



## ORIGINAL RESEARCH PAPER

### ROLE OF ANTIBIOTICS ON AGRICULTURE AND THEIR EFFECTS ON TERRESTRIAL ENVIRONMENT

#### Zoology

**KEY WORDS:** antibiotic resistance and food animals, animal antibiotic use and human and animal health risk.

**Tanusree  
Sengupta**

Department of Zoology Vivekananda college for Women Barisha, Kolkata-700 008  
West Bengal, India

#### ABSTRACT

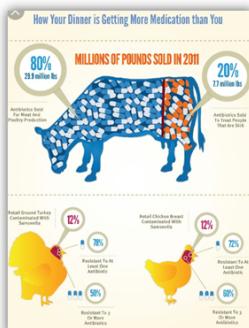
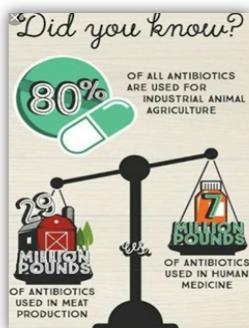
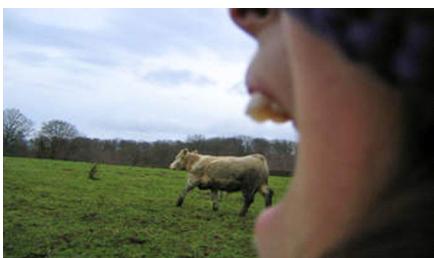
Since their discovery, antibiotics have been instrumental in treating infectious diseases that were previously known to kill humans and animals. However, their widespread use as an additive in animal feeds has raised concerns about the development of antibiotic-resistant microorganisms. Increasingly, more microorganisms are becoming resistant to multiple antibiotics. A high proportion of the antibiotics added to animal feed is excreted in urine or manure. Microbial Resistance to antibiotics is on the rise, in part because of inappropriate use of antibiotics in human medicine but also because of practices in the agricultural industry. Intensive animal production involves giving livestock animals large quantities of antibiotics to promote growth and prevent infection. These uses promote the selection of antibiotic resistance in bacterial populations. The resistant bacteria from agricultural environments may be transmitted to humans, in whom they cause disease that cannot be treated by conventional antibiotics. The trends in antibiotic use in animal husbandry and agriculture in general are reviewed. The development of resistance is described, along with the genetic mechanisms that create resistance and facilitate its spread among bacterial species. Particular aspects of resistance in bacterial species common to both the human population and the agrifood industry are emphasized. Control measures that might reverse the current trends are highlighted.

#### INTRODUCTION

Antibiotics are one of many tools veterinarians and farmers use to promote animal health. Their responsible use helps all of us.

According to World Health Organization , "If we lose that ability, we perhaps begin to lose the ability to have adequate food supplies in the world." In 2012 India manufactured about a third of the total amount of antibiotics in the world

There are also global concerns over the use of antibiotics for growth promotion or therapy purposes because of the potential for some drugs to enter the human food chain despite rigorous withdrawal measures and testing to prevent antibiotic residues in food, increasing antibiotic resistance in animals, a potential although largely unproven link to antibiotic-resistant infections in humans, and what some consider antibiotic misuse.



#### Livestock

Livestock are domesticated animals raised in an agricultural setting to produce labor and commodities such as meat, eggs, milk, fur, leather, and wool. The term is sometimes used to refer solely to those that are bred for consumption i.e, food animals, while other times it refers only to farmed ruminants, such as cattle and goats

#### Antibiotics



Bacteria are everywhere, including on the skin and in the digestive system of humans and animals. While bacteria are critical to normal bodily functions, some types can cause illness. Antibiotics belong to a category of drugs called "antimicrobials," and include penicillin, tetracycline, amoxicillin and many other formulations that can kill or inhibit the growth of bacteria without causing significant harm to patients

#### Use of Antibiotics in Livestock

Antibiotics are used in food animals to treat clinical disease, to prevent and control common disease events, and to enhance animal growth. The different applications of antibiotics in food animals have been described as therapeutic use, prophylactic use, and subtherapeutic use. Antibiotics can be used to treat a single animal with clinical disease or a large group of animals. However, these various uses are frequently indistinct; definitions of each type of use vary, and the approaches are often applied concurrently in livestock populations.

#### And just why are animals given antibiotics?

Antibiotics are a necessary and vital part of modern agriculture and guided by a belief that antibiotics must always be used responsibly. With responsible use as the base, three main reasons farmers give antibiotics to livestock and poultry are:

1. Antibiotics prevent animal suffering.
2. Antibiotics given to farm animals keep them healthy, which makes healthy food.
3. Antibiotics are part of sustainable production.





### List of Drugs and Growth Promoters

Only drugs that have no association with human medicine – and therefore no risk to humans – are allowed to be used for this purpose. It is also important to note that some drugs listed below are ionophores, which are not antibiotics and do not pose any potential risk to human health.

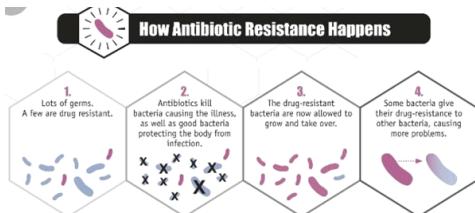
Antibiotic Growth Promoters used in Livestock Production		
Drug	Class	Effect
Bambermycin		Increase feed conversion ratio and weight gain in chickens, cattle, swine, and turkeys.
Lasalocid	Ionophore	Increase feed conversion ratio and weight gain in beef cattle.
Mone硝in	Ionophore	Increase feed conversion ratio and weight gain in beef cattle and sheep; promotes proficient milk production in dairy cows.
Salinomycin	Ionophore	Increase feed conversion ratio and weight gain.
Virginiamycin	Peptide	Increase feed conversion ratio and weight gain in chickens, swine, turkeys, and beef cattle.
Bacitracin	Peptide	Increase weight gain and feed conversion ratio in chickens, turkeys, beef cattle, and swine; promotes egg production in chickens.
Carbadox		Increase feed conversion ratio and weight gain in swine.
Laidlomycin		Increase feed conversion ratio and weight gain in beef cattle.
Lincomycin		Increase feed conversion ratio and weight gain in chickens and swine. – Illegal for this use in the U.S.
Neomycin/ oxytetracycline		Increase weight gain and feed conversion ratio in chickens, turkeys, swine, and beef cattle. – Illegal for this use in the U.S.
Penicillin		Increase feed conversion ratio and weight gain in chickens, turkeys, and swine. – Illegal for this use in the U.S.
Roxarsone		Increase feed conversion ratio and weight gain in chickens and turkeys.
Tylosin		Increase feed conversion ratio and weight gain in chickens and swine. – Illegal for this use in the U.S.

### Drug Delivery (Subcutaneous Injection)

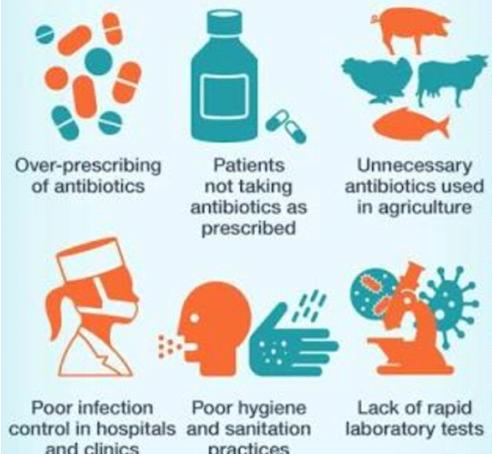


### Antibiotic Resistance

Antibiotic resistance is a looming public health crisis. While once believed to be the province of hospitals and other health-care facilities, a host of community factors are now known to promote antibiotic resistance, and community-associated resistant strains have now been implicated as the cause of many hospital-acquired infections.



## CAUSES OF ANTIBIOTIC RESISTANCE

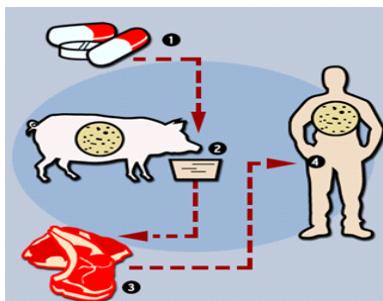


### How Bacteria in Farm Animals Develop Resistance

Bacteria typically develop resistance through the following three ways:

1. Changing the intracellular target.
2. Pumping out the antibiotic.
3. Altering the antibiotic to a harmless form.

### How Resistance is Transferred to Human Microbes



The potential threat to human health results from –

1. Inappropriate antibiotic given to food animals as pathogenic-resistant organisms propagated
2. Livestock are poised to enter the food supply and could be widely disseminated in food products.

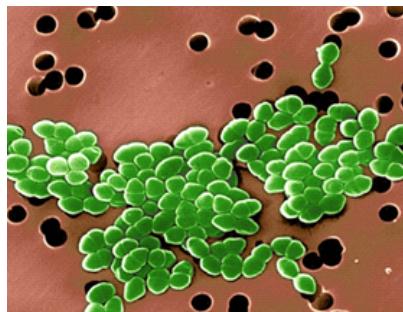
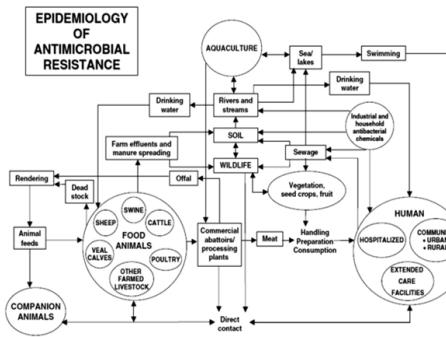
3. 10–15 Commensal bacteria found in livestock are frequently present in fresh meat products and may serve as reservoirs for resistant genes that could potentially be transferred to pathogenic organisms in humans.

### **Effect on Terrestrial Environment**

In both human and veterinary medicine, the risk of developing resistance rises each time bacteria are exposed to antimicrobials.

Resistance opens the door to treatment failure for even the most common pathogens and leads to an increasing number of infections.

The mounting evidence of the relationship between antimicrobial use in animal husbandry and the increase in bacterial resistance in humans has prompted several reviews of agricultural practices by scientific authorities in a number of countries, including the US.



**Reduce the misuse of antibiotics on Livestocks**



1. In Agricultural Sector Ensure that Antibiotics given to animals – including food producing and companion animals – are only used to control or treat diseases and under veterinary supervision

2. Vaccinate animals to reduce the need for Antibiotics and develop alternative to the use of antibiotics in plants

3. Promote and apply good practices at all steps of production and processing of food from animal and plant sources

4. Adopt sustainable system with improved hygiene, bio security and stress free handling of animals (16)

5. Implement international standards for the responsible use of antibiotics and guidelines (by FAO and WHO)

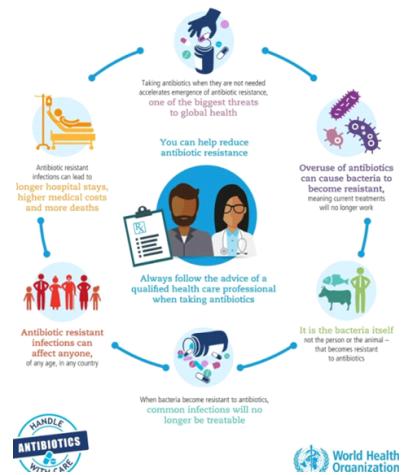
### **Antibiotic Resistance What You Can Do**

Antibiotic resistance happens when bacteria change and become resistant to the antibiotics used to treat the infections they cause.



1. Only use antibiotics when prescribed by a certified health professional
2. Always take the full prescription, even if you feel better
3. Never use left over antibiotics
4. Never share antibiotics with others
5. Prevent infections by regularly washing your hands, avoiding contact with sick people and keeping your vaccinations up to date

### **Misusing and overusing ANTIBIOTICS puts us all at risk**



### **CONCLUSION**

All the facts at our disposal persuade us that whereas resistance is undoubtedly selected in man and animals by the use of antibiotics, in organisms that are part of the normal flora as well as in pathogens, including zoonotic pathogens, and whereas some resistant organisms can be shown to reach man via the food chain, additional harm results from resistance, even when infection supervenes.

Every one has a role to play in helping prevent antibiotic resistance by preventing infection which can reduce the use of antibiotics and limit the spread of its resistance.

WHO is recommending that farmers and the food industry stop using antibiotics routinely to promote growth and prevent disease in healthy animals.

We support truly rational and prudent use of antibiotics in all contexts—aided by the many guidelines that now exist. Emphasis on food hygiene is well founded historically and appears to have had an effect on the overall problem of resistance in food-borne pathogens.

Whatever is done, competent surveillance of disease and antibiotic resistance as well as repeated refinement of risk analyses are a necessity, so that we may concentrate our efforts to limit the

effects of antibiotic resistance on what is shown to work in practice.

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