

A STUDY ON CHEMICAL CONTAMINANTS IN MILK AND PUBLIC HEALTH CONCERNS

Kishornand, Assistant professor

Department of chemistry

V.B.S. Government Degree College Campierganj, Gorakhpur

Email- kishorenandgdc@gmail.com

Abstract

Chemical contaminants in milk comprise chemical hazards that may introduce during milk production, dairy processing or packaging. Veterinary drugs, heavy metals, radionuclides, mycotoxins and pesticides are chemical contaminants that can enter to animal feed and they have some residues in milk. The variability of times and the industrial revolution, as well as indiscriminate use of medicines, especially antibiotics, when domestic animals were ill, and various adulterations and many other contaminants have poisoned the milk consumed by humans, causing the human species to die. A wide range of adverse health effects including antimicrobial drug resistance and carcinogenicity can be observed. Along with the rational use of different types of drugs used in milk protection including treatment of animals and milk production, awareness of veterinary personnel, organizations and general public through literary and other means and proper monitoring can be controlled.

Chemical contaminants in milk are hazards introduced during milk production, dairy processing, or packaging. Chemical contaminants such as veterinary drugs, heavy metals, radionuclides, mycotoxins, and pesticides can enter animal feed and leave residues in milk. Antimicrobial drugs are the most contentious residues found in milk. They pose some risks to people who consume milk and dairy products. Chemical contaminants in milk and dairy products must be prevented and controlled by the government and producers. This study would include a review of chemical contaminants' materials and sources, public health concerns, and methods for controlling these contaminants in milk and dairy products.

Keywords: Chemical contaminants, Humans, Animals, Public Health, Antibiotics.

Introduction

Chemical contaminants in milk are hazards introduced during milk production, dairy processing, or packaging. Chemical contaminants such as veterinary drugs, heavy metals, radionuclides, mycotoxins, and pesticides can enter animal feed and leave residues in milk. Antimicrobial drugs are the most contentious residues found in milk. They pose some risks to people who consume milk and dairy products. Undoubtedly No one can give anything to anyone to eat, but nature already arranges food for every mother in the milk gland for her child to be born and the food gift in the form of milk becomes available to the new born child. Milk is a complete food for the early development of the child. Milk supplies a balanced supply of essential nutrients including sugars, proteins, fats, minerals and vitamins etc. Khaniki, G. J. (2007).

As humans are the primary consumers of milk from other mammals, interspecies consumption of milk is commonly observed. According to the Food and Agriculture Organization, there are more than six billion consumers of interspecies milk and milk products worldwide, most of them in developing countries, and an estimated 12 to 14 percent of the world's population, or 75 to 900 million people, consume milk live on production units or in milk production households (FAO 2010). These milk producers have the responsibility of supplying clean milk to six billion people of the world. India is the largest milk producer in the world with 150 million milk producers. Therefore, it is very important to make these people aware of healthy milk including production of clean milk. D. B., & Carmichael, S. L. (2018).

Despite high nutritional values and excessive use, milk is contaminated by the proliferation of adulterants, chemical and pharmaceutical compounds. Drug residues affect the standards of milk and milk trade and in excess of the permissible limits give rise to significant health hazards to the milk trade. The Food Safety and Standards Act, 2006, describes residues of any veterinary drug as 'parent compounds or their metabolites or each in any edible part of any animal material and the relevant veterinary drug' Contain residues of impurities' (FSSA 2006). The term food safety usually applies to food quality that causes harmful effects in humans, and includes animal disease and adverse effects caused by synthetic products (xenobiotics). Recently, the presence of drug residues in milk and agricultural products and their impact on public health has been recognized as a major concern. India has a large population of dairy cattle and the use of veterinary drugs to treat sick animals is also an integral part of such intensive production practices. It is therefore unlikely that drug residues are not present in milk and milk products. Therefore, to assure the

safety of consumers and good quality agricultural products for export, milk must be frequently screened for drug residues. Nag, S. K. (2010).

Different types of milk contaminants

Organic pollutants / agricultural chemicals: The use of commercial synthetic chemicals, ie pesticides, to control disease vectors and pests in the agricultural sector on a global scale was especially intensified after World War II. These pioneer chemicals were organochlorines such as dichloro-di-phenyl trichloroethane (DDT), endrin (insecticide/rodenticide), and hexachlorobenzene (HCB) (fungicide), all of which persist in the environment and thus show long-term efficacy. Sonawane, B. R. (1995). However, because of their fat solubility (lipophilicity) and resistance to biodegradation, these compounds tend to accumulate in the biosphere and are found in essentially detectable levels globally in many foods, including milk and milk products. Can However, organochlorine chemicals were banned in the 1970s and replaced with organophosphorus insecticides. Solomon, G. M., & Weiss, P. M. (2002). However, the use of sewerage water in agricultural land, or imported dairy cattle feed from some countries, where agricultural practices and/or Organochlorine chemicals such as lindane and DDT are still used in malaria control. Despite being banned, even today organochlorine chemicals or metabolic elements are found in other agricultural products including milk. Blüthgen, A. (2000).

Mycotoxins: Dietary mycotoxin contamination is an ongoing global concern. Mycotoxin contamination is considered an inevitable and unpredictable problem, posing a formidable challenge to food safety even where good agricultural, storage and processing practices are adopted. Mycotoxins are produced by many fungal species that grow on cereals, nuts (peanut shells), spices, fruits and by-products during pre- and post-stages of the food chain that are commonly used as raw materials in animal feed are done. The most important mycotoxins contaminating livestock feed include aflatoxin, patulin, citrinin, ochratoxin, fumonisin, trichothecene, zearalenone, and the latest mycotoxins, such as aniatin (Zahedi, M. T. 2018). Most of these substances are persistent and generally cannot be eliminated by food production processes, so they can reduce animal productivity or have side effects on animals. Since they can accumulate in meat, milk or eggs, they have the potential to reach and affect the health of final consumers.

Antimicrobial drugs: Antimicrobial drugs, including antibiotics, are drugs that are used when an animal is sick. After administration of any antimicrobial drug, these are excreted in animal

products for a certain period of time. Therefore, the use of animal products under treatment is prohibited for a certain period of time. If products from treated animals are used, residues of these drugs enter them and contaminate the food chain. Antibiotic residues in milk were first detected in the 1960s. Laczay, P., Lehel, J., Lányi, K., & László, N. (2015).

Anthelmintic: When animals have worms in their stomach, they are given anthelmintic drugs, some parts of which secrete into the milk, contaminating it. The main drugs given for endoparasites are albendazole, fenbendazole, oxfendazole, thiabendazole, closantel, rifaxanide, nitroxinil, oxalozanide, levamisole, tetramizole, etc., whose fractions are secreted in milk and other animal products for 3 to 14 days. Ivermectin, abamectin, doramectin, and moxidectin drugs used for internal and external parasites whose components, when secreted into milk, pose a risk to human health by contaminating milk. Fallah, A. A., Fazlollahi, R., & Emami, A. (2016).

Milk Adulteration: Food adulteration is a global concern and due to lack of testing agencies and policies, developing countries are at risk. However, it is one of the most common phenomenon which is ignored in many countries. Unfortunately, contrary to popular belief, adulteration of milk can pose serious health hazards leading to fatal diseases. Powdered milk is the second most likely food adulteration risk after olive oil. In addition to water, milk mainly contains adulterants of vegetable proteins, milk and whey of different species which are known as economically motivated adulterants. These adulterants do not pose any serious health risk. However, adulteration of some substances are very harmful to health if ignored. Urea, formalin, detergent, ammonium sulphate, boric acid, caustic soda, benzoic acid, salicylic acid, hydrogen peroxide, sugar and melamine are some of the major chemicals added to milk as adulterants which have been found to have serious adverse health effects on the body. Wadhwa, B. K. (2010).

Main reasons for the presence of antimicrobial drug residues in milk

- **Therapeutic and prophylactic use:** An important reason for the presence of antimicrobial drug residues in milk is the indiscriminate use of antimicrobial drugs in the treatment of infectious diseases, such as thrush, fever, inflammatory and viral diseases. Sometimes, antimicrobial drugs are given to milk animals after calving to protect them from Theladisease and after becoming ill for any reason, which is also responsible for antimicrobial drug residues in milk.
- **Antimicrobials in Multiple Purposes:** Antimicrobials can be a direct or indirect way of contaminating milk by medicinal residues when used during processing and preservation

of milk and related dairy products. The presence of low levels of antibiotic residues in milk and other dairy products causes microorganisms to become antibiotic resistant. Resistant microbes can be passed from person to person through direct contact or indirectly through the exchange of resistant genes in the environment. Aulakh, R. S., & Kaur, P. (2015).

- **Extra-label use:** Residues of antibiotics can be found in milk if the drug's label directions are not followed accordingly. When an antimicrobial drug is approved only for humans, these drugs are used indiscriminately in animals and their residues in milk cause antimicrobial resistance in humans. These drugs may be referred to as extra-label use.
- **Lack of proper Withdrawal period:** After administration of the drug to any lactating animal, human consumption of milk produced by it is prohibited for few days and the period is called Withdrawal period. Is. Without proper maintenance of antimicrobial drug withdrawal times in lactating animals, antimicrobial drug residues appear in milk at high concentrations.

Public Health Concerns

Most antibacterials currently used in the control and treatment of farm animal diseases are relatively nontoxic even at higher concentrations, but there are a few antibiotics that pose a significant threat to public health when present in sufficiently high concentrations in milk. The presence of chemical contaminants in milk is very important for consumers, and it can be a public health concern as well as many unknown diseases in humans because milk and dairy products are widely consumed by humans all over the world. S. D., & Awad, A. A. (2015).

In terms of public health, milk and milk products contaminated with antibiotics and other chemical contaminants above a certain residue level are deemed unfit for human consumption. Antibacterial residues may pose pharmacological, toxicological, microbiological, and immunopathological health risks to humans. This primarily applies to antibiotics used as treatment and feed additives. Antimicrobial overuse in livestock production causes toxicity in humans and animals. W. K., & Lim, J. (2017).

The emergence of resistant bacteria within animals and the transfer of antibiotic resistance genes (R-factor) from non-pathogenic bacteria to other bacteria or human pathogens, resulting in widespread resistance. Aside from the health risks, antimicrobial residues in milk interfere with starter culture activity, disrupting the manufacturing process of milk products. Acute and

malicious pesticide consumption involving higher doses results in death, whereas chronic insidious consumption results in increased cancer risk and disruption of the body's reproductive, immune, endocrine, and nervous systems. Mycotoxins can also be found in milk and dairy products, causing public health issues in humans. Aflatoxin M1 in milk is a carcinogenic metabolite of Aflatoxin B1. Aflatoxin M1 found in milk and dairy products increased the risk of liver cancer (hepatocellular carcinoma). Raza, N., & Kim, K. H. (2018).

Conclusion

Of course, in the changing industrial era, it is the need of the hour to use different types of drugs to control the increasing risks of diseases and it seems difficult to avoid their overuse and other contaminants, but their judicious use, awareness and proper monitoring check such measures. With the help of which the ill effects of these deadly contaminants can be controlled.

Because dairy products are consumed by people of all ages, including infants and children, the presence of aflatoxins in feedstuffs and their subsequent appearances in milk and milk products is a serious health concern. Toxins produced by fungi are resistant to high-temperature treatments such as pasteurisation and sterilisation. The elimination of this problem has recently become a major focus of research. The fungal growth on agricultural products, which become a major component of cattle feed, is primarily determined by the crop's temperature and moisture level, as well as the environment. As a result, controlling the presence of aflatoxin in milk and milk products becomes critical.

State cooperatives and the corporate sector, which are actively involved in the organised production and processing of milk, must play an important role in monitoring the production of animal feed fed to milching animals in order to produce quality milk for consumption by consumers from all walks of life. The public sector can play an important role by educating dairy farmers and milk processors about the dangers of fungal toxins like aflatoxin and taking preventive measures to reduce the occurrence of such health hazards in milk and milk products.

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