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Editorial

Veterinarians' role in global food safety and public health

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Veterinarians are integral to the global food safety framework, bridging the critical domains of animal health, food hygiene, and public health (Rahman and Kabir, 2013). Their contributions encompass a wide range of responsibilities, including zoonotic disease prevention, residue monitoring, antimicrobial resistance management, and the implementation of food safety innovations (Velazquez-Meza *et al.*, 2022; Sundram *et al.*, 2024). With the global food system becoming increasingly complex and interconnected, veterinarians remain indispensable in safeguarding public health and ensuring food security (Cáceres, 2012; Wall, 2014). Additionally, veterinarians contribute to addressing the economic impacts of foodborne illnesses, which cost the global economy billions of dollars annually. The collaboration between WHO and FAO on food safety standards emphasizes the importance of veterinarians in maintaining public health globally (Balogh *et al.*, 2013; Chen *et al.*, 2021).

The World Health Organization (WHO) estimates that over 600 million cases of foodborne illnesses occur annually, leading to significant morbidity and mortality worldwide (Lee and Yoon, 2021; Pires *et al.*, 2021). Furthermore, zoonotic diseases such as brucellosis and avian influenza continue to pose substantial public health risks, highlighting the need for vigilant disease surveillance and control measures (Rahman *et al.*, 2015; Gani *et al.*, 2016; Qureshi *et al.*, 2023). Compounding these challenges is the growing threat of antimicrobial resistance (AMR), which the FAO describes as one of the most pressing health issues of our time (Salam *et al.*, 2023). This editorial explores the critical roles veterinarians play in the global food safety landscape, focusing on their contributions to preventing zoonotic diseases, ensuring compliance with food safety standards, combating antimicrobial resistance, and fostering innovation in food safety practices.

Zoonotic diseases, such as *Salmonella* spp., *Campylobacter* spp., and *Listeria monocytogenes*, remain major public health concerns globally. Veterinarians mitigate these risks through pre-slaughter (ante-mortem) and post-slaughter inspections, ensuring that pathogens do not enter the food chain (Chlebicz and Śliżewska, 2018; Morales-Partera *et al.*, 2018; Castillo-Contreras *et al.*, 2022). For instance, studies indicate that improved veterinary surveillance and biosecurity measures significantly reduce *Salmonella* prevalence in poultry (Sohidullah *et al.*, 2017; Rumi *et al.*, 2019; Faridullah *et al.*, 2022). Emerging zoonotic diseases such as COVID-19 have further highlighted the critical role of veterinarians in monitoring and controlling diseases that cross species barriers, ensuring both animal and human health (Uddin *et al.*, 2020; Akter and Khan, 2021).

The One Health approach highlights the interconnectedness of human, animal, and environmental health. Veterinarians collaborate with medical and environmental scientists to develop integrated zoonotic disease control programs, demonstrating their critical role in public health initiatives (Mackenzie and Jeggo, 2019;

Addisu and Abebe, 2020; Rai *et al.*, 2024). Veterinarians are central to implementing international food safety standards, such as those outlined by the Codex Alimentarius Commission. These standards emphasize hazard analysis and critical control points (HACCP) to mitigate risks during food production and processing (Sultana *et al.*, 2020; Awuchi, 2023; Kabir, 2024; Uddain, 2024). Residue monitoring, another essential responsibility of veterinarians, ensures compliance with maximum residue limits (MRLs) for veterinary drugs and pesticides. This monitoring protects consumers from chemical hazards while supporting international trade (Bristy *et al.*, 2019; Islam *et al.*, 2019, 2023; Alam *et al.*, 2021; Islam *et al.*, 2021; Matubber *et al.*, 2021).

Combating AMR is one of the most pressing challenges in global health. Veterinarians play a crucial role in this area by promoting the prudent use of antimicrobials, implementing vaccination programs to minimize reliance on antibiotics, and monitoring resistance patterns through comprehensive surveillance programs. These measures collectively contribute to mitigating the risks associated with AMR and ensuring the continued effectiveness of critical antimicrobial treatments (Kabir *et al.*, 2015; Hossain *et al.*, 2017, 2021; Salam *et al.*, 2023). Global initiatives like the WHO's Global Action Plan on AMR emphasize reducing antimicrobial use in livestock without compromising animal welfare or productivity (Salam *et al.*, 2023; Aslam *et al.*, 2024). Research shows that implementing such measures can reduce antimicrobial consumption in food animals by up to 50% (Van Boeckel *et al.*, 2015, 2017).

Veterinarians oversee food facilities, including slaughterhouses, dairy plants, and processing units, ensuring compliance with global hygiene standards. Their inspections focus on detecting zoonotic pathogens, monitoring contamination risks, and verifying humane animal handling practices (McKenzie and Hathaway, 2006; Riess and Hoelzer, 2020). At international borders, veterinarians prevent the introduction of diseases and contaminants through rigorous inspections of live animals and food products. This role is crucial for global biosecurity and trade integrity (Wall, 2009).

Technological advancements have transformed veterinary practices in food safety. Whole genome sequencing (WGS) allows veterinarians to identify pathogens with exceptional precision, improving outbreak management and traceback capabilities (Gilchrist *et al.*, 2015; Brown *et al.*, 2019). Molecular diagnostic tools, such as polymerase chain reaction (PCR), enable rapid pathogen detection, reducing contamination risks (Ullah *et al.*, 2023). Moreover, the application of blockchain technology for traceability and artificial intelligence for predictive analytics is revolutionizing how veterinarians monitor and ensure food safety. Veterinarians significantly contribute to advancing research on probiotics, feed additives, and alternative therapies, demonstrating their critical role in food safety innovation (Aung and Chang, 2014; Ellahi *et al.*, 2023; Patel *et al.*, 2023).

Veterinarians face numerous challenges, including limited resources, emerging zoonotic threats, and the effects of climate change on animal health. Addressing these issues requires global collaboration to strengthen partnerships between veterinarians, policymakers, and industry stakeholders (Pappaioanou and Kane, 2023; Sacarrão-Birrento *et al.*, 2024). Investments in training and technology are essential to equip veterinarians with the tools necessary to manage evolving risks. Furthermore, harmonizing international food safety standards can ensure consistent practices across borders, promoting a more unified and effective approach to global food safety. Global organizations like the OIE and WHO emphasize the need for veterinarians to play a central role in achieving food safety and public health goals (McKenzie and Hathaway, 2006; Okpala and Korzeniowska, 2023; Eruaga, 2024).

Veterinarians play a critical role in global food safety by leveraging their expertise in animal health, public health, and food hygiene to combat zoonotic diseases and chemical hazards. They are essential for advancing food safety, addressing AMR, and promoting sustainable food systems through innovations like blockchain for food traceability. Policymakers must prioritize integrating veterinarians into global health frameworks, fostering research on sustainable practices, and supporting their engagement in shaping policies through initiatives like One Health. By addressing emerging challenges, including climate change's impact on zoonotic diseases and food systems, veterinarians can drive innovation and collaboration for a safer, sustainable future.

Ethical approval and informed consent

Not applicable.

Data availability

Not applicable.

Conflict of interest

None to declare.

Author's contribution

Conceptualization, formal analysis, writing-original draft preparation, review and editing: Mustafa Atasever. The author has read and approved the final version of the published editorial.

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