03 USE OF ANTIBIOTICS IN ANIMALS

Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062, INDIA
Ph: +91-11-29956110 - 5124 - 6394 6399 Fax: +91-11-29955879
E-mail: k_amit@cseindia.org Website: www.cseindia.org

FOOD SAFETY

ANTIBIOTICS USE IN FOOD-PRODUCING ANIMALS

Just like in human, antibiotics are used in animals for treating infectious diseases caused by bacteria. However, they are also used for non-therapeutic reasons such as growth promotion in intensive farming of food-producing animals such as chickens, pigs and fish. In response to the growing global demand of animal proteins, antibiotic growth promoters (AGPs) has been an integral part of such commercially driven farm practices ever since the accidental discovery of their growth promoting effect in late 1940s. A third category of use is disease prevention, meaning antibiotic use in the non-infected masses in these intensive farm settings.

Antibiotic use for disease prevention refers to low-doses administered to those who do not have any signs of bacterial infection but are at risk of developing it. The risk could be any stress such as due to travel or spread of infection to other animals in the crowded farm. Such sub-therapeutic levels are administered typically through water in chickens for a specified duration such as a week or until the presence of the risk (see Table 1).

Table 1: Antibiotic use in poultry industry

	Purpose	Dose	Duration	Key route
Therapeutic	Treatment of infected	Relatively high dose: therapeutic level	Relatively short period of time	Water/injection/ drops
Prophylactic	Prevention of those at risk	Low dose: sub-therapeutic level	For several weeks or until risk exists	Water
Growth Promotion	Enhance rate of growth and feed efficiency	Very low dose: sub-therapeutic level	Throughout life cycle	Feed

Source: *Primary research involving discussions with poultry farmers and veterinarians in Haryana; secondary research*

Food-producing animals are raised in groups or herds, often in confined, crowded, unsanitary and stressful conditions that are known to promote spread of infectious diseases, thereby decreasing yield and increasing cost of production. Antibiotic use in such settings tends to compensate for poor farm conditions. While therapeutic use is often essential, the non-therapeutic use can be avoided through better farm practices. Low-doses of non-therapeutic administration over long periods to larger number of animals are known to significantly contribute to antibiotic resistance in animals and humans.

ANTIBIOTIC USE AS A GROWTH PROMOTER

Growth promotion refers to increase rate of weight gain and/or feed utilisation by other than purely nutritional means. This definition applies to food-producing animals which are reared for meat production such as chickens and pigs. Such variety of chickens is known as broiler chickens. Antibiotics as AGPs are extensively used across the world in an uncontrolled way except in certain countries that have started regulating such use over the last decade.

For growth promotion, very low-dose of antibiotic is used on a regular basis, mostly over the lifetime of a food-producing animal. Based on the animal, its age and other conditions such as temperature, hygiene and sanitation, different antibiotics in varying proportions are added to feed of the animal. Broiler chickens in particular are most of the times fed with antibiotic mixed feed for this reason. It is known to help them gain weight faster and use less food to attain it.

Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062, INDIA
Ph: +91-11-29956110 - 5124 - 6394 6399 Fax: +91-11-29955879
E-mail: k_amit@cseindia.org Website: www.cseindia.org

AGPs are known to suppress the gut bacteria leaving more nutrients for chicken to be absorbed for greater weight gain. Its use is known to be influenced by the feed suppliers, particularly in a country like India. Farmers at times use growth promoters on the pretext of preventing diseases. The differentiation is difficult to make. Veterinarians have no role in AGP use.

TYPE OF ANTIBIOTICS USED

There is little separation in antibiotics that are used in animals and humans. Most of the antibiotic classes are same with some difference in type of antibiotic used. In view of the antibiotic resistance and its strong association with antibiotic use, the World Health Organisation (WHO) came up with a list of critical antibiotics that need to be preserved for human use.[1] In India, unlike the countries with stringent regulations, several such antibiotics are used in food-producing animals for non-therapeutic reasons. Almost all AGPs used in the Indian poultry industry are banned in countries of European Union (EU) (see Table 2).

Table 2: Examples of antibiotics used as growth promoters in the Indian poultry industry and their importance to humans

Antibiotic used for growth promotion in India	Antibiotic of human importance as per WHO	Banned in EU countries
Bacitracin	–	Yes
Colistin	Highly important	Yes
Tylosin	–	Yes
Oxytetracycline	Highly important	Yes
Doxycycline	Highly important	Yes
Tiamulin	–	Yes
Virginamycin	Critically important	Yes
Avilamycin	–	Yes
Lincomycin	Important	Yes
Chlortetracycline	Highly important	Yes
Roxithromycin	Critically important	Yes
Erythromycin	Critically important	Yes
Enramycin	Important	Yes
Furazolidone (Nitrofurans)	Important	Yes
Amikacin	Critically important	Yes

Source: *Primary research; European Commission: Ban on antibiotics as growth promoters in animal feed enters into effect; Danish Veterinary and Food Administration: Fact sheets on the Danish restrictions on non-therapeutical use of antibiotics for growth promotion and its consequences; WHO List of Critically Important Antimicrobials, 2011*

Antibiotics of same classes are used in animals and humans (see Table 3). This overlap significantly contributes to the emergence of resistant batcteria in humans. For example, enrofloxacin use in animals is linked to ciprofloxacin resistance in humans. Also, in certain EU countries, animal use of avoparcin has been strongly linked with high resistance to vancomycin in *Enterococci.*

Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062, INDIA
Ph: +91-11-29956110 - 5124 - 6394 6399 Fax: +91-11-29955879
E-mail: k_amit@cseindia.org Website: www.cseindia.org

Table 3: Key antibiotic classes shared by animals and humans

Antibiotic class human importance	Used in animals	Used in humans
β–lactams	Amoxycillin	Penicillin G procaine
Macrolides	Tylosin, Azithromycin	Erythromycin, Azithromycin
Aminoglycosides	Neomycin, Gentamycin	Gentamycin
Fluroquinolones	Enrofloxacin, Ciprofloxacin, Levofloxacin, Ofloxacin	Ciprofloxacin, Levofloxacin, Ofloxacin
Tetracyclines	Oxytetracycline, chlortetracycline	Doxycycline
Streptogramins	Virginiamycin	Quinpristine-dalphopristine
Glycopeptide	Avoparcin	Vancomycin
Phenicols	Florphenicol	Chloramphenicol
Cephalospoprins	Cephalexin	Ceftazidime, Cefexime
Polypeptides	Enramycin	Bacitracin
Pleuromultilin	Tiamulin	Retapamulin

Source: *Primary research involving discussions with poultry farmers and veterinarians; respective websites of veterinary pharmaceutical companies*

AMOUNT OF ANTIBIOTIC USED

Most of the antibiotics produced globally are put to non-human use and a very large quantity of this is used in intensive farming of food-producing animals. Comparing the exact amount of antibiotic use in animals and humans is limited by many factors such as population and body mass of different food-producing animals such as chickens, pigs in a particular country. However, estimates provide an evidence of the disproportionate use. Broadly, non human use is known to be about three-four times than human use. In the US, about 80 percent of antibiotics are reported to be used in animals in recent past.[2] There are no such estimates for India.

References

1. World Health Organisation, WHO list of Critically Important Antimicrobials, 3rd Revision 2011, http://www.who.int/foodborne_disease/resistance/cia/en/
2. Centers for Disease Control and Prevention, http://www.cdc.gov/drugresistance/threat-report-2013/index.html