

Hazards or Toxicity from processing operations

Hydrogenation of oils

- Fats are solids at room temperature, contain saturated fatty acids and obtained from animal sources
- Oils are liquid at room temperature, contain unsaturated fatty acids and obtained from plant sources
- Oils are better than fats due to the presence of cis-fatty acids
- During hydrogenation (conversion of oils into fats) cis-fatty acids are converted into trans fatty acids
- Trans fatty are unhealthy, increase cholesterol and LDL (Low density lipoprotein)

Heating of fats and oils

- Oils and fats when heated in the presence of oxygen form hydroperoxides----- causes irritation of gastric system.
- Chemical compounds formed during deep frying are aldehydes, free fatty acids, alcohols, esters, ketones, aromatic compounds and peroxides-----rancidity.
- These compounds are also formed without strong heating in the absence or due to insufficient antioxidant.
- Prolonged and consistent heating of cooking fat, as in deep frying form carcinogenic acrylamide.

Formation of pyrolytic compounds

- At high temperature processing (Barbeque at 200 °C), pyrolytic burning results in the formation of polycyclic aromatic carbon and polycyclic aromatic hydrogen.
- These compounds are mutagenic and carcinogenic in nature.

Refining

- Refined foods are responsible for not only loss of nutrients but are also cause toxicity
- Raw sugar (Shakkar and Gur) form sugar cane contains gums, mineral elements and vitamins which provide benefits to the human body.
- Refined sugar is known to be a factor in diabetes, heart problem, dental caries and constipation.
- Similarly, in flour milling, wheat bran is removed that results in constipation which is regarded as “mother of diseases”.

Hazards from Packaging materials

- Food packaging is a very vital operation in the food industry
- The main function is to allow safe transport of food from the producer or processor to the consumer
- Several types and kinds of the materials are employed in the manufacture of packages including plastic, paper, plastic film, metal, glass and wood.

Plastic material

- Common plastic material employed for manufacture of food packaging are polyvinyl chloride (PVC), and polyethylene (PE), Polyethylene terephthalate (PET), high density polyethylene (HDPE), low density polyethylene (LDPE), Polypropylene (PP) and polystyrene (PS).
- Polyvinyl chloride and polyethylene are two common plastic materials used in food packaging.
- **Polyvinyl chloride:** Chlorine-based chemicals when heated in the presence of hydrocarbons form dioxin which is a carcinogen. It also disturbs the hormonal system of human being.
- **Polyethylenes:** contain a hexachloroethane which is regarded as a human carcinogen.
- **Polyethylene terephthalate:** is commonly used in the production of soft drink bottles, water bottles and cooking oil bottles. Phthalates make the bottles flexible but disrupt hormonal system.
- **High density polyethylene:** find application in detergent bottles and milk jugs.
- **Low density polyethylene:** is used in the production of shopping bag.
- **Polypropylene:** is commonly found in bottle caps, drinking straws and yoghurt containers.
- **Polystyrene:** is used in the production of cups, plastic tableware, meat trays and take away food containers.
- During the use of plastic material several toxic substances such as lead, cadmium etc used. Such substances are potentially hazardous when they leach into the food from the container.

Metal Container

- Metal containers are widely used for canning fruits and vegetables, fish and meat.
- Tin, aluminium, iron, lead, chromium and copper are commonly employed in packaging material.
- **Tin:** The classic tin can consist of electrolytically tin-plated steel, coated on the inside with an inert material to avoid adverse reaction between metal and the food.
- During handling, cans get damaged resulting in injury to the inert inner layer and exposing the tin plate.
- This allows direct contact between food and tin plate causing toxicity which is symptomized by vomiting, nausea, abdominal pains, fatigue and headache.
- Reaction of acidic food (tomatoes or citrus fruits) with tin produce hydrogen gas results in bulging of the can but it's not injurious for health.
- **Aluminium** foils are used in baking and packaging foods. It is absorbed in food. Exposure to aluminium is usually not harmful as it is excreted by the kidneys and only a small amount is absorbed.
- **Iron:** Iron is used in a variety of cans and as top caps of glass bottles and jars. Toxic effect of iron includes lesion in gastrointestinal tract leading to other diseases.
- **Lead** can leach into the food from side seam of can (three-piece soldered can) can cause lead poisoning characterized by gastrointestinal colic and respiratory system defect.
- **Chromium** is found in some types of cans and utensils and is used to coat other metals. Toxic aspects of chromium are related to its high absorption and easy penetration to the cell membrane.
- **Copper** is used in alloys, particularly in brass, bronze, nickel and silver. Copper when leached in food results in vomiting, anemia, liver damage, increased blood pressure and respiratory rates.

Cellulose packaging

- Almost 34% of food is packed in cellulose packaging
- Cellulose is generally considered safe packaging material.