ADULTERATION IN FOODS
What is Adulteration?

• Deliberate contamination of food material with low quality, cheap, non edible and toxic substances.

• An adulterant is a chemical substance which should not be contained within other substances (e.g. food, beverages, and fuels) for legal or other reasons.
Historical Perspective

• At least as early as 300,000 years ago, early humans had harnessed fire to cook and conserve meat and, later, determined that salt could be added to preserve meat without cooking.

• Over time, the act of adulterating food for economic gain began to emerge.

• During the 18th and 19th centuries, as the United States shifted from an agricultural to an industrial economy the debasement of food for profit became rampant.

• Adulterant usage was first investigated in 1820 by the German chemist Frederick Accum, who identified many toxic metal colorings in foods and drinks.
Food Adulteration Categories

- **Replacement**: Complete or partial replacement of a food ingredient or valuable authentic constituent with less expensive substitute with the intention of circumventing on “origin” and false declaration of the “process”.

- **Addition**: Addition of small amounts of non-authenticated substances to mask inferior quality ingredient.

- **Removal**: Removal of authentic and valuable constituent without purchasers knowledge.
- Cereals, grains, Pulses
- Dairy Products & Milk derivatives
- Fruit juices, concentrates, jams
- Functional food ingredients
- Vinegars
- Oil
- Protein based ingredients
- Sea food
- Spices
- Sweeteners
- Wines, Liquor, Spirits etc.,
- Meats
Food Adulteration Vs Food Additives

Food Additives are Chemical substances added to processed foods:

- To enhance/retain quality attributes such as texture, physical properties, taste, flavor etc.
- To control the spoilage and enhance shelf life of the processed foods.
- Examples: Antioxidants, Bulking agents, Emulsifiers/stabilizers, Acid regulators, Preservatives, Leavening agents, Anti caking agents, Flavor enhancers, Artificial sweeteners, Glazing agents.
Food Adulteration Vs Food Additives

• All additives are not adulterants, if present within the specific limits and once exceeded the limits they become significant adulterants and can cause serious health hazards to the consumers.

• All additives are not adulterants until reported outbreak of food safety issues occur.
Types of Food Adulteration:

- **Intentional adulteration**: The adulterants are added as a deliberate act with intention to increase profit. E.G. sand, marble chips, stones, chalk powder, etc.

- **Incidental Adulteration**: Adulterants are found in food due to negligence, ignorance or lack of proper facilities. E.G. Packaging hazards like larvae of insects, droppings, pesticide residues, etc.

- **Metallic adulteration**: When the metallic substances are added intentionally or accidentally. Eg: arsenic, pesticides, lead from water, mercury from effluents, tins from cans, etc.
Methods of food adulteration:

- **Mixing**: Mixing of clay, stones, pebbles, sand, marble chips, etc.
- **Substitution**: Cheaper and inferior substances being replaced wholly or partially with good ones.
- **Concealing quality**: Trying to hide the food standard. E.G. adding captions of qualitative food to low quality for selling.
- **Decomposed food**: Mainly in fruits and vegetables. The decomposed ones are mixed with good ones
- **Misbranding/ False labels**: Includes duplicate food stuffs, changing of manufacture and expiry dates.
- **Addition of toxicants**: Adding non-edible substances like low quality preservatives, coloring agents, etc.
CAUSES OF FOOD ADULTERATION:

• Profit motive of traders
• Food insecurity
• Increased Urbanization
• High population demands
• Illiteracy of general public
• Lack of effective food laws
• Lack of government in initiative
The Maggi Issue

- Ajinamoto – Monosodium glutamate (MSG)
- Complaints – headache, excess sweating, chest pain
- Studies prove MSG causes eye problem to children.
Some examples of adulterants...

• Cream is adulterated with gelatin, and formaldehyde is included as a preservative for it.
• Butter is enormously adulterated with oleomargarine, a product of beef fat.
• Brick dust in chilli powder, colored chalk powder in turmeric
• Pickle and canned vegetables are sometimes are colored green with copper salt.
Adulteration In Milk

• Milk is most commonly diluted with water - this not only reduces its nutritional value, but contaminated water can also cause additional health problems.

• The other adulterants used are mainly detergent, foreign fat, starch, sodium hydroxide (caustic soda), sugar, urea, pond water, salt, maltodextrin, sodium carbonate, formalin, and ammonium sulphate.
Paneer, khoya, condensed milk and milk
- Adulterant: Starch and water
- Health hazard: stomach disorders

Ice cream
- Adulterant: Pepperonil, Ethylacetate, Butraldehyde, Nitrate, Washing powder etc
- Health hazard: Pepperonil is used as a pesticide and ethyl acetate causes diseases affecting lungs, kidneys and heart.

Coffee powder
- Adulterant: Tamarind seeds, chicory powder
- Health hazard: diarrhea, stomach disorders, giddiness and severe joint pains
Impact of adulteration - Diseases

- Blood pressure, cholesterol, diabetes
- Obesity and Heart problems
- Diarrhea, Viral fever
- Hepatitis
- HIV
- Paralysis
- Cancer
- Anemia
- Abortion
- Brain damage
- Blurred vision, Blindness
Process of Testing some products:

- **Ghee, Cottage cheese, condensed milk, milk powder**: Add 5 ml of dil. H₂SO₄ or Conc. HCL to one teaspoon full of melted sample. Shake well. Pink color in case of h₂so₄ or crimson color in case of HCL indicates coal or tar dyes.

- **Red Chilli Powder**: Add a teaspoon of chilli powder to a glass of water and stir it. A swirl of bright red color indicates the presence of artificial color while the settling of gritty sediment at the bottom of glass indicates the presence of saw dust/brick powder.

- **Tea leaves**: Spread a little slaked lime on white porcelain tile or glass plate; sprinkle a little tea dust on the lime. Red, orange or other shades of color spreading on the lime will show the presence of coal tar color. In case of genuine tea, slightly greenish yellow appears due to chlorophyll after some time.
Food Regulatory Requirements In India

• To safeguard health and safety, Government of India promulgates regulatory requirements for manufacture and sale of goods and services, including imported goods.

• Regulatory measures should have minimum compliance costs.

• Regulatory measures should benefit society.
Prevention of Food Adulteration Act, 1954

Objective:

• Ensuring pure and wholesale food to the consumer and to protect them from fraudulent and deceptive trade practices.

• PFA Act was amended in 1964 and 1971 and lately 1986 to make the act more stringent.
Punishments

• For cases of proven adulteration- minimum imprisonment of 6 months with a minimum a fine of ₹.1000

• For the cases of adulteration which leads to death or such harm may amount to grievous hurt (acc. IPC 320) – Life imprisonment and fine not less than ₹.5000
AGMARK Act, 1937

• The AGMARK Act, 1937 is the first legislation enacted for the quality control of Agricultural products.

AGRICULTURAL PRODUCE: Includes all produce of agriculture or horticulture and all articles of food or drink wholly or partly manufactured from any such produce, fleeces and the skin of the animals.
Penalty

• For unauthorized marking with grade designation mark-six months imprisonment and fine not exceeding ₹.5000

• For counterfeiting grade designation mark imprisonment for a term of not exceeding 3 years and fine not exceeding ₹.5000

• Penalty for selling mis-graded article imprisonment for a term not exceeding 6 months and fine not exceeding ₹.5000
Food Safety and Standards Act 2006

• This Act was enacted by the Indian Government on 2006 and to give effect to the provisions of this Act, Rules and Regulations have been made there under known as “Food safety and standard Rules 2011”.

• The Act along with the rules and regulations have come into force w.e.f. 5th August 2011

• This Food Safety Act consolidates all the previously existing laws relating to food and related products.
4. The Vegetable Oil Products Order, 1947.
7. The Milk and Milk Products Order, 1992 and
Food Safety and Standards Authority of India - FSSAI

• Food Safety and Standards Authority of India is functioning as an independent authority under the administrative control of Ministry of Health and family Welfare.

• Before the formation of FSSAI, from 1954 onwards Prevention of Food Adulteration was part of Directorate General of Health Services. After having detached from the direct administrative control of the Health Ministry, this authority is holding independent authority and has attained special status.
Functions of FSSAI

- Framing of Regulations to lay down the Standards and guidelines.
- Laying down procedure and guidelines for accreditation of laboratories, certification bodies.
- To provide scientific advice & technical support to Central Government and State Governments.
- Collect and collate data.
- Creating an information network across the country.
- Provide training programs for persons who are involved in food business.
- Promote general awareness about food safety and food standards.
Punishments as per FSSAI

• Minimum – 7 years imprisonment.
• With penalty up to 1000000.
• For threatening and disturbing the food safety officer:
  • Imprisonment – 6 months to 2 years.
  • Penalty up to 500000.
## FSSAI – Survey on Adulteration of Milk

### Table 1. India: State-wise samples drawn for the National Survey on Adulteration of Milk, 2012

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**Source:** [National Survey on Adulteration of Milk](http://example.com)

Also see: [Total Samples Analyzed](http://example.com) and [National Survey on Adulteration of Milk: An overview](http://example.com).
FSSAI – Survey on Adulteration of Milk

• The samples were tested in government laboratories for neutralizers, acidity, hydrogen peroxide, sugar, starch, glucose, urea, salt, detergent, skimmed milk powder, formalin, and vegetable fat to determine the presence of common adulterants.

• Results: Approximately 32 percent of the samples analyzed conformed to Indian food laws. The remaining 68 percent failed.
FSSAI Releases National Milk Quality Survey Report – 2018

• The report shows that milk in India is largely safe even though there may be some issues that persist.

• However, the survey found that around 10% of samples had contaminants which were mainly because of poor farm practices. An overwhelming 90% of the samples were found safe in the survey.

• Merely 12 out of a total of 6,432 samples had adulterants that affect the safety of milk.

• Ammonium sulphate was detected in 195 out of 6,432 samples, which is 3% of samples of milk.

• Other Products including milk seems to have adulterated up to 25 percent.
Food Adulteration - Control Approach

**Industry:**

- To feel more ethical and moral responsibility as food business operator to supply & serve wholesome food to the society.

- Regular updates on the process and allergen related outbreaks in the world.

- Risk assessment [probability x severity] for all the ingredients, additives & processing aids and processing techniques w.r.t. adulteration.

- Frequent testing of vulnerable ingredients, additives & processing aids for positive clearance w.r.t. allergens.

- Third party auditing of the process to identify existing & probable lacunae of the system.
Food Adulteration - Control Approach

Scientific Community:

• To develop validated simple, quick and authentic test procedures to scan the ingredients, additives & processing aids for positive clearance. Food Adulteration - Control Approach

• To share the knowledge with the statutory bodies and industry.

Consumers/end users:

• Proper understanding of the adulteration issues.

• To know difference between the natural and aesthetic Food Adulteration - Control Approach attributes [texture, appearance & taste] of foods and accepting the natural ones to the extent possible.
ROOF TOP - GREEN HOUSE PLANS
THANK YOU