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Editorial

AMR-Antimicrobial Resistance: An Emerging Threat for Humans and Livestock

Jawad Ahmad |

***Corresponding Author:** Jawad Ahmad, Department of Veterinary Medicine, University of Veterinary and Animal Sciences, Lahore, Pakistan.

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Alexander Fleming's discovery of penicillin is one of the greatest gift to mankind. Antibiotics revolutionized medicine and animal health, becoming one of the greatest breakthroughs of science of the 20th century. But, the same miracle drugs are now losing their efficacy. Antimicrobial resistance (AMR), often known as the "silent pandemic," is undermining decades of progress in treating infections. What was once treated with a simple course of antibiotics is constantly becoming incurable, leading to higher rate of morbidity, mortality, and economic losses around the globe. The agricultural sector, especially livestock production, plays a basic role in this crisis. For years, antibiotics have been used not only to cure infections but also at sub-therapeutic levels as growth promoters in poultry and preventive agents. While this method boosted productivity, it has unintentionally promoted the rise of resistant bacteria that now threaten both human and animal health.

Development of Resistance

The misuse and overuse of antibiotics remain the strongest factor of AMR. In animal farming, antibiotics are administered to the entire flocks, even when few animals were sick. These prohylactic and metaphylactic practices, along with routine growth promotion, create strong selection pressure for resistant strains of bacteria. There are different pathways of antibiotics resistance spread. Veterinarians, farmers are the main source of emerging AMR issue in livestock due to excessive use of antibiotics in all type of diseases without knowing the exact causative agent of the infection. The food chain is another critical route: resistant E. Coli, Salmonella, and Campylobacter can contaminate meat during slaughter and processing, eventually reaching consumers. Use of different checmicals and fertilizer in the soil can also result in genetic mutations of useful bacteria. Antibiotic residues and resistant bacteria in fossils, wastewater, and soil migrate into the ecosystems, where resistance genes persist and spread into the food chain again.

The mechanism of AMR is complex but simple path is the struggle for survival. Bacterial microbes tend to induce mutations in their genome to fight aand survive against the action of antimicrobial agents. A single genetic mutation or plasmid can confer resistance to multiple drugs, sometimes producing "superbugs" that are both highly resistant and virulent.

AMR is harmful for the health of both humans and animals.MRSA, is the modified form of staphylococcus which is not treated with previously effective drugs. This results in longer treatment duration, treatment failures, kidney and lungs issues due to longer drugs use and higher mortality rates. In livestock, the loss of antibiotic effectiveness results in greater vulnerability to outbreaks, decrease productivity, and increased the production costs.

Economically, the burden is immense. Farmers face trade restrictions, and higher input costs, while healthcare systems struggle with the inefficacy of drugs. Globally, AMR threatens food security and sustainable agricultural development. The most concerning is the zoonotic area, resistant bacteria originating in animals do not remain limited to farms but crossed into human populations in form of new diseases.

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Strategies to Control AMR

It is an emerging threat but control can be possible. The world is changing its traditional approach of use of antibiotics with other effective means of prophylaxis.

Wiset use of Antibiotics: Denmark and Sweden are the countries that banned antibiotics as growth promoters, demonstrated that productivity can be enhanced with good biosecurity and farm management. The cost of antibiotic is shifted towards the biosecurity.

Surveillance and One Health Approach: Monitoring resistance across humans, animals, and the environment provides a clear picture of mutations and risks. There should be proper study of interlinked human and animals bacteria passing through food chain and other ways to develop prevention strategies accordingly.

Alternatives to Antibiotics: Probiotics, probiotics, and synbiotics can restore gut health and reduce infection risks. Promote the growth of bacteria that are useful for our environment by advising such drugs and therapies. The daily use of curd is an excellent replacement of omeprazol, alongside promoting health of beneficial gut microbes. Modern therapies such as bacteriophages, phytochemicals, and ozone therapy are also used as effective means to replace the use of antibiotics.

Improved Genetics: Working on animal genetics, animal welfare, reducing stocking density, proper nutrition, timely vaccination programs, and strict hygiene procedures to reduce the excessive use of antibiotics.

Environmental Safeguards: Effective manure management, wastewater treatment, and stricter controls on pharmaceutical emissions are essential to prevent environmental reservoirs of resistance.

Policy and Awareness: Global collaboration under initiatives led by WHO, FAO, and OIE emphasizes stewardship, veterinary oversight, and public awareness campaigns to reduce misuse. There should be a regular seminar for young doctors to limit the use of antibiotics.

Antibiotic Prescription: Veterinarians and human doctors, should culture and test the samples of patients for the diagnosis of exact causative agent. Then, go for the prescription of antibiotic which is most effective against that microbe. There is a complete digital record of antibiotic class and used dosage, to prevent the antibiotic misuse.

Antimicrobial resistance is analog of nuclear weapon destruction, eroding the foundations of both modern medicine and intensive agriculture. Without immediate action, routine infections would become fatal, and livestock farming would face dramatic loss to cope with food requirements of massively increasing human population. What is needed is a global commitment to stewardship, innovation in alternative therapies, wise use of medicine, and the integration of a One Health approach that unites human, veterinary, and environmental health. Antibiotics are a shared resource, and protection of their effectiveness is a collective responsibility. By acting decisively today, we can preserve these life saving tools for generations to come and secure a sustainable future for both people and livestock.

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