NFI BULLETIN
Bulletin of the Nutrition Foundation of India
Volume 13 Number 4 October 1992

Ensuring Food Safety and Quality
The Present Picture in India

Ramesh V. Bhatt

Health and nutrition are as much dependant on the wholesomeness of food and its freedom from microbial and chemical contamination, as on its adequacy with respect to quantity and nutritive value. In our anxiety to overcome the problems of food shortage at the national level, and of undernutrition at the family levels, we had accorded priority to programmes mainly aimed at augmenting food production; and had relegated programmes for ensuring wholesomeness of food to secondary importance.

This has been a short sighted policy. It is often the poor, the underprivileged and the undernourished who bear the brunt of the deleterious effects of food contamination. Ill health and undernutrition among them are often the end-result of the twin burdens of lack of adequacy and nutritive quality, on the one hand, and presence of food contamination, on the other. Ensuring the wholesomeness of food, in the present context, can posssibly contribute nearly as much to the promotion of health and nutrition, as ensuring its adequacy and nutritive value.

FOOD CONTAMINATION: THE PRESENT STATE

It must be confessed at the outset that there is a striking paucity of reliable data with regard to the extent and nature of food contamination — again reflecting the lack of attention and focus on this problem. The official statistics of the Government of India, for example, are notable for their poor documentation of food-borne diseases. The Indian Council of Medical Research has just concluded a major country-wide study, which should provide useful data. Piecing together such bits of information from reports as are available, we may draw some of the following conclusions.

There is a wide range of potentially toxic agents causing food-borne diseases, and posing problems with respect to food safety. These include: bacteria and bacterial toxins; zoonotic parasites; fungi and fungal toxins; aquatic biotoxins; plant toxins; pesticide residues; heavy metals; veterinary drug residues; food adulterants; certain food additives; radionucleides; nitrates, nitrites and nitrosamines. Among these, microbiological contaminants are the most important in the Indian context.

Microbiological contaminants: Important microorganisms causing food-borne diseases are *Staphylococcus aureus, Baccilus cereus, Salmonella. Escherichia coli, Vibrio parahaemolyticus* and *Clostridium perfringens.* Acute bacterial food poisoning due to contamination of food is quite common. However, bacteriological confirmation of the diagonsis is lacking in most instances.

The diseases transmitted by food are commonly referred to in reports as "food poisoning", and are characterised by abrupt onset of gastrointestinal disturbances — abdominal pain, vomiting and diarrhoea. Most cases go unreported while a few occurring on a mass scale are reported in newspapers. Scientific investigations are carried out in only a few selected instances. Food-borne diseases are not categorised separately in the health statistics of India. Outbreaks of food-borne diseases are recorded separately only when the patients are hospitalised, and that too in selected Government hospitals. For example, in the city of Hyderabad, it was indicated in the official statistics that on an average only 28 cases of food-borne diseases per 1,00,000 population, occurred every year, clearly a gross underestimate[1]. Most cases are unreported and unrecorded.

The foods which are most commonly involved are meat and meat products, poultry, eggs, milk and milk products, sweetmeats and rice preparations. Food handlers are a major contributing factor in the causation of food-borne diseases.

Diseases caused by fungal contamination of foods such as aflatoxic hepatitis, enteroergotism, trichothecene and mycotoxicoses, and diseases caused by phycotoxins have been reported from India[2,3].

CONTENTS

Chemical contaminants: Besides microbiological contamination, chemical contaminants in foods are also responsible for causing food-borne diseases and affecting the quality of food. Chemical contaminants may enter the food chain as naturally occurring toxicants or due to a deliberate use of certain chemicals. Disease outbreaks in humans such as lathyrism, epidemic dropsy, venoocclusive disease due to food-borne toxicants derived from higher plants have been described in India. Among the chemical contaminants, pesticide residues are most important. Several outbreaks of diseases due to pesticides have been reported in India. Heavy metal contaminations of foods also pose a problem.

Food processing facilities: The processed food industry has grown considerably in India during the last decade. Processed foods include snack foods, dairy products, baked foods, confectionery, fruit and vegetable products, convenience foods, etc. Besides the quality of raw materials like fruits, vegetables, meats, eggs, and flour, the quality of food additives and packaging materials like paper, plastic, cardboard, cans, etc, are also important to maintain the quality of the end product.

Processed foods have a considerable export market and international buyers are particular about the quality of food. Usage of food additives is regulated by the Government and only "permitted food additives" are allowed to be used. The decision to allow particular food additives is generally based on their usage in developed countries or on the recommendations of the Joint Expert Committee on Food Additives (JECFA) of the FAO and WHO. While the quality of foods for export is generally ensured, arrangements for ensuring the safety and quality of food for Indian consumers within the country are currently highly inadequate.

Post-harvest management: Post-harvest losses in the quality of food grains are increasingly being recognised. Chief among them are those caused by insect infestation, mould damage and weed seed contamination. Such losses take place during harvesting and threshing, drying, processing, and storage. Improper post- harvest methods lead to insect infestation. Besides quantitative losses, insect infestation leads to deterioration in quality. Certain insects attack the germ selectively, thus causing nutrient losses. Such infestation also accelerates many undesirable chemical changes.

The presence of insect or rodent-infested and damaged grains leads to accumulation of insect/rodent excreta and fragments, thus rendering the food unhygienic for human consumption. Insect infestation leads to loss of protein quality, loss of carbohydrates, loss in fats and increase of free fatty acids, losses in B vitamins, and increase in microflora. Treatment of grains with pesticides as is carried out in some rural areas, would lead to the problem of pesticide residues. Contamination of the harvested grain with weed seeds containing toxic substances has in the past led to disease outbreaks in humans. Such contamination mostly takes place accidentally or rarely as deliberate adulteration.

Household level handling practices: Household level food handling practices, such as storage of raw material, processing, cooking, storage of cooked foods, influence the extent of contamination. Inadequate drying and improper storage, are the major problems faced in the Indian context.

In the case of contaminants like aflatoxins, factors such as the method of cooking, the type of fuel used for cooking, the quantity of water used when boiling food, the amount of heat employed to cook the food, the time taken to cook, etc, play a role in the ultimate level of aflatoxin in the cooked foods. Similarly, treatments before cooking such as cleaning to remove extraneous matter and insect damaged and visibly mouldy grains has been known to reduce the level of contamination. Parboiling of *Lathyrus sativus,* a toxic legume consumed in certain parts of India, has been shown to remove 90-95 per cent of the toxic amino acid present in it. The time gap between the cooking and consumption of food, and the method of its storage, considerably influence bacteriological load in the cooked foods.

Soaking in water overnight followed by germination or sprouting of the grain is a common household practice especially in the processing of pulses. During germination, several enzyme systems become active and bring about profound changes in the nutritive value of pulses. Certain anti-nutritional factors such as phytates, trypsin-inhibitors and haemagglutinins are broken down on germination. On malting, a process that likewise involves germination, loss of phytate is quite pronounced in grains like *Eleusine coracana* (Ragi) and *Pennisetum typhoides* (Ragi).

FOOD QUALITY AND INDIAN EXPORTS

The export of food products from India is a source of foreign exchange. Stringent quality parameters have to be maintained in order to meet the regulations of the importing countries.

The countries importing foods from India often subject them to stringent quality parameters. A perusal of the detention list of foods at the ports of entry in the USA maintained by FDA of USA indicated that among the 2,465 consignments found to be not conforming to specifications from different countries during the year 1989,186 consignments were of Indian origin: foods like rice, sesame seed and shrimp were the most affected commodities. The major quality parameters that were specified as the cause of detention were pathogenic bacteria and animal filth[6].

The need for a National Policy on Food Safety: A sound National Food Safety Policy responding adequately to our health needs has yet to be formulated in our country. The major constraints in the development of such a policy include:

- lack of appreciation of the nature and extent of national food safety problems,
- lack of awareness of the consequences of contaminated food on the nation's health status and economic development;
- lack of sound cost-effective methods of identifying specific food safety problems;
- lack of organised consumer demand for food safety;
- lack of coordination of responsibilities for food safety and food control in different government departments and at various levels which often leads to conflicts of interest; insufficient allocation of resources, including personnel to respond appropriately and in time to the problem; and
- lack of periodic evaluation and updating of food safety policies to meet contemporary problems.

To be sure, basically sound laws and regulations regarding food safety exist on paper. It is the implementation of these regulations that is defective. Responsibilities for implementation are spread over several ministries as well as among the central, state and local bodies, and there is no mechanism for their coordination. The constitution of a National Food Quality Control Board had often been suggested but as yet no steps have been taken to form it.

FOOD SAFETY ADMINISTRATION

Among the various regulations for ensuring food safety and quality, the most important is the Prevention of Food Adulteration Act 1954 (PFA). The major objective of the Act is to formulate and monitor standards of quality and purity with an emphasis on the prevention of adulteration of foods.

The Act also includes a warranty clause of food quality which safeguards retailers' interests in the event of food being found to be adulterated, and makes the dealers, distributors and manufacturers also responsible.

The Central Committee of Food Standards(CCFS) is the primary policy-making body which advises central and state governments regarding the administration of the Act and evolves standards relating to the Act. The provisions of the Act are implemented by the state governments and local bodies in corporations and municipalities.

Besides PFA, for internal trade, three orders, namely, the "Solvent extracted oil, deoiled meal and edible flour (control) order", "Vegetable oil products control order" and the "Meat products order" for maintaining quality control of respective commodities are in force, to be implemented by the Central Ministries directly. For export commodities, "Compulsory Compliance Legislations" in vogue include the "Export (Quality Control and Inspection) Act", "Fruit products order" as well as the "Agricultural Produce (Grading and Marking) Act", all three implemented by the Central Government. The "Voluntary compliance legislation" for internal trade, again implemented by the Central Government departments, includes the ISI Certification Mark Act, the Agriculture Produce Grading and Marking Act, the Sugar control order and the Fruit products order[7].

The major functions under these acts/orders include laying down of specifications, quality control inspection and testing. Beside Government departments and quasi-government agencies like the Bureau of Indian Standards, certain private agencies have been recognised by the Central Government which are competent to conduct inspection of certain notified commodities, specially those pertaining to export products. However, food-borne diseases are notifiable only in selected states like Andhra Pradesh and Maharashtra in India.

Laboratory support services: The laboratories in the country which have facilities to analyse for, and report on, the various food quality parameters can be broadly divided into two categories: research labs which are mainly concerned with analytical method development, detection of newer contaminants and adulterants; and laboratories which routinely analyse samples for quality. It is the latter that are directly involved in the actual implementation of food safety regulations.

In India, there are at least 10 national laboratories and five to 10 university departments which have facilities for analysis of various food-quality parameters.The routine laboratories which analyse foods for quality include 84 food laboratories belonging to state governments, one-third of which belong to local bodies; at least eight composite food laboratories of the Armed Forces; zonal laboratories of agencies like the Food Corporation of India; 24 microbiological laboratories of the Export Inspection Council, belonging to the Ministry of Commerce; four appelate Central Food Labs of the Ministry of Health; and testing laboratories of the Bureau of Indian Standards (BIS) Agmark (at headquarters and in different regions).

In the industry sector, besides the quality control laboratories of leading public and private sector food industries, there are at least 15 major approved firms with over 60 laboratories located at port towns which mainly analyse food commodities meant only for export.

Impressive as the above list may seem, only a small percentage of these laboratories are equipped for analyses of all the quality parameters. A majority of the laboratories routinely analyse samples for checking quality using only a small range of selected parameters. National level research institutions and selected state level laboratories are engaged in research activities pertaining to food quality and safety and are not engaged in routine analytical work connected with the implementation of food laws.

The technical manpower and infrastructure facilities available for undertaking analysis vary markedly with the level of the institution. Currently, there is no testing laboratory in the country which offers all the testing services needed in connection with food quality. National level laboratories have such facilities both in terms of equipment, expertise and technical manpower but they do not routinely provide these services. Many of the other testing laboratories have facilities for undertaking only simple chemical analysis. A few laboratories such as those of the Export Inspection Council and selected state food laboratories have facilities for microbiological analysis.

The sophisticated instruments needed for food control laboratories like high pressure liquid chromatography, gas liquid chromatography with electron capture detector needed for pesticide residue analysis, atomic absorption spectrophotometer needed for heavy metals, are available only in national level research laboratories. The concept of analytical quality assurance (AQA), both inter- and intra-laboratory, among laboratory personnel is not well developed. While there is not much interaction with international analytical quality assurance programmes, recently, at least, with selected contaminants like mycotoxins AQA programmes have been initiated.

Training in food quality related services: The training facilities available with regard to food quality related service can be broadly divided into two levels: those provided before the entry level; and in-service training programmes. The first category is provided by the universities. However, out of the over 150 traditional/agricultural/health university and other institutions, only a few offer programmes related to food quality. Even here, food quality forms a small component of the training provided as part of the nutrition course in the home science or food technology departments of agricultural and traditional universities. Only the Andhra University at Waltair offers a food analysis course at the master's level. At the bachelor's degree level, there is no component of food quality control syllabus in any university programme.

The in-service training programme is the main source of training for food quality personnel. Regular training programmes for in-service personnel are being conducted at institutes such as CFTRI, Mysore; CFL, Calcutta; and DFRL, Mysore. Besides, ad hoc training programmes for the analysis of selected contaminants are offered at places like the National Institute of Nutrition, Hyderabad; Punjab Agricultural University, Ludhiana, etc.

Facilities for the training of food inspectors, who are the key functionaries in the implementation of the food control programme, numbering over 6,000 in the country, are minimal, highly inadequate and not rigorous. A proposal for three months' training for food inspectors has been proposed by the Directorate General of Health Services, and the training curriculum is expected to include food quality inspection.

QUALITY CONTROL OF FORTIFIED FOODS

Fortification of foods is resorted to in order to enrich them with nutrients to ensure nutritional adequacy either to overcome deficiencies or achieve better sales.

Currently, in India, salt is being used as the vehicle for fortification with iodine and iron. Vitamin A and D fortification of foods like hydrogenated vegetable oil (vanaspati) is also being carried out. Fortification of processed foods with vitamins, minerals and even amino acids is often resorted to as part of sales promotion. Infant foods and weaning foods are usually fortified by the manufacturers mainly to conform to the specification of organisations like the Bureau of Indian Standards.

In order to maintain the quality control of iodised salt, necessary standards have been laid down under the Prevention of Food Adulteration Act, (that is, 30 ppm at the manufacturing level and 15 ppm at the consumer level). At the manufacturing level, quality control is checked by the Salt Commissioner's Organisation (Government of India) and at the consumer level, quality control is maintained by the State Health Departments under the PFA rule. An imminent need has been felt to lay down purity/quality standards for raw materials such as salt (98 per cent purity), food grade potassium iodate (for iodine fortification) and for food grade ferrous sulphate and stabilisers-cum-absorption promoters like sodium hexametaphosphate (for iron fortification).

It has been found in certain states of India that only 40-80 per cent of iodised salts conform to standards. The reasons for this include infiltration and mixing up of non-fortified common salt, poor packing conditions, want of an adequate number of covered railway wagons, adulteration of potassium iodate with lime, use of substandard salt, and the use of non-food grade potassium iodate.

STREET FOODS

In India, during recent years, there is an increasing trend towards the sale and consumption of foods at the roadside. This phenomenon is more obvious in the urban areas of the country. The growing pressure of population, increase in the number of working women and the breakdown of the joint family system, resulting in rising numbers of nuclear families, compel people, specially of the lower economic strata, to depend more on ready-to-eat foods at cheaper cost than on foods available at regular eating establishments. Most of these street sales centres have been mushrooming on the roadside, either on the pavements as temporary structures or as push-carts parked on the wayside near public places such as railway stations, bus stands, cinema halls and busy market areas. The emphasis in these establishments is to serve food which cater to the daily needs of the people belonging generally to the lower economic strata.

Such foods mostly satisfy the people, serving specially to the taste of the consumer, with little attention bestowed on hygiene, food safety or nutritional aspects. Regular catering establishments need capital investments in terms of space, equipment, and numbers of employees. On the other hand, a street-foods operation often involves entire families with regard to procurement of the raw material, preparation and cooking as well as the sale of prepared food. With little or no rent given, few overheads and negligible control by the Government as compared to regular catering establishments in terms of taxation or regulation compliance, the street food vendors are able to serve foods to the masses at a comparatively cheaper cost, sometimes even less than that at the household level. These factors lead to a proliferation of this sector at a fast rate.

Studies on urban street foods in India are few. In Maharashtra, urban street food vendors are provided licenses on terms and conditions similar to regular eating establishments. The Corporation of Madras has prescribed certain guidelines for urban street food vendors and collects an annual licence fee from them. However, in most other Indian cities, no control is exercised over street food vendors by Government authorities.

Microbiological examination of various foods served by the street vendors in Pune indicated the presence of faecal coliform bacteria in some of the items. A study conducted in Hyderabad indicated the use of non-permitted coal tar food colours in sweetmeats and of *Lathyrus sativus*, a harmful legume banned under the Prevention of Food Adulteration Act, in certain snack foods.

It can be concluded that while urban street foods are cheap, convenient and are comparable (from the nutritive value and organoleptic evaluation points of view) to the foods served in the regular food establishments, they stand in urgent need of improvement from the hygienic angle. In order to achieve this, it is recommended that

- only certain places be earmarked for selling street foods (food parks) rather than allowing indiscriminate sale at any crowded place;
- the food stalls should be allowed to be established only in clean and well-kept surroundings away from garbage, public urinals and open drainages;
- a licensing system has to be evolved with proper supervision;
- a code of hygienic practices for the preparation and sale of safe food be prepared;
- adequate facilities for providing safe drinking water and waste disposal be made;
- close scrutiny of food safety aspects, including microbiological components and adulterants and unpermitted food colours, be maintained;
- educational materials on food safety be prepared and efforts made to educate vendors about hygiene.

The ongoing account will provide an indication of:

- the wide range of contaminants that are currently involved in under mining the wholesomeness of foods;
- the need for an effective regulatory mechanism for ensuring food safety