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Antibiotic residues in poultry meat and eggs: It's a global health hazard

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ABSTRACT

Antibiotics can be defined as the subgroup of chemotherapeutic agents which are produced by various species of microorganism and are used to kill or suppress growth of other micro-organisms or foreign cells. Traditionally, they were employed to treat aliments and infections both in humans and animals. But recently, they are widely used as growth promoters in many poultry industries. As a result, they find their way to the food chain and accumulate in human beings, making the susceptible population of bacteria resistant to the particular antibiotic. This is a global concern as physicians are unable to treat life threatening cases as the resistant population is burgeoning. The scenario can become grave, once the bacteria acquires resistant against the newer classes of antimicrobials. Antibiotic resistance brings into picture many untoward effects like allergy, anaemia, gastrointestinal disturbances, etc. There are ample of techniques to detect antibiotic residue in food like HPLC, LC, PC, GC, ELISA, etc. The issue calls for stringent legal measures so that the industries are liable to follow the withdrawal period in order to make food free from antibiotic residue. Holistic approach from all is required to address the issue, which is now regarded as a global concern.

KEYWORDS: Antibiotic residues, antibiotic resistance, eggs, meat, poultry

INTRODUCTION

Antibiotics can be defined as the subgroup of chemotherapeutic agents which are produced by various species of microorganism (e.g. Bacteria, Fungi and Actinomycetes) and are used to kill or suppress growth of other micro-organisms or foreign cells (Sandhu, 2013). Basically, antibiotics are therapeutic agents used for treating human infectious diseases along with the diseases of livestock and aquaculture (Nisha, 2008).

In veterinary field, antibiotics were introduced for treating ailments, but now-a-days, livestock farmers, feed companies are widely using them as growth promoters, feed additives, for prophylactic measures, etc (Gelband *et al.,* 2015). Antimicrobial growth promoters when used as feed additives may improve feed efficiency by 17% in beef cattle, 10% in lambs, 15% in poultry and 15% in pork (Nisha,2008). Half life of antibiotics is short but residues may perpetuate to settle in the environment for many ways. Hence, this can be considered as a persistent organic contaminant (Hamscher *et al*., 2002).

In poultry industry, antibiotics are used by veterinarians to enhance the growth, feed efficiency and reduce diseases owing to its anti-microbial activities (Abou-Kassem *et al*., 2021). This makes the poultry meat more tempting to the consumers. But, little do they know that they are consuming antibiotic residues which may lead to Antimicrobial resistance, and thus making the susceptible bacteria resistant to the particular antimicrobial agent.

According to 20th Livestock senses, with respect to total meat production, India holds the rank of 5th position, wherein the production is 8.60 million tons (2019-20). In 2020-21, meat production has increased to 8.80 million tones. India produces 5.3mMT of meat and 75 billions of eggs annually. Current processing level in poultry is 6% and meat is 21%. To meet this demand in future need, farmers and stakeholders are working greatly on intensive poultry farming which brings usage of vaccines, vitamins and minerals and mostly antibiotics. According to USDA report 2015, antibiotics are used for treating the intestinal infections

such as colibacillosis, necrotic enteritis and some other diseases caused by salmonella, E.coli and clostridium species. These diseases are a concern in poultry industry as it can incur an enormous economic loss.

In poultry industry, commonly used antibiotics are aminoglycosides, beta- lactams, Ionophores, Lincosamides, macrolids, quinalones and sulfonamides. Extensive use of antibiotics causes antibiotic resistance in both animals and people who eat them. WHO in 2020 reported that identified a growing list of infections that are becoming more difficult to be treated, viz., T.B, Pneumonia and Gonorrhea in humans as well as animals. Therefore, when the bird or animal is treated with antibiotic, we should avoid consuming egg, milk or meat from them unless the withdrawal period is over.

Different techniques are used to detect the antibiotic residues in foods.

1. High Performance Liquid Chromatography (HPLC)
2. Liquid Chromatography (LC)
3. Paper Chromatography (PC)
4. Gas Chromatography (GC)
5. Enzyme Linked Immunosorbant assay (ELISA)

Pathological effects while Antibiotic residues are present in food :

1. Allergy caused by using of penicillins
2. Bone marrow toxicity by using of Choramphenicol
3. Carcinogenetic effect by using sulfamethazine, furazolidine,oxytetracyclins
4. Mutagenic effect
5. Nephropathy by using of gentamicin
6. Hepatotoxicity
7. Reproductive disorders
8. Bone marrow toxicity by using of chloramphenicol
9. Transfer of antibiotic resistance to man
10. Immunopathological effects

Table. No. 1: Maximum Residual limit (ug/kg) for veterinary drugs

S.No	Name of the Antibiotic	MRL(ug/kg)
1	Benzyl penicillin	4
2	Ampicillin	4
3	Amoxicillin	4
4	Oxacillin	30
5	Cloxacillin	30
6	Dicloxacillin	30
7	Tetracycline	100
8	Oxytetracycline	100
9	Chlortetracycline	100
10	Streptomycin	200
11	Dihydrostreptomycine	200
12	Gentamycine	200
13	Neomycin	100
14	Sulphonamides	100
15	Trimrthoprime	50
16	Spiramycin	200
17	Tylosine	50
18	Erythromycin	40
19	Quinalones	75
20	Polymyxine	50
21	Ceftiofur	100
22	Cefquinome	20
23	Nitrofurans	0
24	Nitromidazoles	0

PREVENTIVE MEASURES

1. Conduct awareness and training programmes, especially for the individuals and organizations involved in the meat, milk and egg processing industries.
2. To develop fast screening methods for analysis and detection of antibiotic residues in food
3. To develop advance processing methods and also use of activated charcoal, resins and UV-irradiation for milk, meat and eggs to inactivate the antibiotic residues
4. Refrigeration as the preservative techniques
5. In pasteurization, mostly antibiotics will looses the activity
6. To identify drug residues in animal and poultry edible food products, a simple and economical filed test to be done
7. Ethano-veterinary practices must and should follow in field conditions
8. Stringent laws against selling of meat or egg before the withdrawal period.

CONCLUSION

Now-a-days antibiotic residues are most common in poultry meat, eggs to enhance the growth, feed efficiency and reduced diseases due to its anti-microbial activities. These antibiotics have both pros and cons, but we need to use antibiotics judiciously and take good initiatives like organizing training and awareness programme for individuals and food processing industries to minimize the usage and safe consumption of poultry products. Laws should be stringent in order to stop the residues from finding a way to the food chain. It is a tedious job and requires holistic approach to deal with it. All the stakeholders should drive all their energy and efforts at minimizing the havoc.

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