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Integrated approaches to the management of food safety throughout the food chain

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Introduction

Most countries with systems for recording foodborne disease have reported significant increases in the incidence of diseases caused by pathogenic micro-organisms in food over the past few decades. As many as one person in three in industrialized countries may be affected by foodborne illness each year and the situation in most other countries is probably even worse. Apart from the deaths and human suffering caused by foodborne disease, the economic consequences are enormous, running into billions of dollars in some countries. In Europe bovine spongiform encephalopathy (BSE, "Mad cow disease") and contamination of food with dioxins led consumers to lose confidence in the safety of foods on the market, with severe economic consequences. In many cases, the origins of food safety problems can be traced back to contamination of animal feed or other factors in the early parts of the food chain, an area which until fairly recently had received scant attention from those responsible for food safety.

Confident customers

It is vital that consumer confidence in the food supply be restored and maintained, not by public relations exercises but by actually increasing food safety. Consumers should be able to assume that all food offered for sale is safe for its intended use. It shouldn't be necessary to ask the butcher if the beef is safe this week or the fishmonger if the oysters are safe today! Furthermore, food should be labelled in such a way that consumers can make an informed choice among the variety of products on the market. At the *Food Chain* conference, organized in Uppsala earlier this year during the Swedish presidency of the European Union, the vision for future food production was summarized as *Safe, sustainable and ethical.* Although much progress has been made in recent decades, all who are involved in trying to ensure the safety of the food supply should recognize that we have a long way to go before we can say we have reached this goal.

Risk analysis

The primary goal of food safety risk management is to protect public health from risks associated with food as effectively as possible through the selection and implementation of appropriate measures. Towards the end of the last century, there was a paradigm shift in the food safety area, with the introduction of a risk-based approach to food safety. In order to stimulate the application of risk analysis principles in food safety work, FAO and WHO jointly organized a series of expert consultations on the different components of risk analysis – risk assessment, risk management and risk communication. The second consultation, held in Rome in 1997, dealt with risk management and the report of that consultation contains recommendations on the elements and principles of food safety risk management (1). These recommendations have been used as the starting point for the introduction of risk analysis principles into the Codex system and they have also been used by many government agencies in developing food safety risk management at the national level.

General principles of food safety risk management

The FAO/WHO Expert Consultation recommended the following eight general principles for food safety risk management.

- Risk management should follow a structured approach.
- Protection of human health should be the primary consideration in risk management decisions.
- Risk management decisions and practices should be transparent.
- Determination of risk assessment policy should be included as a specific component of risk management.
- Risk management should ensure the scientific integrity of the risk assessment process by maintaining the functional separation of risk management and risk assessment. However, it was recognized that risk analysis is an iterative process, and that interactions between risk assessors and risk managers are essential for practical application.
- Risk management should take into account the uncertainty in the output of risk assessment.
- Risk management should include clear, interactive communication with consumers and other interested parties in all aspects of the process.
- Risk management should be a continuing process that takes into account all newly generated data in the evaluation and review of risk management decisions.

Responsibility for food safety

Primary responsibility for food safety lies with *those who produce, process and trade in food* – farmers, fishermen, slaughterhouse operators, food processors, wholesale and retail traders, caterers, etc. It is their duty to ensure that the food they produce and handle is safe and satisfies the relevant requirements of food law and they should verify that such requirements are met.

The main task of the *supervisory authorities* is to lay down food safety standards and to ensure that the internal control systems operated by food producers, processors and traders are appropriate and operated in such a way that these standards are met. In addition, the authorities should carry out certain direct control activities, for example import control, to ensure compliance with legislation and they should also provide information and advice on a wide range of food-related matters which can affect human health. In recent years, the organization of food control at the national level in many countries has been changed and a single agency has been given

responsibility for the whole of the food chain from "farm to fork". Such a system has many advantages and if responsibility is nevertheless divided among two or more agencies at the national level it is vital that there is close co-ordination between them. Similarly, if responsibility for food control is divided between central and local authorities, then it is important that the central authorities have the power to co-ordinate and audit the work of the local authorities.

Consumers are responsible for food hygiene in the home and for ensuring that food storage and preparation recommendations are followed. In addition, it is largely the consumers themselves who decide on the composition of their diet and poor dietary habits are major factor in the causation of food-related disease, especially in industrialized countries. In some cases we are "digging our graves with our teeth" when our intake of certain safe foods is much higher than our needs.

Holistic approach to food safety – the whole food chain and beyond

It is important that care is exercised throughout the whole food production-processing-distribution chain. Previously, food control often concentrated on the examination of end products and on inspection of food processing operations. However, in recent decades there has been a growing awareness of the importance of an integrated, multidisciplinary approach considering the whole of the food chain (and in some cases beyond what is conventionally regarded as the food chain). One result of this change in approach is a much greater awareness of the need for better control on the composition and safety of animal feed. In response to this the Codex Alimentarius Commission established an *ad hoc* Task Force on Animal Feed and in recent years the European Community has introduced much more legislation and control on animal feed. Another result of the paradigm shift is a realization of the need for much closer contact and more interaction between those responsible for food control and those responsible for preventing or reducing environmental pollution. Such pollution, for example with persistent chemicals such as mercury, PCBs and dioxins, can lead to food safety problems. Coupled to this there is now a greater emphasis on source-directed preventive measures. Some examples of this approach are given below.

Hazard Analysis and Critical Control Points (HACCP) approach

Food producers, processors and traders should operate according to the principles of Good Agricultural/Hygienic/Manufacturing Practices. Food production, processing and other handling operations should be analysed with a view to identifying hazards and assessing associated risks. This should lead to the identification of critical control points and the establishment of a system to monitor production at these points (i.e. the Hazard Analysis and Critical Control Point – "HACCP" approach). The introduction of HACCP-based in-house control may be difficult in small and medium-sized enterprises with limited basic knowledge, experience and resources and is probably best achieved by collaboration between the food industry, education and training organizations and the supervisory authorities. The Codex Alimentarius and its parent organizations FAO and WHO have produced useful guidelines and training and information materials on the application of HACCP in food control.

Prevention is better than cure

Different approaches may be used to try to ensure that the levels of contaminants in foods are as low as reasonably achievable and never above the maximum levels considered to be acceptable/tolerable from the health point of view. Essentially, these approaches consist of:

- measures to eliminate or control the source of contamination
- processing to reduce contaminant levels

- measures to identify and separate contaminated food from food fit for human consumption. The contaminated food is then rejected for food use, unless it can be reconditioned and made fit for human consumption.

In some cases, a combination of the above approaches is used, for example when emissions from previously uncontrolled sources have resulted in environmental pollution with persistent chemicals, which have then entered the food chain.

Previously, most systems for regulating food safety were based on legal definitions of unsafe food, enforcement programmes to remove such food from the market and the application of sanctions on those held responsible for contravening the regulations. Such systems have not been successful in dealing with previous or current problems and are unlikely to be able to deal with emerging risks. Control of final products can never be extensive enough to guarantee contaminant levels below established maximum levels and safety and other aspects of food quality cannot be "inspected into" food at the end of the production chain. In most cases, chemical contaminants cannot be removed from foodstuffs and there is no feasible way in which a batch of contaminated foodstuffs can be made fit for human consumption. The advantages of eliminating or controlling food contamination at source, i.e. *a preventive approach*, is that this is usually more effective in reducing or eliminating the risk of untoward health effects, requires smaller resources for food control and avoids the rejection of foodstuffs and resulting economic and other losses. The use of a preventive and integrated approach to the management of food safety throughout the food chain is illustrated in the following examples.

An integrated approach to the control of Salmonella in poultry

The prevalence of *Salmonella* in feed, live animals and animal products produced in Sweden is very low, less than 0.05% in beef and pork and 0.1% in poultry at slaughter. This has been achieved by a national control strategy which was initiated more than 40 years ago, following a severe domestic outbreak of *Salmonella* in 1953, involving more than 9000 people.

This integrated strategy, which is described in detail in a report (2) on zoonoses in Sweden, covers the different parts of the feed-food chain. The overall goal of the control programme is to ensure that animals sent for slaughter are free from *Salmonella*, thereby ensuring that animal products will be free from *Salmonella.* The strategies to reach this goal are as follows:

- To prevent *Salmonella* contamination in all parts of the production chain.
- To monitor the whole production chain: surveillance programmes for feed, live animals, carcasses, meat and other foods of animal origin are in place.
- If Salmonella is found, action is taken to eliminate the *Salmonella* infection/contamination. Any food item contaminated with *Salmonella* is deemed to be unfit for human consumption.

All isolations of *Salmonella* in humans, animals and food of animal origin are notifiable. In addition, findings of *Salmonella* in official samples of food of any origin are notifiable. All primary isolates of *Salmonella* are characterized by sero- and phage-typing the strains and isolates of animal origin are also tested for anitibiotic resistance. In order to illustrate how the system works, some details of the measures taken in the poultry area are given below.

Since the frequency of *Salmonella* isolation in Swedish poultry flocks is very low, most of the measures in current control programmes are of a preventive nature. Four factors are of major importance to maintain this favourable situation.

- The breeding pyramid is kept free from *Salmonella*. All grandparent animals are imported and are quarantined and repeatedly tested negative for Salmonella.

- Feed is maintained free from *Salmonella*. The control consists of three parts: import control of feed raw materials, mandatory heat-treatment of compound feedingstuffs for poultry and an HACCP-based *Salmonella* control in the feed industry.
- High hygiene and biosecurity standards are in place, preventing the introduction of *Salmonella*.
- Measures are always taken in case of *Salmonella* infection in poultry.

An extensive sampling programme continuously monitors the *Salmonella* situation in poultry. In addition to sampling at the flock level, samples are also collected at all poultry slaughterhouses to monitor the end product.

Pesticides and veterinary drugs

Pesticides and veterinary drugs should be subjected to thorough testing and risk assessment prior to approval for use. In order to minimize the risk of high residue levels in food and also to avoid environmental pollution, they should be used according to the principles of Good Agricultural Practice and Good Veterinary Practice and only by persons who have received adequate training. In order to avoid the development of antibiotic-resistant micro-organisms, the use of antimicrobials in food production should be restricted.

Pesticide levels should be monitored in food (including drinking water) and feed to ensure that they do not exceed established maximum limits (MRLs) and the results of such monitoring should be made public. When residue levels above the MRLs are found, this should trigger increased control of products from the same supplier/grower and to remedial action. Likewise, the levels of residues of veterinary drugs in relevant foods of animal origin should be monitored and the results made public. When residue levels exceeding the MRLs are found, this should lead to an intensification of control and remedial action at the source of the problem, usually the primary producer.

Mycotoxins

The problem of contamination of feed and foodstuffs with mycotoxins, such as aflatoxins, ochratoxin A, patulin and trichotecenes, is best tackled by a systematic examination of the whole production, processing and distribution chain in order to discover the points at which contamination is likely to occur, so that appropriate preventive and control measures can be taken. In Sweden, control of aflatoxins in animal feed components and routine monitoring of aflatoxin M1 in milk back to the individual farmer has enabled us to ensure that aflatoxin levels in milk is kept well below our strict maximum limits. Detailed investigations of post-harvest handling methods have shown that in some cases relatively simple changes may lead to marked decreases in mycotoxin levels. Although a considerable amount of work has been done, there is a need for much more research on mycotoxins in order to provide a sound scientific basis for recommendations for both pre- and post-harvest measures. The Codex Committee on Food Additives and Contaminants (CCFAC) has developed and is developing codes of practice to reduce contamination of food and animal feed with mycotoxins, such as aflatoxins, ochratoxin A and patulin.

Persistent environmental pollutants

Previous emissions of persistent chemicals, e.g. PCBs, dioxins, mercury, cadmium, have led to contamination of foodstuffs, especially foods of animal origin, such as fish and a need for monitoring and control of some products to ensure that they do not contain levels above safe limits. In order to protect public health, my agency has also issued recommendations to susceptible population groups, for example women of childbearing age, advising them to restrict their consumption of certain fish species or fish from contaminated waters.

In order to reduce the levels of environmental contaminants, effective measures must be implemented to reduce emissions from industry and other sources. There are several international conventions aimed at reducing environmental pollution with persistent organic compounds. In recent decades such measures have resulted in marked reductions in pollutant levels in some foods and in human exposure to some environmental pollutants. For example, the levels of lead in human blood have dropped quite dramatically in countries where lead is no longer added to petrol. Likewise, measures to control pollution with dioxins and PCBs and a ban on the use of persistent pesticides, such as DDT, has led to a marked reduction in the levels of these substances in food and in human exposure, as measured by the levels in human milk. This is an example of an area where co-operation between the authorities responsible for food safety and environmental protection has borne fruit. The Codex Committee on Food Additives and Contaminants is developing a code of practice to reduce dioxin contamination of food

Revamping meat inspection

Current meat inspection methods are incapable of detecting the symptomless carriage of pathogenic organisms and many of the components of current meat inspection contribute little or nothing to consumer health protection. It is questionable whether it is worth spending limited inspection resources on routine examination for certain parasites in countries where they have not been found in domestic food animals for many years. The need to revamp meat inspection and make it more risk-based was recognized several years ago in, amongst other places, Australia and New Zealand and intensive discussions on this subject are also underway in the European Union. The Codex Alimentarius Commission has decided to start new work in this field and the Codex Committee on Meat and Poultry Hygiene will meet early next year to discuss the modernizing the current Codes of Practice on Meat Hygiene, including poultry hygiene.

Emerging risks – "Looking for trouble"

We live in a world with rapid developments in science and technology, but also of rapid changes in the risks posed by microbiological and chemical hazards. It is therefore important that agencies responsible for food safety have a "reconnaissance" or "intelligence" function with the task of detecting emerging risks. These risks could be due to emerging pathogens, for example pathogens resistant to a wide range of antibiotics, the use of new feed components, new industrial or domestic chemicals, new production, processing and handling methods or to changes in dietary habits. The detection of emerging risks is one of the tasks that will be assigned to the proposed European Food Authority.

Traceability

In order to be able to be able to identify the source of food safety problems, it is necessary to have systems in place be able to trace a food product back through the food chain. Such systems are already in place in the European Union for some foods and legislation currently under preparation in the EU will introduce traceability as a general requirement. A good system for tracing food

throughout the production and distribution chain is also valuable for the food industry and trade, since it should mean that recalls of faulty products can be restricted.

Improved monitoring of foodborne disease and risk assessment

A risk-based approach to food safety risk management implies that food control resources should be directed towards problems which pose the largest threats to health and where the potential risk reduction is large in relation to the resources used. In order to make our priorities risk-based, we need much better systems for following-up and reporting outbreaks of foodborne disease and better international co-operation in this area. WHO is making a major effort to improve the current situation. Furthermore, we need to spend more resources, preferably at the international level, to speed up and improve expert risk assessment of both microbiological and chemical hazards in food.

Transparency

One of the recommendations of the Expert Consultation on Risk Management was that the risk management process should be as open and transparent as possible. The work of the supervisory authorities should be carried out in a transparent manner, with open communication with consumers, producers, traders and other interested parties. One effective way of increasing compliance with food legislation is to make the results of food control activities public. This applies of course to inspection reports and results of control analyses carried out by the supervisory authorities. In countries where responsibility for food control is divided between different authorities, e.g. central and local authorities, it should also apply to audits carried out by national authorities on the food control work carried out by local authorities. In the European Union the European Commission's Food and Veterinary Office audits of the food control activities carried out in the Member States are available on the Internet and we welcome this approach.

Improving food hygiene in commercial catering and in the home

Hitherto I have dealt mainly with the early parts of the food chain: we must not underestimate the importance of the last part. In Sweden there are indications that a large proportion of the cases of foodborne disease are due to poor hygienic practices in restaurants and other commercial catering establishments and in the home. The food control authorities should ensure that those responsible for the operation of catering establishments train their personnel in food hygiene and that they operate in such a way as to be able to guarantee the safety of the food they serve.

The supervisory authorities also have a duty to try to improve consumers' knowledge about domestic food hygiene and to provide them with information to help them to make their dietary habits consistent with good health.

Recommendations

In summary, I would like to make the following recommendations aimed at increasing food safety:

1. Food safety strategies should be risk-based, giving priority to measures that have the potential to result in the greatest reductions in foodborne disease.

2. The follow-up and reporting of foodborne disease outbreaks should be improved and intensified in order to provide a better base for risk-based food control priorities and remedial measures.
3. An integrated, multidisciplinary approach to food safety should be adopted, covering the whole of the food production, processing and distribution chain. This implies increased control of animal feed and other aspects of primary production.
4. Food producers, processors and distributors should have in-house control systems based on the HACCP approach.
5. In order decrease the risk of food contamination, a preventive approach should be adopted, tackling problems at source where possible.
6. Meat inspection should be modernized to make it more risk-based.
7. The results of food inspections and other food control activities should be made public.
8. The training of catering personnel and the education of consumers in food hygiene should be improved.
9. Improve contacts at the local, national and international levels between those responsible for food safety and those responsible for environmental protection and pollution control.
10. In order to decrease the risk of future acute food safety problems, food control authorities should assign resources to the detection of emerging risks.

References

1. Risk management and food safety. Report of a Joint FAO/WHO Expert Consultation, Rome, Italy, 27-31 January 1997. FAO Food and Nutrition Paper 65, FAO, Rome, 1997.
2. Zoonoses in Sweden, up to and including 1999. Ed. H. Wahlström. National Veterinary Institute, Uppsala, Sweden, 2001.