



# ADULTERATION OF FOOD AND ITS IMPACT ON HEALTH

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## ABSTRACT

The worldwide provision of food is significantly impacted by the widespread problem of food adulteration. The article examines the several types of adulteration, including products mislabelling, dilution using subpar components, and the addition to hazardous compounds. This talks about the harmful effects on human health, including short-term dangers including ingesting contaminated food to lasting impacts including weakened immune and long-term illnesses. It also draws attention to the negative social and economic effects, such as a decline in customer trust and unstable business conditions in the food sector. Given the seriousness of the problem, it seems imperative that strict laws, reliable surveillance programmes, and outreach initiatives be implemented in order to protect community health and guarantee the quality and what we eat.

**KEYWORDS** Food adulteration. Health impacts, chronic illnesses, Food security, monitoring systems.

## OBJECTIVE

The objective of this project is to study about some of the common food adulterants present in different food items and the basic impact of health due to the adulterated food.

## INTRODUCTION

Food is obtained from both the plants and animals and is mostly essential for the sustenance of life. Food can be consumed (Example: In the form of cooked items.) or can be drunk in the form of liquids (Example: Fruit juices, milk, coconut water etc..). All living organisms require food to gain the energy and for performing different metabolic activities in the body and also require food for their growth, work, repair and for maintaining the life process. Pure, fresh and healthy diet is mostly essential for the health of the people. We all know that community health is of national health.

Adulteration is the illegal act of contaminating and degrading the quality of the food incidentally or intentionally by adding the unwanted substances or some toxic chemicals to the food which actually lowers the quality of the food and also decreases the value Of nutrients present in the food and causes adverse impacts on the health and also affects the growth and development of a human being. Adulterants are any substances that cause the food's quality to decline. The adulterant might be there in any shape or size.

Food adulteration typically occurs in its most basic form. Drugs that are prohibited are partially replaced. Food adulteration and contamination occur as a result of negligence and unhygienic production, storage, and marketing practices, or as a result of financial gain. Adulteration is a widespread practice in underdeveloped and emerging nations. Adulteration is a tactic used in corporate planning. Food adulteration has long been practiced, but because of its low impact and small-scale use, it went unnoticed.

In the ancient days the land was abundant and the supply of food was more than the demand. The people used fresh food materials available in most natural form and they traditionally cooked by themselves to maintain good health. But at the present era economic adulteration is a long-term problem affecting the food industry at more drastic level because day by day the population is increasing and also the people's lifestyle has been changed and also there is a raise in the income of the people. Because of this more and more people were ready to eat foods at regular basis.

Due to the increase in the population the importation of the food stuff from the other countries are also increasing. In order to enhance the amount of food produced, the manufacturers mimic the food ingredients with other substances and also add additional substances. Customers may be drawn to these items because of their lack of knowledge since they are deceiving their clients in order to boost sales and output in order to maximize profit on fewer investments. In order to maximize profits, they also reduce the quality of the meal by substituting non-authentic components for food items and by taking out essential nutrients. Many packaged and unpackaged items that are discovered to have been tampered with by food labs end up in the trash since they are unfit for human consumption. In this sense, the food that the farmer grows doesn't actually reach the customer; rather, it ends up on his plate as poison.

These days, it's hard to locate a food market segment that doesn't involve adulteration. After the arrival of the fast-food concept the consumers are not even aware of the hazards of adulteration and started ordering the food in online and the consumers really didn't bother about what type of food is being served to them and they totally forgot their health aspect and only concentrating about the order to get into the door steps. By taking advantage of the consumers' laziness, many restaurants and food joints which serve food are not bothered about the quality aspects of the food and they only think to satisfy their customers by serving them on time. They do not bother about the consumers' health and their main motive is to earn the profit by serving the quality less food.

Some producers in order to reduce their manufacturing cost are adding some adulterants to more expensive substances to increase the visible quantities so that he can save his money and can sell the product for more cost when compared to the manufactured price.

## **REASONS FOR FOOD ADULTERATION**

Producers, processors, and merchants that are self-serving engage in adulteration in order to boost output and profit. Adulteration is mostly caused by dishonesty and a failure to do an accidental quality evaluation on suspicious items. The world's population is growing every day, and in order to feed everyone, food is being tampered with. Outsourcing to foreign producers is a further reason for adulterating and falsifying goods and services.

Because labour is very inexpensive in some nations, outsourcing has become conceivable. This also makes creating products easier because production costs are much lower than supernormal profits. Adulteration occurs when supply cannot keep up with demand.

Adulteration is used to reduce production costs and gain a competitive edge over rivals in the market. The reason for adulteration is because the average person cannot purchase foods that have all of their original ingredients. Inadequate training, antiquated methods of food processing, and ignorance of the illness brought on by tainted food items. Absence of drive from the government and absence of well-crafted, efficient legislation.

## 1. TYPES OF ADULTERATION:

There are many types of adulteration.

### 1.1 INTENTIONAL ADULTERATION:

This type of adulteration is deliberate and typically carried out for financial benefit. It is the addition of compounds that are hard to detect and have qualities comparable to the meals they are added to. There are two possible types of adulterants: biological and physical. The most common way that food products are adulterated is by adding colour. Intentional adulteration can take several forms, such as adding water to liquid milk, adding extraneous material to powdered spices, or removing or replacing milk solids from natural products. To increase the profit, dirt, marble chips, and sand are also added to the pulses. It is dangerous because the nutrient substances are deducted from the food items and instead of those extraneous substances are added. Olive oil, milk, honey, saffron, orange juice, coffee and apple juice are the seven most food items which are intentionally adulterated.

### 1.2 INADVERTENT ADULTERATION:

Also referred to as incidental adulteration. Because of ignorance and a lack of infrastructure to ensure food quality, incidental adulteration happens. Incidental adulteration can also be caused by using improper food handling and packing practices. Unknowingly, incidental adulteration happens by mistake. In this instance, food adulteration happened unintentionally. Vegetables cultivated near factories and industrial zones had high harmful levels of industrial contaminants, including heavy metals that were absorbed by the plants. The greatest examples of adulterants in this group include pesticide residues, rodent droppings, and larvae in food. This kind of adulteration happens when food goods and beverages are not kept in adequate hygiene from the production site to the consumption table. Here the producers or traders won't add any adulterants to the food during handling, storing, transportation and marketing the food might be adulterated. Examples for this type of adulteration are residual pesticides, rodent droppings, insects in food, preservatives, mercury from effluents, tin from cans, lead from water etc.

### 1.3 METALLIC ADULTERATION:

Metallic pollutants are present in food in trace levels and enter the food chain through environmental contamination or food manufacturing. Lead in water, pesticide-derived arsenic, and chemical industry effluent are a few instances of metallic adulteration. Tin from cans is one example of a metallic contamination that is regarded as an unintentional kind of food adulteration.

Among the kinds of adulteration caused by metallic pollutants include lead in water, mercury in effluents, and similar toxins.

### 1.4 NATURAL ADULTERATION:

This kind of adulteration refers to the possibility of various chemicals, organic compounds, or radicals that are naturally present in food and are harmful to health even though they are not added to the food on purpose or accidentally. A few types of pulses, Mushrooms and marine food are an easy target to commit the food adulteration. While some kinds of saltwater fish are edible, many are considered to be hazardous.

### 1.5 ORGANIC FOOD ADULTERATION:

During the organic food production, no synthetic pesticides are used for cultivation only organic manures should be used. Instead of the organic manures some people are using BT, pyrethrum and rotenone in this case the organic food doesn't claim to be organic. In this way organic food is adulterated.

### 1.6 POISONOUS OR DELETERIOUS SUBSTANCE ADULTERATION:

Generally, if a food contains any toxic substance, it can be injurious to health. In this case clean food is blended with the toxic substances. For example, apple cider vinegar is infected with E. coli O157:H7 and brie cheese food is infected with listeria monocytogenes. If they are present in the less, they may not be that toxic if they are present in the excess quantity, they may cause some infections.

**TECHNIQUES FOR ADULTERATING FOOD:**

4.1 Mixing: Combining clay, chips of marble, sand, pebbles, stones, etc.

4.2 Substitution: Full or partial substitution of superior substances with less expensive and inferior ones occurs.

4.3 Hiding the calibre of food: Attempting to conceal the quality. Adding subtitles to low-quality food images for sale is one example.

4.4 Decomposed food: Good food and decomposed food are typically combined in fruits and vegetables.

4.5 False labelling and misbranding: it contains duplicate food items and modifies the manufacture and expiration dates.

4.6 Toxicant addition: Adding non-food items to food items, such as colouring additives, low-quality preservatives, and argemone in mustard oil.

**HISTORY**

1.7 Food adulteration was first discussed in the middle of the 19th century, when advances in chemical and microscopically understanding allowed for the analysis of food ingredients. The German scientist Fredrick conducted the first investigation into adulteration in 1820, discovering several harmful metal colourings in food and beverages. The first food adulteration legislation was created in 1860 as a result of substantial study conducted by the physician Arthur Hill Hassall in the early 1850s, but it lacked adequate enforcement mechanisms. Administrative officers were appointed and sanctions for infractions were established in 1872.

1.8 **FOOD ADULTERATION ACT OF 1954:** On September 29, 1954, the president signed the legislation prohibiting food adulteration, which had been approved by both houses of parliament. As the Prevention of Food Adulteration Act of 1954, it went into effect on June 1st, 1955. The nation's standards for food safety are outlined in this statute. This legislation grants the federal government and food laboratory the authority to examine and analyze food products. Additionally, it is against the law to bring tainted or adulterated food into India. This statute, which imposes penalties on those who violate its rules and regulations, was last updated in 1986 to give customers greater control and to impose harsher penalties.

**1.9 ADULTERANTS IN SOME COMMON FOODS:**

The majority of store owners employ readily available, inexpensive alternatives as adulterants. As an illustration, sugar gets tainted by washing soda and chalk powder, combining fresh and decayed produce combining sand, marble chips, pebbles, clay and other materials with grains, legumes, and other crops. Urea, fat, detergent, and diluted water are all used to tamper with milk. Various chemicals and dyes are used to colour vegetables. Chemically treating the fruits to hasten their ripening process. Papaya seeds are combined with pepper.

Injecting steroids into chickens allowed them to quickly transform into hens. Combining oil with less expensive oil. Chalk powder is mixed in with the salt. Desi ghee and Vanaspati ghee are combined, besan and kesari dal are combined, etc. These kinds of adulterants degrade the food products.

**BASIC IMPACT OF ADULTERATED FOOD ON HEALTH:**

Adulteration of food causes harmful effects on health. It decreases the nutritional values in the body and leads to nutrient deficiency disorders. It causes liver disorder, stomach disorders, lathyrism, cancer, vomiting, dysentery cancer, joint pain, heart diseases, some adulterated food causes miscarriages in the pregnant women due to the poor foetal growth and sometimes abortion occurs and the women may die while giving birth to the baby. Adulterated food can cause tumours, anaemia, and asthma, abnormalities on skin, kidney damage, tumours, and abnormalities on eyes.

**THEORY**

The proliferation of food producers and the importation of food items allow producers to deceive and mislead consumers. It is exceedingly difficult to distinguish between people who adulterate food and those who take advantage of legal regulations. Food poisoning and other health problems might result from customer ignorance and unscrupulous business practices. The average person finds it extremely difficult to recognize identical natural food items. Thus, in order to detect them, some basic screening is required. Food adulteration has grown to be one of the biggest, most significant issues in recent years. Eating contaminated food can result in cancer, ulcers, asthma attacks, joint discomfort, vomiting fits, diarrhoea, and certain skin conditions.

Paraffin wax, castor oil, and hydrocarbons make up the majority of fats, oils, and butter. Dried papaya seeds are combined with pepper, water and starch are added to milk, and different oils are blended together with coconut oil. Simple chemical tests are an easy way to identify these adulterants.

The Indian government has established a number of agencies to stop the adulteration process and remove adulterants from food products.

AGMARK, an acronym for Agricultural Marketing, was founded by the government to test food goods for quality and issue certificates for them. The main motive of this is to provide consciousness, awareness and standardization of the food products with their certification to the customers.

## PROCEDURE:

### 7.1 Experiment-1: Tests for milk:

1) Milk starch detection: Starch is the most prevalent adulterant found in milk, along with water. The three main components of milk are solids that include protein, lactose, and minerals (about 8.5%), fat (about 3.5%), and water (about 80%). To keep fat-extracted or diluted milk from being too thin, starch is added to milk. Milk may be tested for the presence of starch by adding an iodine solution.

Reagents used: Iodine solution.

Procedure: I took 30 millilitres of milk sample and boiled it for three to four minutes. After that, I merely let it cool down for a few minutes and added five to six drops of iodine solution, giving it a good shake.



Sample-1



sample-2



Sample-1



sample-2

Observation: The sample-2 does not exhibit any colour change and the sample-1 turned into blue colour

Observation table

S.no.	sample	result
1	Open sample.	Adulterant present
2	Packet sample.	Adulterant absent

### 7.1.2 Detection of vanaspathi in milk:

Milk is adulterated with vanaspathi to increase the fat content in the milk.

Reagents used: Hydrochloric acid [HCL].

Procedure: I took 3ml of milk in a test tube and added 10 drops of hydrochloric acid.

Observation: Both the sample-1 and sample-2 does not turn into red colour.

Observation table

S.NO.	SAMPLE	RESULT
1	Open sample.	Adulterant absent.
2	Packed sample.	Adulterant absent.

### 7.1.3 Detection of formalin in milk:

The most common adulterant in the milk is of formalin it is added to the milk to increase the shelf life for long distance transportation of milk without refrigeration. Formalin acts as a preservative in the milk.

Reagents used: Sulphuric acid [H<sub>2</sub>SO<sub>4</sub>].

Procedure: I took 10 ml of milk in a test tube and added 5ml of sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) to the sides of the walls of the test tube without shaking it.

Sample-1



sample-2



Observation: Sample-1 does not form any violet ring between the intersections of the two layers. In the sample-2 violet ring is formed between the intersections of the two layers.

Observation table

S.no.	Sample	Result
1	Open sample.	Adulteration absent.
2	Packed sample.	Adulteration present.

## 7.2 EXPERIMENT-2: TESTS FOR GHEE:

### 7.2.1 Identification of vegetable ghee, or vanaspathi ghee, in milk product, deshi ghee:

Since deshi ghee is more expensive than vanaspathi ghee, vanaspathi ghee is mixed with deshi ghee. Sesame oil is a component of vanaspathi ghee that is absent from deshi ghee.

Needed Reagents: Hydrochloric acid concentrated (CONC HCL).

Procedure: I took 5 millilitres of ghee sample, added 5 millilitres of strong hydrochloric acid, and then added a pinch of sugar. I then let the sample sit for 5 minutes. of sugar. I then let the sample sit for 5 minutes.



Sample-1



sample-2

Observation: A blood red hue is seen in sample 1 near the test tube's bottom end of the acid layer. In sample 2, there is no visible blood red colour at the base of the test tube's acid layer.



Sample-1



sample-2

Observation table

S.no.	Sample	Result
1.	Buffalo milk ghee.	Adulterant present.
2.	Cow milk ghee.	Adulterant absent.

**7.2.2 Detection of mashed potatoes, sweet potatoes and other starches in ghee:**

Ghee is adulterated with the starch in order to increase in in thickness.

Reagents required: Iodine.

Procedure: I took 1 teaspoon of ghee sample in a bowl and added 3-4 drops of iodine to the sample.

Observation: Sample -1 and sample-2 doesn't turn into blue colour after the addition of iodine.



Sample-1



sample-2

Observation table

S.no.	Sample	Result
1.	Buffalo milk ghee.	Adulterant is absent.
2.	Cow milk ghee.	Adulterant is absent.

**7.3 EXPERIMENT-3: TESTS FOR BUTTER:**

**7.3.1 Detection of vanaspathi in the butter:**

Butter is adulterated with the vanaspathi to increase the fat content in the butter. In this case fat from the milk is replaced with vanaspathi.

Reagents used: Concentrated Hydrochloric Acid [CONC HCL].

Procedure: I filled a test tube with five millilitres of melted butter, five millilitres of strong hydrochloric acid, and a pinch of sugar.



Observation: At the test tube's lower end, a reddish red colour is seen after five minutes.



Observation table

S.no.	Sample	Result
1.	Buffalo milk butter.	Adulteration present.



### 7.3.2 Identifying other starches, like as sweet potatoes and mashed potatoes, in butter.

To make butter thicker and more substantial, it is often laced with sweet potatoes, mashed potatoes, and other carbohydrates.

Used reagents: iodine.

Method: I took a teaspoon of melted butter sample and put it in a bowl with three or four drops of iodine.



Observation: After adding iodine to the sample, no blue is seen.

S.no.	Sample	Result
1.	Buffalo milk butter.	Adulteration absent.

### 7.4 EXPERIMENT-4: TEST FOR ASAFOETIDA:

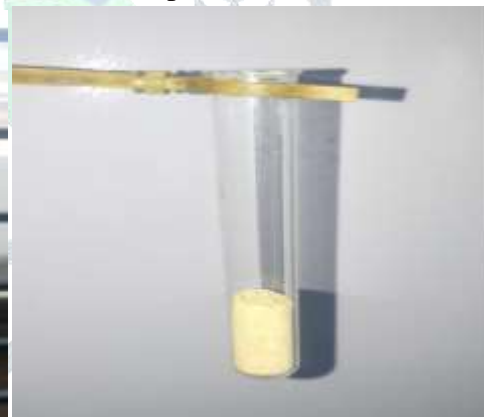
#### 7.4.1 Detection of starch in asafoetida:

In order to make more of the product, asafoetida is mixed in with the starch. The reagent employed was an iodine tincture.

Method: I put three grams of asafoetida in a test tube, filled it with water, and gave it a good shake. Next, I added two to three drops of iodine tincture to the mixture two to three drops of iodine tincture to the mixture.

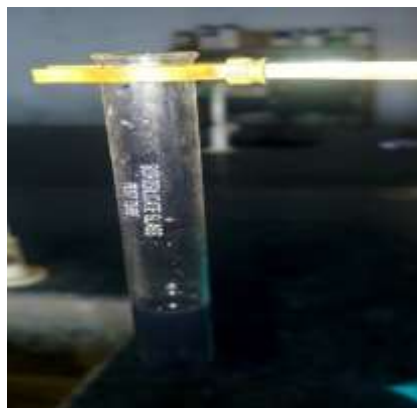


Sample-1



sample-2

Observation: Sample-1 turned into blue colour after the addition of tincture of iodine and no colour change is seen in the sample-2 after the addition of tincture of iodine.



Sample-1



sample-2

Observation table

S.no.	Sample	Result
1.	Packed sample.	Adulteration present.
2.	Packed sample.	Adulteration absent.

## 7.5 EXPERIMENT-5: TESTS FOR EDIBLE OILS:

### 7.5.1 Detection of argemone oil in edible oils:

Edible oils are used in cooking, but because of their high price due to their high demand in the domestic and worldwide markets, they are often combined with less expensive oils, such as argan oil, to increase the amount of edible oils utilized. Materials utilized: concentrated HNO<sub>3</sub> nitric acid.

Method: I took a tiny sample of edible oil, added a few drops of powerful nitric acid, and gave it a good shake in a test tube.



Sample-1



sample-2



Sample-3

Observation: In samples 1 and 2, there is no red colour discernible at the acid layer. The acid layer in sample 3 has a red colour.



Sample-1



sample-2



Sample-3

Observation table

S.no.	Sample	Result
1.	Sesame oil.	Adulteration absent.
2.	Palmolein oil.	Adulteration absent.
3.	Ground nut oil.	Adulteration present.

## 2. PRECAUTIONS:

- Select only the packed items of well-known companies.
- Items should be purchased only from the reliable retailed shops.
- ISI and AGMARK should be checked before purchasing any food product.
- Buy the airtight popular branded products.
- Avoid artificial coloured food and sweets and buy them only from reputable shops.
- Sweets or snacks kept in the open should not be purchased and consumed.
- Avoid purchasing foods from the unhygienic and consuming food from street side vendors.
- Before consuming any vegetables and fruits, wash them with the water.
- Manufactured and expiry date of the product should be checked before purchasing.
- **Before buying the products like milk, oil and other pouches check whether the seal is valid or not.**

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