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Effect of food adulteration on human health

Pavel Rout; Akshay Ramani; Shreya Saha
PhD. Scholar, ICAR-National Dairy Research Institute, Karnal, Haryana

Abstract

In all the growing countries, "food adulteration" is the main source of sickness and death. Some of the most often contaminated foods are meat, fish, milk, ghee, infant formula, honey, spices, sugar, cereals, wheat, tea, coffee, and wine. Food adulteration may occur due to negligence, accident, or chemical or metal contamination. From infants to the elderly, food adulteration poses a variety of health risks, including gastrointestinal disorders, small intestine problems, cardiac disorders, kidney disorders, liver disorders, nausea, vomiting, food poisoning, appendicitis, retarded brain development in babies, and carcinogenic effects, among others. Whether something comes from a natural, processed, or semi-processed source, we must be aware of its purity, integrity, and dietary worth before adding it to a product. This article focuses mostly on the concerns presented by food additives and how they may be detrimental to human health. Food adulteration must be prevented throughout the whole food manufacturing process, from the farm to the fork. GIT disorders are only one of the numerous issues that may result from the use of adulterants, which are occasionally developed intentionally for monetary benefit and can also have poisonous or carcinogenic effects. Food poisoning is a leading avoidable cause of death; thus, consumers must be aware of this and take the necessary measures.

Introduction

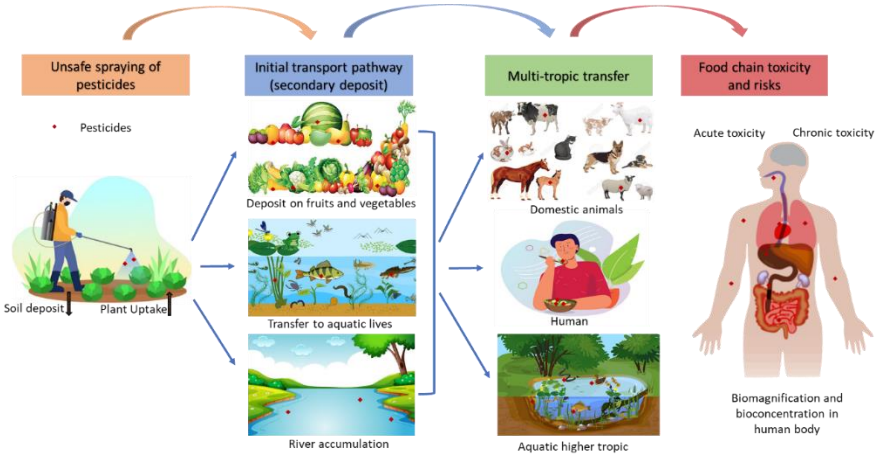
Adulteration, fraud, and misbranding in the food industry are some of today's most pressing issues. People in the food industry intentionally participate in this conduct to create an economic profit or increase volume. Global food control and safety standards have been implemented to evade food adulteration. Food that has been adulterated can have several negative impacts on our health, therefore we must check for originality and integrity before consuming it. The more nutritionally foods we take, the more life expectancy (Böhme et al., 2019; Fadnes et al., 2022). Among the items that are often contaminated include meat products, dairy items, infant formula, honey, coffee, oil, wine, shellfish, cereals, honey, wine, coffee, and numerous spices. Processed, semi-processed, or unprocessed food substances may be ingested for human nutrition and development. Several phases from "farm to fork" (i.e., manufacturing, handling, and shipping and packaging) are vulnerable to intentional contamination (Radford, 2018; Falardeau et al., 2019)Occasionally, food contamination occurs unintentionally as a result of natural processes. For instance,

the development of a fungus that produces cancer-causing aflatoxin during the storage of red chilies or red peppers, which is entirely unintentional on the part of the manufacturer, may be harmful and cause cancer. Inadvertent contamination of alcoholic beverages with biogenic amines produced during fermentation (Banerjee et al., 2017). Food adulteration might be intentional, unintentional, or the result of metal contamination, but its primary goal is to boost profits. This detailed investigation presents an up-to-date review of the deleterious effects of food adulteration on our bodies.

Pesticides application in food

In 2019, almost 54121 metric tonnes of fertilizers and pesticides were used by farmers in India, while approximately 2.65 million metric tonnes were used globally. When growing and storing crops, pesticides are employed to maximize their yield. Pesticides are detrimental to human health in several ways, including making us dumber, and more hyperactive, and causing respiratory disorders such as asthma, among others. Pesticide metabolites, which are left over from the preservative, are sometimes to blame for adulterating food resulting from the hydrolysis or proteolysis process. Dichlorodiphenyldichloroethane (DDE), a by-product of DDT (Dichlorodiphenyltrichloroethane), is sometimes detected in food, even though DDT is no longer used for agricultural purposes. This is due to the lengthy persistence of DDT in the soil. When pesticides are applied excessively or improperly, they not only raise the value of the crop, but they also damage the land, air, and water, harm animals, and harm humans **(Fig.1)** (Mahmood et al., 2016; Kaushik et al., 2018). Environmental changes and their negative effects on our health care system.

Fig.1. Pesticide transport to the human body



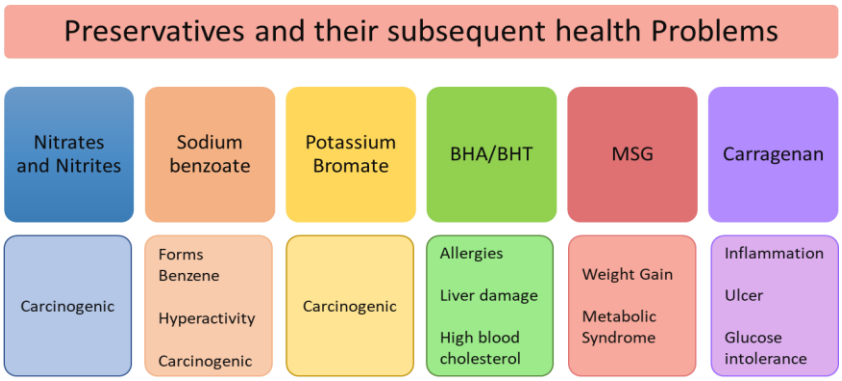
Coloring agents as food additives

Candies, such as sweets, jams, and jellies, breath mints, lollipops, etc., have a variety of colors, both permitted and prohibited. In place of natural turmeric, tartrazine, erythrosine, and sunset yellow color are used in baked products, dhal, and sweets. If a meal has an excessive amount of color, regardless of whether it is permitted or not, it may cause anything from a slight ailment to mental retardation and cancer. Oil-

soluble azo dyes like Dimethyl yellow and Diethyl yellow are used to improve the color of foods, according to the International Agency for Research on Cancer (IARC). These colors may cause cancer, such as the ones used in Tofu produced with soy milk to enhance the color ((Murugkar, 2015) Peng et al., 2017.

Preservatives as food additives

Many foods contain preservatives, so they must be utilized carefully and securely. Meat often contains sodium nitrite as a preservative. It inhibits the development of bacteria. However, when used excessively or in high amounts, it may cause cancer.



Potassium bromate is used in bread making, but now it's banned in many countries for its carcinogenic effect. The popular preservatives BHA and BHT may induce allergies, liver damage, and a rise in blood cholesterol if taken in excess. They are mostly used in fats and oil (Banerjee et al., 2017).

Antibiotic treatment in livestock

Meat from animals and administered antibiotics may promote cardiovascular disease, atherosclerosis, and resistance to numerous treatments(Attrey, 2017; Petric, 2021).

Metal added in meat

Arsenic, lead, mercury, and cadmium are metals that are very hazardous for humans if ingested by food. Due to the high cost of meat, it is often altered while it is still raw or after it has been processed(Mandal, 2017; Mesinger & Ocieczek, 2021). If the level of lead in your blood is less than 10 g/dl, it might induce neurological and toxic illnesses. Both methyl mercury and ethyl mercury are toxic to the central nervous system (Jha, 2015).

Other food adulterants

Ajinomoto (monosodium glutamate) is an ingredient often seen in Chinese dishes and meat-based dishes. It may inhibit the natural development of a baby's brain and cause irreversible damage if consumed in excess. There is some indication that coumarin and di-hydrocoumarin may one day prevent blood from clotting, even though they are most often employed to flavor food. Sometimes, candies contain artificial sweeteners, the consumption of which has been associated with an increased risk of cancer (Attrey, 2017; Purohit & Mishra, 2018). The bulk of olive oil sold now has hazelnut oil as an added component (Medina et al., 2019; Ray et al., 2021). The use of non-compliant materials for food packaging may raise the likelihood of cancer and angioedema. Some people attempt to reach their weight reduction objectives by

using herbal medications. These pills may be purchased online without a prescription from a physician. In China, it is standard practice to blend the roots of Stephania tetrandra with Aristolochia fang chi to aid with weight loss. This practice is conducted because the roots of Stephania tetrandra contain aristolochic acid, which is known to be damaging to the kidneys (Ekar & Kreft, 2019; Joshi et al., 2008). In 2007, an artificial ingredient known as melamine was detected in pet food in the United States and Canada. According to the World Health Organization, it can cause reproductive system problems and kidney stones.

Various harmful effects caused by the adulterants

To induce ripening in mango, banana, and other fruits, calcium carbide is used. Nowadays the use of wax is very common to polish apples. Metallic lead is used in green vegetables to give them an artificial green hue. Too many pesticides are used to cultivate fruits and vegetables. Meat and fish are covered with chemicals that prolong their freshness. Oxytocin is applied to vegetables to stimulate their growth and increase their size. This substance may induce long-term brain damage (Lawson et al., 2020; Manasha & Janani, 2016; McGregor & Bowen, 2012). In addition, food fraud occurs when the date of manufacturing or the date of expiry on a food container is altered. Drinking fresh fruit juice or coconut water is preferable to drinking cold drinks or other beverages with added ingredients. Before purchasing food, individuals should inspect the package for labels and certification symbols. All food additives have a maximum safe dosage, beyond which they become toxic. The reuse of stale cooking oils or oils that have gone rancid is prohibited. Instead, they need to be recycled utilizing contemporary analytical methods. Today, altered food poses a significant hazard to civilization. A recent poll revealed that relatively few individuals routinely check expiry dates, read labels, or examine the ingredient list on food packaging. It is essential to verify the expiration dates of medications before purchasing them. There should be more social media and television programs and advertisements like "Jago Grahak Jago" that discuss manipulated food. If we consume foods that have been altered daily, we may develop major health issues, including issues with our eyes, hearts, kidneys, livers, and brains in children. Some of the chemicals or poisons are eliminated during cooking, such as when the meal is washed, boiled, heated, or fried. Now is the moment to concentrate on preventing food from being tampered with and preventing it from occurring. People in the food sector must be able to employ modern analytical techniques to detect adulterants (Peris & Escuder-Gilabert, 2016; Valand et al., 2020).

Conclusion

Food adulterant poses a significant threat to society, and the negative effects of this practice are seen in the everyday lives of everyone. It is important to conduct awareness campaigns regularly to educate people about the potential dangers associated with the adulteration of food. It is vital to establish legal and

disciplinary actions to eliminate such worries of illegal activity. Farmers now have access to low-cost seeds thanks to cutting-edge technologies that facilitate growing methods that use fewer pesticides, the safe storage of grains and foods, and the availability of low-cost seeds. These technologies also make it possible for farmers to get their hands on inexpensive seeds. All-India Institute of Medical Sciences and the All-India Institute of Hygiene and Public Health should do further research on the topic of food contamination and the negative effects it has on human health.

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