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Government Report to the Parliament on Food Safety

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Table of contents

1. Introduction

The safety of foodstuffs produced and consumed in Finland is of a high standard. Safety is created through action of the whole chain. The main requirements regarding food safety are laid down by law. These are supplemented by the sector's own quality and safety systems. So far, however, the objectives of the national food safety work have not been written down to a document that is dealt with broadly on the political level.

Food safety must be ensured in the increasingly international context. Food trade is growing, consumer expectations are changing and outbreaks are more easily spread around the world. Food trade has been facilitated by creating systems that aim to harmonise the national norms concerning food quality and safety. Finland is bound by the EC legislation as well as agreements concluded in the context of the World Trade Organization WTO. The Agreement on the Application of Sanitary and Phytosanitary Measures SPS requires that the norms relating to food safety rest on a scientific basis and impede trade as little as possible. Each country may select an appropriate level of protection, ALOP, according to which the national safety norms and those for imported foodstuffs are established.

In recent years the food legislation has undergone a comprehensive and quite fundamental reform. The amendments highlight the role of risk management of the operators in the food sector, i.e. their own-checks, in ensuring safety and quality. The planning of the control is enhanced and the control is targeted at specific risks. The central authorities in the food chain have been combined into the Finnish Food Safety Authority Evira, which got started on 1 May 2006.

According to a Government Resolution on the development of food control of 30 October 2003 (point 7), a report on food safety, assessing the state and development of food safety in Finland from the perspective of the whole food chain, is to be submitted to the Parliament once during each electoral period.

The purpose of the food safety report is to describe the state of food safety in Finland, present the main indicators for this and identify the measures through which the standard of food safety can be improved or at least maintained in Finland. The report also lays the foundation for setting the food safety targets regarding the main hazards, which are then given as the ALOP values referred to in the SPS Agreement.

Meeting the objectives presented in the report calls for action all through the food chain. The State measures are undertaken within the budget framework for the State economy.

The nutritional quality of foodstuffs is one of the most important factors in view of the consumers' health. However, this report does not deal with nutritional quality, because this aspect is addressed in the Report on Social Affairs and Health submitted to the Parliament every four years as supplementary material to the Government Annual Report. In recent years the Government has also adopted a number of programmes and strategies relating to food safety, such as the National Programme on Hazardous Chemicals and Consumer Policy Programme for 2004–2007.

2. Main factors influencing food safety

2.1. Microbiological safety of foodstuffs

The microbiological hazards relating to food include various pathogens, which may be bacteria, viruses, parasites, fungi or prion proteins. The most common clinical picture of foodborne infections is acute stomach disease, whose symptoms and duration depend on the pathogen. Some infections involve more serious illnesses, such as kidney insufficiency, nervous diseases and general infections. Some of the infected may develop chronic arthritis as a sequela. Risk groups, such as the elderly, children and persons with reduced immunity may also show acute mortality or increased long-term mortality which appears within a year from the acute disease.

The most significant microbiological hazards in foods are zoonoses, i.e. diseases transmissible between animals and humans. This report does not cover zoonoses transmitted from elsewhere in the environment e.g. via mosquitoes. The significance of different zoonoses can be assessed on the basis of their impacts on the public health and national economy. The impacts on national health can be seen in the acute and chronic total morbidity of the population, severity of the disease and mortality. Impacts on the national economy are reflected in the costs of the disease to the health economy and the costs of preventing and controlling the infections in the food chain. The most significant zoonoses in Finland are salmonellosis, campylobacteriosis, yersiniosis, VTEC and listeriosis.

2.1.1. Monitoring the incidence in the population

2.1.1.1. Register of Infectious Diseases

The National Public Health Institute maintains a National Register of Infectious Diseases, where the information on cases of infectious diseases is collected on the basis of reports from physicians and clinical laboratories. Certain zoonotic microbes are included in the culture collection of the Register for further study. It has been estimated that each year about half a million people are affected by foodborne infections in Finland. Only a small share of these are included in the Register of Infectious Diseases, because most of the infected do not see a doctor, samples are taken from only a small share of those who seek medical help, and the pathogen cannot be isolated in all of the samples taken.

Despite the deficient reporting, however, the information included in the Register of Infectious Diseases makes it possible to follow the long-term trends of different diseases and to compare the number of cases of different infections. Figure 1 shows the number of infections caused by the most significant zoonoses in Finland in recent years. The most common infectious zoonotic diseases reported to the Register are salmonella, campylobacter and yersinia infections. Listeria and VTEC infections are quite rare but the clinical picture may be very serious.

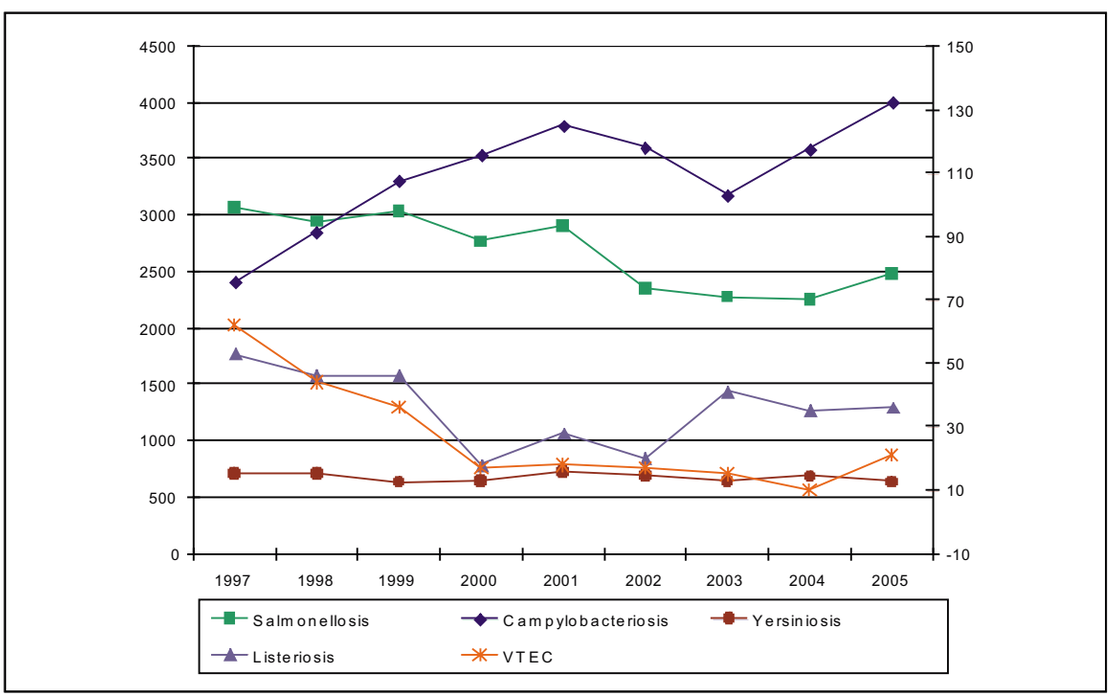

Figure 1. Infections in the Finnish population reported to the National Register of Infectious Diseases in 1997–2005 (Figures include infections of both domestic and foreign origin)

2.1.1.2. Register on foodborne outbreaks

In a foodborne outbreak several persons fall ill after having consumed the same foodstuff or water. The Finnish Food Safety Authority Evira maintains a national register on foodborne outbreaks, where information on foodborne outbreaks is collected on the basis of reports from the municipal food control authorities. Figure 2 presents the numbers of foodborne outbreaks in 1975–2005. The significant increase in the number of outbreaks in 1997 is due to changes in the reporting system.

2.1.2. Vehicles of infections

2.1.2.1. Foodstuffs of animal origin

Finland has long traditions in the prevention of zoonoses transmitted by foodstuffs of animal origin. The prevention follows the principle "from stable to table", which means that the measures are targeted to the whole food chain. In Finland it has been considered the most cost efficient to focus the actions to the primary production stage. The aim is to keep the incidence of zoonotic infections in production animals as low as possible and through this prevent the entry of microbes causing zoonoses to the food chain. The prevention has been highly successful especially as regards salmonella. In many other countries foodborne infections caused by salmonella transmitted via foodstuffs of animal origin are a far more serious problem in terms of both public health and the national economy than in Finland.

2.1.2.2. Plants

As regards microbiological safety, plant products have traditionally not been considered risk products in the same way as foodstuffs of animal origin. This is why the control and monitoring are primarily focused on foodstuffs of animal origin, both in Finland and in the EU. However, the view of plants as safer products should be revised because of the recent growth in the number foodborne outbreaks caused by plant products. Extensive outbreaks have been caused by both Finnish and imported foodstuffs. Examples of outbreaks transmitted by imported foods include the norovirus outbreaks transmitted by berries and lettuce and the salmonella outbreaks caused by iceberg lettuce. It is estimated that the cause for these was the use of contaminated water to irrigate the plants. Outbreaks of domestic origin have been caused by e.g. yersinia in carrots, iceberg lettuce and Chinese cabbage. In these cases the origin of the contamination of the food could not be established. The industrial preparation of vegetables (such as chopping and grating) for mass caterers has increased. The impact of the changes in the preparation processes on foodborne outbreaks should be examined.

2.1.2.3. Drinking water

Each year a few waterborne outbreaks are reported in Finland. In waterborne outbreaks the number of persons exposed to the contaminated water may be considerable, which is why the number of persons that fall ill is usually much higher than in foodborne outbreaks. The most common causes of waterborne outbreaks are norovirus and campylobacter. Almost all waterborne outbreaks in Finland have originated in groundwater abstraction sites where wastewater has been accidentally mixed with the clean water due to flooding or incorrect use. In Finland more attention should be directed at the safety of groundwater plants in accordance with the measures proposed in the final

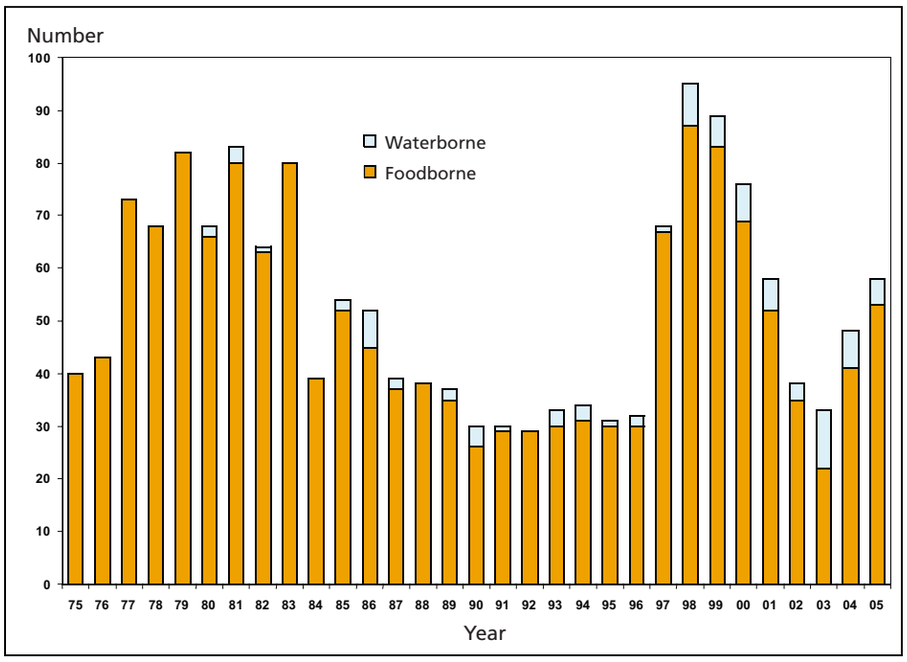

Figure 2. Foodborne and waterborne outbreaks reported in Finland in 1975–2005
Source: National register on foodborne outbreaks, Evira

report of the working group on special water supply situations (Working Group Memorandum MMM2005:7).

2.1.3. Most significant microbes as regards food safety

2.1.3.1. Salmonella

Each year about 2,500 cases of salmonellosis are reported to the Register of Infectious Diseases. About a third of these infections are of domestic origin and the rest are related to travelling. During the 2000s a decreasing trend has been observed in the number or reported cases of domestic origin, but in 2005 the number of cases grew. The real number of salmonella infections is estimated to be about ten times the number of reported cases, which means that the total number of salmonella infections per year would be about 25,000. About 10% of the persons affected develop arthritis as a sequela.

In Finland and the other Nordic countries the salmonella situation of production animals and foodstuffs of animal origin is far better than elsewhere in the world. In recent years harmonised surveys of the prevalence of salmonella in production animals and foodstuffs have been carried out in the EU. Before this there were no fully comparable data on the salmonella situation available. The first of the salmonella surveys completed in the EU concerned the prevalence of salmonella in layer hen flocks. The survey was carried out in October 2004 - September 2005. Based on the results, on average about 20% of the layer hen flocks in the EU are salmonella positive. There is considerable variation in the prevalence of salmonella between the Member States (0-80 %). Of the Finnish flocks 0.4% were found to be salmonella positive.

Finland has applied a National Salmonella Control Programme since 1995. The programme covers poultry, pigs and cattle and meat and eggs obtained from these. In the programme the occurrence of salmonella in production farms, hatcheries, slaughterhouses and meat cutting plants is monitored regularly. The aim is to ensure efficient consumer protection against salmonella infections transmitted via foodstuffs. The target set in the programme is that the prevalence of salmonella in production animals and foodstuffs obtained from these stays below 1%. This target has been met during the time when the programme has been applied. The National Food Safety Authority Evira has carried out risk assessments and cost-benefit estimates relating to the control programme. It has been concluded that the control programme reduces the risk of salmonella infections among the consumers, and that the benefits of the programme are greater than the costs.

Because of the exceptionally good salmonella situation Finland was granted special guarantees with regard to salmonella upon accession to the EU, on the grounds of public health considerations. According to the special guarantees, pork, beef, poultry meat and hen's eggs must be examined for salmonella before they are delivered to Finland. Despite the special guarantees salmonella has occasionally been found in meat consignments purchased on the internal market, especially in poultry meat.
The Salmonella Control Programme calls for strict control of feedingstuffs and zero tolerance of salmonella in feed. Feedingstuffs have an important role in preventing salmonella, because feed control is the most efficient way of preventing salmonella infections in production animals. Imported feedingstuffs involve the highest salmonella risk. Official controls are carried out to examine all imported feed materials of plant and animal origin which may involve a salmonella risk. Official control is supplemented of the own-checks of the industry.

It has been known for a long time that sprouts constitute one major cause of salmonellosis, but in other respects plant products have received very little attention in salmonella prevention. However, most of the increase in salmonella infections of Finnish origin in 2005 was due to an extensive outbreak caused by imported iceberg lettuce. Salmonella has also been found in imported spices, herbs and seeds. Industrially produced sprouts, especially those of mungo bean and alfalfa, have caused more than ten salmonella outbreaks in Finland. No salmonella infections caused by domestic plants have been found, but domestic foodstuffs of plant origin have rarely been examined for salmonella. In the future salmonella prevention should focus more on vegetables.

2.1.3.2. Campylobacter

Campylobacter has become the most common bacterium causing intestinal infections in developed countries. In Finland the number of reported cases of campylobacteriosis has been growing since 1995 and this exceeded the number of salmonella infections in 1998. Less than half of the campylobacter infections are of domestic origin. The incidence of campylobacter is characterised by strong seasonal variation. In Finland the peak season is July-August. Most of the infections found in the summer are of domestic origin, while during the rest of the year most of the infections are related to travelling abroad. The incidence of campylobacter varies considerably from one year to another as well. The number of cases found was the highest in 2001 (3,969) and 2005 (4,002). As sequelae of campylobacter some of those infected may develop arthritis (about 10% of the infected), carditis, inflammation of the eye and pancreatitis as well as the quite rare Guillain-Barré syndrome, which causes muscular weakness and paralysis.

In Finland campylobacter causes about a third of waterborne outbreaks, but it represents only 1% of the foodborne outbreaks. The majority of infections caused by campylobacter are isolated cases or small family outbreaks, and in most cases the source of the infection cannot be established.

Poultry is usually considered the most significant reservoir for campylobacter which causes infections in humans, but in Finland poultry meat is not considered as significant a source of infection as elsewhere in the world. The statutory own-checks in slaughterhouses plants for broilers launched in 2004 calls for regular monitoring of the prevalence of campylobacter in broiler flocks. During the summer months about 10% of the broiler flocks have been positive for campylobacter, while hardly any campylobacter has been found during the rest of the year. In Central and Southern Europe it is quite common that 50–90% of the flocks are positive round the year.

The epidemiology of campylobacter infections is still not very well known. More resources are needed for research in Finland to target the measures to reduce the cases of campylobacter infections in humans in the best possible way.

2.1.3.3. Yersinia

Species of yersinia causing intestinal infections in humans are *Yersinia enterocolitica* and *Yersinia pseudotuberculosis*. Following campylobacter and salmonella, yersinia are the third most common bacteria causing gastroenteritis reported in Finland. Unlike in the case of salmonella, most of the infections are of domestic origin. In some cases the symptoms of yersinia infections are quite mild, but sometimes the symptoms may resemble those of appendicitis and thus lead to unnecessary removal of the appendix. More than 10% of those infected by yersinia develop arthritis as a sequela, which in the most serious cases may even lead to multiple arthritis causing disability.

Pig is considered the main reservoir of *Y. enterocolitica*, and pork and pork products are regarded as the most significant sources of infections. *Y. enterocolitica* bacterium is usually found in the tonsils and intestines of pigs. Tonsils are removed at slaughter as a risk management measure, but this alone is not enough to prevent the spread of the infection. Studies on the prevalence of yersinias in pigs and potential impacts of the preventive measures are under way. There has been very little research on the role of the other possible sources of the infection.

The reservoirs of *Yersinia pseudotuberculosis* bacterium include several wild animals, e.g. rodents, birds and hares. In 1997–2006 there have been several foodborne outbreaks caused by *Y. pseudotuberculosis* bacterium in Finland, where domestic iceberg lettuce, Chinese cabbage or carrot has been established as the source. No functioning risk management methods have yet been found to prevent the contamination of vegetables. Since 2006 regular examinations of water used to irrigate plants that are consumed as such have been required.

2.1.3.4. Listeria monocytogenes

Each year 30–50 listeria infections have been reported in Finland since 1995. In risk groups, i.e. children, the elderly and persons with reduced immunity, listeria may cause general infection and meningitis. As many as 25% of the infections may lead to death. In pregnant women listeria may cause abortion. Listeria infections usually occur as isolated cases. In the past ten years only two outbreaks have been reported in Finland.

Risk foods are products which are intended to be used without heating having a long shelf life and where listeria are capable of multiplying. These include vacuum-packed, cold-smoked or lightly salted (gravad) fish products. Unpasteurised dairy products as well as vegetables and meat products may also contain listeria.

Listeria is a common environmental bacterium that endures highly demanding environmental conditions exceptionally well. In production plants it may easily develop into a permanent bacterial population, which may contaminate the foodstuffs produced. The own-checks of food production establishment must comprise the monitoring of the occurrence of listeria in the products. In recent years the control has been particularly focused on fish establishments. The production hygiene and control of fish products needs to be developed further.

2.1.3.5. VTEC

The group of VTEC bacteria comprises several subtypes of the *Escherichia coli* of which *E.coli* O157 is the most widely known as a causative agent of zoonosis. VTEC bacterium may cause bloody diarrhoea, necrotic enteritis and, especially in children and the elderly, fatal renal failure. Since 1996 10-60 VTEC infections have been found annually, most of these of domestic origin. About half of the cases have been caused by *E.coli* O157 and the rest have been due to other VTEC bacteria.

Most of the infections are sporadic cases, whose cause cannot be established. VTEC bacterium is known to have spread via e.g. meat products, unpasteurised dairy products and vegetables as well as drinking, irrigation and swimming water. One significant source is direct infection from cattle excrement. In Finland there have been several sporadic cases and two outbreaks that can be linked to cattle farms. The outbreak caused by *E.coli* O157 bacterium in 1997 was linked to swimming water and that of 2001 had been caused by foreign kebab meat. One indication of how easily the VTEC bacterium is communicated are the numerous disease clusters within families it has caused.

Cattle are considered the reservoir of VTEC bacteria. In 2004 a statutory obligation entered into force according to which the cattle slaughterhouses must monitor the prevalence of *E.coli* O157 in slaughter animals. About 1% of the Finnish slaughter cattle have been found to carry O157 bacterium. If VTEC bacterium is found in a bovine animal, a risk management plan is drawn up for the cattle holding to prevent the spread of the VTEC infection and to reduce the risk of infection.

So far no monitoring or risk management measures have been introduced in the food chain for the other types of VTEC bacteria. However, the share of the other VTEC bacteria in the infections among the population is growing, especially of the atypical O157, which is why more research would be needed to establish the epidemiology of the bacterium and sources of infections and to find new methods for their prevention.

2.1.3.6. Other bacteria causing foodborne outbreaks

A number of other bacteria that are not zoonotic by nature may cause foodborne diseases. The most serious one is botulism, which is caused by a toxin produced by *Clostridium botulinum* bacterium. Botulism is quite rare but its symptoms are very serious indeed. The most recent cases date from 1999 and 2006. Particular risk foods include homemade canned foods and hot smoked fish products. The main cause for the poisoning is usually insufficient heating during the preparation, too long storage period or too high storage temperature.

Bacteria causing more common and less serious foodborne diseases include *Clostridium perfringens*, *Bacillus cereus* and *Staphylococcus aureus*. These bacteria produce toxins either in the food or in the intestines. Often the cause of the poisoning is inappropriate treatment or handling of the food, such as insufficient heating or cooling and incorrect storage temperature.

2.1.3.7. Norovirus

Noroviruses are the most common cause of acute gastroenteritis in adults. Typical symptoms of norovirus infection include sudden vomiting, diarrhoea and nausea. The virus is easily communicated from one person to another, but also via foodstuffs, drinking water and contact via surfaces. The knowledge on the role of noroviruses as pathogens in humans and their connections to foodborne outbreaks has increased considerably in recent years as new diagnostics methods have been introduced (such as detecting the nucleic acid of the virus by PCR technique). The clinical picture of norovirus infection is usually quite mild, and it does not involve the risk of similar sequelae as bacterial infections do. However, the costs of norovirus infections may be considerably due to e.g. absence from work due to illness.

Norovirus is the most common cause of foodborne and waterborne outbreaks in Finland. Most of the norovirus outbreaks spread via foodstuffs have been transferred from the person preparing the food who was carrier of the infection to the food and through this to the person who eats the food, or directly from one person to another during eating. The established sources of foodborne outbreaks include imported berries, which may have been irrigated with contaminated water waste or waste water sludge. Oysters, mussels and various kinds of fresh products that are not heated before use, such as salads and sandwiches, have also caused outbreaks. Because there are not yet available suitable analysis methods there is not yet enough information available on the occurrence of viruses in different foods and drinking water.

Norovirus infections can be prevented by ensuring an appropriate standard of hygiene among the employees in food industry and trade, especially hand hygiene. A person who is ill should not handle unpacked foodstuffs. Persons with diarrhoea should not handle food at all until more than about 24 hours after the symptoms have disappeared. Foodborne virus infections can also be prevented by sufficient heating to kill the viruses of the raw materials susceptible to the risk (e.g. frozen raspberries of foreign origin). Waterborne outbreaks can be prevented through proper management of the water supply plants and appropriate treatment of water. As regards imported foods and raw materials the possible preventive means are limited for the part of foods that are not heated sufficiently during the process. The importer of berries and vegetables may try to establish the reliability of the supplier through various kinds of audits. Domestically attention needs to be directed at the quality of the irrigation water, fertilisers and, production site of berries and vegetables as well as the irrigation systems.

2.1.3.8. Trichinellae

Trichinellae (*Trichinella spiralis* and other species of *Trichinella*) are parasites that belong to nematodes. Infection may be transmitted when eating insufficiently cooked meat which contains larvae of trichinae. In humans trichinella infection may cause no symptoms, or it may cause chronic muscular symptoms and even lead to death. In Finland the most recent trichinella infection in humans dates from 1977. The source was bear meat.

The prevalence of trichinella in Finnish wild animals is much higher than elsewhere in Western Europe: of the foxes and raccoon dogs examined as many as 50% were found to carry the infection. Infections in domestic animals are also reported more frequently than in the so-called old EU Member States, except for Spain. Each year trichinella infection is found in a few pig holdings and pigs.

In Finland considerable resources have been allocated to the control of trichinella. In connection with meat inspection a laboratory examination is carried on all known host animals of trichinella, such as pigs, wild boars and carnivorous game animals. According to the new EU Regulation on the control of trichinella, no trichinella inspection needs to be carried out in the meat inspection of pigs if they come from a farm which is classified as trichinella-free or from a low-risk area. In Finland trichinella infection in animals is so common that we cannot consider giving up trichinella inspections without a thorough scientific risk assessment.

2.1.3.9. BSE

A variant of the Creutzfeld-Jacob's disease has been found in humans (vCJD), which is assumed to derive from cattle carrying

the BSE disease. The cases of vCJD disease have probably been caused by the entry of the prion protein causing BSE in cattle to food. The vCJD disease has never been found in the Finnish population, and the number of cases found in the whole world is about 160. The BSE scandal which started in Great Britain and shook the whole Europe led to massive preventive measures in Finland as well. As required by the Community legislation, for example, all bovines that are over 30 months old that are intended to be used as food are examined for BSE. So-called specific risk material, i.e. tissue that might contain the prion causing the disease, must be removed from the carcasses of bovines, sheep and goats. The use of meat-and-bone meal in the feedingstuffs of any production animals is banned to minimize the BSE risk. In Finland one case of BSE was found in 2001. The source of the infection could not be established.

The costs of preventing BSE are higher than those of any other zoonosis. Some of the risk management measures applied in the Community, such as the testing of all healthy bovines that are over 30 months old for BSE, do not reduce the risk to the consumers in any significant way. This is why it has been decided that the risk management measures will gradually be cut down.

2.1.3.10. Antimicrobial resistance

Antimicrobial resistance is one of the most serious problems in modern medicine and veterinary medicine. In recent years the resistance has been growing and it has become increasingly diverse, which has led to an increase in the morbidity and mortality of humans and in the healthcare costs. Increased resistance in bacteria causing zoonoses, such as salmonella and campylobacter, is a potential threat to public health. Resistance can be prevented only through controlled use of antibiotics and measures promoting the health of production animals.

A regular resistance monitoring programme, FINRES-Vet, was launched in Finland in 2001. In addition to the resistance of bacteria isolated from animals and foodstuffs of animal origin the programme covers the monitoring of the consumption of antimicrobials and feed additives. Continuous follow-up of the resistance situation in bacteria isolated from animals and food derived from these is important because it ensures the rapid detection of increase in the resistance and appearance of resistant strains, and the necessary measures, such as changes in the recommendations for use of antimicrobials, can be taken immediately.

Because of the good animal disease situation in Finland, the use of antimicrobials in the medication of animals is quite low and the quantities used have been stable. In Finland the annual use of antimicrobials is about 14,000 kg of active substance. The recommendations for the use of antimicrobials in veterinary medication have contributed to their use in a controlled way. In international comparison the situation in terms of the resistance of bacteria is still quite good in Finland. However, the resistance situation of certain bacteria causing diseases in animals has deteriorated, which means that more information and training on resistance, prudent use of medicines and combating animal diseases needs to be provided to veterinarians and owners of animals. The use of medicines must be improved in a prudent way. Sufficient resources must be allocated to the training, resistance monitoring and examination of the problems involved. Cooperation and communication with the different parties working on resistance monitoring of bacteria in humans is of primary importance.

2.2 Chemical and physical safety of foodstuffs

Substances that may be a hazard to human health in food include natural toxins, such as mycotoxins, residues in the raw material, i.e. pesticide residues or environmental toxins, such as heavy metals. Packaging materials and other substances and materials that are in contact with food may also be a source of contamination. Some harmful substances, such as acrylamide, are created during the preparation of food. Certain substances, such as allergens, may cause acute and strong symptoms, but only in certain people. Mycotoxins usually cause acute symptoms, while environmental toxins like dioxin accumulate in the body and may cause serious problems at population level in the long term. Despite the considerable potential risks relating to the composition of foodstuffs, only few of them constitute an immediate risk to consumer safety as regards the population as a whole. In Finland no comprehensive food consumption data have been collected on the most sensitive consumer groups like children and pregnant women, whose safety needs to be ensured through special communication and recommendations.

Ensuring the safety of children's foods is a high priority in foods control both in Finland and in the EU. In the legislation the limits for contaminants intended for children are much stricter than in other foodstuffs in line with the precautionary principle. In children's food even a suspicion that a substance found may be harmful leads to thorough examination, as was seen when semicarbazide was found in the gaskets of metal lids of glass jars containing children's food. In recent years children's foods have been examined for mycotoxins, nitrates as well as the heavy metals lead, cadmium, mercury and arsenic. No quantities exceeding the maximum content have been found. Mercury content was below the limit of detection in all children's foods. Instead, in some cases quantities of pesticides exceeding the maximum allowable limits have been found.

The consumers are also exposed to chemical substances through drinking water. In most cases the potential chemical problems concern arsenic, nitrate, radon, uranium as well as fluoride in drilled wells. About half of the 700,000 of the users of well water obtain their drinking water drilled wells. The problems are often local, for example, the arsenic or nitrate content may be high in a single well. The harmful impacts of radon are based

on radiation. In small doses fluoride has even positive impacts e.g. on teeth.

In Europe there have been some crises affecting the whole food chain where dangerous contaminants, such as transformer oil, have been mixed in animal feed. In Finland such situations are extremely unlikely because of the efficient control all through the food chain and responsible action of the operators.

2.2.1 Harmful substances created in food preparation

The significance of harmful substances created in the preparation of food, such as acrylamide, heterocyclic amines and polycyclic aromatic hydrocarbons (PAH) in terms of human health is still unclear. Some of the directly food-related cancer risks may involve these substances, but the magnitude of the risk cannot be established as yet.

The intake of PAH compounds depends mainly on meat and fish products smoked using the traditional methods. In Finland smoked foods are consumed in relatively high quantities and the intake of the PAH compound benzo(a)pyren which is suspected to be carcinogenic, is higher than in the other EU Member States on which data is available. The European Commission has set maximum limits for benzo(a)pyren and issued recommendations to examine PAH compounds and their sources in different foodstuffs.

Acrylamide is produced through a chemical reaction in the heating process in foodstuffs containing potato or cereal. There is not enough information on the consumption of such foods especially among the young. In the food industry methods are being developed to minimise the creation of acrylamides.

2.2.2 Heavy metals

As regards food safety risks the best known heavy metals are lead, cadmium and mercury. In Finland efficient measures have been taken to restrict the use of lead.

Cadmium is transported from soil to plants, and its intake must continue to be carefully monitored. The most significant risks are the cadmium in fertilisers, with phosphorus fertilisers as the main source, fallout from the atmosphere, by-product lime, sludge and animal manure. Finland has been granted a derogation to prohibit the marketing and use of fertilisers where the cadmium content exceeds 50 mg/kg of phosphorus. The cadmium content of phosphorus fertilisers produced in Finland is very low, and the use of sewage sludge in arable farming has also been restricted very strictly. The persons exposed to cadmium are mainly those who consume offal of game animals, such as elk's liver and kidneys. Liver and kidney of horse and over one-year-old elk cannot be sold on the Finnish food market.

In terms of food safety the most significant heavy metal is methyl mercury in predatory fish. Of the domestic fish pike is the most important source of mercury because of its large size and popularity among leisure fishers. It is recommended that pike be consumed no more than once or twice a month, and pregnant women should not eat pike at all. Eating tuna fish in large quantities may also involve a risk. In addition to heavy metals, radioactive caesium 137 may also accumulate in predatory fish.

Inorganic tin is used to brighten the colour of preserved pineapple. The maximum allowable content of tin has been set down by a Community Regulation. The tin content of canned foods must be monitored carefully, because towards the end of the shelf life the content may exceed the allowable limit and the product may cause acute stomach disorders. Organostannic compounds are used in several materials that come into contact with foodstuffs, and they have also been used in the bottom paint of ships to prevent the surface growth of organic material. Organic tin is toxic to the aquatic living organisms and it disturbs immune response in laboratory animals. The most important foodstuff to be monitored is fish. Research institutes, coordinated by the Finnish Food Safety Authority Evira, have been studying the amounts of organic tin in waters close to the ports for issuing recommendations for fish catches, if considered necessary.

2.2.3 Persistent organic pollutants (POP)

Persistent organic pollutants include pesticides, PCB compounds, dioxins and furan (PCDD/F compounds) as well as brominated compounds. POP compounds accumulate in the body. The widely discussed POP compounds dioxin and dioxin-like PCB compounds are produced in industrial processes and e.g. in small-scale burning of wood. Possible health impacts of dioxins and dioxin-like PCBs are developmental disorders and certain types of cancer. Dioxin and PCB content has been monitored e.g. in breast milk. The content of both dioxin and PCBs has decreased strongly since the early 1970s. The EU aims to further reduce the exposure to dioxin and PCBs.

The dioxin and PBC content in Finnish foodstuffs is among the lowest in the EU. Of the intake among the Finns more than 80% comes from fatty fish caught from the Baltic Sea, such as big Baltic herring and salmon. In Europe the main sources of dioxin and PCBs are meat, milk and eggs. Finland has a derogation to market fish that exceeds the maximum dioxin content within its territory. Finland has mainly justified this derogation by public health considerations, because fish is an excellent and cheap source of omega-3 fatty acids and vitamin D. The beneficial fatty acids of fish have been proven to reduce the risk of cardiovascular diseases, and vitamin D has an important role e.g. in the prevention of osteoporosis in the ageing population. The Finnish Food Safety Authority Evira has issued special recommendations for pregnant women, the young and fishers'

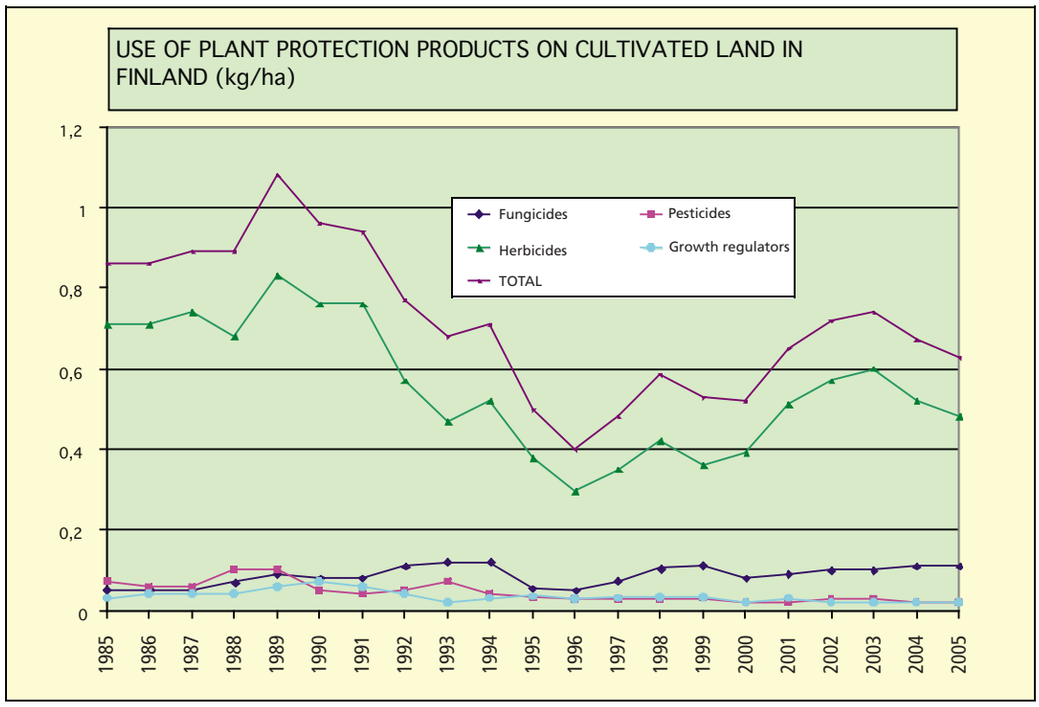

Figure 3. Use of plant protection products on cultivated land in Finland (kg/ha)

families where the contaminants in fish have been taken into account. The entry of dioxin to the food chain has also been reduced by a decision to stop using fish from the Baltic Sea as feed for farmed fish.

Polybrominated compounds used for fire prevention and fluoridated hydrocarbons used in e.g. textiles, leather products and electronic appliances may be transported to waters. In higher contents than at present they could disturb vital activities that depend of hormones, which makes it very important to monitor their content in fish.

2.2.4 Plant protection products

Plant protection products include the substances used to protect the plants and prevent e.g. insects and pests. Of all plant protection products used 70-80% are herbicides. In Finland the use of plant protection products is about 0.7 kg/ha/year, while in e.g. Belgium this is 3 kg/ha/year. The low use in Finland is due to the cold winter, use of resistant varieties, crop rotation, and selection of cultivation techniques according to the site. On the other hand, in the northern conditions the substances decompose more slowly than in e.g. Central Europe and thus they may accumulate in the soil when used repeatedly.

Thanks to the low use of plant protection products, the residue levels in foodstuffs produced in Finland are also very low. In Finland about 91% of the intake comes from imported foods, especially apples, pears, rye, grapes and oranges. The residues in imported fruits result from the substances used to treat the fruit after harvesting and use of growth regulators (e.g. diphenylamine, thiabendazol, captan, chlormequat, carbendazin, iprodion and imazalil). Most of the intake of domestic origin comes from cereals (growth regulator chlormequatchloride 62%) and strawberries (tolylfluanid 16% and iprodion 4%, fungicides). During the 2000s the role of meat, fats, fish and egg in the pesticide intake has not been examined at all. However, these products still lead to the intake of organochloride compounds that accumulate in fat. At the most the intake of a single substance has been 1/100 of the acceptable intake value. Potentially plant protection products are a serious risk, which because of the strict regulation and control mainly concerns occupational health rather than consumers.

The most important insecticides used in Finland are organophosphates, carbamates and pyretroids. Because of the earlier use of organochloride compounds such as DDT some of these are still present in e.g. the sediment and living organisms of the Baltic Sea. Unlike DDT, organophosphates and carbamates decompose rapidly in the nature and body and thus they constitute no significant food risk, but the risks mainly concern occupational health. Because of the rapid decomposing in the body pyretroids are not a food safety risk to the consumers, either.
The most common herbicides are glyphosate, phenox acetic acid derivatives, and sulphonureas, which have quite recently entered the market and are used in small quantities (e.g. MCPA and dichlorprop). Herbicides are spread in early summer and the waiting period until the harvesting of cereal is long. When used in accordance with the regulations, the herbicide residues in foodstuffs are quite insignificant. In the national inventory of

groundwater aquifers certain cases have been reported where glyphosate or other most commonly used herbicides have been found in groundwater, but in Finland these do not end up to the consumer in any significant quantities. Glyphosate is hardly at all toxic to mammals, because its effect is based on preventing an enzyme that occurs in plants.

The most significant products as regards possible fungicide residues are imported fruits and domestic apples and strawberries, which may be treated close to the harvesting season. Imported fruits may also be treated for transport. Because of the possible harmful impacts of these substances the exposure should be kept as low as possible by means of residue control.

2.2.5 Natural harmful substances

2.2.5.1 Nitrate

Nitrate may be present in well water and certain vegetables. Differences in the intake between individuals are great. The total nitrate intake of adults and children is about 35% of the accepted daily dose. In the EU maximum nitrate content has been set for spinach, fresh lettuce, iceberg lettuce and children's foods. It is also recommended that spinach be avoided in the diet of small children.

2.2.5.2 Allergens

Reactions caused by allergens are highly individual by nature in terms of both the amount of allergen needed to cause the reaction and the severity of the reaction. Allergens are the only group within the chemical and physical safety of foodstuffs that cause significant clinical symptoms and even life-threatening situations. Symptoms of food allergies include skin symptoms (e.g. atopic rash), intestinal symptoms (e.g. vomiting and diarrhoea), respiratory tract symptoms (e.g. rhinitis, dyspnoea, asthma) and cardiovascular symptoms (e.g. fall of blood pressure). The most serious symptom is the acute general reaction in the body, anaphylaxis, which may be life-threatening and requires immediate treatment. In 2000–2005 349 cases of anaphylaxis were reported to the register of anaphylaxis maintained by the Helsinki University Central Hospital. Of these 46% were allergic reactions to foodstuffs, most commonly caused by nuts or seeds (23%). The most common food allergens for children are milk, eggs and wheat, while for adults they are often products linked to allergy to pollen (e.g. celery), fruits (e.g. kiwi, apple) and nuts (e.g. peanuts, tree nuts). The only treatment for food allergies is to avoid the substances concerned in the diet. To make it possible for consumers to efficiently avoid the allergens that may be dangerous to their health, the most significant allergens must be indicated in the labelling. Failure to indicate the presence of an allergen or contamination by an allergen during the food production or preparation process may be a serious problem for people who get severe symptoms from it. Each year a few cases of mistakes relating to allergens are reported to the Finnish Food Safety Authority, which leads to withdrawal of the product from the market. In most cases the allergen (wheat, milk, nuts) has not been indicated in the label. The control of allergens is a field of food safety control which calls for more and more attention and resources.

2.2.5.3 Natural toxins

Poisonings caused by toxins that occur naturally in plants (e.g. solanine in potato, toxins in leguminous plants) are rare in Finland, because the consumers are well aware of how different foods need to be prepared. However, some poisonings caused by mushrooms are registered annually, and in the early 2000s certain imported beans that were not properly treated caused toxic symptoms.

2.2.6 Metabolites produced by mould and bacteria

Mycotoxins are toxic metabolites produced by moulds created in various kinds of nuts, grapes and raw coffee beans as well as moisture-damaged cereals especially in warm and humid conditions. The problems with aflatoxin and ochratoxin concern mainly imported foods. In problematic years high contents of fusarium toxin (scab, *Fusarium roseum*) have also been found in domestic cereal. Because of the high quality standards for food industry and efficient control, in these days poisonings caused by mycotoxins are extremely rare.

Biogenic amines that cause food poisoning symptoms include histamine, tyramine and tryptamine. High contents of these are usually linked to an increase in microbes that produce amines in food raw materials, manufacturing processes or storage. Special risk foods are soured foods that are stored for a long time, foods of impaired quality and spoiled products.

2.2.7 Residues of veterinary medicinal products

Medicinal residues are examined in live animals as well as meat, fish, milk, eggs and honey. Samples are tested for substances belonging to different groups set down in the EC Directive. Official sampling is targeted to products where residues are the most likely to occur, and the analyses focus on substances that are the most likely to be found. Each year about 10,000 analyses for medicinal residues are carried out, and increased residue values are found in isolated cases. Based on the examinations, however, the residue content has not been a risk to consumer safety. Because of the strict regulation of medication and residue control medicinal residues are not a consumer health risk in Finland.

2.2.8 Chemicals added intentionally to food

There are about 350 food additives approved with an E code for use in food industry. The safety of and need for additives is always assessed before their use is approved. On the popula-

tion level the intake of food additives is low, but the intake of heavy users of a certain product may be almost double the accepted daily intake. The most problematic additives especially for children are benzoic acid and nitrites used as preservatives. The intake of benzoic acid can be reduced by substituting it at least partly with safer preservatives especially in domestic juices intended for children.

In terms of risk assessment the nitrate and nitrite used as additives are problematic. On the one hand, they contribute to the prevention of the strong botulin toxin in meat products; on the other hand nitrite may produce nitrosoamine carcinogen in the gastrointestinal tract. The intake is the most problematic for 1–6 year old children who eat a lot of sausages relative to their weight. No official recommendations for eating sausages have been issued, even if the intake of especially 2–3 year old children may exceed the accepted daily intake. The accepted daily intake of nitrite is calculated so that only a hundred fold excess of this may constitute adverse health effects. Assessing the role of nitrate and nitrite is also complicated by the fact that some nitrate converts into nitrite. Because of the wide variety of sources of nitrates and nitrites and complexity of the toxicological mechanisms involved their intake calls for constant monitoring.

Thousands of different kinds of spices and aromatic substances are used in food. Most of these have not been subjected to scientific assessment, but their safe use is founded on small doses and centuries of experience. The European Food Safety Authority EFSA, among others, examines and assesses aromatic substances and, where necessary, the use of the known harmful chemical compounds has been restricted.

During the processing foodstuffs may be supplemented by vitamins and minerals, both for public health reasons and for the needs of special groups. In addition to these there is a growing trend of commercial supplementing, aimed to highlight the health image of the products. Often nutrients are added to foodstuffs even if no deficiency has been observed. Supplementing the foods is not always targeted to those who need it the most. Instead, in certain consumer groups the risk of excessive intake of certain nutritive substances increases, especially when the margin between the recommended and maximum safe intake is very narrow. This applies to e.g. vitamin A and D, niacin, pholic acid and all minerals.

2.2.9 Food supplements

Food supplements are prepacked preparations sold as pellets or pills that are marketed as foodstuffs. Food supplements are consumed in small doses, which is why they have no significance in term of energy intake. So far no maximum allowable quantities for the intake of vitamins and minerals contained in food supplements have been laid down by law, but the work on this is getting started. When setting the limits, the intake from all sources needs to be taken into account, including the supplements. The safety of food supplements also depends on the other substances they contain. Especially plant extracts are physiologically active and they often have pharmacological properties. Occasionally, for example, liver damages caused by substances contained in food supplements or harmful interactions with medicines are reported. So far there is no EC legislation on the other substances contained in food supplements. Their role in between foodstuffs and medicines is a challenge to the authorities.

2.2.10 Genetically modified foods

Within the EU a licence must be applied for from the European Commission for using GM crops in the cultivation. Similar licence procedure applies to foodstuffs and feedingstuffs. The purpose of the licence is to make sure that the GM feeds and foods are safe for the users and environment. The safety assessment is carried out by the European Food Safety Authority EFSA. The processing aimed at product approval takes place on the Community level through the regulatory committee procedure in accordance with EC Regulation No 1829/2003 (or sometimes Directive No 2001/18/EC for the part of live GM products). The distribution of tasks among the Finnish authorities in establishing the national position on approval has been laid down in the Gene Technology Act and Government Decree 910/2004. For the part of foodstuffs the competent authority is the Ministry of Trade and Industry, with an independent Novel Foods Board as an advisory body, and for the part of feedingstuffs the Ministry of Agriculture and Forestry, as well as Gene Technology Board for the part of environmental risks. So far quite few applications for using GM crops in cultivation have been submitted - of the 35 applications submitted cultivation is included in only seven applications concerning maize and one concerning soya bean. The processing of the cultivation applications is only getting started, except for one application concerning starch potato (amylopectine potato) and two maize varieties. Moth resistant maize has been cultivated for several years, mainly in Spain, and most of this is used as feed.

Most of the GM foods approved in the EU are maize, soya and oilseed rape. The ingredients used in foods are usually oil, groats, meal or starch, in feedingstuffs also groats or pellet. In addition to these, cotton oil as well as yeast and bacterial biomass as additives have been approved. GM foods are widely used outside the EU, and they have not been observed to differ from foods bred and produced by the traditional methods in any negative way. Shortcomings have occasionally been found in the labelling of certain imported foods, mainly sport supplements containing soya or maize. The Community labelling requirements for GM foods and feeds have been specified in great detail in EC Regulations No 1829/2003 (GM foods and feeds) and No 1830/2003 (traceability and labelling of GMOs, foods and feeds).

In the EU the coexistence of genetically modified and conventional and organic agricultural production has so far been left to the competence of the Member States, in compliance with the principles written in Commission Recommendation (2003/556/EC). The statutes do not deal with environmental and safety issues, which are being addressed in connection with the product approval, but they aim to solve the economic questions that may arise in the application of different types of production side-by-side. Farmers should be allowed to produce the type of crops they wish, and none of the types of production should be impossible to apply in practice. Different types of products should be produced to ensure consumer choice. In Finland two working group reports have been completed on the matter (MMM 2005:9 and MMM 2005:16), and a proposal for a framework act on coexistence should be completed in 2007.

2.2.11 Novel foods

New technologies and globalisation have introduced new raw materials, products and production methods that have not been used earlier within the EU, at least in significant quantities. The market access of these, so-called novel foods is subject to licence, which means that products regarded as novel foods cannot enter the Community market before a risk assessment approved by the Community has been carried out.

New products marketed as functional foods approved in the EU include margarines containing plant sterols, rye bread, milk, cheese and yoghurt-type products, products based on new raw material sources, such as noni juices as well as products manufactured by means of new methods like high-pressure method in fruit-derived products.

More than a hundred novel foods have been approved on the Community market and the number of products will be growing. In the future there is a need to consider the special questions regarding the control of these products and examine, for example, the intake of the different ingredients of novel foods whose excessive consumption may involve negative health effects.

2.2.12. Radiological emergencies and food safety

Food safety may be endangered in a radiological emergency caused by the spread of radioactive substances to the environment as a result of a serious accident on a nuclear power plant, explosion of a nuclear weapon, or terrorist attack. Exposure to radiation increases the risk of cancer. The probability of a serious accident causing radiation risk is extremely low, but it cannot be completely excluded. The threat caused by nuclear weapons is also still real. The extent of the area at risk depends on several factors, including the amount of the substances released to the environment and weather conditions. The area where foodstuffs may be contaminated is much larger than the area which calls for rapid measures to protect the population. In a fallout situation the EU sets maximum limits to the radioactivity content of foodstuffs on the market as considered necessary.

The European Commission has recommended that the cesium-137 content of natural products placed on the market should not exceed 600 Bq/kg, and the population should be informed of the local situation. In certain locations in Finland the content in freshwater fish and mushrooms exceeds the recommended value, but the exposure to radiation they cause is usually very small.

2.2.13 Substances detached from vessels and packages

Because of the suspected risk of cancer and possible hormonal impacts there has been some discussion on the phthalates used as softeners in plastic products. The EU restricts their use if considered necessary. The European Food Safety Authority EFSA estimates that the risk caused by semicarbazide in children's foods is very small. Copper is quite toxic, but it is also a trace element which is indispensable for the body. In excessive amounts it may cause irritation of the gastrointestinal tract. Nickel and chromium are not known to cause health problems when consumed orally. Lead may dissolve from ceramic kitchen ware. The Community legislation has set specific migration limits for e.g. lead and cadmium in ceramic kitchen ware and plastics.

2.3 Summary of microbiological and chemical food safety

In most cases children, the elderly and other people with weakened resistance due to e.g. illnesses are the most seriously affected by illnesses caused by the microbiological, chemical or physical properties of food. Often the public interest is focused on the chemical risks. Information on the normal composition of food is indispensable for people suffering from allergies to prevent allergic symptoms, which may be very serious. Microorganisms originating from food or water are a serious health problem especially in the developing countries but in the developed world as well pathogens in food continue to cause clinical illnesses. It has been estimated that each year every third person in industrialised countries catches a disease that is caused by a microbe present in food. As a whole we still do not know very much about the long-term impacts of the infections.

Risk assessment of microbiological hazards calls for continuous methodological research, also in Finland, to ensure that the necessary precautionary measures can be taken efficiently. Chemical substances contained in food which may impair food safety often cause very low morbidity which can be seen only in e.g. the statistics. Often it is impossible to connect a certain chemical hazard to a specific foodstuff. The hazards may relate e.g. to

the risk of cancer or development disorders. The special risk groups in view of the chemical food hazards are children and pregnant women, whose food consumption should be monitored very carefully.

In the microbiological safety of foodstuffs we should focus especially on developing the monitoring and control systems for campylobacter, yersinia, listeria and EHEC bacteria. Of the chemical food hazards special attention should be directed to mercury, nitrite and PAH compounds, as well as the predisposition of certain heavy users to vitamins and minerals, and benzoic acid. In many foods the nutritional benefits exceed the negative impacts caused by the hazards.

Table 1. Assessment of the significance of chemical and physical factors on food safety in Finland.

Significance class	Factor influencing food safety	Factor to be monitored
I	allergens	informing consumers of product composition
	certain additives	nitrite in meat products, benzoic acid in certain juices
	certain heavy metals	cadmium intake, mercury intake in pregnant women
	PAH compounds	measures by industry and consumers, information
II	inorganic tin	canned pineapple
	dioxin and PCB compounds	content in breast milk, fatty fish in the Baltic Sea
	mycotoxins	raw material of food industry, efficient import control
	biogenic amines	food preservation and storage conditions
	vitamins, minerals	informing large-scale consumers
	nitrate	contents in vegetables
III	radioactive substances	freshwater fish, berries and mushrooms in certain locations
	pesticide residues	product approval, import control, controlled use
	vet. medicinal product residues	sales licences, prudent use of veterinary medicinal products

Table 2. Assessment of main microbiological hazards in food and drinking water in Finland.

Hazard	Severity of the disease	Probability of illness	Significance to consumers (severity and probability combined)	Rate of current preventive action	Main development measures
Campylobacter	moderate	high	high	low	More thorough examination of infection sources to direct preventive measures Hygiene in water plants
Salmonella	moderate	moderate	moderate	high	More thorough examination of infection sources Control of internal market trade and import
Yersinia enterocolitica	moderate	moderate	moderate	low	More thorough examination of infection sources Hygiene in slaughter of pigs
Yersinia pseudotuberculosis	moderate	moderate	moderate	low	More thorough examination of infection sources Hygiene in handling vegetables Traceability of vegetables
Listeria monocytogenes	high	low	moderate	low	More thorough examination of infection sources Hygiene and own checks on fish plants Own-checks of plants manufacturing packed vegetables and unpasteurised cheeses Informing risk groups
VTEC	high	low	moderate	low	More thorough examination of infection sources, Developing analytics for different types of VTEC bacteria
Norovirus	low	high	moderate	very low	Hygiene in mass caterers Hygiene in water plants Safe irrigation water
Trichinellae	moderate	very low	low	high	Meat inspection of wild game
BSE	high	very low	low	high	EC legislation
Clostridium botulinum	high	very low	low	moderate	Hygiene in preparation of vacuum-packed foods, storage temperatures and shelf life
Clostridium perfringens	low	low	low	low	Hygiene in food preparation and handling by mass caterers
Bacillus cereus	low	low	low	low	Hygiene in food preparation and handling by mass caterers
Staphylococcus aureus	low	low	low	low	Hygiene in food preparation and handling by mass caterers

The table is based on expert assessments by the national standing working group for zoonoses and national interagency co-ordinating group for food and water borne infections. The table does not include infections of foreign origin and microbes which have not been found in Finland. The estimates are proportioned to each other according to the situation in Finland, which means that they cannot be compared to the international situation.

3. Food safety measures in the whole food chain

3.1. Primary production

In Finland solid quality systems to support food safety have been developed for primary production. The central element in these systems is close cooperation between private actors and authorities. Several products have been launched under the National Quality Strategy for the Food Sector. Voluntary actions, i.e. the so-called national level which goes beyond the statutory level, have been agreed on in different food production sectors. The companies may also set their quality and safety standard at a level that is more demanding than the national level.

On farms quality work is being done by developing quality systems and quality management of farm enterprises. Quality management is part of the implementation of the National Quality Strategy on farms. By the end of 2005 about 21,000 farm entrepreneurs had participated in quality training of 6 to 12 days.

One significant factor in the primary production of foodstuffs of animal origin is the Association for Animal Disease Prevention (ETT) set up jointly by the producers and food industry. The tasks of the Association comprise promoting the health of production animals and ensuring the safety of foodstuffs of animal origin. This task is carried out by focusing on concrete, everyday measures on farms: preventing infectious diseases and illnesses, monitoring the health situation and voluntary action in exceptional situations. The Association has coordinated and developed animal healthcare work together with Finnish Food Safety Authority Evira and other authorities since 2001. The aim of the work on animal healthcare is to launch commonly agreed and voluntary healthcare measures on farms for the benefit of the whole food chain. Healthcare work contributes to the efforts to consolidate the strengths of Finnish food production, i.e. good health situation and low use of medicines, as well as to develop the documentation of these. This also improves the monitoring of diseases and detection and management of exceptional situations.

In the context of the National Quality Strategy instructions for good production practice have been drawn up for different production sectors. Today, for example, more than 90% of Finnish milk and broiler meat is produced in accordance with these instructions. A health classification for pig farms was introduced in 2004 and in 2006 80% of Finnish pigmeat was produced on farms that are on the national level set in the animal healthcare system.

As regards the safety of primary production one key issue is the control and reduction of environmental risks in the soil and waters. The measures are usually excluded from the actual food control. Risk factors in food production should be among the priority areas in the national and international environmental policy.

3.2. Food industry

The implementation of own-checks in the food industry is an important measure for managing food safety risks. Own-checks in food industry became mandatory in 1995, but the companies had carried out quality work and own checks even before this. The most advanced own-checks are carried out in the product groups where the risks are highest. The manufacturers of foodstuffs of animal origin must submit their own-check plans to the control authority for approval. The Ministry of Agriculture and Forestry has issued by decree highly detailed instructions for the content of the own-check plan and its implementation, based on the HACCP principle (Hazard Analysis Critical Control Points). Companies manufacturing products of plant origin and composite products must be aware of the critical points in food manufacture as regards food safety, and they must be capable of presenting a plan on their control and its implementation method to the authorities upon request. The Finnish Food and Drink Industries' Federation has estimated that the costs of own-checks vary between 0.5 and 1.5% of the turnover, depending on the sector. In for example, the dairy sector about 140 AWU are being used for the implementation of own-checks to ensure the safety of the products. However, so far not all Finnish companies have extensive enough own-check plans, and the quality of the plans needs to be improved as well. On the other hand, some companies have acquired an international certificate for their quality systems.

The new Hygiene Regulations of the EU set down even stricter requirements for the own-checks of food industry. In the future the own-check plans of companies operating in all food production sectors must be founded on the HACCP principle. The Finnish Food and Drink Industries' Federation, together with the Finnish Food Safety Authority Evira, has prepared a guide for drawing up an own-check plan based on the HACCP for the most common processes of the six largest sectors of food industry. The guides help especially small companies, whose own expertise would not be sufficient to draw up an own-check plan based on the HACCP, to implement their own-checks in a way that further improves our food safety. In practice the implementation of the new requirements for own-checks will lead to significant further improvement in food safety.

3.3. Restaurants and mass caterers

The number of meals consumed outside the home has been growing rapidly. In 2005 the cafeterias, restaurants, canteens and institutional kitchens in Finland manufactured altogether 769 million meals. Restaurants and mass caterers, like other food premises, have been under a statutory obligation to carry out own-checks since 1995. No data have been compiled on the costs of own-checks and quality systems of restaurants. In general it can be said that the standard of own-checks varies greatly. Especially actors operating as chains have introduced quality systems that go beyond the statutory level, while small operators have difficulties in meeting the food hygiene requirements laid down by the law and official norms.

The functioning of the own-checks varies considerably and the commitment to monitoring the activities and improving the practices is sometimes quite low. On the other hand, many companies also wish to stand out among their competitors through their efficient and goal-oriented quality work.

Of the reported foodborne outbreaks 80 to 90% originate in restaurants and mass caterers. One reason for this high figure is the fact that these outbreaks are easier to examine and trace back to their source than outbreaks caused by foodstuffs distributed widely on the market.

In 2005 the Finnish Hotel and Restaurant Association drew up quality and own-check guides for the restaurant sector and the Federation for Finnish Municipalities drew up the guides for the municipal mass caterers.

3.4. Retail sector

In Finland as well as in the other northern countries the trade in daily consumer products is highly concentrated. The entry of a new foreign competitor to the Finnish market in 2004, competition between the two largest Finnish trading groups for market shares and EU enlargement led to tight price competition on the Finnish market of daily consumer products. The structure of trade has been changing and the share of large supermarkets is growing.

The standard of the own-checks of food trade operators was measured in a joint project of the Finnish Food Marketing Association and National Food Safety Authority in 2002. The project was part of the National Quality Strategy and it aimed to find out the state of own-checks in the retail stores. The quality survey showed that the reception of the goods, storage, placement on the market, pest control, waste management and processing of customer feedback functioned quite well at the stores. Shortcomings were found in the handling, preparation, cooling and packaging of foodstuffs and external operators. Own-checks were perceived as tools and instruments, not an unnecessary burden, and many companies have raised their quality objectives above the statutory level and aim to develop the product quality by means of various quality strategies.

In 2004 the Finnish Food Marketing Association cooperated with the authorities to prepare guides for own-checks, including the best inhouse-control practices and statutory requirements. The application of these guides started in the trading groups during 2005. The aim of the guides was to harmonise the own-checks carried out by the operators and increase the dialogue with the authorities. In 2005 the Finnish Food Marketing Association also started an electronic own-checks databank, which can be utilised by both the different units in the trade sector and the authorities.

3.5. Quality Strategy

A National Quality Strategy for the Food Sector was launched in Finland in 1997. The Strategy is coordinated by the Ministry of Agriculture and Forestry and it involves all operators in the sector. In consumer communication this quality strategy work is called "quality chain". The chain starts on the farm and extends all the way to the consumer's plate. The chain includes the production input industry, producers, food industry, trade and restaurants and catering services, as well as food-related research, education and training, advice and administration. Finally, it is up to the consumers to ensure the preservation of quality through their own actions.

The objective of the National Quality Strategy is to develop the strengths of the domestic food chain, such as competitive advantage founded on consumer confidence and competitiveness through more efficient joint action. The Strategy also aims to reinforce the role of social responsibility in the practices and improve the consumer awareness of the activity, impacts and interactions in the food sector.

The National Quality Strategy produces practices that benefit all parts of the food chain. Work is focused in a systematic way on the quality of both the products and operations. Safety, traceability, information on the origin and controlled production make the Finnish products increasingly attractive on the international market as well. Success of the quality work is measured by consumer satisfaction.

Compliance with the legislation lays the foundation for quality work in the food sector. The Quality Strategy focuses on work that goes beyond the statutory requirements and comprises joint projects between different parts of the chain, commonly agreed practices and agreements and systems and other solutions aimed to improve the efficiency of the operations.

Maintaining good quality and quality improvement call for a wide consensus and cooperation among all parties to the food

chain, both in the management and in continuous development of the National Quality Strategy. In particular, communication is one of the basic prerequisites for success in quality work, which is why the Food Quality Information Network ELATI is being developed. The organisations committed to the quality work have agreed that responsibility, customer satisfaction and profitability are the values that steer the activity of the food chain.

3.6. Scientific risk assessment and research

Chemical and toxicological risk assessment of foodstuffs was started already in the 1970s when it proved necessary to assess the impacts of additives and plant protection products on human health. As set down in the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), a country that restricts imports must show, on the grounds of scientific principles, that protection is needed to preserve consumer, animal and/or plant health and welfare and that the import restriction is not unjust for the importers, i.e. aimed to protect the economic interest of the domestic sector. SPS Agreement refers to risk assessment as the method for estimating the need for import protection and accepts the norms, instructions and recommendations for risk assessment issued by the Codex Alimentarius Commission (Codex), besides the World Organisation for Animal Health (OIE) and International Plant Protection Convention (IPPC).

As regards chemical hazards, the role of the European Food Safety Authority EFSA in risk assessment is constantly on the increase. The growing inputs in scientific research in the EU also increase the risk assessment work of the EFSA. Primarily the EFSA has examined contaminants in foodstuffs that are not of animal origin. The EFSA also examines food additives, but not medicinal product residues. The work of the EFSA also comprises the collection of data and intake calculations for risk assessment. The EFSA takes account of the safety assessments of the CODEX risk assessment bodies, JECFA (the Joint FAO/WHO Expert Committee on Food Additives) and JMPR (Joint Meeting on Pesticide Residues).

The active substances of plant protection products are approved on the Community level. Finland has participated in the risk assessment of active substances. The final assessment is made by the EFSA. Formulations are assessed by the Member States. In Finland the Pesticide Board approves the products to the market, while the Finnish Food Safety Authority Evira coordinates the risk assessment. The National Product Control Agency for Welfare and Health (STTV) and Finnish Environment Institute (SYKE) also take part in this work. No ongoing risk assessment of pesticides is carried out in Finland, but this would be needed as the foundation for the domestic control.

Risk assessment of veterinary medicines is carried out at the European Agency for the Evaluation of Medical Products (EMEA) in London, which also decides on the approval of veterinary medicines to the EU market. The safety of medicines is assessed by the Committee for Medicinal Products for Veterinary Use (CVMP), which issues the allowable intake levels for medicines approved for production animals. The Commission sets the maximum residue levels (MRL) for veterinary medicinal products. The role of the EFSA in the risk assessment of medicinal residues is still open. Very likely the EMEA will be cooperating with the EFSA. The risk assessments on medicinal product residues by CODEX/WHO will support the work of the EFSA in the same way as those on other contaminants.

National risk assessments should be developed to complement the international risk assessments. The analyses and monitoring of contaminants in food and feed serve this purpose in Finland. A national risk assessment should be carried out, for example, on the most significant chemical hazards detected in these, to be used for improving consumer safety and as the foundation of legislative work.

Microbiological risk assessment of foodstuffs started to develop after the conclusion of the SPS Agreement, alongside with the risk assessments of animal and plant diseases that were strongly linked to food production. Towards the end of the 1990s the Ministry of Agriculture and Forestry initiated the development work on risk assessment on these in Finland. One of the first objectives was to use risk assessment to study the justification of import protection imposed for certain foodstuffs (fresh beef, pork and poultry meat, minced meat) because of the risk of salmonella. The calculation of the cost-benefit ratio for salmonella prevention has also been developed. According to quantitative (calculated) estimates the incidence of salmonella in the Finnish food production chains is very low, and the costs of the measures to maintain the situation are relatively low. In the early 2000s risk assessment was extended to the other zoonoses and animal diseases causing severe production losses in Finland.

Maintaining and developing a high food safety standard calls for high-level and sufficient research on foodstuffs, food production and risk assessment thereof, as well as risk assessment that fulfil the scientific criteria. Each year a few risk assessments concerning food safety are carried out at the Finnish Food Safety Authority Evira. In an international evaluation published by the Academy of Finland, the international panel acknowledged specifically the high standard of food safety research in Finland. The panel recommended further increase in the research cooperation between the industry, administration and academic research. The Ministry of Agriculture and Forestry has used uncommitted research funding especially for research and risk assessment relating to food safety that is carried out in cooperation between universities and/or different research institutes.

The industry has also been involved in the projects to an increasing extent. In recent years uncommitted research funding has been used especially for projects concerning the research on foodborne zoonoses and the risks involved. The impacts of plant protection products and waste-based fertiliser products on groundwater and foodstuffs have also been studied.

In addition to the comprehensive framework programmes on the development of research and technologies the European Commission also contributes to the efforts to improve the efficiency of research carried out by means of national funding. Funding for this is allocated from the EU framework programme through the so-called ERA-NET scheme.

3.7. Risk communication

Risk communication is mutual exchange of information and views on risk assessments between the parties responsible for risk, consumers and other stakeholders. The greatest challenge is how to communicate the information based on research that may be quite complicated and involve a great deal of uncertainty to the public.

The predecessors of the Finnish Food Safety Authority Evira launched a risk communication network in Finland in the mid-1990s. Representatives from the whole "from stable to table" chain were invited to participate in the network. The first significant case dealt with in the network was the finding of acrylamide in foodstuffs, where the network decided jointly on the actions to be taken and related communication. This practice has proven successful as well as highly necessary, because it allows all parties to the chain to decide jointly on the content of the messages while ensuring that they all have access to the same information.

The European Food Safety Authority EFSA develops risk communication within the EU. To deal with crises, connections for video negotiations have been created to all Member States. In Finland the contact body is the Finnish Food Safety Authority Evira. The principle of European risk communication cooperation is open, transparent, rapid and reliable action for the benefit of the consumers. The EFSA and Evira are also involved in the European Rapid Alert System for Food and Feed (RASFF), which ensures rapid communication between the authorities of different EU countries in hazard situations concerning food or feedingstuffs.

Producing information to the consumers is part of risk communication. The Finnish Food Safety Authority Evira provides information to the consumers to empower them to make informed choices relating to food and food safety. During the three-year campaign (2002–2004) "Ruokailoa" "Joy from Food" Internet material and brochures were produced in Finnish, Swedish and, some of them, in English on e.g. hygiene, storage and handling of food at home and package labelling. The material has also been used at schools and colleges.

Recommendations, restrictions and warnings concerning food have been issued for various population groups, especially for certain sensitive groups such as new-born babies, children, pregnant women, persons with serious illnesses and elderly people. Pregnant women have been informed of the listeria risk in certain foodstuffs and urged not to eat freshwater pike due to the mercury risk. Children and young adults have been recommended to restrict the consumption of fish from the Baltic Sea that may contain dioxin (big Baltic herring and salmon). However, because of the high nutritional benefits of fish consumers have also been informed of the recommendation of the Finnish Food and Nutrition Board that fish should be consumed at least twice a week.

The consumer confidence in information produced by the different parties varies. The Finns rely on information provided by the consumer organisations, experts, authorities and media, while information given by market actors and politicians is considered far less reliable. However, the Finns still show more confidence in, for example, the food industry than people in many other European countries.

3.8. Food control

Food control means the supervision of the compliance with the national and EU legislation concerning foodstuffs. Food control covers the whole production chain, starting from primary production. The control covers the general guidance and advice by the authorities and various kinds of measures through which the authorities establish whether the operators in the food sector have complied with the food regulations. The authorities may also use administrative coercive measures against the operators.

Food control is carried out by several authorities. The control has been differentiated according to the national, regional and local level. On the same administrative level different authorities may carry out the control regarding certain statutes and tasks.

Ministries and central authorities

The general planning and supervision of food control takes place at the Ministry of Agriculture and Forestry, Ministry of Trade and Industry and Ministry of Social Affairs and Health. The Ministry of Agriculture and Forestry is responsible for the control of the production inputs of agriculture, food hygiene of foodstuffs of animal origin before retail and food hygiene of plants in primary production. The Ministry of Social Affairs and Health controls the other aspects of food hygiene and drinking

water. The Ministry of Trade and Industry carries out tasks relating to the so-called market control concerning the quality of food on the market and consumer information. In addition to these, the Finnish Customs under the Ministry of Finance carries out certain food control duties. Food control by State Provincial Offices is supervised by the Ministry of the Interior.

As of 1 May 2006 the Finnish Food Safety Authority Evira has functioned as the central food control authority in Finland. The Evira comprises the earlier food control authority, the National Food Agency, National Veterinary and Food Research Institute EELA, Plant Production Inspection Centre KTTK and implementation tasks of the Ministry of Agriculture and Forestry in the veterinary sector.

The tasks of the Evira include the planning, steering and development of food control, including the responsibility for drafting a national food control programme. The Evira also carries out practical control tasks, such as the control of agricultural inputs and meat inspections and control of the establishments in large slaughterhouses and plants operating in connection with these. Special duties of the Evira include steering the State Provincial Offices in auditing the municipal food control and the responsibility for the control of contaminants in foodstuffs of animal origin and other food control tasks which call for special expertise. The control of foodstuffs of animal origin imported from other EU countries (first destination control) will be transferred from the municipalities to Evira in the beginning of 2008.

The Evira may use administrative coercive measures in matters relating to the marketing of agricultural inputs and foodstuffs as well as when the failure to comply with the regulations concerns an area larger than a single municipality. According to the new Food Act, the Evira may also decide to use coercive measures within a single municipality if there is reasonable doubt that the measures taken by the municipal food control authority are insufficient to prevent a health hazard.

Other central food control authorities are the National Product Control Agency for Welfare and Health (STTV) and Finnish Customs. The tasks of the STTV concern the control of alcoholic beverages and drinking water, while the Customs assists in the control of agricultural inputs and carries out import control of foodstuffs of plant origin. Import of foodstuffs of animal origin from non-EU countries (third countries) are controlled by the veterinary officers who carry out border inspections. Some of these work for the Evira, some are municipal veterinarians and provincial veterinary officers authorised by the Evira. The healthcare organisation of the Finnish Defence Forces controls foodstuffs in certain sites governed by the Defence Forces or which are difficult to access. The tasks of the Radiation and Nuclear Safety Authority (STUK) include the control of radiation in the environment, including food.

Regional and local authorities

State Provincial Offices are the regional food control authorities. They employ both provincial veterinary officers and food and health inspectors. The general duty of the provinces is to steer and supervise the food control carried out by the municipalities, e.g. by evaluating the municipal control plans and through audit visits to municipalities. The State Provincial Offices inspect plants that process and handle foodstuffs of animal origin, under the supervision of the Evira. One special task of State Provincial Offices is the organisation of the inspection of reindeer meat. State Provincial Offices hire part-time or full-time meat inspection veterinarians to reindeer slaughterhouses.

Inspectors of the Rural Departments of the Employment and Economic Development Centres and inspectors and samplers authorised by the Evira assist the Evira in the control of agricultural inputs and organic production.
Most of the food control in practice is the responsibility of municipalities. Municipal control covers all food premises except for large slaughterhouses and reindeer slaughterhouses. In the municipalities food control is usually managed as part of the so-called environmental health care.

There are 223 municipal environmental health units in Finland. Their number has been decreasing: in 2002 there were still almost 270 units. As regards their resources the units are quite small, on average only 3.5 AWU for environmental healthcare as a whole. According to the Government Resolution on the development of food control made in 2003, altogether 50–85 larger sub-regional control units should be set up in Finland Food and environmental laboratories serve the local environmental healthcare. Most of the laboratories used to be owned by the municipalities as part of the environmental healthcare organisation. Today part of them are commercial enterprises and some of them have been privatised.

4. Government objectives for food safety 2007–2010

4.1. Food safety in international context

National food safety is to an increasing extent linked to the international trends. The movement of foodstuffs, other goods and people is growing rapidly. Liberalisation of world trade increases the pressures to remove border controls. The WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) sets the conditions for preserving the national level of food safety in international trade. One central factor is the development of the consumer needs and growing demand for products that are not produced in Finland. Increased imports of other products, especially agricultural inputs such as feeds and fertilisers, may also increase food safety hazards. The mobility of people, travelling and use of foreign labour increase the work-related risks in the food sector. Even if the consumption of imported foods would not grow very much in Finland, animal disease and foodborne outbreaks may still spread here along with imports to the other EU countries. The pest situation is also expected to deteriorate as a result of the growing imports.

Foodstuffs also offer a potential tool for bioterrorism. Foodstuffs have been used as means for sabotage and threat. Preparations for terrorism threat call for measures by the food industry to protect the production plants and facilities as well as transports.

Objectives:

1. Better consumer communication on domestic high-quality products
2. In international trade focus on food safety as well as the whole production chain, including animal production conditions
3. Maintaining and developing border and internal market control especially as regards products of plant origin
4. More active participation in improving food safety in developing countries and main import countries
5. Increased influence in international decision-making (EU, Codex, OIE)
6. Focus on foodstuffs and agricultural inputs as part of action against bioterrorism

4.2. Maintaining and developing national safety level

In international comparison the standard of food safety is very good in Finland. This has been reached by means of long-term, hard work all through the food chain. In the present situation the focus in maintaining and promoting food safety is in prevention. Maintaining the current level calls for functional systems and sufficient funding for control and research.

However, foodstuffs still cause significant health problems in Finland, which should be further reduced. In the future action is needed especially to reduce health hazards that cause the greatest risk to the population. As regards the microbiological safety we should focus on developing monitoring and control systems for campylobacter, yersinia, listeria and VTEC bacteria. Of the chemical food hazards attention should be directed to mercury, nitrate/nitrite, benzoic acid and the predisposition of certain heavy users to vitamins and minerals. In physical safety we should prepare for acute radiation situations.

In addition to sporadic risk factors we also need to direct attention to the predisposition of different population groups. The use of nutrients by the children and young people are changing rapidly, and we must be able to monitor this. Population ageing increases the share of the over 65-year-olds and the number of people in institutions and outpatient care, most of whom get their food from mass caterers. The over 65-year-olds have a reduced immunity to microbiological food hazards.

To ensure a sufficient food safety standard for the population, we need to establish the internationally recognised Appropriate Level of Protection (ALOP) values for the main hazards in the near future. ALOP is part of the SPS Agreement of the WTO adopted in 1995, according to which each party to the agreement may establish an appropriate level of protection of its own, i.e. an acceptable risk level. Based on the ALOP each country defines the necessary risk management measures, for example, sets maximum limits for contaminants in food. So far the ALOP has been established in very few countries. Examples of possible national ALOP values are given in Annex.

Objectives:

1. Prevention and research of foodborne illnesses is increased; focus on managing health risks due to campylobacter and yersinia; monitoring of long-term impacts of the most significant zoonoses is started
2. Activity of the Zoonosis centre is started in cooperation between the Finnish Food Safety Authority and National Public Health Institute
3. More detailed data for predisposition calculations are collected on the nutrition of children, the young and elderly people

4. Monitoring of use of plant protection products and veterinary medicinal products on farms is improved
5. By 2008 ALOP values are established for the following risk factors: nitrite, mercury, salmonella, campylobacter and caesium
6. Import safeguard measures allowed by EU legislation, including special guarantees for salmonella and low cadmium content in fertilizers, are maintained
7. Functioning quality and safety systems all through the food chain are ensured. The whole Finnish primary production sector is covered by quality and safety systems by 2010
8. Sufficient and high-quality official control in the whole food production chain is ensured
9. Resources for national research in support of food safety are ensured

4.3. Consumer-oriented food safety

Consumers value the good quality and safety of Finnish food very highly. Consumers play a significant role in ensuring food safety, because a major share of foodborne illnesses are caused by improper handling of food at home. On the other hand, the share of food consumed at home is decreasing, while a growing number of meals are consumed at restaurant or prepared by mass caterers.

Consumer choices have a central role in the development of the range of foodstuffs available. Consumer needs and the development of trade and the other parts of the distribution chain are likely to lead to growth in food imports, both from the EU and from third countries. This means that the food distribution chains are getting longer and it is increasingly difficult to find out the origin of food. On the other hand, significant efforts are being taken to develop food entrepreneurship in the countryside, and small food companies may be important producers of local foods.

In recent decades the consumers' general interest in food safety has been growing. Food risks differ from many other risks in the modern society – such as environmental risks - in that people feel that, one way or the other, they are capable of influencing the risk they are faced with. While the experts assess the probability of the risks, the assessments by the consumers focus on the severity of the risk, how frightening or familiar, and the possibilities to anticipate or influence the risk.

For the Finnish consumers safety is guaranteed by functioning legislation and regulation systems, even if these are mostly invisible in everyday life. Important safety factors for the Finns are strict hygiene regulations, regular inspections of retail outlets and food premises, import data, safety rules of the EU and own-check systems of the food sector operators.

Operators in the food sector and consumers must have enough information on factors influencing food safety. In Finland almost 400,000 persons have acquired a certificate on hygiene competence, a so-called hygiene passport, under a scheme launched in 2002. Consumer information can be further increased through more detailed labelling. However, the main principle is that all foodstuffs sold and served in Finland are safe and the responsibility for risk management is not transferred to the consumer. Besides the package labelling, other information must be offered to the consumers as well. Risk communication must be directed to population groups whose exposure is clearly higher than in the other population. Food safety should be taught at schools as part of the all-round education.

Development and globalisation of food production and distribution bring along new production methods and technologies which may involve unknown risks or re-emergence of hazards we thought we had already won. Comprehensive monitoring and research work is needed to detect such risks.

Objectives:

1. Systematic development of the quality of food and operations and own-check and traceability systems which have proven reliable and consumer communication on these. A national labelling method using modern IT-technology that tells about controlled quality systems is developed for this purpose. Control of the conditions of the system is developed in cooperation between the operators and authorities
2. A consumer confidence and safety barometer is carried out to measure possible changes in consumer confidence in the safety of the food chain and the views of consumers on the risks in food and eating as well as on how they can influence food safety through their own action
3. Food safety measures are directed according to the needs of different consumer groups
4. Food safety included in household science and health education at schools
5. Food control results are published regularly
6. A survey of safety risks related to mass caterers is carried out
7. Testing of competence of employees of plants supplying drinking water is started
8. Requirements of the hygiene passport are developed and the passport is granted for a fixed period only
9. Risks of foodborne outbreaks due to fresh products are reduced

ANNEX Examples of possible ALOP values in Finland

Proposed contaminant	Example of possible ALOP
Nitrite	Exposure of the most sensitive 10% of the population stays below 50% of the maximum accepted intake
Mercury	Exposure of the most sensitive 10% of the population stays below 50% of the maximum accepted intake
Dioxin and dioxin-like PCB compounds	Exposure of the most sensitive 10% of the population stays below 50% of the maximum accepted intake
Salmonella	Share of infections of domestic origin does not exceed the present level
Campylobacter	Share of infections of domestic origin does not exceed the present level
Caesium (Cs-137)	Exposure to caesium due to foodstuffs decreases

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