P: ISSN No. 0976-8602 RNI No. UPENG/2012/42622 VOL.-11, ISSUE-1, January 2022

E: ISSN No. 2349-9443 Asian Resonance

Milk and Milk Products Contamination with antibiotic residues

Paper Id.: 15473, Submission Date:01/01/2022, Acceptance Date: 12/01/2022, Publication Date: 13/01/2022

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Abstract

To attain the target of safe and wholesome milk farmers rely on the practice of disease treatment and prevention using vaccines, veterinary drugs and nutraceuticals. Responsible and timely management practices can reduce the incidence of disease, which may result in reduced need for antimicrobials. Nonetheless, antibiotics are a necessary tool to manage infectious diseases in milk giving animals. Careful use of antimicrobials is important to reduce livestock pain and suffering as well as minimize losses due to diseases. The toxic antibiotic residues of the drugs could be present for a long time after administration. Sometimes growth enhancing antibiotics are added in animal diets. Because of frequent and injudicious use of antibiotics in dairy animals, antibiotic residues in milk products present great health hazards to the consumers. It has been reported that many of the pathogens isolated from a variety of milk foods are resistant to antibiotics tested.

Keywords : Antimicrobial, Antibiotics, Disease, Vaccines, Veterinary, Milk.

Introduction

Milk is a whole food; it is categorized as a perishable food as it is a nutrient that supports the growth of a wide variety of micro-organisms and is susceptible to spoilage. Milk is highly susceptible to contamination by detergents, disinfectants, antibiotics, pesticides and pathogens like bacteria, viruses, toxins released by moulds such as aflatoxins and heavy metals etc.

Withdrawal time

It is the time required for a drug concentration to fall below the tolerance level. It is expressed in hours, days, weeks or months.

Acceptable Daily Intake

ADI is the average daily dose of a drug or chemical residue, which can be safely ingested without any risks to the person's health. ADI value is always subjected to revision whenever new information becomes available. It should be based on the environment and surrounding conditions. It is expressed as milligrams per kilogram of body weight.

Target species

Target species refers to the determination of safety and efficacy of a drug directly within the species or in species, which is near to very similar, for which therapeutic claims are made by manufacturers.

Unintentional residues

This kind of residue gets into food items as a result of circumstances. Such chemicals are never added to protect the food or feed against infection of bacteria, fungus or parasites. The unintentional residues also include the residue of a drug or chemical that occurs as an environmental contaminant. Unintentional residue cannot be differentiated from residue due to actual use of drugs or chemicals.

Tolerance levels

This is the limit of a chemical permitted in the tissues or milk of animals. Tolerance level is the maximum allowable level of a drug or chemical in food, milk or meat at the processing, storage, marketing and up to time of consumption by humans. It is expressed as mg per kg or a mg per ml i.e., ppm or mg/kg or mg/ml i.e., ppb, hg/kg or hg/ ml i.e., ppt.

Following are four types of tolerances:

1. Finite tolerance: It is defined as a measurable amount of drug (non-carcinogen) that is permitted in food. The ADI of humans is determined by applying a safety factor of 1: 100. If the drug or chemical is teratogens, a safety factor of 1: 1000 is applied.
2. Negligible tolerance: It is a toxicologically insignificant amount of residue, a small fraction of maximum ADI.
3. Zero tolerance: zero tolerance means that no residue is permitted in feed or food. Carcinogenic drugs fall into this category.
4. Temporary tolerance: It is valid only for short periods of time and is subject to the availability and revision of experimental data. Generally, for novel drugs and sometimes also referred to as interim or administrative tolerance.

Study Duration One month.

.**Aim of the Study** As the harmful antibiotics residues of the drugs after administration can last for a long time.. The objective of this paper is to collect information regarding the presence of antibiotics in the milk of the treated cows and buffaloes, the measures taken for the reduction of antibiotic residues, attitude of food and drug administration on the presence of antibiotics in milk and milk products.

Review of Literature Present day, society prefers to buy branded milk due to apprehensions of adulteration and safety of raw milk sold by the local vendors. However, if branded milk and milk products are having residues, these are equally hazardous as locally available milk. In addition, the hazardous effects are also due to the mixing of non-potable water, neutralizers, detergents, preservatives, urea and presence of residues of pesticide, heavy metals, antibiotics, aflatoxins and other veterinary drugs. Improper handling of milk also increases the likelihood of transmission of diseases like TB, anthrax, foot and mouth disease, hepatitis, Q fever, diphtheria, brucellosis, salmonellosis, E coli poisoning and botulism. Further, nowadays the public has also become more concerned about synthetic milk. Therefore, full assurance for the supply of safe milk has added an edge on quality.

FAO and WHO aim to promote tackling of food safety and quality issues by multipronged coordinating strategies involving the government bodies, industries, academic and research institutions, FAOs, consumers bodies, professional and farmers organizations. FAO defined it as providing assurance that food will not cause harm to the consumers when it is prepared, added or eaten according to its intended use. Food safety has been a global priority for WHO since the last two decades.

Hypothesis **Antibiotic residue's presence in treated milk**

Cows/ buffaloes administered with antibiotics for treatment of mastitis and other bacterial infections produce milk with antibiotic residues for a sufficient period after treatment. Treated cows/ buffaloes are therefore required to be excluded from the milk supply chain for a specific withdrawal period to ensure that antibiotic residues no longer remain in their milk. Antibiotic residues contaminate the milk supply if treated cows or buffaloes are returned to the milking herd early or when a cow or buffalo retains antibiotic residues in their system for an extraordinarily long period. Lot of studies have been conducted to determine the withdrawal period, maximum residue limit, acceptable daily intake, tolerance level and other data on residue of different antibiotics and antimicrobial drugs in milk and milk products. Many of these reports on all such parameters are overlapping and sometimes contradicting each other.

Sampelling Seven - antibiotics for MRL, sixteen- antibiotics for withdrawal period, four- for acceptable daily intake and thirteen - for tolerance levels.

Statistics Used in the Study Data was collected from literature.
Amoxycillin

Analysis **Contamination of treated milk with antibiotic residues:** Cows/ buffaloes administered with antibiotics for treatment of mastitis and other bacterial infections produce milk with antibiotic residues for sufficient period after treatment. Treated cows/ buffaloes are therefore required to be excluded from the milk supply chain for a specific withdrawal period to ensure that antibiotic residues no longer remain in their milk. Antibiotic residues contaminate the milk supply if treated cows or buffaloes are returned to the milking herd early or when a cow or buffalo retains antibiotic residues in their system for an extraordinarily long period. Lot of studies have been conducted to determine the withdrawal period, maximum residue limit, acceptable daily intake, tolerance level and other data on residue of different antibiotics and antimicrobial drugs in milk and milk products. Many of these reports on all such parameters are overlapping and sometimes contradicting each other.

Result and Discussion

Ampicillin
Data collected on residue of antibiotics and antimicrobials is presented below:

Table1:The Maximum Residual Limit (MRL) of some antibiotics

S. No.	Antimicrobial agents	MRL in milk (mg/kg)
1.	Benzylpenicillin	0.004
2.	Ceftiofur sodium	0.12
3.	Dihydrostreptomycin and streptomycin	0.21
4.	Gentamicin	0.13
5.	Neomycin	0.54
6.	Oxytetracycline	0.01
7.	Spectinomycin	0.24

Table 2: Withdrawal Period of Intra mammary Antimicrobials

S. No.	Drug	Milk discard (hr)
1.	Amoxycillin	60
2.	Ampicillin	48
3.	Cephalosporins	60-96
4.	Chlortetracycline	96
5.	Cloxacillin	48
6.	Dihydrostreptomycin	24-96
7.	Erythromycin	36
8.	Fluoroquinolones	60-84
9.	Neomycin	60-84
10.	Oxytetracycline	96
11.	Penicillin-G	60-84
12.	Tetracycline	60-72

Table 3: The Withdrawal Period of antibiotics

S.No.	Drug	Milk discard
1.	Amoxycillin	96
2.	Ampicillin	48
3.	Cloxacillin	84
4.	Dihydrostreptomycin	48
5.	Erythromycin	72
6.	Gentamicin	60
7.	Neomycin	72
8.	Penicillin-G	48

9.	Procaine penicillin	72
10.	Streptomycin	48-78
11.	Sulfabromomethazine	96
12.	Sulfamethoxypyridazine	72
13.	Sulfamethazine	96
14.	Sulfonamides + TMP	72
15.	Thiabendazole	96
16.	Tylosin	96

Table 4. Acceptable Daily Intake (ADI) of Antimicrobials.

S.No.	Antibiotics	ADI (mg/kg)
1.	Benzylpenicillin	0.0005 (0.03mgper person per day)
2.	Oxytetracycline	0.003
3.	Spiramycin	0.005
4.	Sulfamethazine	0.004

Table 5: Tolerance Levels of Antibiotics in Milk

S.No.	Antibiotic	Tolerance Level (ppm)
1.	Bacitracin	0.05
2.	Ampicillin	0.01
3.	Lincomycin	0.01
4.	Streptomycin	0.00
5.	Neomycin	0.15
6.	Dihydrostreptomycin	0.00
7.	Procaine penicillin	0.05
8.	Penicillin-G	0.00
9.	Tylosin	0.05
10.	Chlortetracycline	0.00
11.	Sulfadimethoxine	0.01
12.	Sulfamethazine	0.10
13.	Thiabendazole	0.05

Conclusion

Use of drugs and chemicals in production of more food from animals must always be evaluated against public health risks. It is forecasted that in the future humans would use more and more chemicals and drugs to grow more food to feed the increasing population. In future the human population will increase more rapidly than the production of food crops. This will result in increased demand for food from animal origin. In such a scenario, a system for producing livestock by feeding grass will be more beneficial. In such a case, our future responsibility to produce drug residue free and healthy milk will be increased many fold. Implementation of Food safety and standard bills should aim to integrate the Food safety laws in the country and will be a big challenge to the Food and dairy industry in India. It will provide great incentive to the food processing industry of India and bring a paradigm shift from regulatory regime to self-compliance.

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