VETERINARY PUBLIC HEALTH, FOODBORNE DISEASES, AND FOOD SAFETY

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The importance of food in disease and health has been historically recognized. The empirical link between diet and disease has been increasingly replaced by sound scientific evidence during the last century which demonstrates unequivocally that what we eat has a major impact on our health. Aside from its nutritional aspects, food serves as a means by which people could be exposed to harmful toxic agents.

It was long thought that contaminated water supplies were the main source of pathogens causing diarrhea, but it has been shown that food has been responsible for up to 70% of diarrheal episodes, especially in developing countries. In 1995, the World Health Organization (WHO) reported that diarrheal diseases caused more than 3 million deaths, of which more than 80% were among children under 5 years of age.
Foods interact with the three basic elements of the environment: soil, air and water, and thus may be contaminated by biological and chemical agents they harbor. Foods reach the consumer after passing through a long chain of steps involved in production, transport, processing, distribution, marketing and handling giving ample opportunities for harmful agents to enter the chain at one or more of these steps. For these reasons, an effective program for the sanitary control of food has to be organized based on a concerted intersectoral approach. The intervention methods must be integrated and strategic addressing each critical point where potential risks and hazards exist, and applying the necessary control along the chain of steps from production to consumption. The hazard analysis critical control point (HACCP) methodology was developed which has been recently adopted by the US Government in its food safety and inspection service.

Given the size and complexity of problems related to food safety, governments are hard-pressed to provide protection against unsafe food. Food protection in many developing countries should be seen against a backdrop of food shortages, both in terms of quantity and quality of foods available for consumption and of the improper distribution of food supplies. Food protection, therefore, should be viewed from both a health and economic perspectives.

Food protection programs must have at least the following objectives:

1. Prevention and control of foodborne diseases;
2. Prevention of food losses from spoilage; and
3. Promotion of international food trade and commerce.

Veterinary Public Health, according to WHO definition, As a component of public health activities dedicated to the application of knowledge, expertise and resources in veterinary medicine for the protection and improvement of human health. Veterinary medicine provides a broad vision of food protection, not only sanitary control, that encompasses all the chain of steps from production to consumption. The professional education of the veterinarian provides the needed knowledge of the various aspects of animal production and health, environmental health, microbiology, food hygiene, epidemiology and preventive medicine which are vital ingredients in putting together a coherent program of food protection.

Historically, veterinarians have managed the food hygiene programs of most countries, designed to protect humans from any ill-effects that might be caused by foods of animal origin. Most of these programs, however, have limited emphasis on meat inspection leaving the other steps in the food chain process vulnerable to contamination and without sanitary protection. The veterinarian must re-establish leadership and provide the necessary broad vision in food protection in the modern world with the application of the concepts of veterinary public health.

The Regional Plan of Action for Technical Cooperation in Food Protection of PAHO WHO identified five (5) essential components of a food protection program that could address the different chain of steps from production to consumption: organization of an integrated food protection program, inspection services, analytical services, surveillance and control of foodborne
diseases, and street food hygiene and consumer protection.

According to the evaluation conducted by PAHOWHO in 1995, most countries in the Americas have some kind of food legislation but lack effective implementation. 100% of the countries have laboratory capabilities for residue and microbiological analysis; some have multiple laboratory facilities. 100% of the countries practice some form of food inspection. However, there are no coherent programs for the effective concertation of efforts to address the problem of food protection in many countries, despite the existence of activities in food safety albeit atomized and dispersed in different institutions.

There is an urgent need to develop and organize the necessary mechanisms and infrastructure in order to integrate existing food safety activities so that they are made to bear at all critical points in the production-transport-processing-storage-distribution-consumption chain. Countries must have a clearly defined and articulated food protection policy to ensure that efforts among the ministries of the national government are not fragmented, and that there is an effective coordination between levels of government and the private sector. Coordination among the various agencies is often hampered by competition for staff, funds and prestige, and the fact that different agencies have different missions in regards to food control.

**Foodborne Diseases**

Foodborne diseases are perhaps the most widespread health problem in the contemporary world both in the developing and developed countries, ranging in severity from mild indispositions to life-threatening illnesses. Their true incidence, however, is grossly underreported since not all patients suffering from diarrhea will seek medical care, stool samples are not always sent to the laboratory, outbreaks are not usually investigated, and not all illnesses are officially notified.

Despite these limitations, there are available information albeit limited on the occurrence of foodborne diseases. Estimates of the number of cases of foodborne diseases in the United States range from 6.5 to 81 million cases per year, with from 525 to > 7,000 foodborne-disease associated deaths per year. Economic losses to ill persons, producers and the national economy have been estimated between $8 to $23 billion annually.

An investigation of a small outbreak of salmonellosis in Argentina involving 36 persons who ate contaminated sandwiches was estimated to have cost some US$50,000. Information on the economic impact of foodborne diseases in Latin America and the Caribbean is not available or has not been published.

In Europe, salmonellosis due to S. enteritidis is still the most important foodborne disease and, in most countries, notification of cases is a comparatively good one.

Understanding the causes of foodborne diseases is essential in developing and implementing appropriate prevention and control measures, and the most important indicator of a successful food safety program is the reduction of the incidence of foodborne illnesses in the human population.
There are a number of factors that have contributed to the increase in foodborne diseases. Among them are the increased consumption of food in commercial food service establishments, new methods of food production, changes in microbial pathogens, among others.

The epidemiological surveillance of foodborne diseases is one of the components in the organization of food safety programs in the Region of the Americas. The Veterinary Public Health Program of PAHO/WHO, through its Pan American Institute on Food Protection and Zoonoses (INPPAZ) in Buenos Aires, Argentina, has established a regional information system for the epidemiological surveillance of foodborne diseases.

In 1995, 16 countries have started reporting on the occurrence of foodborne diseases. A total of 620 outbreaks were reported to INPPAZ, involving 21,755 cases and 49 deaths. In 66% of the outbreaks, the etiologic agents were identified, the food involved was known in 85% of the outbreaks, and in 65% of the outbreaks the place where the food were consumed was known.

Prevention and Control of Foodborne Disease

The principal mission of a food protection program in public health is the prevention and control of foodborne diseases. Its main focus is to protect the health of the population, ensuring that the food that is consumed is nutritious, safe from biological and chemical hazards, and in good condition. Epidemiological surveillance of foodborne diseases is an integral part of any food protection program. The gauge and quantitative indicator of the success of a food protection program in public health terms are the number of food poisoning outbreaks and foodborne diseases that have been prevented or controlled.

The Primary Health Care (PHC) strategy set forth in the Declaration of Alma-Ata in 1978 indicates that promotion of food supply and proper nutrition is one of the 8 elements with which PHC must be concerned. The problem of food and nutrition in many developing countries is an issue related more to food availability and economic factors resulting from the lack of ability to access the food supply that are safe and of high quality due to poverty. Most problems of malnutrition stem from poverty-related underconsumption of protein and energy, but equally important are deficiencies of key micronutrients – iodine, vitamin A and iron – from which children and women suffer disproportionately. According to the World Bank, increasing the incomes of the poor is the most effective means of reducing protein-energy malnutrition, although governments can play a direct effective role through nutrition education, measures to increase consumption of micronutrients, basic sanitation to prevent diarrheal diseases, and prevention of crop failures from leading to famines.

Some 780 million people worldwide suffer from protein-energy malnutrition, according to estimates of WHO. This is not a foodborne disease, but a condition resulting from diets deficient in both energy and protein that are rooted in poverty, neglect, exploitation and ignorance. In addition to its direct effect, malnutrition plays a major role in determining the virulence of common infectious diseases and in influencing the overall capacity of the body to ward off disease.
The promotion of a safe food supply and proper nutrition within the framework of PHC should be established as an important public health activity, but the approaches and strategies to their operationalization are distinct. For instance, nutrition education is an essential strategy to communicate messages related to sanitary protection at the consumer level. A basic concept of PHC is that it focuses action at the household and community levels. Since large numbers of food-related illnesses have their origin and solutions in the home and community, nutrition education should include messages aimed at families to ensure the handling of food at the household level. On the other hand, promotion of a safe food supply addresses food protection, a comprehensive and integrated program of food safety that encompasses all the critical points in the production-transport-processing-distribution-consumption chain. From a public health perspective, the end in view is to prevent food contamination with biological and chemical agents and to ensure that food reaches the consumer safe and wholesome.

With the exception of a few, most of the important foodborne diseases are zoonoses, including enterotoxigenic and invasive *E. coli*, salmonellosis, brucellosis, campylobacteriosis, taeniasiscysticercosis, diphyllobothriasis, fascioliasis, marine toxins, etc. Veterinary public health could play a fundamental and cost-effective role in the prevention and surveillance of foodborne diseases by controlling the zoonoses at the animal reservoir level and at the chain of steps from production to distribution before they cause human illness.

**Promotion of International Food Trade Standards and Commerce**

In addition to establishing food protection as a public health activity, the program must be designed to protect consumers from fraud and promote trade. In decisions on food safety, public health considerations should be given priority. In many countries, food protection is viewed more as a means of meeting export requirements and generating foreign exchange rather than as a vital defense to national public health. To prevent fraud and to establish an international food standards, the Food and Agriculture Organization of the United Nations (FAO) and WHO established in 1962 a Codex Alimentarius whose purpose is to guide and promote the elaboration and establishment of definitions and requirements for foods, to assist in their harmonization and, in so doing, facilitate international trade. The standards contain requirements for food aimed at ensuring the consumer a sound, wholesome food product free from adulteration, correctly labeled and presented.

The indicators of a food protection program whose principal purpose is to facilitate international trade are the growth in volume and value of international food trade, and food shipments rejected by importing countries. For instance, FAO reports that growth rates in imports and exports have been phenomenal for some individual countries. International food trade reached $200,000 million in 1989 and continues to grow. Non-tariff trade barriers and failure to harmonize or adopt accepted food standard have resulted in countless shipments being rejected by importing countries.

In the Americas, food industry is characterized by a large numbers of small- and medium-sized producers. Many of these lack capital, facilities, and trained personnel for proper sanitary and quality control. The policy of many countries are geared towards meeting export standards favoring the large producers at the expense of the small-producers, while foods that do not meet export
standards are dumped in national markets for local consumption.

As noted previously, it is of critical importance that food protection be viewed primarily as a public health protection measure, rather than as an economic support activity. For this reason, it has been recommended to assign an important but not necessarily exclusive role to health ministries in developing and coordinating national food protection policies. Regardless of the reporting relationship of food safety activities, the ministry of health should be the final authority in setting health standard. Given the traditional powers of the ministries of agriculture, as compared to health ministries, it is highly desirable to develop a close, statutory-defined relationship which recognizes and protects the legitimate concerns of each in the area of food protection and promotes intersectoral collaboration. Other ministries such as trade, industry, commerce, finance, customs and local government also have valid concerns and views about food control which should be taken into account when formulating and administering an integrated food protection program.

For instance, in most countries, the Codex Alimentarius contact points are usually in the Ministry of Commerce, Industry, Trade or Foreign Affairs.

The decision on the best mechanism for ensuring consultation and coordination between institutions with food safety responsibilities and for ascertaining the lead ministry in the food safety area should be best left to the national authorities in the light of their own needs and procedures. Animal health and veterinary public health programs with responsibility on food safety and who could provide the vision and leadership in the organization of an integrated food control program that would be comprehensive enough to ensure the safety and protection of foods in the production-transport-processing-distribution-consumption chain are usually part of the organization of the ministries of health and agriculture.

**Prevention of Spoilage and Food Losses**

Proper facilities for storage, such as refrigeration, transport and distribution are frequently lacking and inadequate in most developing countries. Furthermore, the supply of food available for sale and consumption is decreased by significant losses resulting from rodent and vermin infestations and contamination by bacteria, molds and other causes and vectors of disease during production, storage, transport, processing, and distribution. Physical losses of food from spoilage due to improper handling has been estimated to account for 40% of the total food production, with serious repercussions to food security and trade. According to the FDA, the United States imported more than $8.5 billion worth of food in a single year from countries of the Americas. Of this, 2,450 food shipments were detained involving more than 51 metric tons of food valued at $2 million. Of these, 33% involved rejections because of mycotoxins, 26% were due to filth and the problem of microbiological and chemical contamination and other unsafe practices and conditions accounted for the rest.

In effect, the infrastructure and technical expertise necessary for sanitary protection of foods at all critical points in the chain of steps from production to consumption are lacking and do not function effectively in most countries resulting in prodigious food losses.
Veterinary public health has an important role to play in the sanitary protection of food from the pre-harvest to the post-harvest levels since the activities of the veterinary profession encompass and involve food animal production hygiene, thus ensuring proper handling and storage to prevent food losses from contamination and spoilage.

Veterinary public health has an important and unique role to play in the sanitary protection of food from the pre-harvest to post-harvest levels since the activities of the veterinary profession encompass and involve food animal production hygiene. Veterinary public health could thus provide the comprehensive vision and leadership in food protection by ensuring proper handling and storage to prevent food losses from contamination and spoilage, the surveillance and control of foodborne diseases, and the promotion of international food trade standards and trade.
References


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