

- ◇ Misleading advertising
- ◇ Exposing food in better conditions at the front

Types of fraud

Alteration

This type includes modifications on the organoleptic characteristics, hygiene and nutritive value without human interference or action of physical, chemical (and more) agents.

However, it's the economic agent that orders its commercialisation.

Adulteration

- ◇ Addition of inferior food or substances to the product
- ◇ Addition of forbidden or unrevealed substances
- ◇ Removal of some components
- ◇ Simultaneous removal and addition
- ◇ Substitution of one or more components
- ◇ Substitution of the original food for an artificial one or a raw material of a lower value
- ◇ Simulation of the quantity/amount that is written in the package
- ◇ Use of unsuitable food
- ◇ Fraudulent retrieval of the food

Sampling

Sampling and the collection of samples are necessary to obtain representative results.

The sampling plan is dependant on the type of sample that is analysed.

The taken sample (or fraction of it) should reflect the entire composition.

Food Toxicology Analysis

1. Sampling Plan
2. Sample Collection
3. Transportation, Storage and Pretreatment
4. Analysis of Contaminants
5. Analysis of Results

Procedures

1. Designing the sampling plan
2. Implementing the sampling plan

Dioxins and furans

Dioxines (or PCDDs) are a group of 75 structurally similar chlorinated aromatic compounds. Furans are a group of 135 related compounds, most of which are highly toxic.

The toxicity depends on the number of chlorine atoms that substitute hydrogen and the position of the chlorine atoms in the molecule.

General Characteristics

- Environmental contaminants (soil, vegetation, water)
- Lipophilic, chemically stable and of low volatility
- Some of these compounds are highly toxic to lab animals, which means it's possible that there are noxious effects for humans as well.
- The compounds with the higher amount of chlorine substituents are the most ecotoxic. This toxicity is seen in living organisms especially when the substituents are on the positions 2, 3, 7 and 8.
- Chronic toxicity is related to their hydrophobic nature and with the possibility of bioaccumulation.

Sources

Combustion processes originate a high amount of furans and dioxins emissions, especially in (decreasing order):

- Incineration of municipal waste
- Incineration of medical waste
- Incineration of hazardous wastes
- Incineration of sludge in water treatment plants
- Combustion of products from cellulose industries
- Tire burning
- Biogas combustion
- Cremation
- Regeneration of catalysts on oil refineries
- Smoke from road transport and cigarette smoke
- Fires
- Manufacture of products of mineral origin (glass, bricks, cement, ceramics and rubber)

Ways of exposure

After their emission, dioxins and furans can be transported over long distances, through air. When they're released in the waste waters, some of these compounds are degraded through solar energy or evaporate. However, the majority becomes attached to the soil and sediments. The human exposure to dioxins and furans (roughly 90%) is mostly related with the ingestion of contaminated food.

Nitrates and nitrites

Naturally distributed, part of the global biogeochemical cycle of nitrogen.

The biogeochemical cycle is the cyclic permute of the chemical elements that occurs between living beings and the environment. All the natural chemical elements have a dynamic movement in the ecosystems, transitioning constantly between the physical environment and the organisms. These cycles involve biological, physical and chemical phases, hence the used designation.

Exposure

Endogenous way

Nitrates and nitrites are metabolites of nitric oxide, a free radical that plays a relevant role in physiological functions such as:

- Vasodilation and neurotransmission
- Rejection of transplants and diabetes
- Cytotoxic agent used by macrophages against pathogenic bacteria and carcinogenic cells.

Exogenous way

The nitrite salts are food additives used with two objectives:

- prevent the microbial development (*Clostridium botulinum*, which can cause lethal intoxication)
- increase the organoleptic quality of processed food

How do nitrates become toxic?

In ruminant animals, nitrates are converted to nitrites (due to acid pH) or absorbed through the stomach wall and into the bloodstream.

Nitrates can be converted into nitrites with saliva or in the GIT. In the bloodstream, nitrites combine themselves with hemoglobin, forming methemoglobin and reducing the capability of transporting oxygen.

Ex.: children have their intestines highly colonized by bacteria capable of reducing nitrates into nitrites. (blue-baby syndrome)

Toxic effects

- Anxiety
- Tachycardia