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Food Quality Monitoring

After air and water food enters our bodies in largest quantity. Once inside a biological system it is decomposed into constituent units and utilized as a source of energy or as building material for body tissues. The bulk of food material which we ingest comes from biological sources, about 85-90% coming from primary produces and rest from higher trophic levels of the food chain depending upon the food habits of the individuals.

More than 3,000 metric tons of food is produced annually in the world which may be categorized into cereal, meat, milk, eggs, vegetables, fruits and nuts, oil seeds pulses etc. About 85% of non-occupational exposures to pesticides and toxic ions and heavy metals are through our food supplies while only about 11 % are caused by water and about 4% by air.

During production, transportation, storage and processing a variety of chemicals are used for the protection of food materials against various fungi insects and pests. Traces of these chemicals persist in the food stuff which we ingest. Many chemicals are added as flavouring or colouring agent and as preservatives in processed food which we buy from the market.

If the food is grown on soils contaminated with heavy metals these may be absorbed by the plants and persist in the grains or fruits and nuts which we eat. Ready to use materials such as powdered condiments, oils, butter, ghee, tinned and packed foods may be adulterated as well. As an average healthy individual consumes about 1.0 to 1.5 kg food every day, diet may therefore, be the primary source of low level, long term exposures to a number of toxic substances. The food stuff which we consume has to be regularly examined for the following:

1. Presence of adulteration in food supplies:

Adulteration is an age old practice. It is detected by diverse physical and chemical methods of examination. Changes in taste, smell, flavour, texture etc. provide valuable clue for the detection of adulteration.

2. Presence of infectitious organisms:

Presence of pathogenic forms or infectitious micro-organisms are easily detected as they bring about changes in taste, flavours and may often cause foul smell. Perishable food stuff or materials requiring refrigeration for storage and transportation may at times possess infectious organisms or their toxic secretions. These organisms themselves, cause changes in taste flavours or foul smell or are almost invariably accompanied by other microbes which spoil the food material and which can be easily detected.

3. Presence of pesticides or pesticide residues:

Detection of the presence of trace amounts of pesticides and their toxic residues which

cause low level exposures over a long period of time is usually a difficult task. These chemicals which are present in trace amounts and which do not cause any appreciable symptoms of toxicity remain undetected or often their presence is not even suspected. In the long run they cause general non-specific type of disorders.

Organ chlorine pesticides persist in the environment for long periods of time and the likelihood of their presence in the environment and food materials is greater than other groups of pesticides like organophosphate and carbamates. The usual method of estimation of organochlorine pesticides involves gas chromatography. The food sample is extracted repeatedly with 15% ethyl-ether in hexane. The combined extract is evaporated on steam bath to a small volume and suitable dilutions are prepared.

A small amount of this extract is now injected with the help of microsyring into the gas-chromatographic column. Ar/CH₄ is used as the carrier gas which moves at a rate of about 60 ml per minute. Pesticides are vapourized. They move through the column at different rates and are detected by the electron capture detector at the end of the column. For the estimation of carbamates and organophosphates. Which is more poisonous, measurement of total cholinesterase inhibition activity is the preferred method.

4. Presence of toxic ions and heavy metals:

Food items may sometimes contain heavy metals which are undesirable and harmful. They are usually present in very small amounts – in traces. Their presence, like many persistent pesticides remains undetected as they do not cause any appreciable and specific symptoms of toxicity.

However, their effects appear only after long periods of chronic exposures in the form of general non-specific type of ailments. They are usually extracted with the help of a some suitable solvent from the food material concentrated and estimated by advanced analytical methods using chemical, optical, spectral or nuclear properties of the element concerned.