

ANTIMICROBIAL RESISTANCE: THE SILENT PANDEMIC OF THE 21ST CENTURY

Archana¹, Akanksha Yadav¹, Sourabh Swami² and Suchita Kumari³

¹Dept. of Veterinary Public Health & Epidemiology, CoVAS, Kishanganj, ²Veterinary Officer, Kaimur, Bihar, ³Dept. of Veterinary Parasitology, CoVAS, Kishanganj

DOI: <https://doi.org/10.5281/zenodo.21236417>

INTRODUCTION

Imagine a time when a minor cut, a common fever, or a routine surgery could become life-threatening because medicines no longer work. This frightening scenario is increasingly becoming a reality due to Antimicrobial Resistance (AMR), often called the "Silent Pandemic of the 21st Century." Unlike COVID-19, AMR spreads quietly over many years, making it difficult for people to notice until infections become difficult or impossible to treat. Antimicrobials are medicines used to kill or stop the growth of microorganisms such as bacteria, viruses, fungi, and parasites. Antibiotics are antimicrobials used specifically against bacteria. When these medicines are used incorrectly or excessively, microorganisms develop the ability to survive the drugs that once killed them. This process is known as antimicrobial resistance.

Today, AMR is recognized as one of the greatest threats to human health, animal health, food security, and the environment.

WHAT IS ANTIMICROBIAL RESISTANCE?

Antimicrobial resistance occurs when bacteria, viruses, fungi, or parasites change over time and no longer respond to medicines. As a result, infections become difficult to treat, leading to prolonged illness, increased medical expenses, disability, and even death.

For example, if a person takes antibiotics unnecessarily for a viral illness such as the common cold, the bacteria present in the body may gradually become resistant. Later, when the person develops a serious bacterial infection, the same antibiotic may no longer be effective.

WHY IS AMR CALLED A SILENT PANDEMIC?

AMR does not spread rapidly like an epidemic. Instead, it develops slowly due to continuous misuse and overuse of antimicrobials. Every year, resistant microorganisms become stronger, making infections more difficult to cure.

According to the World Health Organization (WHO), antimicrobial resistance is among the top ten

global public health threats. A landmark global study estimated that nearly 4.95 million deaths were associated with bacterial AMR in 2019, including 1.27 million deaths directly caused by drug-resistant bacterial infections.

Without immediate action, experts warn that AMR could cause millions of deaths annually in the coming decades and significantly affect the global economy.

HOW DOES ANTIMICROBIAL RESISTANCE DEVELOP?

Microorganisms naturally evolve. Whenever antibiotics are used, susceptible bacteria die, but a few naturally resistant bacteria may survive. These resistant bacteria multiply and spread their resistance genes to other bacteria.

Resistance develops faster because of:

- Overuse of antibiotics in humans.
- Self-medication without medical advice.
- Not completing the prescribed antibiotic course.
- Use of antibiotics for viral infections where they are ineffective.
- Excessive use of antibiotics in livestock, poultry, and aquaculture.
- Poor infection prevention and hygiene.
- Improper disposal of pharmaceutical waste into the environment.

CAUSES OF AMR IN VETERINARY PRACTICE

Animals play an important role in food production and human livelihoods. However, improper antibiotic use in animals contributes significantly to AMR.

Major causes include:

- Routine use of antibiotics without veterinary consultation.
- Incorrect dosage or duration of treatment.
- Use of antibiotics as growth promoters in some production systems.
- Poor farm hygiene leading to frequent disease outbreaks.
- Lack of vaccination and biosecurity measures.

- Failure to observe withdrawal periods before marketing milk, meat, or eggs.

Drug-resistant bacteria from animals may spread to humans through direct contact, contaminated food, water, or the environment.

IMPACT OF AMR

1. Human Health

- Longer hospital stays.
- Higher treatment costs.
- Increased risk of complications.
- Greater number of deaths due to untreatable infections.
- Reduced effectiveness of life-saving surgeries, chemotherapy, and organ transplantation.

2. Animal Health

- Increased disease burden.
- Poor productivity.
- Higher treatment expenses.
- Increased mortality.
- Economic losses for farmers.

3. Food Safety

Drug-resistant bacteria can contaminate meat, milk, eggs, fish, and other food products. These bacteria may reach consumers if food is not handled or cooked properly.

4. Environmental Health

Antibiotic residues and resistant bacteria enter rivers, soil, and wastewater from hospitals, farms, pharmaceutical industries, and households. The environment then becomes an important reservoir for resistant microorganisms.

THE ONE HEALTH APPROACH

AMR cannot be controlled by the medical sector alone. Human health, animal health, and environmental health are closely interconnected. This integrated concept is known as the **One Health Approach**.

Successful control of AMR requires collaboration among:

- Medical doctors
- Veterinarians
- Farmers
- Pharmacists
- Microbiologists
- Environmental scientists
- Policymakers
- Public health professionals
- General public

Working together helps reduce the emergence and spread of resistant microorganisms.

HOW CAN WE PREVENT ANTIMICROBIAL RESISTANCE?

For the General Public

- Use antibiotics only when prescribed by a qualified doctor.
- Never buy antibiotics without a prescription.
- Complete the full course of treatment.
- Do not share leftover medicines with others.
- Maintain good personal hygiene.
- Keep vaccinations up to date.
- Wash hands regularly with soap and clean water.

For Farmers

- Consult a registered veterinarian before using antibiotics.
- Improve farm hygiene and sanitation.
- Vaccinate animals regularly.
- Provide balanced nutrition.
- Isolate sick animals promptly.
- Avoid unnecessary antibiotic use.
- Follow recommended withdrawal periods for milk, meat, and eggs.

For Veterinarians

- Prescribe antibiotics responsibly.
- Promote disease prevention rather than routine antibiotic use.
- Encourage laboratory diagnosis whenever possible.
- Educate farmers on antimicrobial stewardship.
- Maintain treatment records.

For Governments

- Strengthen surveillance of AMR.
- Regulate antibiotic sales.
- Improve laboratory facilities.
- Promote awareness campaigns.
- Support research and development of new medicines and vaccines.
- Encourage responsible antibiotic use across human and veterinary sectors.

INDIA'S EFFORTS TO COMBAT AMR

India has recognized AMR as a major public health concern. Several initiatives have been launched, including:

- National Action Plan on Antimicrobial Resistance (NAP-AMR).
- National Centre for Disease Control (NCDC) surveillance programmes.
- Indian Council of Medical Research (ICMR) AMR surveillance network.
- Strengthening antimicrobial stewardship in hospitals.
- Promotion of the One Health approach through intersectoral collaboration.

Veterinary institutions, universities, and research organizations are also working to improve responsible antimicrobial use in livestock and poultry production.

THE ROLE OF VETERINARY PUBLIC HEALTH PROFESSIONALS

Veterinary Public Health professionals serve as a bridge between animal health and human health. Their responsibilities include:

- Monitoring antimicrobial use in animals.
- Surveillance of resistant pathogens.
- Food safety monitoring.
- Public awareness programmes.
- Training farmers and veterinarians.
- Supporting government policies on antimicrobial stewardship.
- Promoting One Health practices.

Their contribution is essential for safeguarding both animal and human populations.

CONCLUSION

Antimicrobial Resistance is a growing global crisis that threatens the health of humans, animals, and the environment. Unlike many infectious diseases, AMR spreads silently and gradually, making it one of the greatest challenges of this century. Every individual has a role to play in preventing this crisis. Responsible use of antibiotics, improved hygiene, vaccination, disease prevention, and strong collaboration under the One Health framework can slow the spread of resistance.

Protecting antibiotics today means protecting future generations. If we act responsibly now, these life-saving medicines will remain effective for years to come.

REFERENCES

- World Health Organization (WHO). 2023. *Antimicrobial Resistance*. Available at: <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance>
- World Health Organization. 2015. *Global Action Plan on Antimicrobial Resistance*. Geneva: WHO.
- Food and Agriculture Organization (FAO), World Organisation for Animal Health (WOAH), United Nations Environment Programme (UNEP) & World Health Organization (WHO). 2022. *One Health Joint Plan of Action (2022–2026)*.
- Murray, C.J.L., et al. 2022. Global burden of bacterial antimicrobial resistance in 2019: A systematic analysis. *The Lancet*, 399(10325): 629–655.
- Indian Council of Medical Research (ICMR). *Antimicrobial Resistance Surveillance and Research Network*. New Delhi: ICMR.
- National Centre for Disease Control (NCDC), Government of India. *National Action Plan on Antimicrobial Resistance (2017–2021)*. Ministry of Health and Family Welfare, Government of India.
- World Organisation for Animal Health (WOAH). *Antimicrobial Resistance*. Paris, France.
- Food and Agriculture Organization (FAO). *The FAO Action Plan on Antimicrobial Resistance 2021–2025*. Rome, Italy.

Cite this article:

Archana, Akanksha Yadav, Sourabh Swami and Suchita Kumari. (2026). Antimicrobial resistance: the silent pandemic of the 21st century. *Vet Farm Frontier*, 03(06), 24–26. <https://doi.org/10.5281/zenodo.21236417>