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# A CRITICAL REVIEW ON FOOD ADULTERATION AND ITS RISK ON HEALTH

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**Abstract**

"Food adulteration" is a very common issue to the society and its harmful effects on health are the vital reason for the mortality and morbidity in the developing countries. The most common adulterant foods are milk, infant formula, meat, fish, honey, ghee, spices, tea, coffee, wine, sugar, grains, wheat etc. Food adulteration may be of intentional, incidental or by contamination with foreign substances such as metals. There are lots of health hazards seen with the food adulteration starting from infant to the older people such as various stomach disorder, small intestine problems, nausea, vomiting, food poisoning, cardiac disorder, kidney problems, liver problems, appendicitis, delay in brain development in case of children and carcinogenic effects etc. Before we eat any kind of food, we must know its quality, authenticity and nutritional value whether, it is obtained from natural sources, processed or semi-processed one. The objective of this article is focused on the review of food adulterants and their hazardous effects on our health. Care must be taken in every step to prevent from adulteration i.e. from cultivation land, processing of food in the industry, transport, proper storage or preservation of food to the kitchen, catering service or at restaurants level. People make adulteration intentionally mainly for the making of profit and these adulterants not only cause GIT disorders but also some poisonous or carcinogenic effects. Thus, consumers should aware of this and some serious safety measures must be taken care to prevent the unnecessary death due to foodborne diseases.

**Keywords:** Food adulteration, hazardous effects, authenticity, nutritional value, carcinogenic effects, Food Borne Diseases

## Introduction

Food adulteration, food fraud or food mislabelling are one of the emerging issues now-a-days. This type of activity is practiced intentionally by the people from the food industry for making the economic profit or to increase the volume. There are so many regulations have been enforced for the food control and safety worldwide in order to prevent adulteration and contamination. As adulterated food has many harmful effects on our health, we must ensure its authenticity, originality before we eat it. The more is the healthy food we eat, longer will be the life span of human being [1]. The commonly adulterated foods are dairy products, meat, oil, honey, wine, coffee, sea food, grains, infant formula and other spices etc. food is defined as any substance, either processed, semi-processed or raw that can be ingested by the human for nourishment and growth. Foods are passed through many stages, "farm to fork" i.e. starting from production, processing, transport and packaging where, food may get contaminated intentionally [2]. Sometimes, food contamination is happening unintentionally as a result of natural processes. For example, growing of aflatoxin producing fungi while

storage of red chillies or red pepper which is purely without the ill motive of the producer, but this can be deleterious and causes cancer. Contamination of alcoholic beverages with biogenic amines due to fermentation that is also without any intention [3]. Food adulteration may be of intentional, incidental or metal contamination type and the primary objective of adulteration is to make the profit. This comprehensive review narrates about updated overview on food adulteration and its ill effects on our health system.

**Pesticides application in food**

It is the most common type of food adulteration everywhere in the world. Around 408 million kg of pesticides or fertilizers were used in the United States of agriculture lands and about 1.3 billion kg of pesticides are used worldwide in the year of 2012. Pesticides are applied in crops to maximise the yield during the process of cultivation and storage purpose. Consumption of pesticides has some serious ill effects on our health like poor intelligence, hyperactivity, respiratory symptoms like asthma etc. The degraded substances from the preservative i.e. pesticide metabolites are sometimes responsible for the food adulteration (result from hydrolysis or proteolysis process). Example: DDE i.e. Dichlorodiphenyldichloroethane, a degraded product from DDT (Dichlorodiphenyltrichloroethane), sometimes DDE is found in food even if DDT is no longer used for cultivation and found due to its bio persistence by the soil [2]. The rampant usage of pesticides inappropriately not only cause a rise production value of crop but also cause pollution or adverse effects to the soil, air, water environment, animals and human population [4].

**Colouring agents as food additives**

A wide range of permitted and non-permitted colours have been used in the preparations of various confectionery items like sweets, jams & jellies, mouth fresheners, lollipops etc. Tartrazine, erythrosine and sunset yellow colour are used instead of natural turmeric in confectionery, bakery foods and dhal items. The colour (permitted or nonpermitted) used in excess quantity in food, it may cause mild illness to mental retardation, carcinogenic one. According to the IARC (International Agency for research on cancer), Diethyl yellow and dimethyl yellow are the oil soluble group of azo dye used in foods for adulteration which can be a carcinogenic (e.g. Tofu from soy milk to enhance the colour [5].

**Preservatives as food additives**

The use of preservatives is growing widely in the making of food stuffs but its efficient and safety use of this is very much essential. Sodium nitrite is a preservative used in meat frequently and it reduces the growth of microorganism. But, the excess use or at high concentration, it may be carcinogenic in nature. The very common preservative BHA and BHT may cause allergy, liver damage and increase in serum cholesterol level in overdose and mostly used in oils and fats [3].

**Antibiotic treatment in livestock**

Meats from antibiotics treated animals have some serious heart related diseases, hardening of artery and other multiple drug resistance effects [6].

**Metal use in meat**

Mercury, lead, arsenic and cadmium are some of the metals which are having some serious ill effects on our health if we consume through food. As meat is very expensive one, it is adulterated either in raw form or canned form i.e. processed [7]. If the level of lead in blood is ≥ 10 g/dl, it may cause some toxic and neurological disease to our body. The major form of mercury is methyl mercury and ethyl mercury which are having some adverse effects on central nervous system [8].

**Other food adulterants**

Monosodium glutamate is an additive commonly used in Chinese preparation, meat products and its maximum use may hamper brain development in infants and brain damage. Coumarin and di-hydrocoumarin are mainly used in flavoured foods and it may later cause blood anticoagulant. Also, artificial sweeteners that are used in

sweets and its excess use is carcinogenic [6]. Olive oil now-a-days very popularly used, and it is mostly adulterated with hazel nut oil [9]. The use of nonstandard food grade packaging material may origin cancer, angioedema. Some people are using pills of herbal origin for weight loss or slimming purposes and these are available online without the need of any prescriptions. *Stephania tetrandra* roots are commonly adulterated with roots of *Aristolochia fangchi* in China for weight loss and it contains 'aristolochic acid' which is known to be nephrotoxic in nature [10]. 'Melamine' is a synthetic product which are commonly found in pet foods at north-America in the year 2007 as reported by WHO and it has harmful effects like stones in kidney and reproductive system disorders [8].

**Table 1: Various harmful effects caused by the adulterants** [11]–[13]

| Sl. No. | Food type | Adulterants added | Health risk |
|---|---|---|---|
| 1 | Sugar | Chalk powder | Stomach illness |
| 2 | Fish | Formaldehyde | Carcinogenic |
| 3 | Jaggery | Washing soda, chalk powder | Diarrhoea, vomiting |
| 4 | Coffee | Chicory powder | Joint pain, stomach pain |
| 5 | Wheat, grains | Sand, marble chips | Digestive tract disorder |
| 6 | Turmeric powder | Anillin dyes | Carcinogenic |
| 7 | Asafoetida | Colophony resins | Dysentery |
| 8 | Chilli powder | Brick dust, artificial colour | Stomach disorder, cancerous |
| 9 | Juice, jam | Non permitted dye | Carcinogenic |
| 10 | Soft dinks | Cadmium | Acute gastritis |
| 11 | Liquors | Cobalt | Heart disease |
| 12 | Tea | Used tea leaves, coloured leaves | Liver disorder, appendicitis |
| 13 | Milk | Unhygienic water, urea | Stomach disorder |
| 14 | Black pepper | Papaya seeds | Liver disorder |
| 15 | Mustard | Argemone seeds | Epidemic dropsy |
| 16 | Silver foil | Aluminium foil | Small intestine problems, appendicitis |
| 17 | Honey | Water | Small intestine problems, appendicitis |
| 18 | Common salt | White powder stone | Small intestine problems, appendicitis |
| 19 | Ice cream | Washing powder | Small intestine problems, appendicitis |
| 20 | Infant formula | Melamine | Falsify the protein level, nephropathy |
| 21 | Wheat flour | Ergot | Poisonous effect |

Also, calcium carbide is used to ripen the mango, banana and other fruits. Wax is used to give shine to the apples. Artificial green colour such as metallic lead is used to colour the green vegetables. Pesticides are used in excess amount during cultivation of fruits and vegetable. Meat and fish are coated with preservatives for the storage of long duration of time. A hormone known as oxytocin is applied to vegetables for faster growth and bigger in size and this chemical may lead to brain damage in later [12]. Changing of the expiry dates or manufacturing dates in the package of food item is also a type of food fraud. It better to drink fresh fruits juice or coconut water instead of drinking adulterated cold drinks and other drinks. Consumers must ensure the labelling and certified marks on packaging before buying food items. All the food additives must be used with in specific limit and beyond its usage cause harmful effects. Use of left-over oils after cooking and expired oils cause some serious adverse effects on health and it must be recycled by some modern analytical techniques.

Now-a-days, food adulteration is a major threat to the society. From a recent survey study, it has been found that very few people are having a habit of checking expiry dates, ingredients on package or read any labelling on it. It is important as in case of medicine expiry dates before buying. There should be more awareness and promotional programmes regarding the food adulteration in social media or via advertisement in TV like 'Jago

Grahak Jago'. Although, the 'Food Safety and Standard Authority of India (FSSAI) is regulating standards of food to some extent, but some of the consumers are not aware of this effectively [14]. The daily consumption of adulterated foods causes some serious illness to our health such as vision problem, heart problem, kidney disorder, liver issue, mental retardation in children etc. Some of the adulterants or toxins are partially removed during the cooking process like washing, boiling, heating and frying. This is the high time to focus on control of food adulteration and how to prevent it utmost. Some advanced analytical methods to detect a food adulterant must be familiarised in the food industry [15].

## Conclusion

'Food adulteration' is a major life threat to the society and its harmful effects impact our routine life of everyone. Awareness campaign regarding the risk factors associated with food adulteration should be conducted periodically. Some legal and penalty enforcement must be implemented to prevent such type of illegal issues. Advance technologies can be adopted for easy cultivation method, less usage of pesticides, safe storage of grains and foods, availability of seeds at low price to the farmers. More research is required in the area of food contamination and its ill effects on health by the All-India Institute of Medical Sciences and All India Institute of Hygiene and Public Health.

## Conflict of Interest

The authors declare there are no conflicts of interest.

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