THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
Popular Article
December, 2025 Vol.5(12), 11110-11113

Milk Adulteration

Shekhar R Badhe
Assistant professor, Department of Livestock Products Technology
Nagpur veterinary College, Nagpur
DOI:10.5281/ScienceWorld.18046895

Introduction

Milk is one of the most important and widely consumed foods across the world, particularly in India, where it plays a vital role in human nutrition from infancy to old age. It is considered a nearly complete food due to its balanced composition of carbohydrates, proteins, fats, vitamins, and minerals. However, the increasing demand for milk and milk products, coupled with economic pressures and inadequate regulatory enforcement, has led to the widespread problem of milk adulteration. Milk adulteration refers to the deliberate addition or substitution of inferior or harmful substances in milk to increase quantity, enhance apparent quality, or gain unfair economic advantage. This malpractice not only reduces the nutritional value of milk but also poses serious risks to public health.

In recent years, milk adulteration has emerged as a major concern for consumers, regulatory authorities, and the dairy industry. Reports of adulterants such as water, detergents, urea, starch, sugar, neutralizers, and even hazardous chemicals like formalin and hydrogen peroxide have raised serious questions about milk safety. Ensuring the supply of clean, safe, and unadulterated milk is therefore essential for protecting consumer health and sustaining trust in the dairy sector.

Milk adulteration can be defined as the intentional addition of any foreign substance to milk or the removal of valuable constituents from milk, thereby degrading its quality and safety. According to food safety standards, milk should be free from any extraneous matter, preservatives, coloring agents, or chemical substances not permitted under law. Any deviation from these standards constitutes adulteration.

Adulteration may occur at various stages of the milk supply chain, including production, collection, transportation, processing, and marketing. Small-scale vendors,

middlemen, and even organized sectors may sometimes be involved due to economic incentives, lack of awareness, or poor-quality control systems. Adulteration not only affects raw milk but also extends to milk products such as curd, paneer, khoa, butter, ghee, and ice cream.

Common Adulterants Used in Milk

Several substances are commonly used to adulterate milk. These adulterants can broadly be classified into intentional adulterants and incidental adulterants.

Water

Addition of water is the most common form of milk adulteration. It is done to increase the volume of milk and hence the profit. The water added may be contaminated with pathogens, pesticides, or heavy metals, thereby posing serious health hazards. Dilution with water also reduces the nutritional value of milk by lowering the concentration of proteins, fats, and minerals.

Starch

Starch is added to diluted milk to restore thickness and viscosity. Although starch itself is not highly toxic, its presence in milk indicates adulteration and can cause digestive problems, particularly in infants and elderly individuals.

Sugar and Glucose

Sugar or glucose is added to increase the lactometer reading and compensate for dilution with water. Excessive intake of such adulterated milk may be harmful for diabetic patients and can contribute to metabolic disorders.

Urea

Urea is added to milk to increase the non-protein nitrogen content, giving a false impression of higher protein levels. Consumption of urea-adulterated milk can cause gastrointestinal irritation, kidney problems, and metabolic disturbances.

Detergents and Soaps

Detergents are sometimes added to emulsify fat and give milk a frothy appearance similar to natural milk. These substances are highly dangerous and may cause food poisoning, diarrhoea, and damage to the gastrointestinal tract.

Neutralizers

Neutralizers such as sodium carbonate, sodium bicarbonate, and caustic soda are added to neutralize the acidity of spoiled milk and prolong its shelf life. Long-term consumption of milk containing neutralizers can lead to digestive disorders and disrupt normal body pH balance.

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 15/12/2025

Preservatives and Chemicals

Chemicals like formalin, hydrogen peroxide, boric acid, and salicylic acid are used illegally to prevent microbial growth and extend the keeping quality of milk. These substances are highly toxic and carcinogenic, and their consumption may lead to severe health consequences.

Health Hazards of Milk Adulteration

Milk adulteration has serious implications for human health. The nature and severity of health effects depend on the type and level of adulterant present in milk. Consumption of adulterated milk may cause immediate symptoms such as nausea, vomiting, abdominal pain, diarrhea, and food poisoning. Long-term exposure to chemical adulterants can result in chronic health problems including kidney damage, liver disorders, hormonal imbalance, and increased risk of cancer. Infants, children, pregnant women, and elderly individuals are particularly vulnerable to the adverse effects of adulterated milk. Adulteration also leads to nutritional deficiencies due to dilution or removal of essential nutrients. This can contribute to malnutrition, impaired growth in children, and weakened immunity. Therefore, milk adulteration is not only a food safety issue but also a major public health concern.

Detection of Milk Adulteration

Detection of milk adulteration is essential for ensuring quality control and consumer protection. Various simple, rapid, and laboratory-based methods are used for detecting adulterants in milk.

Physical and Chemical Tests

Simple tests such as lactometer reading, clot-on-boiling test, alcohol test, and acidity test can provide preliminary information about milk quality. Chemical tests using specific reagents can detect adulterants like starch, urea, glucose, neutralizers, and detergents.

Prevention and Control of Milk Adulteration

Prevention of milk adulteration requires a coordinated approach involving producers, processors, regulators, and consumers. At the production level, adoption of clean milk production practices, proper animal health management, and hygienic milking methods are essential. Training and awareness programs for farmers and milk handlers play a crucial role in reducing adulteration. At the processing and marketing level, strict quality control measures, regular testing, and implementation of food safety management systems such as HACCP are necessary. Regulatory authorities must enforce food safety laws

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 15/12/2025

effectively and impose stringent penalties on offenders. Consumer awareness is equally important. Educating consumers about the risks of milk adulteration and simple detection methods can empower them to make informed choices and report suspected cases.

Role of Regulatory Agencies and Awareness Programs

Government agencies and organizations such as the Food Safety and Standards Authority of India (FSSAI) play a pivotal role in controlling milk adulteration. Implementation of food safety regulations, regular surveillance, and milk adulteration drives are essential components of regulatory control.

Public awareness campaigns, milk testing camps, and observance of events such as World Milk Day and National Milk Day contribute significantly to educating the public about milk quality and safety. Collaboration between academic institutions, dairy industry, and professional organizations further strengthens these efforts.

Conclusion

Milk adulteration is a serious challenge that undermines food safety, public health, and consumer confidence in the dairy sector. The practice not only reduces the nutritional quality of milk but also exposes consumers to potentially harmful substances. Effective control of milk adulteration requires strict regulatory enforcement, adoption of clean milk production practices, regular monitoring, and increased public awareness.

Ensuring the availability of safe, pure, and wholesome milk is a shared responsibility of farmers, dairy processors, regulatory authorities, and consumers. Continuous education, technological advancement in detection methods, and strong policy support are essential to combat milk adulteration and protect public health.

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 15/12/2025