

# Veterinary Drug Residues in Food: A Public Health Concern

Joyce Beatrice\*

Department of Public Health, 405 Park Drive, Boston, MA 02215, USA

## Introduction

Veterinary drug residues in food have become a growing public health concern worldwide due to the increasing use of pharmaceuticals in livestock, poultry, and aquaculture. These drugs primarily antibiotics, antiparasitics, and hormones are used for therapeutic purposes, disease prevention, and sometimes as growth promoters. While these interventions are important for maintaining animal health and productivity, improper use or failure to observe appropriate withdrawal periods can lead to residual traces of these drugs remaining in meat, milk, eggs, and fish consumed by humans. As the global demand for animal products continues to rise, so does the risk of exposure to these residues. The presence of such compounds in food raises alarm because of their potential to cause allergic reactions, disrupt endocrine function, contribute to antimicrobial resistance, and have other long-term toxicological effects. As such, understanding the sources, impacts, detection methods, and regulatory challenges related to veterinary drug residues is essential for ensuring food safety and protecting public health [1].

## Description

Veterinary drugs enter the food chain primarily through intensive animal farming practices. Animals treated with medications may still carry residues of these substances in their tissues or bodily fluids at the time of slaughter or milking if proper withdrawal periods are not followed. These residues can accumulate in edible products such as meat, milk, eggs, and fish, leading to unintentional consumption by humans. Among the most concerning residues are antibiotics, which are often overused in livestock for prophylactic or growth-promoting purposes. The persistent intake of antibiotic-laden food can contribute to the emergence of antibiotic-resistant bacteria a global health crisis that makes human infections harder to treat. Hormonal residues, used in some countries to accelerate animal growth or control reproduction, have been associated with reproductive health risks and developmental problems, especially in children. Moreover, the presence of antiparasitics and anti-inflammatories, although less discussed, can lead to organ toxicity and other chronic conditions over prolonged exposure [2].

However, this progress has also introduced a new set of challenges related to food safety most notably, the issue of veterinary drug residues in meat, milk, eggs, and fish products. These residues are trace amounts of pharmaceuticals that remain in animal tissues or products when animals are slaughtered or milked before the drugs have been fully metabolized or excreted. While small in quantity, these residues can pose serious risks to human health, especially when exposure is chronic. Potential impacts range from allergic reactions and organ toxicity to endocrine disruption and the proliferation of antibiotic-resistant bacteria a public health crisis recognized by the World Health Organization (WHO) and other global bodies. As the world becomes more interconnected through trade and agriculture, the presence of these residues is no longer a local issue; it is a global concern that calls

for stronger international collaboration, better regulation, advanced detection technologies, and informed consumer awareness. Understanding the sources, mechanisms, analytical challenges, and preventive measures related to veterinary drug residues is crucial to safeguarding public health and ensuring that food systems remain safe, ethical, and sustainable [3].

Veterinary drugs are used for several legitimate reasons in animal farming, including therapeutic treatment of infections, prophylactic disease control in crowded or industrial settings, and in some regions, to promote faster growth and weight gain. These drugs include antibiotics, antiparasitics, hormones, anti-inflammatory agents, and anesthetics. However, when these medications are not used responsibly such as when farmers fail to adhere to the recommended withdrawal periods before animal products enter the food supply residual traces remain in the products consumed by humans. These residues, though microscopic, can bioaccumulate in the human body over time, leading to potentially harmful effects. One of the primary concerns is the role of antibiotic residues in contributing to Antimicrobial Resistance (AMR). When humans are exposed to sub-therapeutic levels of antibiotics through food, it can contribute to the emergence of drug-resistant bacteria. These "superbugs" are increasingly difficult to treat and are already responsible for hundreds of thousands of deaths globally each year. Hormonal residues used in livestock to influence reproductive cycles or enhance growth such as estradiol, progesterone, and testosterone analogs are also concerning. They can act as endocrine disruptors, potentially affecting human hormone balance, reproductive health, and even fetal development in pregnant women [4].

In children, such exposure may interfere with growth and sexual development. Monitoring and controlling veterinary drug residues involve complex and sensitive analytical methods. Techniques such as liquid chromatography, gas chromatography-mass spectrometry, and ELISA are commonly used to detect trace levels of drugs in food. These methods, while highly accurate, require well-equipped laboratories and trained personnel, which are often lacking in developing countries. Even with such technology, the enforcement of regulations varies significantly across regions. Developed countries typically have strict standards and monitoring programs, while less-developed regions may face challenges due to weak governance, lack of awareness among farmers, and insufficient infrastructure. Preventive measures must be implemented across the entire food production chain. At the farm level, this includes responsible drug administration by licensed veterinarians, strict adherence to withdrawal times, and the promotion of alternative treatments such as herbal remedies, probiotics, and vaccines. At the policy level, governments should establish and enforce maximum residue limits (MRLs), improve veterinary drug regulations, and invest in public education campaigns to raise awareness among farmers and consumers [5].

## Conclusion

Veterinary drug residues in food represent a silent yet significant threat to public health. Their presence not only undermines food safety but also contributes to the broader issues of antibiotic resistance, hormone-related health disorders, and reduced consumer confidence in animal products. Addressing this challenge requires a holistic, coordinated approach involving better regulation, scientific innovation, farmer education, and international collaboration. By investing in preventive strategies and promoting responsible veterinary practices, we can safeguard the food supply, protect public health, and ensure a more sustainable and transparent food system. Ultimately, the control of veterinary drug residues is not only a scientific and regulatory issue but a moral obligation to ensure that the food we consume does not compromise our health or the health of future generations.

\*Address for Correspondence: Joyce Beatrice, Department of Public Health, 405 Park Drive, Boston, MA 02215, USA; E-mail: joyce@beatrice.edu

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None.

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## Conflict of Interest

There are no conflicts of interest by author.

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