The maintenance of good health demands that food should not only be nutritious but also safe and of good quality. There has been growing concern regarding environmental contamination of food and excessive use of chemicals in food production and processing in the country in recent times. The growth of the food processing industry in India has consequently been very rapid, about 24 per cent in 1995. The use of various food additives has also grown with the industry.

Furthermore, as a part of modern advancements in agriculture technology and the application of pesticides and fertilisers to crops, the use of various compounds in animal husbandry and veterinary practice has increased, often resulting in residues of these unintended contaminants persisting in the final food product.

Apart from these relatively 'new' food contaminants, others such as aflatoxin which have been prevalent in different parts of the country, continue to exert their deleterious effects occasionally.

Though food habits are generally governed by traditions and family backgrounds, they are subjected to changes in lifestyles. With the breakup of joint families, increasing numbers of women are now joining the work force. This, together with the increase in exposure of the population to mass media and advertisements, has caused processed foods to increasingly find their way in the day-to-day menu of families. A study of the consumer's attitude towards processed foods has revealed easy availability to be the most important reason for increased consumption followed by the view that these foods are "more nutritious, tasty and easy to store".

This paper examines the challenges faced by the scientific community in evaluating the safety of the food available to the population in the context of a rapidly changing sociocultural and technological scenario.

Food processing in India: The food processing industry in India comprises the organised and unorganised sectors, the latter being much larger, consisting of small cottage or household type manufacturing units. Monitoring the quality of the processed food prepared in this sector is especially difficult.

It is the poor community which is more exposed to food produced in the unorganised sector, the quality of which is suspect, as borne out by several independent surveys. Studies conducted by the Industrial Toxicology Research Centre (ITRC) in the state of Uttar Pradesh have revealed that nearly 62 per cent of the artificially coloured eatables in the rural markets have non-permitted colours which are hazardous to health.

Another study in the central and sub-urban areas of Calcutta also revealed the use of non-permitted colours including some textile dyes by itinerant vendors, the unorganised sectors as well as small and cottage scale industries. In 6.6 per cent of the cases where permitted colours were used, the statutory limit of 200 ppm was exceeded with some eatables containing as much as 730 ppm of colour. Studies conducted by the National Institute of Nutrition (NIN), Hyderabad, have shown the use of adulterants like Lathyrus sativus and non-permitted colours in urban street foods.

Thus, in the Indian diet, non-permitted colours, permitted colours added in excess and a large number of other adulterants are likely to be present. These have been shown to induce a wide range of adverse reactions in humans. Metanil yellow, the frequently used non-permitted colour in foods was found to cause toxic methaemoglobinemia and cyanosis in two incidences of human food poisoning. Among the permitted food colours, tartrazine has been most frequently reported to be associated with hypersensitivity responses.

Technological advancements: The last two decades have seen a phenomenal increase in the quality and quantity of processed foods available. New technologies have led to the development of new, modified forms of products and novel foods or novel food ingredients (i.e., those which have hitherto not been used for human consumption to a significant extent and/or which have been produced by extensively modified or entirely new food production processes). Biotechnology has made it possible to prepare recombinant food proteins with mutation breeding and genetic engineering to develop high-yielding seed varieties with the desired characteristics.

This increasing use of newer methods of food processing could lead to the formation of new, toxic compounds or enhance the allergenicity of the given food. As the prevalence of food allergy is also influenced by genetic and geographical factors as well as regional diets, it is of utmost importance that these foods be indigenously evaluated for safety rather than relying on data generated in some other country under different environmental conditions.

REGIONAL PROBLEMS

Health problems arising due to the consumption of special foods are region specific as they largely depend on the cultural and dietary habits of the people. Data for the safety evaluation of such foods has to be generated indigenously. For example, the habit of chewing tobacco in the form of pan masala/gutka (perfumed, sweetened mixtures of tobacco and nut powder), is an emerging threat to health, especially among people in the Indian subcontinent. A recent study by NIN in collaboration with Government Dental College and Hospital, Hyderabad, has found habitual chewing of pan masala/gutka to be associated with the presentation of oral submucous fibrosis (OSF). Traditionally in India, only married adults have been consumers of betel quid. However, during recent years with the advent of attractive, conveniently packed sachets and mass media advertisements, the consumption of pan masala by young people has increased. In fact, a prospective study among 1,790 patients attending a dental hospital in Hyderabad has found 23 per cent of the diagnosed cases of OSF to be aged between 14 and 19...
years. The habit of chewing tobacco in the form of pan masala/gutka is thus emerging as a threat to health not only in India but also in other parts of the world, notably among people with origins in the Indian subcontinent.

Unlike in the developed countries where people purchase packaged milk from bulk suppliers, in India, the unorganised sector is still the dominant supplier. People get their milk directly from individual animals or farmers with very small herds. The risk of being exposed to veterinary drug residues thus is greater in such a situation. This fact was borne out in a study by NIN in Hyderabad. Nearly 87 per cent of the farmers interviewed were found to be treating animals without consulting a veterinarian and almost 73 per cent of the milk samples from individual animals was found to contain antibiotic residues. In contrast, most of the pooled milk samples tested negative for these residues.

**CHALLENGES AHEAD**

With the liberalisation of trade in India, there is a growing list of food additives and processing aids which require to be approved by the regulatory authorities for their use in different foodstuffs. There is an urgent need for the scientific community in India to evaluate whether these additives are indeed technological necessities and whether they pose a hazard to the Indian consumer.

The rationale of fixing a uniform permissible limit for different foods may not be justified. There is a need to fix the levels based on the overall intake of the specific food which will vary from country to country depending on the dietary habits of people. Hence, India needs to generate its own exposure data not just for colours but for all other food additives.

**CASE STUDIES OF SELECTED FOOD ADDITIVES**

A few examples of specific problems may be mentioned.

**Silicon:** Recently some companies have sought permission to use amorphous silicon dioxide as an anticaking agent in various food products including baby food, while some others have requested butylated hydroxy anisole (BHA) and talc be allowed in chewing gum.

Although the use of these food additives is permitted in a number of countries, the potential health effect estimated for the population in other countries may not be applicable in the Indian context because of the different dietary habits. For example, the average intake of silicon in the US diet is about 20-50 mg/day whereas the Indian diet may have much higher levels of silicon, that is, 111-424 mg/day, mostly due to a higher intake of cereals and plant foods.

Studies have shown that residents consuming plants with high silicon content develop renal calculi. Anasuya and Rao observed that the urine of the majority of stone-formers studied contained higher content and concentration of silicon compared to non-stone-formers. Recent studies at NIN have also shown silicon to be an important risk factor for aggravating fluorosis, the prevalence of which is high in certain parts of India. This example illustrates that safety evaluation is very much dependent on the environment.

**Talc:** Use of talc as a filler instead of calcium carbonate in chewing gum flavour also needs critical evaluation in the Indian context. Talc is nothing but a hydrous silicate of magnesium. Commercial talc is not pure mineral talc alone but also fibrous silicates which in part are classifiable as asbestos. Besides the risk posed by silicates, asbestos exposure has been shown to increase the incidence of gastrointestinal cancer. In fact, asbestos-contaminated talc may play a causative role in cancers of the stomach among the Japanese who have a preference for talc-coated rice.

**BHA:** BHA is an extensively used antioxidant in various foods such as edible oils and fats, cereal products, biscuits, breakfast foods, dry fruits, potato chips, flavour concentrates, etc. BHA has been shown to produce hyperplasia and/or tumours specifically in the forestomach of rats. It is also weakly oestrogenic having stimulator effects on both the transcriptional activity of the human oestrogen receptor and the growth of breast cancer cells in vivo. BHA is a permitted food antioxidant in India but only in a specific number of foods. Before it is allowed to be added to other foods, there is a need to evaluate whether the total intake of BHA through the Indian diet exceeds the ADI levels (0.5 mg/kg body weight).

Hence great caution needs to be exercised in permitting the addition of an increasing number of food additives in diets without first evaluating the total intake of that additive from all sources in the Indian diet. This is especially true for infant foods, such as milk powder and foods consumed more frequently by children such as chewing gum, confectionery, etc.

**SELECTIVE APPLICATION OF TOXICOLOGICAL DATA**

An example of this is the recent proposal by the Codex Alimentarius Commission (CAC) to reduce the permitted level of sulphur dioxide in sugar from 40 to 15 mg/kg. The ostensibly objective of the CAC is to reduce the overall consumption of sulphur dioxide by population groups. According to the revised limits of the CAC, the maximum level for sulphur dioxide allowed in sugar is 15 mg/kg (lowest) and in wine (grape) 2,000 mg/kg (highest). For the rest of the foods the levels are in between. There appears to be no justification for reducing the level only in one product, ie, sugar.

Surveys on the intake of sulphite/sulphur dioxide from various foods carried out in developed countries have shown that the ADI for this additive (ie, 0.7 mg/kg body weight or 42 mg/day in a 60 kg adult) is likely to be exceeded if proper regulatory measures are not taken. The average consumption of sulphur dioxide/sulphite in France is 20 mg/day/person. The daily intake is about 29-40 mg in average consumers of wine, cider and beer and it is 10 mg in occasional consumers. On the other hand, in teetotallers, the average intake of sulphur dioxide is only 1.96 mg/day.

Thus, it is obvious that more than 90 per cent of the intake is through alcoholic beverages such as wine. If at all there is a need to regulate the intake of sulphur dioxide, it is essential to minimise the consumption of sulphur dioxide through alcohol. Decreasing the permitted limit in sugar will only create technological problems for sugar manufacturers in developing nations where sulphur dioxide is used as a bleaching agent. This also raises doubts about the motivation behind reducing the addition of sulphur dioxide in sugar.
dictated by certain groups that are marketing their good products in cans? High levels of sulphur dioxide in canned foods are likely to corrode the tins if stored for a long period of time.

Need to resist pressure: To date, there has been only a limited effort to generate both toxicity and dietary exposure data in India. In the absence of valid data, pressures are likely to be exerted by vested interests to accept the recommendations of the international expert committees in toto in the name of 'international harmonisation'. Such pressures need to be resisted where the major goal is providing safe food to the nation. Objective, scientific, fair and balanced decisions need to be taken by the appropriate food control agency in the country, taking into account the data generated within the country, after giving due consideration to the toxicological data available from abroad.

CONCLUSION

It is imperative to constantly re-evaluate the safety information available. There is need for greater interaction between industry, government, research institutions and voluntary consumer associations for assessing the safety of the ever increasing number of technological innovations and modifications of familiar food-stuffs.

Although it is not unwise to accept valuable information generated worldwide, it is essential to generate unbiased data in one's own country giving due consideration to the environment, dietary habits and ethnic factors which have a bearing on the evaluation of the safety of the food supply in a country.

References


FOUNDBATION NEWS

- Scientific Report 12: 'Use of Carotene-rich Foods to Combat Vitamin A Deficiency in India — A Multicentric Study' edited by Dr Subadra Seshadri, has been released.

Meetings

- The Third Foundation Day Lecture was delivered by Dr M.S. Swaminathan on: 'A Food and Nutrition Secure India — The Final Milestone' on November 29, 1996.

- Study Circle Lectures

October 30: Dr Caroline Fall (MRC Environmental Epidemiology Unit, University of Southampton, UK) on: 'The Foetal Origins of Adult Chronic Disease'.

December 16: Dr A.K. Susheela (Professor, Department of Anatomy, AIIMS, New Delhi) on: Fluoride 'Nutrient' or 'Contaminant'?.

- President's Engagements

Lecture: 'Nutritional Considerations in Agriculture and Food Policies' at the Plenary Session of the Third Agricultural Congress on March 12, 1997, in Ludhiana.

- Fund Raising

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