <https://doi.org/10.3389/fcimb.2018.00283>.
19. G. Cowlshaw, S. Mendelson, and J. M. Rowcliffe, "Structure and Operation of a Bushmeat Commodity Chain in Southwestern Ghana," *Conservation Biology* 19, no. 1 (2005): 139–149, <https://doi.org/10.1111/j.1523-1739.2005.00170.x>.
20. C. Adenyo, K. Ohya, Y. Qiu, et al., "Bacterial and Protozoan Pathogens/Symbionts in Ticks Infecting Wild Grasscutters (Thryonomys swinderianus) in Ghana," *Acta Tropica* 205 (2020): 105388, <https://doi.org/10.1016/j.actatropica.2020.105388>.
21. C. Adenyo, R. Ogden, B. Kayang, M. Onuma, N. Nakajima, and M. Inoue-Murayama, "Genome-Wide DNA Markers to Support Genetic Management for Domestication and Commercial Production in a Large Rodent, the Ghanaian Grasscutter (Thryonomys swinderianus)," *Animal Genetics* 48, no. 1 (2017): 113–115, <https://doi.org/10.1111/age.12478>.
22. J. McNamara, J. E. Fa, and Y. Ntiama-Baidu, "Understanding Drivers of Urban Bushmeat Demand in a Ghanaian Market," *Biological Conservation* 239 (2019): 108291, <https://doi.org/10.1016/j.biocon.2019.108291>.
23. H. Chai, Q. Liu, N. N. Gaudreault, and W. Zhang, "Editorial: Zoonotic Diseases Originating From Wildlife: Emergence/Re-Emergence, Evolution, Prevalence, Pathogenesis, Prevention, and Treatment," *Frontiers in Microbiology* 14 (2023): 1165365, <https://doi.org/10.3389/fmicb.2023.1165365>.
24. C. Milbank and B. Vira, "Wildmeat Consumption and Zoonotic Spillover: Contextualising Disease Emergence and Policy Responses," *Lancet Planetary Health* 6, no. 5 (2022): e439–e448, [https://doi.org/10.1016/S2542-5196\(22\)00064-X](https://doi.org/10.1016/S2542-5196(22)00064-X).
25. L. A. Kurpiers, B. Schulte-Herbrüggen, I. Ejotre, and D. A. M. Reeder, "Bushmeat and Emerging Infectious Diseases: Lessons From Africa," in *Problematic Wildlife: A Cross-Disciplinary Approach* (Springer International Publishing, 2015), 507–551, https://doi.org/10.1007/978-3-319-22246-2_24.
26. H. N. K. Sackey, J. McNamara, E. J. Milner-Gulland, and Y. Ntiama-Baidu, "The Bushmeat Trade in Northern Ghana: Market Dynamics, Drivers of Trade and Implications for Conservation," *ORYX* 57, no. 2 (2023): 216–227, <https://doi.org/10.1017/S0030605322000096>.
27. S. O. Addo, B. O. A. Baako, R. E. Bentil, et al., "Molecular Survey of Anaplasma and Ehrlichia Species in Livestock Ticks From Kassena-Nankana, Ghana; With a First Report of Anaplasma capra and Ehrlichia minasensis," *Archives of Microbiology* 205, no. 3 (2023): 92, <https://doi.org/10.1007/s00203-023-03430-1>.
28. S. O. Addo, R. E. Bentil, B. O. A. Baako, et al., "First Record of Babesia and Theileria Parasites in Ticks From Kassena-Nankana, Ghana," *Medical and Veterinary Entomology* 37, no. 4 (2023): 878–882, <https://doi.org/10.1111/mve.12688>.
29. S. Kumi, P. Addo-Fordjour, B. Fei-Baffoe, A. O. Adjapong, and F. B. Asamoah, "Dynamic Influence of Mining-Induced Land Use Land Cover Changes on Avifauna Community Over a Mining Landscape, Ghana," *Trees, Forests and People* 15 (2024): 100515, <https://doi.org/10.1016/j.tfp.2024.100515>.
30. S. Ma, L. J. Wang, J. Jiang, and Y. G. Zhao, "Direct and Indirect Effects of Agricultural Expansion and Landscape Fragmentation Processes on Natural Habitats," *Agriculture, Ecosystems and Environment* 353 (2023): 108555, <https://doi.org/10.1016/j.agee.2023.108555>.
31. P. A. Nuttall, "Climate Change Impacts on Ticks and Tick-Borne Infections," *Biologia* 77, no. 6 (2021): 1503–1512, <https://doi.org/10.1007/S11756-021-00927-2>.
32. M. Sánchez Pérez, T. P. Ferial Arroyo, C. S. Venegas Barrera, et al., "Predicting the Impact of Climate Change on the Distribution of Rhipicephalus sanguineus in the Americas," *Sustainability (Switzerland)* 15, no. 5 (2023): 4557, <https://doi.org/10.3390/su15054557>.
33. A. Estrada-Peña and M. Salman, "Current Limitations in the Control and Spread of Ticks That Affect Livestock: A Review," *Agriculture* 3, no. 2 (2013): 221–235, <https://doi.org/10.3390/agriculture3020221>.
34. J. de la Fuente, A. Estrada-Peña, M. Rafael, et al., "Perception of Ticks and Tick-Borne Diseases Worldwide," *Pathogens* 12, no. 10 (2023): 1–31, <https://doi.org/10.3390/pathogens12101258>.
35. T. A. Djiman, A. S. Biguezoton, and C. Saegerman, "Tick-Borne Diseases in Sub-Saharan Africa: A Systematic Review of Pathogens,

Research Focus, and Implications for Public Health,” *Pathogens* 13, no. 8 (2024): 697, <https://doi.org/10.3390/pathogens13080697>.

36. M. LeBreton, A. T. Prosser, U. Tamoufe, et al., “Patterns of Bushmeat Hunting and Perceptions of Disease Risk Among Central African Communities,” *Animal Conservation* 9, no. 4 (2006): 357–363, <https://doi.org/10.1111/j.1469-1795.2006.00030.x>.

37. N. D. Wolfe, C. P. Dunavan, and J. Diamond, “Origins of Major Human Infectious Diseases,” *Nature* 447, no. 7142 (2007): 279–283, <https://doi.org/10.1038/nature05775>.

38. M. Sharan, D. Vijay, J. P. Yadav, J. S. Bedi, and P. Dhaka, “Surveillance and Response Strategies for Zoonotic Diseases: A Comprehensive Review,” *Science in One Health* 2 (2023): 100050, <https://doi.org/10.1016/j.soh.2023.100050>.

39. K. E. Saylor, M. M. Mouiche, A. Lucas, et al., “Market Characteristics and Zoonotic Disease Risk Perception in Cameroon Bushmeat Markets,” *Social Science & Medicine* 268 (2021): 113358, <https://doi.org/10.1016/J.SOCSCIMED.2020.113358>.