Working Group Memorandum MMM 2004:5a

Finnish Strategy on Zoonoses in 2004-2008

Helsinki 2004

MINISTRY OF AGRICULTURE AND FORESTRY

MINISTRY OF SOCIAL AFFAIRS AND HEALTH

TO THE MINISTRY OF AGRICULTURE AND FORESTRY
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On 3 February 2000, the Ministry of Agriculture and Forestry appointed a permanent working group for zoonoses for the term of 3 February 2000-1 February 2002. The objectives set for the working group were coordinating the monitoring of the prevalence of zoonoses, compiling the annual zoonoses report as required by the Community legislation, making proposals for development of legislation and surveillance programmes, coordinating the national preparatory work for the amendment of the Community's zoonoses legislation, developing the collaboration regarding zoonoses between different authorities, research institutions and the industry as well as drafting and updating the national strategy for the combating of zoonoses.

Development Director Riitta Maijala from the National Veterinary and Food Research Institute was appointed chairman of the working group. The appointed members of the group were Deputy Director General Matti Aho, Senior Officer Päivi Mannerkorpi and Veterinary Officer Heidi Rosengren from the Ministry of Agriculture and Forestry, Senior Officer Marjatta Rahkio from the Ministry of Social Affairs and Health, Special Researcher Pekka Nuorti from the National Public Health Institute, Senior Officer Maija Hatakka from the National Food Agency and Veterinarian Anna Pitkälä from the Plant Production Inspection Centre. Veterinary Officer Terhi Laaksonen from the Ministry of Agriculture and Forestry was appointed as secretary for the working group.

On 12 February 2002, the Ministry of Agriculture and Forestry reappointed the permanent working group for zoonoses for the term of 12 February 2002-28 February 2004. The objectives of the working group were the same as in the first term. Head of Department Riitta Maijala from the National Veterinary and Food Research Institute was appointed as chairman of the working group and the appointed members of the group were Deputy Director-General Matti Aho, Agricultural Counsellor Päivi Mannerkorpi and Senior Veterinary Officer Vesa Myllys from the Ministry of Agriculture and Forestry, Senior Health Officer Kirsi Soppela from the Ministry of Social Affairs and Health, Senior Officer Maija Hatakka and Senior Officer Maria Miettinen from the National Food Agency, Head of Group Eija Seuna from the National Veterinary and Food Research Institute, Unit Chief Petri Ruutu and Laboratory Director Anja Siitonen from the National Public Health Institute and Veterinarian Annikki Latvala-Kiesilä from the Plant Production Inspection Centre. Senior Veterinary Officer Terhi Laaksonen from the Ministry of Agriculture and Forestry was appointed as secretary for the working group.

Matti Aho, having moved to the duties of Director-General of the Department of Agriculture mid-term, was replaced by Deputy Director-General Veli-Mikko Niemi. Equally, due to internal changes, Vesa Myllys was replaced by Veterinary Officer Minnami Mikkola, and Kirsi Soppela first by Senior Health Officer Veli-Mikko Niemi and thereafter Senior Health Officer Sebastian Hielm. In addition, the working group invited Senior Officer Leena Oivanen from the National Food Agency as a permanent expert.

The preparatory work for the Zoonoses Strategy was started in September 2001 by a strategy seminar, arranged by the permanent working group for zoonoses, to which experts from the areas of research, control, health care and the industry were invited. Following the seminar, the strategy has been developed in meetings and independent seminars of the working group. A draft proposal for the Strategy was widely circulated for comments amongst various stakeholder groups in July-August 2003, and the Strategy was amended according to the comments received. The drafting has been done primarily by the chairman, the secretary and the members of the permanent working group for zoonoses, but Special Researcher Katri Jalava from the National Public health Institute, Senior Officer Leena Oivanen from the National Food Agency and Director Kaija Varimo from the Plant Production Inspection Centre have also participated in the drafting.

Upon completion of the national strategy for the prevention of zoonoses, according to the assignment, the working group respectfully submits its unanimous report to the Ministry of Agriculture and Forestry and the Ministry of Social Affairs and Health.

Helsinki, 26 February 2004.

Riitta Maijala

Päivi Mannerkorpi	Minnami Mikkola
Veli-Mikko Niemi	Sebastian Hielm
Maija Hatakka	Maria Miettinen
Eija Seuna	Petri Ruutu
Anja Siitonen	Annikki Latvala-Kiesilä
	Terhi Laaksonen

EXECUTIVE SUMMARY

The Zoonoses Strategy for Finland for 2004-2008 has been drawn up by the permanent national zoonoses working group appointed by the Ministry of Agriculture and Forestry, with representatives from the Ministry of Agriculture and Forestry, the Ministry of Social Affairs and Health, the National Food Agency, the National Veterinary and Food Research Institute, the National Public Health Institute and the Plant Production Inspection Centre.

Zoonoses are communicable diseases naturally transmissible between humans and animals either by direct or indirect transmission mechanisms. An indirect transmission is carried by a vehicle, such as foodstuffs, water or insects.

<u>Current zoonoses situation in Finland:</u>

Zoonoses are a group of diseases of public health significance in Finland. The current zoonoses situation in Finland is, however, in many respects better than the European average. The prevalence of salmonella bacteria and BSE in the food chain is low. Brucellosis, bovine tuberculosis or *Echinococcus multilocularis* have not been detected in the human or animal populations in Finland for decades, some never.

The most significant zoonotic agents causing foodborne infections in Finland are campylobacter, yersinia, salmonella, listeria and the EHEC bacterium. Epidemic nephropathy, borreliosis, Pogosta disease and tularemia are some of the most significant zoonotic infections transmitted by wild animals.

Particular attention has been paid in Finland to the prevention of zoonoses transmitted by foodstuffs of animal origin. Preventive measures aimed against zoonoses transmitted by plants, insects and wild animals have been few. For many zoonoses, increasing multidisciplinary research, risk assessment and economic evaluationis required for improving the preventive work.

The work on combating zoonoses involves many different parties within the sectors of healthcare, foodstuff control, feedingstuff control and veterinary medicine as well as within the research done in these fields. Collaboration between the different fields has increased in recent years, but the roles are still somewhat unclear.

Changes taking place in the operating environment, such as the globalisation of food production, food trade and human interactions together with structural changes in trade and industry and changes in consumer habits all set greater demands on the combating of zoonoses.

<u>Vision on the zoonoses situation in Finland in 2008:</u>

Despite the increase in threats in the operating environment, the current zoonoses situation in Finland will be better than in 2003. The control of the most significant zoonoses has been implemented efficiently and economically, based on scientific data and with good collaboration between the authorities, research institutes, universities and the industry.

<u>Strategic areas of operation, objectives and action to be taken:</u>

In order to develop the surveillance, control and prevention of zoonoses, it is essential to act within the following three areas:

1. Focus the work done in Finland in the prevention of zoonoses at the most significant zoonoses in an efficient and cost-effective manner.
2. Controlling the risks of zoonoses in imported feedingstuffs, animals and foodstuffs.
3. Developing cooperation within the entire field of operation involved with zoonoses.

Key actions to be taken:

The following are considered the key actions to be taken in 2003-2008:

1. **Creating a national system for monitoring and/or surveillance of campylobacter, yersinia, listeria and the EHEC bacterium**

- The systems must conform to the requirements set by the new EU Zoonoses Directive. Regular monitoring of production animals or foodstuffs will be launched in 2004, for yersinia in 2005.
- In 2004, a system conforming to the requirements of the EU's surveillance network of communicable diseases will be set up within the National Infectious Disease Register, which will aid the collection of information regarding the country of origin of these infections together with other information relevant to tracing the source of infection.
- The detection of epidemics caused by these most significant zoonoses will be made more efficient by increasing and coordinating the typing of the microbe strains isolated from patients or the food production chain.

2. **Drafting plans of action for the zoonoses considered most significant for public health, animal production and national economy**

- In 2004, the permanent working group for zoonoses will lay down the principles for comparing the signicance of different zoonoses to public health and economy.
- The most significant zoonoses will be assessed according to these principles. In addition, the efficacy and cost-effectiveness of risk management measures for preventing these zoonoses will be evaluated.
- The permanent working group for zoonoses will create plans of action for the most significant zoonoses in 2005-2008.

3. **Increasing funding for multidisciplinary research in support of further development of combating zoonoses**

- The public health and economical significance of campylobacter, EHEC, listeria and yersinia , as well as the relative significance of different sources of transmission are to be established by investing in epidemiological research, risk assessment and economic evaluations
- Other multidisciplinary zoonoses-related research projects are to be supported for focussing the risk management measures more efficiently.

4. **Improved risk management in connection with the import of feedingstuffs, animals and foodstuffs**

- An active role in further development of the zoonoses-related legislation in the EU.
- The industry is to develop further its own risk management methods of zoonoses.

5. **Creating a network-like zoonoses centre between the national organisations**

- By the year 2006, a network-like zoonoses centre is to be created within the organisations under the Ministry of Agriculture and Forestry and the Ministry of Social Affairs and Health, both of which participate in the surveillance and control of zoonoses.
- In 2004, the permanent working group for zoonoses of the Department of Food and Health of the Ministry of Agriculture and Forestry, (MMMELO) will determine the procedures for organising the zoonoses centre, its tasks as well as the additional requirements for staff and other resources.

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1. PREFACE

Zoonoses are diseases naturally transmissible between humans and animals either directly or indirectly. Vehicles for indirect transmission may be, for example, foodstuffs, water or insects. Zoonotic agents include bacteria, viruses, parasites and fungi. Many of the most significant infections in humans worldwide are zoonoses. Some of the zoonoses cause relatively mild infections whilst others are life-threatening to humans as well as cause significant economic losses to societies.

Many different parties in areas of healthcare, foodstuff control, veterinary medicine and feedingstuff control participate in the control and prevention of zoonotic infections. Control and prevention are largely based on legislation and the work done by the authorities, but voluntary preventive work as well as the monitoring undertaken by individual branches of the industry, are also of great significance.

In 2000 the Ministry of Agriculture and Forestry appointed a permanent working group for zoonoses, with representatives from the Ministry of Agriculture and Forestry, the Ministry of Social Affairs and Health, the National Food Administration, the National Veterinary and Food Research Institute, the National Public Health Institute and the Plant Production Inspection Centre. Among the objectives of the working group are monitoring the occurrence of zoonoses in Finland, developing the collaboration between different parties as well as drawing up a strategy for combating zoonoses.

The objective of this Zoonoses Strategy is to clarify the roles of, strengthen the collaboration between different parties and to highlight shared objectives for developing the combat against zoonoses. The Strategy is based upon the current view of the occurrence and significance of zoonoses in Finland (chapters 5 and 6), as well as on the influence of the operating environment and legislation (chapters 3 and 4). For the Strategy, the working group has created the key principles in combating zoonoses (chapter 2) and a vision for the year 2008, together with proposals for both objectives and proposed action (chapters 7 – 9).

The Zoonoses Strategy is also in part associated with the National Quality Strategy for the Food Sector in Finland drawn up under the guidance of the Ministry of Agriculture and Forestry. The aim of the National Quality Strategy is to develop the quality of products and operations with joint efforts of the administration, research, training and consultation as well as the food chain. This is to ensure the permanently high level of quality whilst improving the competitiveness of the industry. The entire food production industry participates in the implementation of the quality strategy. Other product- and sector-specific strategies and action programmes are currently being drafted in the Ministry.

2. ZOONOSES STRATEGY: BASIS AND PRINCIPLES

The following jointly agreed basis and principles laid the foundation for the Zoonoses Strategy and for the prevention and combating of zoonoses.

1. The objective of combating zoonoses is to improve public health.
2. Systematic and prophylactic action is more effective than rectifying repairing? damages already occurred. The ability to take action also under unusual circumstances must be secured.
3. The surveillance and control of zoonoses cover the entire food production chain from the farm to the table as well as the entire chain of transmission, defined by epidemiological investigations, from wild animals to humans.
4. When setting specific objectives and deciding upon the measures of surveillance and control of zoonoses, matters related to animal health and well-being, environmental protection and the competitiveness of the Finnish food production industry will all be taken into consideration as well.
5. Effective combating of zoonoses prevents financial losses in the food production industry.
6. The surveillance and control of zoonoses must be based on scientific risk assessment or other scientific evidence. The applicability of scientific knowledge to the Finnish operating environment will be assessed case-by-case.
7. The absence of or insufficient scientific knowledge is not a justification for lack of action when the risk to the public health is apparent or imminent (so-called precautionary principle). In such a case, temporary surveillance or control measures, based on the best possible available data, are to be taken until the necessary scientific evidence is obtained.
8. The resources aimed at combating zoonoses are to be allocated in the most efficient manner. The distribution of resources is to be guided by means of cost-effectiveness analyses.
9. The decision-making procedure needs to be transparent, and the justification for decisions together with necessary situation analyses are accessible to all interested parties.

3. OPERATING ENVIRONMENT AND LEGISLATION

3.1. Risk management of zoonoses

In addition to legislation, the operational environment, diagnostics available, scientific research and training given all affect the risk management of zoonoses.

Alongside the EU legislation, the national legislation and guidelines can significantly influence the prevalence of zoonoses in our country. The voluntary action undertaken for the prevention of zoonoses by those involved in production, industry and trade holds a key role. The growing international trade, developments in agriculture, expanding EU, structural changes in animal production, improved manufacturing and packaging technologies and possibly even climatic changes are all new challenges to the combating of zoonoses in feedingstuffs, animals and foodstuffs. In healthcare, the prophylactic measures of communicable diseases are regulated solely by national legislation.

The standard as well as the regional accessibility of the diagnostics available affect how readily a zoonosis is identifiable in our country. Poor and inadequate diagnostics used on the population, foodstuffs, animals and/or feedingstuffs may significantly impede the planning and application of prophylactic measures to be taken against an infection. Interdisciplinary, well-planned and duly implemented research programmes are a prerequisite for focusing scientific research on the prevention of zoonoses in order to produce the most essential information. Training also has a great significance in managing the risk of zoonoses in everyday situations both at work and leisure.

Zoonotic infection in humans can be food-borne, water-borne, vector-borne, inhaled through the respiratory tract or contracted by direct contact with animals. Because the methods of transmission vary, planning the prevention of zoonotic infections must be pathogen-specific in order for it to be effective. Decisions made in this planning work ought to be based upon scientific evidence.

3.2. Economic and health impact of prevention of zoonotic infections

Economic, social, political, ethical and practical factors are all taken into account together with scientific data when making decisions regarding the prevention of zoonoses. Some preventive measures may be effective in breaking up the chain of infections whilst being economically and/or in practice impossible to implement. Yet the pressures caused by political or economic implications in, for example, the EU may direct significant preventive measures to areas where true biological risks are small in Finland.

In practice, the so-called zero risk does not exist but it is always a question of how low a desired safety level we wish to set. Controlling the risk of zoonotic infections can be carried out in different stages of the production chain (feedingstuffs, animals and foodstuffs), through risk management of the environment and water as well as direct prophylactic measures aimed at humans (e.g. information campaigns, vaccinations). In the case of under-diagnosing, leading to misconceptions of the prevalence of the infection, the true prevalence rate may result in significant costs in healthcare even if the original investment in risk management has been low. Equally, extensive preventative measures taken at the primary production stage of the food chain, ensuring Finland to be free of an infection, may result in very low expenditure in healthcare.

Three different types of situations can be distinguished in the risk management of zoonoses in Finland: (A) no significant action to be taken in managing the risk of a zoonotic infection, (B) current action taken in the risk management of a zoonotic infection aims at reducing the incidence to a reasonable level or eradicating the infection altogether, (C) current action taken in the risk management of a zoonotic infection aims at preventing the recurrence of an infection already eradicated from the country. All three situations have different economic impacts.

(A) No significant action in risk management

A situation where no significant investments are made for the prevention of zoonotic infections may exist due to three different reasons:

(1) no proven preventive methods exist. This kind of situation often arises in the case of zoonotic infections transmitted from wild animals to humans, e.g. Puumala virus and tularemia. In such cases preventive measures and the costs incurred generally remain relatively low and the risk management is primarily based on informing the population as to how to avoid the infection.

(2) preventive methods exist but they have not been applied. In this kind of situation only few investments are made in the risk management procedures regardless of the facts that cases occur in the Finnish population and that methods could be applied to at least some of the sources of infection (e.g. campylobacters and yersinias). This may be due to various reasons, for instance, lack of knowledge regarding different ways of transmission, low risk of infection, or economic or political viewpoints.

(3) preventive measures are not needed under normal circumstances. With certain zoonoses, risk management action taken and costs incurred are low but under special circumstances the expenditure rises rapidly when prearranged procedures of risk management are launched (e.g. anthrax and other zoonotic biological weapons).

(B) Risk management procedures aim at lowering the incidence rate
When a zoonotic agent is prevalent in a country's wild animal population, food production chain and/or human population, and the decision has been made to combat the spread of the infection, new and often considerable costs are incurred. While maintaining a low incidence rate may be highly cost-effective (i.e. the national salmonella control programme for broilers), aiming at a zero-risk, in turn, often proves very expensive. With a lower incidence rate the utility factor derived from preventive work usually grows smaller and eradication of the disease may turn out to be very expensive as discovering the last seats of infection is often problematic, requiring wide-spread surveillance and systematic destruction of identified infections. However, when it comes to zoonoses, it is sometimes difficult to determine an acceptable level for the risk, i.e. how safe foodstuffs, for example, should be. The lower the target level, the more expensive and/or difficult it becomes to reach, beyond a certain limit. Moreover, when the incidence rate of a zoonosis becomes very low or when a zoonosis is successfully eradicated from our country, the expenditure is set at the level of maintaining a surveillance system. Other specific active measures can be abandoned. Surveillance in this case indicates to the Finnish consumers, as well as the buyers of Finnish export items, that the target level has been reached. In addition, the surveillance system warns against the possibility of exceeding the target level.

(C) Risk management procedures aim at prevention of recurrence of infection
There are also procedures in Finland aimed at preventing the recurrence of a particular zoonosis already eradicated from our country (e.g. bovine tuberculosis, brucellosis and rabies). Risk management costs are incurred by both the surveillance system and the destruction of possible carriers of the infection. However, to lose the status of a country officially free of a particular zoonosis would generate costs both in prevention of the disease and in healthcare, should cases be discovered in the human population. The healthcare system must be prepared to diagnose and treat such cases as well because Finns contract these infections in connection with foreign travel.

3.3. National legislation and control

3.3.1. Population

Provisions concerning zoonoses are laid down in the Act on Infectious Diseases (583/1986, as amended 76/1991, 770/1992, 935/2003) and Decree on Infectious Diseases (786/1986, as amended 91/1991, 928/1991, 833/1992, 1237/1993, 841/1997, 1383/2003). In the Decree the infectious diseases are divided into generally dangerous infectious diseases, notifiable infectious diseases and other microbial findings to be registered. The National Public Health Institute has issued further technical instructions for the monitoring and reporting of infectious diseases and for keeping a national register on them (558/44/2003, 559/44/2003). The Ministry of Social Affairs and Health has issued orders on the monitoring and reporting of food-borne outbreaks and health inspection of staff working in contact with foodstuffs (1383/2003). Examinations needed to diagnose infectious diseases under the Act on Infectious Diseases may be carried out only at the National Public Health Institute and laboratories approved for this purpose by the State Provincial Offices.

The National Infectious Disease Register kept by the National Public Health Institute on the basis of reports from laboratories and physicians and the system for reporting suspected cases for the early detection of food- or waterborne outbreaks are important instruments in the monitoring of zoonoses found in humans and detection of epidemics. All the most important zoonoses found in Finland are included in the monitoring system of the National Infectious Disease Register. For the part of the clinical microbiological laboratories this means that reports are collected on 70 different microbes and for the part of physicians that they need to report about 30 infectious diseases. In the case of certain zoonoses the strains of the zoonotic agents are also stored in the Strain Collection of the Infectious Disease Register. The responsibility for the prevention of infectious diseases rests with the municipal health authorities together with the control authority. The municipal health authorities are steered by the State Provincial Offices and Ministry of Social Affairs and Health, and the expert organisations are the hospital districts and the National Public Health Institute.

The Occupational Safety and Health Act (299/58 repealed, new act 738/2002) sets down the obligation of the employer to take care of the employees' safety and health at work. The Decision of Council of State (1155/1993) concerns the protection of employees from risks caused by biological agents. In the Decision the biological agents are divided according to the degree of the risk into classes from I (no risk to healthy persons) to IV (highly serious risk to the individual and society). The Decision of the Ministry of Social Affairs and Health (229/1998, repealing the Decision of the Ministry of Labour 739/1996) on the classification of biological agents confirmed the classification. In the annex to a safety bulletin of the Ministry of Social Affairs and Health (43/2003) biological agents are divided into isolation classes 2-4, which correspond to classes I-IV based on the risk. The microbes dealt with in the Zoonoses Strategy belong to classes 2 or 3, except the rabies virus, which belongs to class 4.

Biological agents are also included in the Act and Decree on Occupational Diseases (1343/1988, 1347/1988). The Decree makes special reference to certain zoonoses: milker's nodes, erysipelas, brucellosis, anthrax, listeriosis, fungal skin diseases, toxoplasmosis and tuberculosis. The Health Insurance Decree (717/91) issued by virtue of the Health Insurance Act (364/63, 1192/90) lists predisposing agents which entitle to special maternity allowance. Of the zoonoses reference is made to toxoplasmosis and listeriosis. The Decision of the Ministry of Social Affairs and Health (931/1991) concerning agents causing risk to the development of foetus and risk assessment, also issued by virtue of the Health Insurance Act, deals with toxoplasmosis and listeriosis, as well as certain other biological agents.

Annex 1 shows the flow of information on infectious diseases and Annex 3 describes the classification of the most important zoonoses in the legislation on infectious diseases.

3.3.2. Foodstuffs

The control of foodstuffs and their handling in Finland is mainly based on three acts: Act on the Hygiene of Foodstuffs of Animal Origin (Hygiene Act, 1195/96), Food Act (361/1995) and Health Protection Act (763/1994). These acts and decrees issued under them also deal with the occurrence of zoonoses in foodstuffs. The municipal authorities are responsible for the control of these on the local level, except for slaughterhouses, which are controlled by the State veterinary officers for meat inspection. Control on the regional level is carried out at the State Provincial Offices by provincial veterinary officers and food and health inspectors. The central food control authority is the National Food Agency, which is responsible for the supreme management, guidance, planning and development of the control. The focus of food control is shifting from direct control to the control of the functioning of the operators' own-check programmes.

The purpose of the Hygiene Act is to ensure the quality of foodstuffs derived from animals and prevent the spread of infections from animals to humans via foodstuffs. The Act applies to the handling of foodstuffs of animal origin, quality requirements for food hygiene, control and inspections before retail sale. Further provisions on these actions and requirements are laid down in Decrees and Decisions of the Ministry of Agriculture and Forestry issued under the Hygiene Act. Detailed orders concerning zoonoses are included e.g. in the provisions concerning meat inspections in the Decree on Meat Hygiene (16/EEO/2001). There are certain other provisions on the occurrence of zoonoses in foodstuffs, including the occurrence of listeria in milk products (Decree of Milk Hygiene 31/EEO/2001), salmonella control in slaughterhouses and cutting plants (20/EEO/2001), carcass surface samples, equipment surface samples and EHEC samples at slaughterhouses and cutting plants (13/EEO/2003). The provisions have been supplemented by recommendations concerning e.g. listeria control at meat and fish establishments and retail sale of meat and fish products (National Veterinary and Food Research Institute and National Food

Agency 27 November 2000 Dno 982/40/00). Specific provisions have been issued on the prevention of TSE/BSE and the removal and handling of risk material at slaughterhouses (e.g. Decisions of the Veterinary and Food Department 3/EEO/2002, 22/EEO/2001 and 32/EEO/2001).

The main objective of the Food Act is to ensure the health quality of foodstuffs and protect the consumers against health damages caused by foodstuffs that are unfit for human consumption. Foodstuffs which can be suspected to cause a poisoning, illness or other health damage either directly or as a result of longstanding use are considered unfit for human consumption. In addition to the official control the operators are obligated to carry out own-checks, where the operators must be capable of identifying the critical points in the manufacture and handling of foodstuffs in terms of the relevant provisions. If a foodstuff sold on the market is found or suspected to be unfit for human consumption, coercive measures such as removal from the market are applied.

According to the Health Protection Act, an operator who suspects that a foodstuff handled in the establishment may have caused food poisoning must report this to the municipal health protection authority. To increase the cooperation between different authorities and clarify the reporting procedures for food-borne outbreaks, the Ministry of Social Affairs and Health has issued instructions for this by the order "Investigation and reporting of food-borne outbreaks" (1/01/97). A municipal or local work group for examining food-borne outbreaks, which includes a health protection official and an official responsible for communicable diseases, reports the suspicion concerning an outbreak to the Department of Infectious Disease Epidemiology of the National Public Health Institute, which forwards the report to the National Food Agency and the National Veterinary and Food Research Institute. After examining the food-borne outbreak a final report is sent to the national Food Agency. The National Food Agency sends the report to the National Public Health Institute and Veterinary and Food Research Institute and keeps a national register on food-borne outbreaks.

Annex 2 shows the flow of information on food-borne outbreaks.

3.3.3. Drinking water

The control of the quality of drinking water in Finland is based on the Health Protection Act and statutes issued under it. The Health Protection Act aims to maintain and promote the health of individuals and the whole population and prevent, reduce and eliminate factors in the environment which may be harmful to the health. In the case of drinking water this means that water must be harmless to health in all respects. Further provisions on drinking water have been issued by the Decree of the Ministry of Social Affairs and Health (461/2000) on the quality requirements and control examinations of drinking water and Decree of the Ministry of Social Affairs and Health (401/2001) on the quality requirements and control examinations of drinking water in small units. The requirements concerning laboratories carrying out examinations on drinking water are given in the Decree of the Ministry of Social Affairs and Health (173/2001) concerning laboratories which carry out control examinations on drinking water. The Health Protection Act and provisions issued under it implement the Council Directive 98/83/EC on the quality of water intended for human consumption in Finland.

The municipal health protection authority is responsible for the control of the quality of drinking water on the local level, and the State Provincial Offices steer the control in the provinces. On the national level the National Product Control Agency for Welfare and Health steers and supervises the control, and the supreme authority responsible for the management and planning of the control is the Ministry of Social Affairs and Health.

According to the Health Protection Act, the municipal health protection authority who has received information on an outbreak caused by drinking water must initiate measures to prevent the spread of the disease (e.g. a zoonosis). The epidemic must also be reported to the National Public Health Institute immediately. The examination of an outbreak caused by drinking water is organised and carried out in the municipalities as set down in the order of the Ministry of Social Affairs and Health (1/01/97) in the same way as in the case of foodstuffs (see Chapter 3.3.2. above).

3.3.4. Animals

Provisions on combating and preventing animal diseases are laid down in the Animal Disease Act (55/1980). In this Act animal disease means an illness or infection which can be transmitted between animals or from animals to humans either directly or indirectly. In the Animal Disease Decree (601/1980) the animal diseases to be combated are divided into easily spreading animal diseases, dangerous diseases and diseases to be controlled. A zoonosis can be included in the animal diseases to be combated if an infection may cause a serious illness in humans.

The Decision of the Veterinary and Food Department of the Ministry of Agriculture and Forestry (1346/1995, as amended 532/1997 and 136/1998) on animal diseases to be combated and reporting animal diseases sets down the animal diseases which are to be combated and reporting procedures concerning animal diseases to be combated and other animal diseases for the veterinarians. Annex 3 describes the classification of the most important zoonoses on the basis of the animal disease legislation.

The decrees of the Ministry of Agriculture and Forestry and decisions of the Department of Food and Health also lay down further provisions concerning the combating and control of certain zoonotic agents, such as the Brusella, salmonella, Anthrax and tuberculosis bacteria, rabies virus, Trichinella parasite and BSE.

The Department of Food and Health of the Ministry of Agriculture and Forestry is responsible for the prevention of animal diseases and control of the import of live animals to Finland. The control authorities on the regional and local level are the provincial veterinary officers and municipal veterinarians. The National Veterinary and Food Research Institute is responsible for most of the laboratory diagnostics, except for the investigations of salmonella. The control of zoonoses in animals is mainly based on regular monitoring of the incidence of the diseases and reporting obligation when diagnosing of suspecting cases of disease. This reporting obligation concerns all veterinarians. When an animal disease to be combated is suspected or diagnosed, restrictive orders concerning the movement of animals and feedingstuffs and improving biosafety are issued to the production farm. In special cases the source of the infection may be sanitised at the cost of the State, with possible Community co-financing.

Regular monitoring based on laboratory diagnostics is carried out for Salmonella, EHEC and Brucella bacteria, Rabies virus, Trichinella parasite and BSE. In meat inspections the monitoring also covers the occurrence of tuberculosis bacteria and echinococcus parasite in animals.

3.3.5. Feedingstuffs and agricultural inputs

The feedingstuff legislation deals with the prevention of two zoonotic agents, salmonella and BSE. In the case of these the purity of feedingstuffs from zoonotic agents plays a significant role in preventing the infection in animals and humans. The Feedingstuff Act (396/1998) promotes the use of high-quality and safe feedingstuffs in animal nutrition. Feedingstuffs may contain no harmful substances, products or organisms in such quantities which would cause quality damages or risk to humans, animals or the environment.

Provisions on the maximum content of harmful substances, products and organisms in feedingstuffs and the hygiene requirements for feed products are laid down in a Decision of the Ministry of Agriculture and Forestry (163/1998). In Finland no salmonella is accepted in feedingstuffs. The Decree of the Ministry of Agriculture and Forestry (20/2001) lays down provisions on the obligation of the operators in the feed sector to organise the own-checks of their operations, especially in respect of the hygienic quality control, and on the official control of the own-checks. If they want, the companies may apply for the approval of the Plant Production Inspection Centre for their own-check system. When using fish meal and in the manufacture and use of certain feed additives this is compulsory.

To control the BSE disease in bovines the European Community has laid down restrictions on the use, manufacture, sale, storage (including storage on farms), transport, export and import of animal proteins and feed products containing these. To implement these provisions the Ministry of Agriculture and Forestry has issued decrees by virtue of the Feedingstuff Act, Animal Disease Act and Act on Veterinary Border Inspection.

The purpose of the Fertiliser Act is to promote the supply of fertiliser products which are of high quality, safe and suited for the Finnish conditions. The Act applies to the marketing, import and manufacture for marketing purposes of fertilisers, soil improvers, fertilised growing media, nitrogen bacteria products and compost products. Fertiliser products must meet the quality requirements. According to the Decision of the Ministry of Agriculture and Forestry on certain fertiliser products (46/94), soil improvement compost may not contain harmful organic substances or micro-organisms in such quantities that using it in accordance with the instructions may cause damage to humans, animals or the environment. Compound manure, fertilised growing media and compost and nitrogen bacteria products must also meet the above-mentioned quality requirements.

To prevent the spread of animal diseases when manufacturing certain feedingstuffs, the Animal Disease Act (55/1980) is applied to the control of feedingstuffs of animal origin in export and import between Finland and the other EU Member States and the Act on Veterinary Border Inspection is applied to imports to Finland from third countries or via Finland to the other EU countries.

Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules concerning animal by-products not intended for human consumption regulates the handling, transport, storage, incineration, composting and biogas plants and other disposal of materials derived from animals.

The Ministry of Agriculture and Forestry is responsible for the general steering of the control of feedingstuffs and fertilisers. The Plant Protection Inspection Centre is responsible for the implementation of the Feedingstuff and Fertiliser Act, i.e. for the control of the production, marketing and imports of feedingstuffs and fertilisers as a whole, and the Regulation on animal by-products 1774/2002. Import control is carried out by the Finnish Customs, together with the Plant Production Inspection Centre. The provincial veterinary officers and police may assist in the implementation of the Feedingstuff Act. In the control of farms the Plant Protection Inspection Centre is assisted by authorised inspectors of the Employment and Economic Development Centres.

3.4. Legislation of the European Community

3.4.1. Legislation on zoonoses

The new EU legislation on zoonoses entered into force in December 2003, including Directive of the European Parliament and of the Council on the monitoring of zoonoses and zoonotic agents (2003/99/EC) and Regulation of the European Parliament and of the Council on the control of salmonella and other specified foodborne zoonotic agents (EC No 2160/2003). The new legislation must be complied with as of June 2004.

The new legislation is based on the earlier Community Directive on zoonoses (92/117/EEC), which contains the following main points:

- monitoring of the occurence of zoonoses and annual reporting on zoonoses,
- control of two types of salmonella (S. Enteritidis, S Typhimurium) in breeding flocks (egg and meat production lines), and

- Community contributions to the financing of control programmes for zoonoses in Member States

The objective of the earlier directive on zoonoses (prevent and reduce the foodborne zoonoses among the consumers) has not been realised, which is the main reason for the reform of the directive. The new legislation also aims to further improve food safety, but the means have been developed on the basis of the "from farm to table" principle and risk analysis. Efforts are being made to design the actions and objectives so that they are founded on scientific risk assessment. According to the Commission, the fact that risk assessment is lacking in the majority of the fields to be inspected may not lead to inactivity.

Directive on the monitoring of zoonoses and zoonotic agents (2003/99/EC)

Like under the earlier directive, the Member States compile an annual report on the incidence of zoonoses in animals, foodstuffs and feedingstuffs and the Commission drafts a summary of the reports. The collection of data on the number of infections in the population is no longer included in the scope of application of the Directive, but this is carried out as set down in Commission Decision 2119/98/EC.

One problem in the annual summary report drafted by the Commission has been the incomparability of the data collected from different Member States. The requirements for monitoring and reporting have been developed in the new directive. The monitoring is still based on Member States' own systems, but where necessary common rules for the monitoring of a certain zoonosis can be established by comitology procedure. Monitoring and reports should be capable of producing data needed for the risk assessment and development of the control. There are eight zoonoses which must be monitored and reported on in all Member States: brucellosis, campylobacteriosis, echinococcosis, listeriosis, salmonellosis, trichinellosis, tuberculosis due to Mycobacterium bovis and verotoxigenic Escherichia coli (EHEC). The list is founded on the opinion of the EU Scientific Committee of 12 April 2000 on the most significant foodborne zoonoses. The other zoonoses are to be monitored according to the epidemiological situation in each Member State. The monitoring is mainly targeted at the level of primary production, i.e. the production animals, but where necessary the monitoring may take place at different stages of the food chain. The zoonoses which according to the directive must be reported to the EU are already being monitored on the national level in Finland, except for campylobacteriosis and *Listeria monocytogenes* bacteria.

In addition to the zoonosis infections the Member States must monitor the antimicrobial resistance of strains of microbes isolated from production animals and foodstuffs. The monitoring of the antimicrobial resistance concerns the strains of salmonella and campylobacter and certain indicator strains, i.e. strains which occur normally in the intestines. In Finland the resistance of the strains of microbes has been monitored for a long time and the monitoring system is being developed further, which means that meeting the requirements set down in the directive should cause no problems in Finland.

The new directive contains requirements for the investigation and reporting of food-borne outbreaks as well. Such requirements are already included in the Finnish health protection legislation. The directive also obligates the operators to give the information on zoonosis infections detected in own-checks and the isolated strains of zoonotic microbes to the authorities. This calls for further development of the national legislation.

Regulation on the control of salmonella and other specified foodborne zoonotic agents 2160/2003

The control of zoonoses is founded on the targets of the Community to reduce the prevalence of zoonoses. No targets are laid down in the regulation, but these are set by comitology procedure. Instead, the regulation gives a time scheme during which the Community should set certain targets concerning zoonoses. These concern the prevalence of the salmonella serotypes with public health significance in breeding flocks of hens and broilers, laying hens, broilers, turkeys and fattening and breeding pigs. The salmonella serotypes to be controlled have not yet been selected, but for the part of breeding flocks the control will at first cover only five and for the part of other poultry only two most commonly reported human serotypes in Europe. The targets will be set by degrees between 2004 and 2008. Where necessary, other zoonoses may be included in the list by comitology procedure.

When the targets have been set the Member States must submit a control programme through which the targets can be reached to be approved by the Commission. The control programme should cover feedingstuffs, production animals and food processing, but the focus should be in primary production. The means of control may be decided by the Member States, but the use of certain means may be prohibited or common methods may be agreed on by comitology procedure. The regulation lays down the minimum requirements for the sampling concerning salmonella. The operators may develop control programmes of their own, which must be approved by the competent authority of the Member State concerned.

The regulation influences the rules of the trade on the internal market. One year after a certain target has been set the live animals/flocks and breeding eggs must be tested for the zoonosis concerned before they are dispatched. The animals must be accompanied by a certificate of the testing and its result. By comitology procedure, the recipient Member State could be granted the right to require that the animals traded on the internal market meet the national requirements of the country for a certain transitional period. This means in practice that a Member State with good salmonella situation may restrict the purchases of animals from countries where the situation is not so good.

The Regulation does not impose similar rules for the trade in foodstuffs. It does lay down a general requirement to be fulfilled in 2010 that eggs intended for direct consumption must come from flocks where no salmonella has been found. Similarly, a requirement that poultry meat sold on the market may contain no salmonella unless it is intended to be heated in the processing industry would enter into force in 2011.

So far the Regulation has no impacts on the additional guarantees for salmonella in Finland and Sweden. If the salmonella situation in the Community improves and reaches the same level as in Finland and Sweden, additional guarantees will no longer be necessary and they will be abolished. However, the situation is not likely to improve in any significant way in the near future. Targets set under the new Regulation are likely to remain far away from the objectives of the Finnish and Swedish salmonella control programmes, where the prevalence of all salmonella serotypes in production animals is less than 1%.

The new Regulation does not call for any essential changes to the Finnish salmonella control programme, except that the frequency of the sampling of laying hens may have to be increased. However, the control programme must be approved under the new Regulation.

3.4.2. Network for the epidemiological surveillance and control of communicable diseases

In 1998 the European Parliament and Council issued a Decision according to which the surveillance of communicable diseases in the population is organised through a network of the surveillance systems for specific diseases or groups of diseases. Each disease-specific surveillance system has a coordination centre which collects the data required to meet the objectives of the surveillance network from the Member States, analyses them and reports in a way that supports the prevention of the disease concerned. The coordination centre forwards the information to the other international organisations, for example, the other data collection systems for communicable diseases of the EU. The disease-specific surveillance systems will be incorporated into the public health programme of the EU to be started in 2004. Recently a decision on setting up a centre for communicable diseases was made. This European Centre for Disease Prevention and Control (ECDCP) will get started in 2005 and its functions will include the coordination of network of the disease-specific surveillance systems.

Many of the disease-specific surveillance systems in the EU follow the incidence of zoonoses in humans. The purpose of the Enter-Net network is to detect outbreaks caused by salmonella and EHEC and coordinate the national investigations of these. Listerianet is a surveillance system for Listeria infections. The main function of EuroTB is to follow the trends in *Mycobacterium tuberculosis* infections, but it also follows the *M. bovis* infections in humans.

The disease-specific surveillance systems of the EU compile the data from the cases confirmed in the national laboratories included in each country's health care system. The information is not comparable when estimating the burden caused by the infections in the whole population. However, the data collected are still highly useful as they reflect the trends and changes and help to detect international outbreaks.

3.4.3. White Paper on Food Safety

The White Paper on Food Safety published by the Commission on 12 December 2000 (COM (2000) 719 final) follows the Commission's Green paper on Food Law (COM (1997) 176 final). After the food crises in the 1990s the perspective of the White Paper was extended outside the traditional food law concept. In the White Paper the concept food chain covers both primary production and food processing, manufacture and trade.

The White Paper ratifies the efforts to transform EU food policy into a pro-active, dynamic, coherent and comprehensive instrument to ensure a high level of human health and consumer protection. The White Paper highlights the scientific basis of actions relating to food safety, transparency in the decision-making, consistency and efficiency. The document ratifies three principles for the development of the legislation:

1. the roles, i.e. tasks and responsibilities, of all stakeholders in the food chain (feed manufacturers, farmers and food manufacturers/operators, the competent authorities in Member States and third countries, the Commission, consumers) must be clearly defined;
2. food safety must be taken into account at all stages of the food chain (from farm to fork); and
3. traceability of feeds and foods and their raw materials and ingredients.

Decision making on food safety must be based on risk analysis. However, in the decision making process in the EU, other legitimate factors relevant for the health protection of consumers and for the promotion of fair practices in food trade may also be taken into account. Of such factors reference is made to environmental considerations, animal welfare, sustainable agriculture and consumers’ expectation regarding product quality, fair information and definition of the essential characteristics of products and their processing and production methods.

The White Paper contains 84 legislative proposals of different kinds, including the statutes on zoonoses described above.

3.4.4. General Food Regulation

Regulation (EC) No 1642/2003 of the European Parliament and of the Council laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety was issued on 28 January 2002.

This so-called General Food Regulation will enter into force by degrees. The sections concerning the European Food Safety Authority, Rapid Alert System for Food and Feed (RASFF) and comitology procedure entered into force on 21 February 2002, and the other sections will become effective in 2005 and 2007.

The purpose of the Regulation is to create consistent and open rules for food safety which ensure that only safe foodstuffs enter the markets, functioning procedures are in place for possible problem situations and the internal market works well also in the food trade.

The Regulation lays down the general requirement that only safe foodstuffs and feedingstuffs enter the market. The primary responsibility for the safety of food and feed rests with the operators. The general principles for food safety laid down in the Regulation apply to all stages of the production and distribution of food and feed. The Regulation also lays down the requirements for the traceability of foodstuffs, feedingstuffs and their ingredients as well as on the removal of hazardous foodstuffs and feedingstuffs from the market.

The Regulation points out that measures directed at health protection must be based on scientific risk assessment, as well as sets down the conditions for the use of the precautionary principle in risk management. It is also noted that, in addition to scientific information, other legitimate factors may be taken into account in risk management.

The Regulation also lays down the rules for the establishment of the European Food Safety Authority. The operations of the Authority are founded on high scientific quality, independence, transparency and efficiency. The tasks of the Authority comprise all scientific issues which relate to the safety of the food chain either directly or indirectly. The European Food Safety Authority consists of the Management Board, Executive Director and his staff, Advisory Forum, Scientific Committee and Scientific Panels. The members of the Scientific Committee are the Chairs of all Scientific Panels and independent scientific experts. The Authority is responsible for their activities and coordination. The Authority creates networks with all the relevant organisations working in the same field.

The main function of the Authority is to provide independent scientific opinions on all issues with direct or indirect impacts on food safety. Scientific opinions may be requested by the European Commission as well as the European Parliament and the Member States. The Authority also provides scientific and technical support to the Commission, collects and analyses data and commissions scientific studies.

According to the Regulation, the Commission must draw up, in close cooperation with the European Food Safety Authority and the Member States, a general crisis management plan. Should serious risks appear, the Commission must set up a crisis unit. The Regulation makes it possible to apply emergency measures to all foodstuffs independent of their nature or origin if they are likely to constitute a serious risk to human health.

3.4.5. Proposal for a regulation on food and feed control

The proposal for a Regulation on official feed and food controls brings together the rules concerning the official control in the food and feed sector. The provisions concern the national control at the central, regional and local level, control of the foodstuffs and feed imported to the Community and control at the Community level.

The proposed Regulation would for the most part replace Directives concerning the official food and feed controls in force at present. However, the special provisions concerning the veterinary border inspection and the control of prohibited substances, contaminants and food hygiene relating to foodstuffs of animal origin and the control of TSEs, zoonoses, pesticide residues in plants and frozen foods would remain in force. The regulation on feed and food control would also not be applied to the control of the common market organisations of agricultural products.

A new element in the proposal is the possibility to delegate control tasks - except for coercive measures - to certified and accredited third parties. The proposal would also allow temporary control actions coordinated at the Community level.

The proposal obligates the Member States to organise the official feed and food control. The way the control is organised may be decided by the Member States, subject to certain conditions laid down in the Regulation. The Regulation emphasises the planning, transparency and efficiency of the control. In the control directed at businesses the focus would be on auditing, i.e. in the control of their own-check programmes.

The document would obligate the Member States to draw up national contingency plans to be implemented in food and feed emergencies as well as a general plan for the organisation of official food and feed controls and organisation of official control in the areas of animal and plant health and animal welfare. The Member States should report annually to the Commission on the realisation of the plans.

3.4.6. Hygiene legislation

The processing of the proposals for regulations and directives concerning food hygiene submitted by the Commission in summer 2000 (the so-called hygiene package) should be completed in the European Parliament and Council in winter 2003-2004. The hygiene package consists of five proposals:
(1) regulation on the general hygiene of foodstuffs,
(2) regulation on specific hygiene rules for food of animal origin,
(3) regulation on the control of food hygiene of foodstuffs of animal origin,
(4) directive concerning the animal health rules relating to foodstuffs of animal origin,
(5) a technical directive repealing the directives in force at present.

The fourth one, Council Directive 2002/99/EC of 16 December 2002 laying down the animal health rules governing the production, processing, distribution and introduction of products of animal origin for human consumption, has already been approved in the Council and it enters into force on 1 January 2005. The other regulations should enter into force in the beginning of 2006.

The purpose of the proposals is to combine the general food hygiene directive 93/43/EEC and 14 hygiene directives dealing with foodstuffs of animal origin into one regulation. In addition to this the provisions concerning the control of foodstuffs of animal origin should also be combined into a single regulation. The content of the present directives will be reformed and harmonised. The most important issues in the proposals concern the consistent application of own-checks, the so-called HACCP principles (Hazard Analysis and Critical Control Point) and uniform application of risk assessment to all groups of foodstuffs. In addition, general hygiene requirements, such as guides concerning the organisation of the production and provisions on bookkeeping on farms, as well as hygiene control would be extended to cover the primary production of foodstuffs, both animal and plant production. However, the scope of application will not be extended to the production of feedingstuffs and other agricultural inputs. The detailed hygiene rules for the foodstuffs of animal origin will not be mitigated. The proposals emphasise the safety of foodstuffs, which means that they contain no provisions concerning the quality characteristics of foodstuffs included in the legislation in force at present.

The proposals are based on the view that provisions concerning primary production and the production, marketing and control of agricultural inputs would continue to be laid down in the sector-specific legislation.

The proposals contain no new provisions on the storage temperatures of products, microbiological requirements or conditions for trade concerning these on the internal market, or reform of meat inspection. However, an enabling rule concerning these has been attached to the proposals.

The proposals have no impacts on the additional guarantees for salmonella in Finland and Sweden, but these would remain in force. The additional guarantees require that fresh beef, pigmeat, poultry meat and eggs imported to Finland and Sweden must have been examined for salmonella in the equivalent way as in the national system, with negative results.

The proposal for a regulation concerning the official controls on products of animal origin deals with the reform of the controls for meat, official controls on production of live bivalve molluscs and on fishery products and controls on milk. The proposal aims to bring the Community rules on the organisation of meat controls to the current scientific level in the field, in particular taking into account the most important risks to human and animal health based on the most recent information. The reform of the meat controls will proceed gradually. In the future the animals to be slaughtered must be accompanied by an account of the primary production containing the essential food safety information on the animal, which is already being applied in the slaughter of poultry.

3.4.7. Proposal for a Commission Regulation on microbiological criteria for foodstuffs

The Commission Discussion Document concerning the microbiological criteria examines the possibilities to provide for the microbiological criteria concerning food safety on the Community level in a more consistent way than before. The quality criteria would be set by the operators. The Document if based on the opinion of the Scientific Veterinary Committee dealing with public health issues in the Community of 23 September 1999. The Scientific Committee considers that, unlike at present, the microbiological criteria should be founded on scientific risk assessment as recommended by the Codex Alimentarius Committee. However, the Scientific Committee was also ready to keep a number of temporary criteria in force. The Scientific Committee has emphasised that, when considering the establishment of the criteria, their functionality as a means of risk management should be taken into account, in addition to the impacts of the microbes on consumers. If a certain microbe occurs relatively infrequently in foodstuffs, setting criteria for this and continuous testing of foodstuffs is not an efficient means of protecting the consumer.

The Commission proposal states that the microbiological criteria could be provided for on the Community level so that, on the one hand, they would be directed either to the production stage or to the finished product and, on the other, the criteria would be either guidelines or mandatory. The proposal presents binding criteria for the finished products concerning, for example, listeria in ready to eat foodstuffs and guidelines concerning e.g. salmonella in meat. The new microbiological criteria should enter into force at the same time with the new hygiene regulations in the beginning of 2006.

3.4.8. Feed Hygiene Regulation

The EU is processing a Regulation laying down requirements for feed hygiene, which aims at improving the safety of feedingstuffs in the whole feed chain. The Regulation lays down provisions concerning the registration or approval of operators in the feed sector and own-checking, including a compulsory HACCP for feed manufacturers. It sets down the requirements for the manufacture of feed on farms and good practices for feeding. The hygiene criteria will be established later on by comitology procedure. The regulation will encourage to the drafting of good production codes for feed companies and farms.

3.4.9. BSE legislation

Regulation (EC) No 999/2001 of the European Parliament and of the Council laying down rules for the prevention, control and eradication of certain transmissible spongiform encephalopathies (TSEs) lays down the procedures to be followed when these diseases are suspected or detected, regular sampling for TSEs in the Member States, removal of so-called risk material, restrictions on the use of meat-and-bone meal in feed, health conditions to be followed in the trade in live animals and products derived from these and classification of states in respect of the BSE risk. Even if BSE is the only TSE proven to be linked to the vCJD in humans, the regulation also covers the prevention of the encephalopathies in other animals in accordance with the precautionary principle. These include the scrapie in sheep, transmissible mink encephalopathy (TME) and chronic wasting disease in deer (CWD).

3.4.10. Animal By-Products Regulation and treatment of biowaste

Regulation of the European Parliament and of the Council laying down health rules concerning animal by-products not intended for human consumption (1774/2002) aims, among other things, at reducing the risk of spreading BSE when handling and disposing of animal by-products. Efforts are also made to prevent the risk caused by other animal diseases and zoonoses and the possible harmful substances contained in by-products to public health and animal health. The Regulation lays down detailed rules for the collection, transport, storage, handling, use and disposal of animal by-products and the requirements to be applied in the trade of such products.

The tightening EU regulation is going to alter the treatment of all biowaste. If the reservations concerning the increase in the waste incineration capacity continue, the sorting of waste in a landfill and collection logistics for biowaste may cause zoonosis problems. In landfills the risk affects especially the workers carrying out the sorting. In the so-called mechanical/biological treatment (MB) the garbage bags are reopened in landfills after a certain delay, which may expose the workers directly to the pathogens. In the MB strategy the public zoonosis risk may be further increased in two ways. First, it produces low-quality fuel with bad smell which does not sell very well. The piling stocks may lead to rat problems if appropriate preventive measures are not taken. 2) If the biowaste really is recycled, i.e. waste is spread widely in the society (e.g. agriculture), it may increase the zoonosis risk in general. Separate collection of biowaste involves logistics problems, which in the case of delays may attract rats in large areas in different parts of Finland. This may also happen if composting at homes becomes increasingly popular in sparsely populated areas. When carried out appropriately (especially considering the rats) composting at home is expensive compared to the municipal services which have been available so far. There is the risk that to cut the costs the composts are not rat-proof and the composts are not managed in a way they should be.

3.5. Research and training

Scientific research is needed for the prevention of zoonoses to be effective and optimally targeted. Research regarding zoonoses is done primarily in veterinary and human medicines but also in the fields of agricultural sciences, ecology, epidemiology, microbiology and economics. In Finland scientific research on significant zoonoses has mainly concerned salmonellosis, listeriosis, campylobacteriosis, yersiniosis, trichinellosis, echinococcosis, EHEC infection and Puumala virus together with other viral zoonoses.

Research in veterinary medicine has concentrated first and foremost on reducing the prevalence of pathogens both in the animal population and the production environment of the food industry. Correspondingly, research in human microbiology has concentrated on diagnostics and profiling which has advanced greatly due to the DNA based methods in the past decade. Nevertheless, the Finnish zoonoses research, as often its European counterparts, has lacked in long-term and interdisciplinary research and the missing data has led to problems when planning preventive action. In order to efficiently control the occurrence of infections data is needed primarily regarding human morbidity but also regarding the ecology and dynamics of the host animals, structures of production as well as the impact and costs of different risk management options.

The overall picture of both immediate and long-term effects of zoonotic microbes on the health of a population is somewhat unclear. Hence, in many areas of zoonoses where preventive programmes, aimed at primary production or advanced processes of the food industry, are planned and implemented, the data regarding the effects on the public health based on research or evidence-based medicine is scarce. Using foreign research data as a foundation for Finnish prevention programmes should always be circumspect due to variations in conditions, processes and the marked differences appearing to exist in the morbidity in different countries. Prevention programmes of the most significant zoonotic diseases ought to be based primarily on domestic research findings.

Diverse applied epidemiological research should be done on the most significant zoonoses in which the complex of problems of a specific microbe or group of microbes is studied with a holistic approach whilst integrating the research in the risk assessment and interventions of primary production and advanced processes with the research on the morbidity amongst the population. Markedly more powerful than the current criteria can thus be derived from the public health indicators for steering the prevention programmes. Consumer habits are of great significance in the risk assessment of zoonoses spread by foodstuffs, which means that the collection and analysis regarding the valuable information ought to be increased. The prioritising of the preventive measures could be clarified by high-quality research data. This could lead to improved cost-effectiveness in both health protection and food industry.

Applied epidemiological research on infectious diseases is not given high priority either in the Finnish or international research funding. Therefore, it has proven highly problematic to get funding for larger entities in which research on primary production veterinary medicine, food hygiene and their intervention potential in Finland would be combined with the epidemiological research on the human population. There would be excellent facilities for joint interdisciplinary research in Finland due to the well-developed infrastructure, good liaison networks between the authorities and the research workers together with virtually unique research opportunities in public health aided by centralised recording systems.

Neither the risks of infection in foodstuffs and the environment nor outbreaks are given much emphasis in the basic training of physicians.. Many physicians then later on end up in positions in which they should be prepared to undertake investigative and preventive measures, when sporadic cases, clusters or outbreaks appear. In recent years, municipal health authorities and groups of experts in charge of communicable diseases in hospital districts have been given short courses of further training in order to improve their readiness. Due to limited resources the training supplied does not meet the demand.

The basic training of veterinarians concentrates far more on areas like identifying, investigating and preventing the risks of infection in foodstuffs and the environment than that of physicians. Both elementary and applied research on bacterial zoonoses have traditionally been active whereas research on viral and parasitic zoonoses has been limited by lack in lecturers' posts for these special fields in the Faculty of Veterinary Medicine. For zoonotic virology, there was a turn for the better when the University of Helsinki created a joint professorship of the particular field for the Faculties of Medicine and Veterinary Medicine in 2002, albeit only temporarily for the five-year-period of 2003-2007. The training in veterinary parasitology continues to be purchased from experts outside the university, which sets significant limitations on the continuity of both training and research of this specific field as well as on the opportunity for the students of veterinary medicine to obtain comprehensive know-how. One of the cornerstones of preventive veterinary medicine is epidemiology, the research of which has, thus far, concentrated on combating the animal diseases, which can be seen in extremely low prevalence of many of the animal diseases carrying a potential risk to human health. This in turn has a direct impact on the human morbidity. In addition, the university has recently created new lectureships for infection epidemiology, quantitative epidemiology and meat inspection, which is likely to increase training, for instance, in zoonoses epidemiology.

Of the different special fields within veterinary medicine, especially healthcare of production animals, communicable animal diseases, environmental healthcare and food production hygiene all teach good readiness for the prevention of zoonoses - not forgetting the hygiene proficiency examination which almost half of the veterinary practitioners take shortly after qualifying. Nevertheless, knowledge of field epidemiology obtained in practice, which may be difficult to obtain in smaller municipal units, is of essence when tracing the source of a zoonosis. Hence, the current process of regionalising environmental healthcare where veterinarians specialise within the units is to be considered a positive development.

Microbiologists are trained in the University of Helsinki in both the Faculty of Agriculture and Forestry and the Faculty of Science. Training for readiness to identify the risks of infection in foodstuffs and food production as well as the environment is given primarily in the subject of microbiology in the Faculty of Agriculture and Forestry. Food sciences (food microbiology, food chemistry and food technology as well as dietetics) are the faculty's second largest line of studies. Approximately 150 persons work with food sciences in Viikki in teaching, research and related tasks. Within the field of microbiology, both elementary research and applied research on food poison bacteria and zoonotic bacteria as well as training regarding their risk assessment have been particularly active in recent years. The training of microbiologists in the Faculty of Science lays more stress on general and clinical microbiology. The microbiologists' four year specialisation training in clinical microbiology has included training on zoonotic microbes.

More physicians, veterinarians and microbiologists ought to be trained for this specific field in promotion of qualitative, effectiveness-oriented multidisciplinary research on zoonoses involving varied authorities, experts and researchers. Common concepts and code of action generated by the shared theoretical instruction and, using that as groundwork, problem solving through practical experience of epidemiological work in the field significantly increase the effectiveness of the collaboration and the end-result of different sectors. Further domestic training courses of one week's duration on investigation of outbreaks, as a result of cooperation of several sectors, have been carried out since 1998. Notably wider scope of readiness can be obtained in special training programmes of field epidemiology, such as the 2-year Epidemiology Intelligence Service (EIS) in CDC in the USA, where foreign students have been able to receive training and which has been used as a model for the European Program for Intervention Epidemiology Training (EPIET) created in the 1990s and maintained by the EU. A number of Finnish physicians and veterinarians have received training in the European establishment. The need for training is further increased by the rapidly developing surveillance and combating of communicable diseases between the EU Member States.

The volume of training must be greater than that necessary for routine work in order to ensure sufficient readiness and strategic reserves. Both the frequency of the above mentioned short courses for outbreak investigation and the number of trainees in the more extensive programme of field epidemiology ought to be increased, which in turn requires further resources. The upkeep of practical readiness in those who do not continuously work with this particular complex of problems ought to be guaranteed by, for example, rotation whereby those who have received training would have the opportunity to implement their acquired knowledge in practice.

3.6. Nordic cooperation

Finland, Sweden, Norway and Iceland, as well as Denmark in part, form a fairly uniform area with regard to zoonoses. Relatively few zoonotic pathogens are prevalent in their food production chains compared with many Central European countries (e.g. salmonella, campylobacter and EHEC). There has also been a similar trend in human morbidity; for instance, the number of reported cases of campylobacter infections exceeded the number of reported salmonella cases in all these countries already some years ago. The food production chain, natural conditions, many of the people's customs and eating habits together with the level of control are all very similar in these countries.

Therefore, reasonably close cooperation with other Nordic countries in the field of zoonoses has been considered beneficial. Collaboration is carried out in the fields of control and research as well as in the working groups and projects under the Nordic Council of Ministers together with EU projects. Cooperation has also covered other areas considered important by these countries.

There is a national centre of zoonoses in three Nordic countries. That of Denmark is the largest (approx. 30 employees). In the zoonoses centre in Sweden, there are five academic employees as well as technical staff of 1.5 man-years, in addition to staff to the value of 2-4 man-years otherwise connected with the operation, per annum. The Norwegian zoonoses centre has 3 full-time research workers and a secretary together with a part-time scientific advisor. Approximately one third of the zoonosis centre budget has been dedicated to the local Institute of National Health, which has used the funds for employing two research workers. The tasks of the zoonoses centres include coordinating the national collection of zoonoses data from feedingstuffs, animals, foodstuffs and humans according to the Zoonoses Directive, developing the collaboration of different authorities, giving consultative aid, participating in scientific research and carrying part of the responsibility for informing the public of different zoonoses. In addition, some of them arrange training and participate in the investigation of food-borne outbreaks (in Denmark and Sweden) or are responsible for operations of the veterinary aspects of the national programme of antimicrobial resistance (Norway). They also have an active role in international cooperation; for instance, already the fourth annual conference of the Nordic zoonoses centres was arranged in April 2003.

4. CHANGES IN THE OPERATING ENVIRONMENT

4.1. Challenges of the changing agriculture

The operating environment of agriculture and food production industry has undergone marked changes in the past decade. Membership in the EU and its common agricultural policy and internal market have made international competition fiercer and increased the mobility of agricultural products and food products. Furthermore, the wider international pressure for change, such as the WTO negotiations to liberalise world's agricultural market also influence the operating environment. Discussions for the expansion of the EU have taken place with 10 applicant countries. A prerequisite for the undisturbed function of the internal market is the implementation of the Community's legislation by the applicant countries.

The reform of the common agricultural policy (CAP) of the Community includes development measures for animal welfare and food safety. The Commission proposes complementary conditions (cross-compliance) for farms to qualify for the receipt of direct aid payments and abiding by the rules of the farm advisory system. Complementary conditions would consist of, on the one hand, Community legislation on food safety (feedingstuffs, foodstuffs, pesticides), animal and plant health, occupational safety, the environment and animal welfare and, on the other hand, good farming practice. Failing to fulfil the complementary conditions would be followed by a decrease in direct aid payments or even a ban from the aid scheme for a number of years. Discussions regarding the implementation of the future scheme are still going on.

4.1.1. Developments in agriculture

Finland's membership in the EU from the beginning of the year 1995 brought about considerable changes particularly in agriculture. Agriculture of the EU is characterised by concentration of production both regionally and in individual holdings. The number of farms has decreased by 21% in 1995-2001. Production has decreased particularly in remote districts both nationally and regionally. In 2001, there were 75 400 holdings in Finland with the average area of 29.3 ha (farms >1 ha). Production has concentrated to larger holdings than previously whilst smaller holdings have ceased operation. The share of larger production units of the overall production has grown, particularly in the production of pigmeat, poultry meat and eggs. However, the average size of the Finnish farm is still small by the European standards.

In 1995-2001 the share of animal farms of all holdings decreased whilst the share of plant production farms has clearly increased. In 2001 42% of all holdings which applied for direct aid were animal farms and 54% raised arable crops. Corresponding figures from 1995 were 52% of animal farms and 39 % of crop farms.

4.1.2. Changes in animal production

Apart from the increase in poultry meat production, no significant changes have taken place in Finland's total volume of produce of animal origin under the EU. Holdings that have made investments have been able to compensate for the missing output of those farms that have ceased their operation. In view of the current situation, the structural developments in the animal production sector will continue to take place and the size of the production units will increase. The increase in the size of the production units as well as the regional concentration of production have been an ongoing trend in recent years. This may have significance on the spreading of zoonoses, as epidemics may be spread more easily in areas of dense animal population as opposed to areas with low animal density.

In 2000, dairy husbandry was the main line of production for approximately 21,000 farms, one third less than in 1995. A significant proportion of beef continues to be produced on dairy farms when the farm's own bull calves are reared for slaughter. Beef rearing on dairy farms has, however, decreased in the past two years. Approximately 5,100 holdings specialised in beef production in 2001.

The number of holdings specialising in pigmeat production was nearly 4,000 in year 2001. Of those, the main production sector was piglet production on almost 1,500 holdings (38%), on 1,200 holdings (30%) it was pigmeat production and a combination of the two on 1,300 holdings (32%). After joining the EU, the amount of pigmeat produced has not changed notably, but the number of holdings specialising in pigmeat production has fallen nearly by 40%. Thus, the unit sizes in pigmeat production, piglet production in particular, have increased in the past few years. At the same time, the production is distinctly concentrating to Southwest Finland and Ostrobothnia.

In 2001 egg production was the main production sector on approximately 1,000 farms, one third less than in 1995. At the same time, the average size of a poultry farm had more than doubled, yet the total volume of production has decreased from 75 million kilograms to 57 million kilograms while the output per hen stays unchanged (17.2 kg/hen/year). In 2001 poultry meat was produced on less than 300 farms, of which 80% produce broiler meat and 20% turkey meat. The overall production has almost doubled since 1995. Broiler production in particular tends to concentrate near slaughterhouses. Hence, the size of the existing production units has grown as a result of the increase in production. Production is concentrated around the four largest slaughterhouses in Southwest Finland, Ostrobothnia and regions of Häme and Etelä-Savo.

4.1.3. Organic production

The share of organic production in Finland is 6.7% of overall production, but the objective is to increase the share to 10% by 2006. The share is among the largest in Europe, which means that the scientific background of the health and safety aspects ought to be studied extensively. Very little research data exists on the beneficial effects and safety of organic produce.

In organic production, it has been feared that the use of manure, in particular, will spread significant zoonotic agents such as *salmonella, yersinia* and the EHEC bacterium. Attempts are made in both organic and traditional production to prevent these pathogens from spreading to the food chain by composting the manure before its use as fertiliser. Processing the manure is therefore essential in the prevention of spreading an infection to feedingstuffs, animals and foodstuffs.

Based on the current knowledge, there is no evidence that organically produced foodstuffs cause any more or less food poisonings than those produced by traditional methods.

4.2. Animal import and its changes

Zoonoses which have not existed previously or have already been eradicated from Finland may be brought to the country by live animals. Such potential new zoonoses, currently not prevalent in our country, include *Echinococcus multilocularis*, brucellosis, rabies, West-Nile encephalitis and avian influenza. If animal import is uncontrolled it may also impair the situation with the currently existing zoonoses in our country (e.g. salmonella).

The import of production animals is relatively low at present and the fear of dangerous animal diseases tends to guide the imports to regions/holdings considered safe. Voluntary work within the industry is of great significance in managing the import-induced risks since the authorities' means to regulate the precautionary measures in connection with import is limited within the EU's internal market. The Association for Animal Disease Prevention (ETT) has drawn up guidelines for the import of production animals in which the prevention of zoonoses has also been taken into account. A great majority of the import of production animals follows these guidelines.

The import of exotic animals has been on the increase since the 1990s. The import of bisons, alpacas, ostriches, Highland cattle and miniature pigs, for example, was launched for the purposes of breeding, adventure travel and pets. The popularity of turtles, lizards and other reptiles as pets has increased, but new zoonoses can also be brought into the country by ordinary pets, like dogs. Some smuggling also takes place in addition to legal importation. A surge of smuggling of turtles and even dogs followed the liberation of the eastern borders in the 1990s. A potential, albeit smaller, risk are the trips made abroad for exhibition and breeding purposes by animals residing in Finland, or similar trips to Finland made by foreign animals.

An infection can be transmitted from the imported animals to the domestic animal population of the same species (e.g. brucellosis, tuberculosis), spread to new animal reservoirs (e.g. salmonellosis, tuberculosis), the environment (e.g. echinococcosis), the feedingstuffs (e.g. BSE or salmonellosis) or directly to humans. Trade and the transportation of animals may spread an infection or accelerate the birth of a domestic chain of transmission.

4.3. Food industry and its changes

A rapid decline or, at the very least, reduction of the food industry was predicted when Finland joined the EU in 1995. International competition was feared to create problems for our own food industry. At the end of the 1990s the situation for a number of companies seemed, indeed, serious. Positive developments started taking place in the food industry in 2000 and they are still going on. For many companies within the food industry, the year 2001 was the best under the EU membership so far. The share of exports grew by 12% and their value exceeded one billion euros while domestic turnover grew by 12%. One important factor has been the trust placed in domestic food produce by the Finnish consumers.

The gross value of the food industry in Finland was approximately EUR 8 billion in 2000 and it was the fourth largest branch of industry. Among the different branches of food industry, meat industry had the largest value added of approx. EUR 0.4 billion in 2001. The export of pigmeat and poultry meat, in particular, has increased during our EU membership while the export of beef has decreased significantly. A decrease in overall beef consumption in the EU followed the BSE crisis.

Both import and export of foodstuffs have grown considerably under the EU membership. The increasingly international trading chains and the growth in stores' own brand products present further challenges. Enterprise purchases, fusions and collaboration have all become commonplace. The expansion of the EU will further increase the competition

The food industry must be prepared to meet the varied domestic challenges as well, such as the growing number of small households, aging population and continued urbanisation. Consumers have specific demands: some consumers are more demanding gourmets and behavioural patterns are changing faster than before. At the same time, the popularity of ready-made meals is on the increase and the health, safety and ethics of food are considered important.

Industry aims at raising the degree of processing globally, which leads to more and more highly processed products which are packaged already in the country of their origin. The proportion of ready-packaged products is rising steadily in our country, too. Processing and packaging mainly reduce the risk of infection, but longer shelf-lives increase the risk of infection from certain pathogens.

The production and packaging techniques of food products have changed and are developing continually. Improved hygiene in production and developed packaging techniques allow for longer storage and thus longer sales periods of perishable foodstuffs. This brings along its own hazards, particularly in connection with the multiplication of pathogens thriving in the cold. Examples of these are *Listeria monocytogenes* and yersinias.

4.4. Changes in trade

Among the most central characteristics of trade is the aim to meet the demands of the clientele. Increased long-distance foreign travel and experiences gained by it enable the customers to wish for and expect an even wider and more exotic choice in food products. In its purchases a store, on the one hand, aims at cooperation in both purchases and logistics but, on the other hand, at discovering specialities differentiating it from its competitors. Naturally a store also attempts to benefit from all differences in price. All this may play a part in increasing the risk of foodborne zoonoses.

However, stores are very conscious of product liability and want to protect themselves from the risks. Hence, trading associates are chosen carefully. Attempts are made to guarantee quality and prompt deliveries with, for example, the aid of auditing and sampling of the products. Central retail companies which implement in-house control expect this, together with risk management, of their own suppliers.

Major changes can already be seen taking place in the food trade, such as the food giants' strengthening footing on the international market as well as the concentration and chaining of outlets.

4.5. Changes in population and consumer behaviour

The Finnish population is aging as more and more seriously ill people can be treated, meaning that the share of the immune compromised amongst the population is increasing steadily. This also predisposes that share of the population to various infectious diseases which would not normally increase the morbidity amongst those with a healthy immune system.

Infectious diseases also play a part in the onset of many chronic illnesses. The Finns are known to have a significantly raised predisposition of being stricken with, for instance, reactive arthritis as a complication of salmonellosis or yersiniosis. Multiresistant strains of bacteria are a particularly burning issue and a growing problem in other parts of the world but, at least for the time being, they are not a significant risk to the public health in Finland.

New pathogens are discovered continuously whilst old problems are re-emerging, as with the immune compromised patients. The variation in the risk factors is growing, among other things, due to the multiplicity of the food production chain as well as globalisation.

The marked increase in foreign travel, particularly in long-distance travel, also raises the morbidity in new and rare zoonotic diseases. Good and efficient guidelines and services to the public regarding healthcare abroad are needed in order to reduce the risks. Effective utilisation of vaccination programmes also reduces morbidity. Tourism and immigrants from foreign cultures have increased the Finnish people's interest towards new and exotic foodstuffs. The will to experiment with new ingredients and methods of preparation also increases the risk of new diseases.

Consumers' interest towards everything natural seems to be on the increase, but the comprehension that natural does not necessarily mean safe does not appear to be increasing. Epidemics spread by unpasteurised milk are examples of this. Increase in the number of zoonotic infections may also reflect the consumers' hectic life-styles. The growth in the consumption of ready-to-use, ready chopped or grated, fresh produce can thus lead to an increase in the number of cases of infections caused by cold-resistant zoonotic bacteria (yersinia, listeria). Also the growing consumption of fast food and ready-to-eat products may reflect to increased cases of food poisoning.

4.6. Environmental changes

Internationally, and in part nationally, the quality of both groundwater and surface water is deteriorating. Following the increased control of point source pollution in the water system (building of treatment plants, more effective water treatment) the biggest threat to the quality of Finland's surface water is diffuse pollution (emissions from agriculture, other diffuse pollution, forests and other land sites) together with fish and fur farming locally. The quality of Finland's groundwater is threatened by the use of deicing salt, the release of harmful substances into the nature together with point source pollution (nitrite emissions from fur farms as well as sawmills and laundries). Excessive use of water, and the consequent drop in the groundwater levels, is not a problem in Finland: we only use 2% of the water yield of groundwater whereas the corresponding figure elsewhere in Europe exceeds 15%. For the part of household water, the aging water pipe network forms a threat to the quality of Finnish drinking water.

The increase in waterborne epidemics caused by the campylobacter in recent years is one of the most significant threats presented by zoonoses in Finland. Campylobacter-infected household water has been identified as the source of some quite extensive epidemics in Finland in recent years (Haukipudas, Asikkala). Another significant causative agent for waterborne epidemics is the norovirus found in the human faeces. Nearly all waterborne epidemics in Finland have been at groundwater catchment areas where wastewater has mixed with clean water as a result of either flooding or human error. During exceptionally dry summer seasons (e.g. in 2002 and 2003), wells have dried out, resulting in the use of reserve water catchment areas, which has been reflected as poorer hygienic quality of water.

Health implications of climatic changes as well as their magnitude are difficult to assess. Global warming can make farming unprofitable in many areas and interfere with food production. This may result in extensive problems of migration and refugees. Particularly in the developing countries this may involve indirect health hazards, such as epidemics in refugee camps and a growth in the prevalence of communicable diseases derived from poor hygiene.

The most significant health risks posed by global warming are the changes to the areas where vector-borne diseases (spread by insects or other arthropods) are prevalent. The natural rotation of certain tick-borne viruses is made possible as the climate becomes more favourable. For instance, when various developmental stages of ticks simultaneously attempt to feed on the blood of a single rodent at the same time of the year, the tick-borne encephalitis (TBE) transfers far more easily from the ticks' nymph stages to the larvae. This is why the prevalence of tick-borne encephalitis has increased ten-fold in a decade, resulting in a need for an active vaccination campaign in the Åland Islands. Malaria and, of zoonotic infections, the West Nile virus are examples of diseases that may be spread to Finland in a mosquito population carrying the virus. Global warming also affects the ecology and population dynamics of rodents and small predators, presumably increasing the prevalence of rodent-borne zoonoses.

4.7. Bioterrorism

The aggravated state of world politics has caused more and more concern for increased bioterrorism in recent years. Political or religious groups are regarded as the biggest threat, as opposed to governments whose action, at least in principle, is limited by the 1975 treaty banning the use of biological weapons. The aim of bioterrorism is to spread diseases and thus use the threat of this to paralyse the operation and economy of the target population. In the worst scenario, in addition to psychological fear, bioterrorism would cause serious threat to the public health. Bioharassment is in the epidemiological sense more limited and milder as a phenomenon, but it might be instigated by a larger crowd of discontented nationals. Attempts have been made to secure the samples of pathogens through legislation (biosecurity) although in practice, securing them is extremely difficult. Due to the biological agents' ability to multiply even the smallest amount in the wrong hands is potentially dangerous. Furthermore, it ought to be acknowledged that, even with relatively modest know-how, many pathogens can easily be isolated from human, animal or environmental samples.

A number of zoonotic microbes, or toxins produced by them, have potential for intentional use in bioterrorism or bioharassment. The documented cases of bioharassment of recent years include, for instance, polluting the food with salmonella bacteria in a luncheon restaurant, whilst anthrax spores specifically bred for warfare were used as a means of bioterrorism by planting them in letters in the autumn of 2001. Recognising bioharassment and bioterrorism requires a well-functioning detection system for case clusters and epidemics, the essential parts of which are a well-trained clinical field as well as the necessary laboratory facilities on standby. The realisation of bioterrorism requires the use of microbes or their toxins whose detection in the infected individuals as well as in samples taken from foodstuffs and the environment requires the use of highly developed specific methods in specialised laboratories.

4.8. Product safety in international trade

International trade in agricultural produce has grown intensely in the last decade. This trend is likely to continue with the expansion of localised free-trade areas as well as amongst international trading syndicates. Freedom of trade has given rise to concern about the spreading of pathogens or other factors harmful to plants, animals and/or humans to new areas. However, it has been considered important to ensure that potential health risks are not used to hinder free trade without the appropriate assessments of true risks.

In order to manage trade-connected health risks, including zoonoses, principles or agreements have been created to promote advancing freedom of trade whilst taking the safety aspects into consideration. The most significant ones are the SPS Agreement, the use of risk assessment in decision-making, precautionary principle, food safety objective (FSO) and appropriate level of protection (ALOP).

4.8.1. SPS Agreement

The World Trade Organisation's (WTO) agreement regarding sanitary and phytosanitary measures, the so called SPS Agreement, gives the consumer basic protection as the user of produce of international trade. According to the SPS Agreement, trade must not cause risk to the lives of the consumers, animals or plants. The SPS Agreement covers the legislation designed for the protection of human health from the presence of additives, contaminants, toxins in foodstuffs and disease-causing organisms as well as their surveillance systems. For the part of animal and plant health, the Agreement further covers active measures aimed at protecting animals and plants from diseases or health-risks.

In their sanitary and phytosanitary measures, the members of WTO are obliged to conform to the international standards, guidelines and recommendations established by the Codex Alimentarius Commission, the International Office of Epizootics (O.I.E.) and organisations within the framework of the UN International Plant Protection Convention as strictly as possible. However, the SPS Agreement entitles the members to apply a higher level of protection in their surveillance measures than that stated by the international standards. Provisions for such action are that it must otherwise conform to the Agreement, it must be based on scientific risk assessment and it must not be unnecessarily restrictive to trade. One problem in the application of the SPS Agreement has been the definition of member states' own individual acceptable level of protection (ALOP), i.e. their acceptable level of risk, and its effect on the surveillance requirements in practice.

A member may also apply provisional sanitary and phytosanitary measures without sufficient scientific evidence, based on existing relevant information. This entitlement to apply protective measures can be called the precautionary principle of the SPS Agreement. The application of this precautionary principle of the SPS Agreement continues to be subject to risk assessment within a reasonable period of time or at least re-evaluation of the relevant information.

4.8.2. Risk assessment of zoonoses

Risk assessment is an essential part of the entire process of risk analysis of zoonoses aiming at optimised decision-making. In addition to assessing and managing the risks, information regarding the risks is a part of the entirety (FAO/WHO 1997). Risk assessment entails the entire process whereby the potential hazards of a particular foodstuff / animal / the environment to humans are identified and described together with evaluating the predisposition to them and assessing the risk they present. The current view is that, in addition to assessing the risks related to international trade, the development and control of both national and EU legislation also ought to be based on risk assessment. The EU's European Food Safety Authority (EFSA) was founded for this purpose in 2002. National scientific risk assessment is necessary in situations where higher levels of protection than those applied by other countries are desired or individual solutions for the risk management of zoonoses are sought.

WHO and FDA have produced four risk assessments regarding zoonoses requested by the Codex. Out of these, examinations for Salmonella in eggs and broiler chickens have been completed whilst those for *Listeria monocytogenes* in ready-to-eat products, *Vibrio* spp. in seafood and campylobacteria in broiler products are all under way. The reports are all freely available to the public (e.g. http://www.fao.org/es/esn/food/risk_mra_riskassessment_en.stm). In addition, the risk profile of the EHEC bacterium is currently being drawn up. The Codex Alimentarius Commission uses these reports together with other information as the basis for discussing the risk management principles of the abovementioned zoonoses.

Scientific Committees under the European Commission have also carried out risk assessments on zoonoses. Now this work continues in the Scientific Panels within the framework of the European Food Safety Authority (EFSA) and, in particular, in the Panel on biological hazards. However, the completed reports are often scientific opinions mainly regarding the question of limited risk management rather than actual risk assessments. They are used to aid the development of EU legislation. The latest reports include Honey and the *Clostridium botulinum*, Norwalk-like viruses, trichinella, vibrios, EHEC and salmonella (http://europa.eu.int/comm/food/fs/sc/scv/outcome_en.html). The Scientific Steering Committee has continually worked on the risk of BSE, including the geographical BSE risk of cattle.

Many countries carry out national risk assessments to assist their own decision-making. Examples of these are *Salmonella* Enteritidis in eggs and Fluoroquinolone resistant campylobacter, both carried out in the USA, Campylobacter in broiler chickens under way in Denmark and the UK, risk evaluation of listeria in France and risk assessments of e.g. EHEC made in Canada, Ireland, Holland and the USA. The objective of each country is to take into account the national fluctuation in the prevalence of an infection, the production chain as well as consumer habits in order to optimise the risk management measures undertaken. In Finland, risk assessments have been published on *Echinococcus multiolocularis* and *E.chinococcus granulosus*, salmonella in pigmeat and broiler meat production, the risk of BSE in import and general outline of the risk of campylobacter.

4.8.3. Precautionary principle

The Commission presented a Communication regarding the application of precautionary principle on 2 February 2000. According to the Commission, the precautionary principle has been a politically accepted risk management strategy in a number of fields. Even if the precautionary principle has been mentioned specifically in connection with the environment in the treaty establishing the European Community, the Commission regards the application of the principle exceeding the field of nature conservation to include the protection of human, animal and plant health. The document presented by the Commission is based on the definition of the precautionary principle as included in the Cartagena record of biosecurity agreed upon in Montreal in 2000.

The Commission Communication emphasizes that defining the acceptable level of risk within the EU is a political task. The Communication aims at giving grounds, together with an outline of framework, for action under scientifically uncertain circumstances as well as pointing out that the precautionary principle does not justify the disregard of either scientific evidence or protective measures.

When the application of the precautionary principle necessitates sanitary measures, they ought to be in proportion to the desired level of protection, equal to those of similar risks and congruent with preceding similar measures. Furthermore, the advantages and disadvantages of action or non-action ought to be scrutinised. The adequacy and relevance of the chosen measures ought to be estimated in the light of the latest scientific evidence. The measures undertaken in compliance with the precautionary principle should continue only until sufficient scientific data is obtained to re-evaluate the measures or until the risk following the resignation of the measures becomes socially acceptable. Additionally, the responsible party or one who possess the burden of proof to produce the necessary data for a comprehensive risk assessment is established upon the introduction of the sanitary measures.

The Nice European Council scrutinised the Communication and issued a Council Resolution in support of it. The Council accentuates the significance of risk assessment, albeit admitting that it may not always be possible to complete all stages of risk assessment successfully. In relation to consistency with previously adopted similar measures, the Council noted that the latest developments within science together with elevation of the desired level of protection must be paid due regard to. The Council also emphasizes transparency in risk assessment and risk management as well as expected recognition of the precautionary principle in appropriate international forum.

The response of the international community has been reserved. The USA and a number of developing countries have noted that precaution should be taken into consideration in the scientific forum, i.e. risk assessment.

4.8.4. Food safety objectives (FSO)

Food safety objectives (FSO) in appropriate stages of the production chain are needed in order to reach an acceptable level of protection (ALOP). Unfortunately, the precise definition of the FSO is still undecided even if there have been lengthy discussions regarding it at the international level at the Codex Alimentarius Commission. The fundamental principle is that the FSO applicable to zoonoses would describe the prevalence and/or the level of a zoonotic agent considered safe in a particular food. According to the current view, the FSO is composed of three parts: the food, the hazard and the level of protection. The level of protection reflects each country's objectives in food hygiene and national health as well the readiness to achieve them. The set level could, therefore, be national, regional or even company-specific. The relation of FSO to actual microbiological limit values, and to ALOP, remains still unclear.

FSO could introduce a new dimension into the risk management of zoonoses in that, in addition to risk assessment and risk management, parameters would exist by which the effectiveness of the aforementioned measures could be verified. Changing the target values into controllable parameters would benefit both the surveillance authorities and the industry. FSOs would mean validating certain processes to guarantee the safety level, which would ease the consultation work done by the authorities and ensure greater flexibility for the entrepreneurs in their choice of processing methods. Exact and detailed regulations could give way to a more flexible approach whereby the enterprises within the food industry would have a greater freedom of choice between a number of techniques, providing these would conform to the FSO and would have been verified as functional by the HACCP system.

For prevalence of salmonella, for instance, using such approved methods sets the limit value in Finland to zero. If this zero-level is exceeded and salmonella is detected, action will be taken. This zero-level, however, is not an FSO. According to the national salmonella surveillance programme, the target level of the percentage of salmonella-infected, i.e. contaminated, meat and eggs is defined as less than 1 %.

4.9. Strategic speeches

Sweden organised a seminar called Food Chain 2001 under its EU presidency in the spring of 2001. The seminar's presentations regarding zoonoses called for harmonised and efficient case monitoring as well as the modernisation of the food surveillance system. Underreporting of foodborne diseases was recognised as a problem. Meat inspection system ought to be developed towards to meet the actual proven risks to humans.

4.9.1. Gro Harlem Brundtland

Brundtland, Director-General of the WHO stated in her speech that it was high time for Europe to acknowledge that the European food safety systems are nowhere near as effective as had been led to believe. Brundtland recognised two waves in the betterment of food safety; the pasteurising of milk together with the entire operating system of abattoirs early last century and the application of HACCP system at the end of the century. She stated that time had come for the third wave dictated by the marked increase in identified cases of foodborne infections in humans. For example, the incidence of salmonella and campylobacter infections has increased manifold in industrialised countries over the past 15 years. The emphasis of the third wave action must lie in the actual risks to humans. A good start would be to improve our knowledge of the epidemiology of foodborne diseases; tracing the diseases all the way back to the farms. According to Brundtland, this entails:

1. improving the risk assessment measures,
2. developing the methods for the epidemiological surveillance and identification of foodborne diseases,
3. collection of comparable data on the pathogenic micro-organisms of foods and humans, on the one hand in the food chain and on the other hand in different regions and countries and,
4. cooperation between the experts of agriculture and healthcare.

4.9.2. Jørgen Schlundt

Schlundt, the WHO food safety expert presented a nine-point programme through which the focal point of the food safety systems can be directed at the actual risks posed to humans:

1. channelling the resources as close to the pathogens as possible,
2. redirecting and amending the old inspection and control routines to focus on the significant pathogens,

3. reforming the meat inspection procedures so that inspection is directed at the faecal contamination of the meat together with prevention and monitoring of the significant pathogens specific to meat,
4. redirecting the testing of products at retail level so that the information obtained will benefit the entire surveillance system,
5. launching of schemes whereby information regarding the prevalence of pathogens in all stages of production is collected and scrutinised and thereafter compared with the prevalence of diseases in the human population,
6. using scientific evidence as the foundation of decision-making, with the aid of risk assessment,
7. setting targets for the reduction of zoonoses spread by foodstuffs available,
8. follow-up and assessment of the effects of risk management decisions, and
9. combining effective information regarding the risks with all food safety procedures.

4.9.3. A.M. Johnston

A.M. Johnston, Professor in Food hygiene (Royal Veterinary College, UK), noted that it is necessary to reform the meat inspection system so that it is based on the proven risks posed to humans particular to individual species at slaughter. The reformation of the system decreases cross-contamination and unnecessary incising of the carcasses. Abandoning some of the traditional inspection methods may result in the loss of information essential to animal health unless alternative surveillance methods are introduced. This applies, in particular, to the monitoring of bovine and human tuberculoses. Consumers can be guaranteed in the very least the same level of protection as that offered by traditional inspection.

4.9.4. Robert V. Tauxe

Infection expert Robert V. Tauxe (Centers for Disease Control (CDC), USA) raised the following questions:

1. We can presume that many microorganisms present in foodstuffs and causing foodborne diseases are also otherwise infective.
2. Humans suffer from a number of unexplained syndromes and chronic ailments whose origin may be connected to an infection by microorganisms or a condition thereof.
3. It seems that plant and animal pathology rarely intersect but perhaps if we were to meet more often, the problem shared…
4. There is a huge void in our knowledge of the gigantic family of archaebacteria (Archaea).

According to Robert Tauxe's prediction, there is no reason not to believe in the emergence of new zoonoses at the same rate as since the year 1977, namely at least one discovery every two years.

4.10. Factors affecting the detection and number of zoonotic infections

The effects of the changes in the operating environment on the number of detected cases of zoonotic infections in the population have been outlined in figure 1.

<u>INCREASING</u>:

- ↗ Rise in awareness of food poisoning
  - in media → among consumers
  - in research/health care
- ↗ Globalization
  - increased travel and mobility amongst population, animals and products
- ↗ Changes in eating habits and handling of food
  - longer distances of transportation and longer sales periods of food
  - exotic, unknown ingredients
  - consumers' exposure to new pathogens
- ↗ Improved laboratory diagnostics
  - improved identification methods for pathogens
  - classification methods of strains of microbes
    - international networks of cooperation
    - identification of widespread epidemics of low morbidity
  - discovery of new host foods
- ↗ Lack of resources in food control
- ↗ New pathogens
  - influence of potential global warming
- ↗ Possible bioterrorism or bioharassment

<u>DECREASING</u>:

- ↘ Safer preparation methods of food
  - in food industry
    - HACCP, GHP and own-check
    - hygiene proficiency
    - improved acces control
  - in homes and in catering
    - communication directed separately at risk groups
    - airtight, disposable consumer packaging
- ↘ Safer transportation and storage of food
  - overall improved refridgeration equipment
    - tightened levels of target temperatures
  - improved logistics and information administration
    - automated circulation and ordering of food produce
- ↘ Utilising reports of epidemiological tracing
  - include exact data on Finnish zoonoses epidemics based on experience
  - evaluations on the true effectiveness of risk management procedures based on these
- ↘ Prevention: risk assessment → risk management
  - good production practice of primary stage of production
  - shorter sales periods for risk products
  - developing legislation into preventive

Picture 1. Factors affecting the numbers of zoonotic infections detected in the population

The number of identified zoonotic infections is often significantly lower than the actual number of existing cases. Figure 2 presents varied statistics held which accrue data on the prevalence of zoonotic infections and their causes.

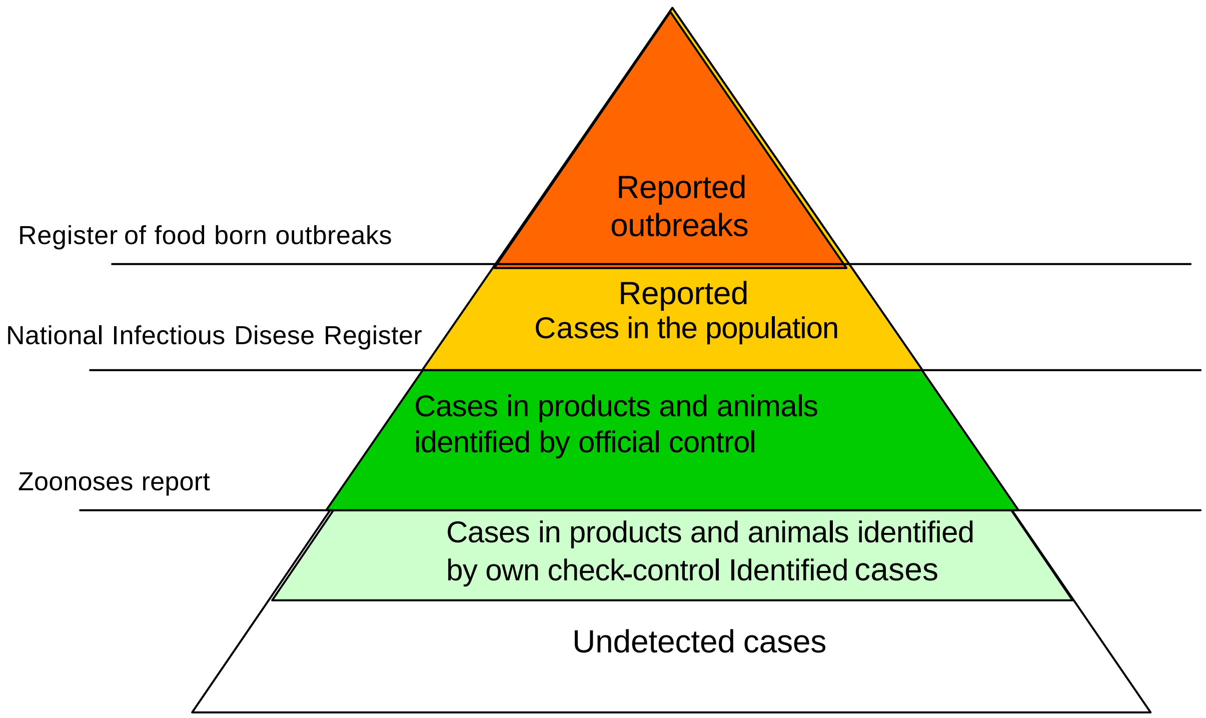


Figure 2. The relationship between the number of cases and cases notified and included in the statistic of zoonotic infections

5. THE MOST SIGNIFICANT ZOONOSES IN FINLAND

Zoonoses may be significant either because they infect vast numbers of people (e.g. salmonellosis, campylobacteriosis, yersiniosis and the Puumalavirus) and/ or because of their serious implications to health (e.g. listeriosis, EHEC infection). Furthermore, particular efforts are made in Finland within the surveillance of animal production to control certain zoonotic agents that either do not exist in Finland or no known cases have been detected for many years. Some of this control is carried out to maintain our official disease-free status (e.g. brucellosis, bovine tuberculosis and rabies). Some of the control is carried out as laid down by the Community or national legislation regarding diseases prevalent in our animal population (e.g. BSE and trichinellosis). Such zoonoses are significant because of the input invested in their preventive work. Due to this work no domestic cases have been detected in Finland for decades.

In Finland a zoonoses report is drawn up annually, as required by the Community legislation. The report describes the majority of the significant zoonoses prevalent in our country as well as those to be combated as required by law. This chapter briefly examines these zoonoses. In addition, some zoonoses are included which the EU's new zoonoses legislation lists as zoonoses of either statutory monitoring or monitoring according to the epidemiological situation, together with some other zoonoses. The zoonoses descriptions have been divided into groups according to their primary method of transmission. However, as shown in Table 1, many zoonoses are transmissible to humans in various ways.

Table 1. Examples of different routes of transmission to humans of certain significant zoonoses in Finland.

Foodborne zoonoses	Waterborne zoonoses spread by drinking water	Zoonoses spread directly by animals or their secretions	Vector-borne zoonoses
Bacterial diseases: Botulism EHEC infection Campylobacteriosis Listeriosis Salmonellosis Yersiniosis **Parasitic diseases:** Echinococcosis Trichinellosis Toxoplasmosis **Prion diseases:** BSE, vCJD	**Bacterial diseases:** Campylobacteriosis Salmonellosis **Parasitic diseases:** Giardiasis Cryptosporidiosis	**Bacterial diseases:** EHEC infection Tularemia Listeriosis Anthrax Salmonellosis Swine erysipelas **Parasitic diseases** Giardiosis Echinococcosis Cryptosporidiosis Toxoplasmosis **Viral diseases:** Puumalavirus Rabies **Fungal diseases:** Dermatophytosis Bovine trichophytosis	**Bacterial diseases:** Borreliosis Tularemia **Viral diseases:** Tick-borne encephalitis Pogosta disease

5.1. Zoonotic microbes as causative agents of human diseases

Most zoonotic agents produce either an asymptomatic or an acute infection (e.g. salmonellosis or rabies). Certain zoonoses may induce long-term effects in addition to acute symptoms (e.g. salmonellosis, yersiniosis, borreliosis and the Puumalavirus). These include different forms of arthritis, opthalmitis, neurological complications and myocardites. A number of zoonotic infections also remain undetected; possibly because a diagnostic examination is carried out only in some of the cases. This is usual in common ailments such as acute gastroenteritis. Alternatively, the reason can be lack of diagnostic knowledge or methods due to the rare or exotic nature of the diseases. It is known that the share of these undiagnosed cases is notable, thus their significance in chronic illnesses is probably much greater than the statistics indicate.

Data regarding the zoonoses prevalent in the human population can best be obtained from the National Register on Infectious Diseases, which includes all of the most significant zoonoses detected in the population and verified by laboratory testing. Additional information is obtained regarding some of the zoonoses by detailed collection of data; for instance, in the case of salmonella it is examined whether the infection is of domestic or foreign origin.

Table 2 shows the population's zoonotic infections as registered in the National Register on Infectious Diseases in the past six years. Quantitatively, the most frequently reported cases were the following zoonoses: salmonellosis approx. 2,700 cases, campylobacteriosis approx. 3,500 cases, yersiniosis approx. 700 cases, Puumalavirus approx. 1,000 cases, tularemia approx. 100 cases and borreliosis approx. 600 cases per annum.

Of the most common zoonoses, campylobacter, salmonella and yersinia bacteria cause intestinal infections and are commonly either foodborne or waterborne. The number of campylobacter infections has been on the increase in recent years. In 1998 the number of campylobacter infections exceeded that of salmonella infections for the first time and since then the campylobacter continue to be the most common bacterial cause of intestinal infections. Approximately one third of salmonella infections are of domestic origin while the remainder of infections are contracted following a trip abroad. No systematic data has been collected of the origin of campylobacter infections, but findings based on the existing random data suggest that a significant proportion of the infections are connected with foreign travel. Yersinia infections are thought to be primarily of domestic origin.

The source of infection with Puumalavirus, tularemia and borreliosis are wild animals. A notable annual variation in incidence amongst the human population can be seen, which is due to the changes in the sizes of the animal population. The number of voles influences the incidence of Puumalavirus. In 2002 the number of reported cases was as high as 2,600. The year 2000 was particularly dismal for the part of tularemia: approximately 900 cases were reported. The incidence of borreliosis varies according to the rodent and tick populations.

Table 2. Zoonotic infections reported to the National Register on Infectious Diseases in 1997–2002 (Source: the National Public Health Institute).

Year	2002	2001	2000	1999	1998	1997
Campylobacteriosis	3738	3929	3527	3303	2851	2404
Puumalavirus	2603	1050	774	2300	1305	758
Salmonellosis	2357	2700	2624	2801	2735	2885
Borreliosis	884	681	895	404	457	538
Yersiniosis	695	721	641	634	713	704
Pogosta disease	597	77	123	27	135	264
Giardiasis	264	301	221	282	296	333
Tularemia	106	29	926	87	117	109
Tick-borne encephalitis	38	33	41	12	16	19
Toxoplasmosis	35	48	40	48	31	45
Listeriosis	20	24	17	39	44	46
Cryptosporidiosis	18	12	4	5	9	16
EHEC infection	17	18	17	32	44	62
Brucellosis	0	1	0	0	1	0
Echinococcosis	0	0	0	0	1	0
Bovine tuberculosis	0	0	0	0	0	0
Anthrax	0	0	0	0	0	0
Rabies	0	0	0	0	0	0
Trichinellosis	0	0	0	0	0	0
vCJD	0	0	0	0	0	0

5.2. Foodborne and waterborne zoonoses

The source of foodborne zoonoses is commonly domestic animals or the environment where foods or their ingredients are handled. Contamination of food may take place either directly by animals, e.g. at slaughter, or by environment or water contaminated by faeces. Zoonotic agents can contaminate food at the primary stage of production, processing or preparation either in institutional kitchens or at home. Contamination rarely occurs during storage, transportation or retail, but zoonotic agents which have already entered the item of food may multiply to a harmful extent.

Preventing the spread of foodborne zoonotic infections calls for active measures within the entire food production chain. Zoonoses can be combated by blocking the zoonotic agents' entry into the food (e.g. the salmonella monitoring programme), by destroying the potential infectious agent (e.g. pasteurising milk) or by preventing its multiplication in the food (maintaining the refrigeration chain). A worker in the food industry may also unknowingly contaminate a food by infecting it with a zoonotic microbe. To prevent this, the workers handling unpacked, perishable foods are required to demonstrate knowledge in food hygiene, either acquired by training or passing a test in food hygiene. Other people working in the food industry must also be able to demonstrate adequate knowledge of basic food hygiene.

In Finland it has been regarded as most cost-effective to concentrate on the primary stages of production in the prevention of zoonoses. The objective lies in keeping the prevalence of zoonotic infections among the production animals as low as possible, thus preventing the zoonoses' access into the food chain. For the part of salmonella, this has succeeded very well. Surveillance and control systems aimed at the primary stages of production are also being developed for other zoonotic infections spread by production animals (campylobacter, EHEC, yersinia). The healthcare systems for production animals have undergone marked developments in recent years following the collaboration between the food industry, the producers organisations and the authorities. The Animal Healthcare System (ETU) is a joint collaborative organisation of the Association for Animal Disease Prevention and the National Veterinary and Food Research Institute, the objectives of which are to combat the prevalence of animal diseases, improve the quality of foodstuffs of animal origin and promote animal welfare. Improved healthcare also contributes to the prevention of zoonoses.

Zoonotic agents, for instance through infected irrigation water, may contaminate foods of plant origin as well. Tracing of sporadic, soil-based causative agents back to be verified as the cause of food-poisonings may be extremely difficult. Sewage sludge and products thereof, used in a similar manner to fertilisers, also carry the risk of zoonosis (LIVAKE Project; the Publications of the Ministry of Agriculture and Forestry 2/2001, 2/2003, in Finnish). Refuse dumps as the final location for sludge and products thereof were mostly banned in 2001. In all probability, pressure towards the agricultural use of sludge increased thereafter. The control of the use of sludge (both putrefied and lime-stabilised) and its compounds is currently the responsibility of the Ministry of the Environment as laid down by a Government Decision (282/94). The control has been insufficient. The hygiene risks of sewage sludge and products thereof are likely to be growing with the increased foreign travel and expanding international trade unless the processing of the sludge prior to its agricultural use is brought up to appropriate standards. The Ministry of Agriculture and Forestry, on the other hand, controls agricultural use of sludge composts and the soil thereof, as laid down in the Fertiliser Act (232/93). Stabilisation by lime is not always carried out properly and the composting practice varies according to municipalities. The composting process must be efficient enough in order to prevent the spread of zoonotic agents. The handling of compost containing infectious agents in the compost field as well as spreading it may also present occupational safety hazards.

In recent years an increasing number of food poisonings of plant and plant product origin have been reported in Finland, whereas the proportion of food poisonings spread by foods of animal origin has decreased. In 1999 36% of food poisoning epidemics were traced back to foods of animal origin whilst the proportion of plants was a mere 11%. In 2002 plants and plant products were reported as the source of infection in as many as 26% of epidemics whilst the share of foodstuffs of animal origin was a mere 5%. The most significant of plant-born epidemics have been salmonella epidemics spread by shoots, *Yersinia pseudotuberculosis* epidemics spread by salad and grated carrots as well as norovirus epidemics spread by imported deep-frozen berries.

The number of waterborne epidemics is smaller than that of foodborne epidemics. During waterborne epidemics, the numbers of people exposed to contaminated water are vast; hence the amount of infections is considerably higher than in foodborne epidemics. The most common causative agents in waterborne epidemics in Finland are the norovirus and the campylobacter. Usually the sources of infection in waterborne epidemics are waterworks using groundwater. The safety of the groundwater waterworks obviously calls for further investments.

5.2.1. Brucellosis

Brucellosis, or contagious abortion, continues to be a significant zoonosis in the South of Europe. *Brucella abortus* in ruminants and *B. melitensis* in small ruminants are the most important of the zoonotic strains. *B. suis* presenting in pigs is also dangerous but less common as a zoonosis. According to the National Register on Infectious Diseases in Finland, brucellosis has been detected in the population twice during in 1997-2001. Both cases were of foreign origin. Due to lack of diagnostic methods, however, brucellosis may be under-diagnosed in the population. In humans, brucellosis takes the form of a prolonged generalised infection. Normally the infection is contracted from contaminated food.

The last reported case of *B. abortus* infection in an animal was in 1960. Other strains of brucella have never been reported in our country. The European Union has granted Finland the officially brucellosis-free status of ruminants. Finland has applied for corresponding additional securities for porcine brucellosis but the case continues to be pending in the EU. In order to maintain the status, the Member States are obliged to monitor the disease situation in compliance with EU regulations. Dairy herds are monitored for antibodies by collecting annual tank milk samples; approximately 10% of the herds are tested by random sampling. In addition, blood samples of beef cattle, sheep, goats and pigs are tested for antibodies. Furthermore, microbiological testing for brucella is carried out on suspected aborted fetuses. The possible spreading of brucella to Finland would most likely take place through a live animal or contaminated food, e.g. cheese made of unpasteurised milk.

Brucellosis is one of the zoonoses with the status of statutory monitoring according to the new Zoonoses Directive. The new Directive, however, does not alter the current monitoring requirements. The annual antibody testing for *Brucella* has exceeded the EU's minimum requirements. Finland could, therefore, reduce the intensity of the monitoring for brucellosis.

5.2.2. EHEC infection

Enterohaemorrhagic *Escherichia coli* (EHEC) group of bacteria consists of several subgroups of *E. coli* bacterium, of which the best-known zoonotic serotype is O157:H7. The bacterium is most commonly present in the alimentary tract of bovines and other ruminants where it is occasionally also excreted into faeces. The infection is normally asymptomatic in animals, but in humans it may produce bloody diarrhoea, necrotising bowel inflammation and life-threatening kidney failure, particularly in children and the elderly. In recent years, the number of epidemics caused by EHEC has been increasing in different parts of the world. The infection has normally spread through contaminated foods, such as meat products, unpasteurised milk products, vegetables or through drinking water or swimming water. Infection through direct contact with bovine faeces is also seen as significant. Infection may also be transmitted between humans, particularly infants still wearing diapers.

As late as the beginning of the 1990s, only detected cases of the EHEC in humans were sporadic, mostly of foreign origin. In 1997-1998 there were approximately 50-60 cases per annum, followed by a decrease in the number of cases to approximately 20 per annum. Since the bacterium can even be fatal to small children, the National Public Health Institute interviews all infected cases in order to trace back the chain of transmission. A number of EHEC infections in Finland have been traced back to farms, apparently caused by bovine faeces. In addition, some case clusters have been traced back to consumption of food as well as one widely spread epidemic in connection with swimming water. No EHEC infections have been traced back to items of food of domestic origin on the market.

It was discovered in a survey carried out in 1997 that 1.3% of Finnish bovines are carriers of the EHEC-bacterium serotype O157:H7. The survey was repeated in 2003, when only 0.4% of the tested bovines were found to be carriers of the serotype O157:H7. A study has been planned for 2004 to discover the proportion of EHEC positive cattle farms. According to the current view, it is not possible to implement an eradication programme in a cattle farm in order to eradicate EHEC infection, similar to that of a salmonella infection. Compliance with good sanitation practice can, however, affect the prevalence of the EHEC bacterium on a farm. Since the EHEC is not an animal disease to be combated by legislation, no restrictive orders are issued for a farm where the bacterium has been isolated. However, the EHEC bacterium is notifiable. A voluntary practice was started in 2003 whereby a specific risk management plan is drawn up for a farm with EHEC in order to prevent the spread of the infection.

The cleanliness of slaughter animals is of utmost importance in the prevention of the EHEC bacterium, as with other zoonoses. Faeces can contaminate the surface of the carcass and spread the infection at slaughter. Maintaining good sanitation at slaughter is difficult with mucky animals and the contamination of the carcass is probable. There are plans to renew the agreement regarding recommendations for sending mucky animals to slaughter (so-called manure fine agreement) in 2004.

According to the new Zoonoses Directive, EHEC is included in the list of zoonoses and zoonotic agents of statutory monitoring. The monitoring will be implemented In Finland by an own-check programme of slaughterhouses started in 2004. The slaughterhouses are to monitor the prevalence of the EHEC bacterium in the faecal samples of slaughter cattle. Research regarding the EHEC bacterium ought to be increased in order to trace back its epidemiology and sources of infection together with discovering new preventive measures. Little information exists regarding, for instance, the bacterium's behaviour in e.g. liquid manure and forage. The significance of other serotypes, in addition to serotype O157, ought to be examined, as their share of the prevalence in the population has been on the increase.

5.2.3. Giardiasis

Giardiasis is caused by a protozoon *Giardia duodenalis* (also known as *G. lambilia, G. intestinalis*) living in the intestines of mammals and ending up in the water system in faeces. Approximately 300 cases of giardiasis are detected in the Finnish population per annum. In all probability, some of these cases are traveller's diarrhoea but the share of infections of foreign origin is not known. Normally the *G. duodenalis* infection is contracted through contaminated drinking water or food, but direct transmission between humans is also possible. Beaver, muskrat and rodents in general are thought to be natural hosts of giardia. Giardia has caused widespread waterborne epidemics all over the world. The share of giardia in the Finnish waterborne epidemics is not known, as the patient samples taken during epidemics are not normally tested for giardias. Very little research has been done on the prevalence of giardia in the Finnish water system or domestic animal population. Studies have been carried out in the past three years but data collected from them remain relatively scarce.

Giardias are classified as having the status of zoonotic infections of statutory monitoring according to the epidemiological situation in the new Zoonoses Directive. In the light of the current known prevalence of giardiosis in the Finnish population, no need exists to initiate a regular surveillance system of giardias. However, it would be necessary to increase research on the prevalence of giardias in the water system and the animal population. Due to giardia's particular significance to travellers, further input in the information regarding foreign travel is called for.

5.2.4. Campylobacteriosis

The most common of campylobacters producing intestinal symptoms to humans is *Campylobacter jejuni,* but *C. coli* and *C. lari* may also produce similar symptoms. Complications of a campylobacter infection include arthritides (approximately 10% of patients), ophthalmitis, myocarditis and pancreatitis as well as the rare Guillain-Barré syndrome inducing paralytic symptoms.

Since 1998 the campylobacter has been the most frequently reported cause of intestinal infections in Finland. The number of infections has clearly been on the increase in recent years, apart from the year 2002. The number of detected cases was approximately 2,400 in 1997, whereas the corresponding figure was already as high as approx. 3,900 in 2001. A similar rise in the numbers of campylobacter infections has been noted in several other EU countries. The cause for the increase is unknown, as the epidemiology of the campylobacter remains largely untraced. The campylobacter is commonly present in the alimentary tracts of mammals and birds. The bacterium is unable to multiply outside the alimentary tract but survives for long periods in, for example, water systems. Poultry meat and contaminated drinking water are thought to be the most significant sources of infection in humans. Clear seasonal fluctuation can be seen in the prevalence of campylobacter infections: infections are more common late summer and early autumn.

Isolating the campylobacter is technically difficult; hence it is likely to be underdiagnosed. There are also plenty of cases not included in the National Register on Infectious Diseases because during waterborne epidemics the sampling is carried out only on the first 10-20 cases even though the actual number of infections is known to be far higher. The campylobacter is found to be the cause of approximately one third of waterborne epidemics in Finland, whereas its share of foodborne epidemics has been only 1% in recent years. This, however, may be due to heavy underdiagnosing, as campylobacters are not tested for in many of the food laboratories. Data regarding the campylobacter infections' country of origin has been systematically collected within a research project since 2002, together with the information regarding the entire population entered in the National Register on Infectious Diseases since the beginning of 2004. According to individual studies, the proportion of infections of domestic origin is less than half of all campylobacter infections.

No similar statutory surveillance or monitoring programme for the prevalence of campylobacter in broilers exists in Finland to those in Sweden and Norway. The broiler cutting plants, however, have invested significantly into the monitoring and prevention of campylobacter in their own-check programmes. The prevalence of campylobacter in flocks of broilers in Finland is significantly lower than that of international standard. Less than 10% of the flocks carry the bacterium during summer-autumn season. Corresponding seasonal fluctuation exists in broiler infections to that of humans, thus the prevalence of the bacterium in the flocks is sporadic during the remaining seasons. Input at the primary stage of production is most essential in order to prevent contamination of poultry meat by the campylobacter. Poultry flocks contract campylobacter from the production environment. A similar type of transmission from mother hens and hatcheries to that of salmonella is of no significance. Combating bacteria in poultry farms is based on biosafety and good hygiene in production. The prevention of campylobacter infection in organic poultry farming is not possible using current measures as the birds are predisposed to the bacterium whenever outdoors.

According to the new Zoonoses Directive, *Campylobacter* is included in the list of zoonotic infections of statutory monitoring. No surveillance systems regarding production animals or foods exist in Finland. A regular surveillance system as required by the Directive must be created for poultry. The surveillance of the infections in the human population ought to be tightened, in addition to collecting data on the infections' domestic ratio. Scientific research on campylobacter is much needed. In particular, information regarding sources of infection together with risk factors would be greatly needed in order to optimise the targeting of preventive measures.

5.2.5. Cholera and other vibrio infections

Vibrios are common aquatic bacteria which are present in seafood, including fish, all over the world. The best known human pathogens are the strains *Vibrio cholerae* and *Vibrio parahaemolyticus.* The vast majority of diseases transmitted to humans by seafood worldwide are caused by vibrios.

V. cholerae is the causative agent for cholera. A typical symptom of cholera is severe watery diarrhoea. Cholera typically presents as extremely widespread and long-lasting epidemics, often reaching several countries or continents, otherwise known as pandemics. Contaminated household water is a common source of infection in developing countries. Cholera is extremely rare in Finland. The last epidemic took place during the First World War. Nowadays only isolated cases of cholera, in connection with foreign travel, are detected in our country. An exception to this was a case of cholera contracted from smuggled cockles in 1998.

V. parahemolyticus bacterium is commonly present in seawater and in fish and crustaceans caught from the sea. Over 50 serotypes of the bacterium are known, but not all of them are pathogenic. *V. parahemolyticus* is a common cause for food poisonings worldwide, but its significance in our country is quite small. It has caused no food poisoning epidemics in Finland. 0-2 cases per annum have been reported to the National Register on Infectious Diseases. Of foodstuffs in our country, the bacterium has been isolated from imported crabs. Underdiagnosing of vibrios is apparent, as testing for vibrios is not part of routine diagnostics. Only few food laboratories have the readiness for diagnosing vibrios.

According to the new Zoonoses Directive, vibriosis is a zoonotic disease whose monitoring depends on the epidemiological situation. The current view is that there is no need for regular surveillance of vibrios in Finland. Companies importing fish products ought to consider including vibrios in their own-check programmes when drafting and updating the plans for the own-check system.

5.2.6. Cryptosporidiosis

Cryptosporidiosis is caused by a protozoon *Cryptosporidium parvum.* The most typical symptom of cryptosporidiosis is severe watery diarrhoea. Long-term illness affects only the immune-deficient. Approximately 10-20 cases are detected in the population per annum. In all probability, the true number of cases is considerably larger since the diagnostics requires special skills and methods which are not part of routine investigations.

Cryptosporidium infection is normally transmitted to humans through contaminated drinking water. Elsewhere in the world *C. parvum* has indeed produced sizeable widespread waterborne epidemics. Animals are thought to act as hosts to the *C. parvum* protozoon. Calves, mice and wild animals are suspected to be significant sources of infection elsewhere.

No large studies have been carried out in Finland regarding the prevalence in wild animals, production animals or water systems. Project-type studies have found cryptosporidia in the faeces of less than 10% of young calves. Cryptosporidia have also been detected in Finland in bank voles and short-tailed voles.

The EU Scientific Committee has included cryptosporidiosis in the list of the seven most significant foodborne zoonoses. However, cryptosporidiosis is not classified as a zoonosis of statutory monitoring in the new Zoonoses Directive, as a routine method for testing for cryptosporidiosis currently remains unavailable for use and the epidemiology of the infection is not very well known.

C. parvum does not appear to be a very significant zoonotic agent in Finland compared with many other countries. On the other hand, studies have begun only recently to investigate its role as a causative agent for waterborne epidemics and, as it may often remain undetected in patients, significant underestimations may influence the diagnoses. A study ought to be carried out where all human samples pending parasitological investigations would also be tested for cryptosporidium. In addition, more studies are needed regarding the prevalence in water systems and the animal population.

5.2.7. Fish tapeworm infection

An infection caused by the fish tapeworm or the broad tapeworm (*Diphyllobothrium latum)* is called diphyllobothriasis. The fish tapeworm is a parasite of fish-eating mammals, whose intermediate hosts are freshwater fish and crustaceans and the main host a human or another mammal. The parasite can grow up to 10 metres long in the intestines of the main host and live as long as decades. It reproduces by producing eggs which are then spread to the environment in the faeces of the host. In freshwater, the egg develops into larva whose development continues in a copepod.

A fish eats the copepod and the development continues within the fish. The main host is infected by eating the fish containing the infected larvae, or products thereof.

The larvae of the broad tapeworm live in the freshwater predatory fish, most commonly in the meat and spawn of perch, pike, burbot, ruff and the pike perch. Larvae can be destroyed by either heating or deep-freezing the product.

An infection by the fish tapeworm produces intestinal symptoms and weight-loss in humans. Some patients develop a deficiency in vitamin B12 and folic acid together with anaemia.

Dozens of infections amongst the population continue to be discovered every year, but since the findings are not notifiable the exact figure is not known. The fish tapeworm was very common in the population before 1960. Apart from humans, infections are also detected in dogs, cats and foxes. Diphyllobothriasis is prevalent in cultures where products of fresh fish are consumed, such as Japan and the Nordic countries.

Fish tapeworm infections are combated by orders and directions to deep-freeze products of fresh fish and roe. Diphyllobothriasis is not a zoonotic disease of statutory monitoring according to the new Zoonoses Directive.

5.2.8. Listeriosis

Listeriosis is caused by the *Listeria monocytogenes* bacterium. In healthy adults with a normal immune system, the infection is usually either asymptomatic or produces passing gastrointestinal symptoms. Listeria can cause a severe general infection and meningitis in groups of people at greater risk including the elderly, the neonates and the immunocompromised. For the pregnant, listeria can induce a miscarriage. Approximately 30-50 cases of listeriosis are detected in Finland every year and the trend has been decreasing in recent years. Nevertheless, the diagnosed infections are often severe, with mortality as high as25 %. The share of population belonging to the high-risk groups has already exceeded 20% and continues to increase.

Most commonly, the source of infection in humans is food. Direct transmission from an infected animal is possible but rare. Due to the long incubation period, the contaminated item of food often remains untraceable. High risk foods are fresh products, ready to eat without heating, with a long shelf-life and in which listeria can multiply. Particularly vacuum packed cold smoked and salt cured fish products fall into this category. On average, less than 12% of the tested vacuum packed fish products were *Listeria monocytogenes* positive. On the whole, the quantities have been low, less than 100 cfu/g, however, larger quantities up to 25.000 cfu/g have also been measured. Unpasteurised dairy products, e.g. cream cheeses, as well as vegetables and meat products may also contain listeria.

Listeria is a common environmental bacterium. It can be found in soil, water, vegetables, feedingstuffs and the intestines of both humans and animals. It can tolerate demanding environmental conditions exceptionally well. It is capable of easily forming a permanent bacterial growth (biofilm) in a production plant, thus contaminating the foodstuffs. Listeria’s capability of multiplying in refrigerator temperatures makes it problematic. Hence, the shelf-lives of high risk foods should not be too long. In Finland the dairy and fish production plants are obliged to monitor the prevalence of listeria in their products. The National Food Agency and the National Veterinary and Food Research Institute (EELA) have published guidelines for monitoring listeria in dairy, fish and meat production plants. In recent years, the biggest inputs in monitoring have been aimed at fish production plants.

According to the new Zoonoses Directive, *Listeria* is classified as a zoonotic infection of statutory monitoring. Listeria is monitored in the own-check programmes of different establishments, yet centralised monitoring regarding the degree and the results of surveillance is insufficient. There is a need for further development of hygiene and monitoring in fish production.

5.2.9. Bovine tuberculosis

In addition to animals, the causative agent of bovine tuberculosis, *Mycobacterium bovis,* can produce tuberculosis in humans. No *M. bovis* infections have been discovered in the human population in recent years. In animals, bovine tuberculosis was last detected in a cattle herd in 1982.

The prevalence of *M. bovis* in both human and animal population was very high early last century, but due to persistent prevention work and systematic eradication programmes we have been able to eradicate the disease from our country. The European Union has granted Finland the so-called disease-free status for bovine tuberculosis. In order to maintain the status, continued monitoring of the prevalence is required. Currently, examining for bovine tuberculosis is included in the health monitoring programmes for artificial insemination bulls as well as in connection with animal import and export. In addition, every carcass is examined for signs of tuberculosis at meat inspection. Monitoring the prevalence of bovine tuberculosis is also included in the health monitoring programmes of deer farms. Interest in the import of exotic animals, e.g. alpacas, has grown and their importation increases the risk of infection crossing the borders.

Due to persistent prevention work *M. bovis* is no longer a significant pathogen amongst the human population in Finland, whereas *Mycobacterium tuberculosis* is a growing problem as a causative agent for tuberculosis infections amongst the population and it is transmissible from humans to animals. Bovine tuberculosis continues to be a significant zoonosis in many of the Member States of the EU. Thus, *M. bovis* is included in the new Zoonoses Directive as a zoonosis of statutory monitoring. Current monitoring complies with the requirements of the Directive.

5.2.10. Salmonellosis

Salmonella is one of the most common causes of food poisoning worldwide and a significant problem to both public health and national economy in many countries. The salmonella situation in animals and products of animal origin in Finland, Sweden and Norway is far better than elsewhere in the world.

Approximately 2,500 human cases of salmonella are reported to the National Register on Infectious Diseases per annum, of which approximately one third are of domestic origin. This is just the tip of the iceberg of the true number of cases. Individual population based studies in other parts of the world have concluded that the ratio of all cases to the detected cases of routine investigations is approximately 3.2-38-fold. Based on this information, there would be approximately 9,000 – 106,000 cases of salmonella in Finland every year. The ratio has been estimated to be tenfold in Finland, resulting in approximately 30,000 actual cases per annum. Salmonella also produces a reactive arthritis as a complication in approximately 10% of the patients in Finland, making salmonella an extremely important factor in morbidity of chronic ailments.

Animals which rarely fall ill with symptomatic salmonellosis act as hosts to salmonella. Potential carriers of salmonella include all mammals, birds and reptiles. Salmonella infection in humans is mostly foodborne, but direct transmission from an animal or from an infected person to, for example, other family members is possible. Food poisoning statistics from the past five years show salmonella to be the cause in approximately 9% of the epidemics. However, the trend is decreasing. Salmonella can produce long-term carriers, which means that the importance of hygiene must be emphasised to those who handle unpacked perishable foods as well as to others working with food in a high-risk environment. In confirmed cases of salmonella, the high-risk employees ought to be monitored until no excretion of salmonella can be detected.

The national salmonella control programme was implemented in 1995. The control programme covers poultry, cattle and pigs and meat and eggs thereof. In the control programme, regular inspections are made for the prevalence of salmonella in production farms, slaughterhouses and meat cutting plants. The detection of salmonella invariably leads to statutory measures in order to prevent the spread of the infection and to trace the origin of the infection. The target of the programme is to keep the prevalence of salmonella in production animals and foods thereof below 1%. This target has been reached quite well. Flocks of broiler chickens have been an exception: the salmonella detected in them has slightly exceeded the target level. The National Veterinary and Food Research Institute (EELA) has also carried out risk assessments and financial assessments concerning the control programme. According to the assessments, the programme of the broiler production is both well functioning and cost-effective. In addition to the control programme, the industry's voluntary work is also an important factor in maintaining the favourable salmonella situation. The farms of production animals in Finland are also well covered with a group insurance against salmonella. The terms and conditions of the insurance include abiding by good sanitation practice on the farm. Hence the insurance system has contributed to our favourable salmonella situation.

Finland is allowed to require salmonella investigations for imported beef, pigmeat and poultry meat, eggs and live poultry based on additional guarantees granted to Finland by the EU. However, requirements do not apply to consignments of beef and pigmeat intended for the preparation of products undergoing heat treatment, which means that they apply only to a small proportion of imported beef and pigmeat. The realisation of additional guarantees is monitored in the primary points of call, i.e. companies who receive consignments of foodstuffs from other Member States of the EU. In the random tests carried out in these primary points of call, salmonella has sometimes been detected. Consignments of poultry meat have proven the most problematic.

Feedingstuffs play a significant role in combating salmonella, as monitoring of the feedingstuffs is an effective method of prevention for salmonella infections. In Finland, the Plant Production Inspection Centre is responsible for the monitoring of feedingstuffs. In general, all consignments of mixed feed material are tested before use either within an own-check system or as a part of statutory monitoring and the feed material is not used while investigations are pending.

Before joining the EU, Finland became known as a country of strict salmonella control. However, Finland was not granted the exemptions giving the right to require certification for negative salmonella status for feedingstuffs similar to those for foodstuffs of animal origin. When Finland joined the EU, the long tradition of well functioning official control was first replaced with voluntary inspections of imported feed material by the Association for Animal Disease Prevention (ETT). Later on, it was made mandatory for companies to set up an own-check system, whose hygiene part could be approved by the authorities. The industry's own action, nevertheless, is essential in combating salmonella. ETT maintains a positive list of import and manufacturing companies within the feed industry. An example of a prerequisite for an entry into the list is salmonella testing for each imported consignment of feeds and feedstuffs. In practice, all feed industry operators in Finland belong to the positive list programme.

It can be concluded from the results of the salmonella surveillance in the 1990s that there are fewer problems with the feeds entering the food chain. The most problematic are, in order of significance, protein meals of plant origin arriving in large consignments (soy meal and rape meal) whose import has grown markedly following the ban on meat and bone meal in the prevention of BSE, sunflower seeds intended for wild birds imported from Eastern Europe as well as rawhide bones and pigs' ears intended for pets.

Salmonella is a zoonotic infection of statutory monitoring according to the new Zoonoses Directive. The required monitoring systems are already in operation in Finland, both for the prevalence of salmonella and for the surveillance and reporting of food poisoning epidemics. The overall input to combat salmonella is adequate.

5.2.11. Cysticercosis

Cysticercosis is a larval stage infection produced by a tapeworm infestation in the intermediate host whose organs have parasitic cysts, cysticerci, present. The human's narrow tapeworm armed with rostellar hooks is called *Taenia solium*, whose definitive host is human and the intermediate host is the pig. Its close relative is a narrow tapeworm, without the rostellar hooks, called *Taenia saginata*, whose definitive host is human and the intermediate host is the cow. Cysticercosis in animals is extremely rare in Finland. Both *Taenia solium* and *T. saginata* remain, however, a serious problem in different parts of the world.

Cysticercosis in pigs and cattle is combated by measures applied during meat inspection. The masticatory muscles in cattle and the myocardium in both pigs and cattle are examined by incising the tissue whilst other muscle tissues are examined visually. Neither *Taenia solium* nor *T. saginata* are zoonotic infections of statutory monitoring according to the new Zoonoses Directive, but monitoring included in meat inspection is mandatory according to the Community's meat hygiene legislation.

Taenia solium
The human's narrow tapeworm *Taenia solium*, armed with rostellar hooks, can grow up to several metres in length in the human intestine. It develops cysticerci of approximately 1x2 cm in diameter in the muscles and internal organs of its intermediate host. Its larval stage in the intermediate host is called *Cysticercus cellulosae.* Humans can act as intermediate hosts to the parasite, which makes it particularly dangerous.

On average, one *T. solium* infection is identified in the human population per annum. Three cases of *Cysticercus cellulosae* have been discovered in the population since 1995, but all of them have apparently been contracted abroad. *Cysticercus cellulosae* has never been identified in pigs in Finland.

The intermediate host (pig) gets infected by eating eggs which spread in the human faeces. The definitive host (human) gets infected by eating raw or undercooked pigmeat containing the infective cysts. The infection may produce symptoms in the intestinal organs or central nervous system. This tapeworm may also cause autoinfection in humans where cysticerci are developed in the patient's internal organs, resulting in the human also acting as the intermediate host of the parasite. Humans can also contract the infection through eating food contaminated by the eggs of the parasite or as a result of poor hygiene directly person-to-person.

Taenia saginata
The human's narrow tapeworm without the rostellar hooks, *Taenia saginata*, uses bovines and other ruminants as its intermediate hosts. In the intestines of its definitive host, the human, the parasite grows into a tapeworm of several metres in length whose segments, containing eggs, break off to be excreted in faeces. The parasite produces cysticerci, parasitic cysts, of approximately 0.5x1.0 cm in diameter in the muscle tissues of its intermediate host. The larval stage in the intermediate host is called C*ysticercus bovis.*

The intermediate host gets infected by eating the eggs of the parasite which are spread by the faeces of the definitive host. The human as the definitive host gets infected by eating raw or undercooked beef containing infective cysticerci. The infection is often asymptomatic in the definitive host, but symptoms of the alimentary tract and nausea may be present.

Approximately four *Taenia saginata* infections are detected in humans every year. Apparently these have been of foreign origin. These infections are not notifiable diseases.

5.2.12. Toxoplasmosis

The protozoon *Toxoplasma gondii* causes toxoplasmosis. Usually the infection in humans is asymptomatic but it can produce encephalitis and ophthalmitis together with other organ damage. Infection contracted in pregnancy can cause severe developmental damage in the fetus. Approximately 30-50 cases of toxoplasmosis are reported in the population per annum. It is estimated that approximately 50 children are born every year with congenital toxoplasmosis.

Cat is the definitive host for the toxoplasma parasite. In a study carried out in 1994, approximately 50% of Finnish cats were found to have antibodies to toxoplasma. Cat gets infested by eating birds or small rodents which have encysted parasites in their tissues. Cat spreads the infection by excreting oocysts in its faeces. Normally it excretes oocysts only for approximately two weeks of its entire life, usually as young when it has contracted the infection for the first time. The oocyst must survive outside the cat for at least two days in order to become infective. Other animals do not excrete oocysts after contracting the infection but have the parasites encyst in their tissues. Eating the encysted meat usually infects carnivores, whereas herbivores eat the oocysts in the environment. Eating undercooked meat containing the tissular cysts or vegetables containing the oocysts can infect humans.

To date, no efficient methods in food or animal disease control exist to prevent toxoplasmosis. The most important preventive measure is informing the public. Pregnant women, in particular, ought to be directed by the antenatal care staff to avoid eating raw meat and to comply with hygienic practice in the kitchen. It would also be advisable for them to avoid emptying litter boxes of cats. It would also be possible and cost-effective to screen expectant mothers for toxoplasma antibodies in the antenatal clinics in order to reduce the number of congenital toxoplasma infections.

According to the new Zoonoses Directive, toxoplasma is one of the zoonotic infections of statutory monitoring according to the epidemiological situation. Regular monitoring of animals or foods is not practical due to lack of monitoring methods. However, project type studies would be recommended regarding the prevalence of toxoplasma in cats, cattle, meat and outdoor vegetables. More efficient monitoring of the prevailing infections in the population would be justified considering the gravity of the implications of the disease.

5.2.13. Trichinellosis

Trichinellosis is caused by trichinella (trichina) of the genus of nematodes. In Finland, the most common species of trichinella are *Trichinella nativa* and *Trichinella spiralis*. *Trichinella britovi* and *Trichinella pseudospiralis* have also been isolated in our country. Trichinella is a parasite of carnivore mammals and found nearly everywhere in the world. Once infected, the animal carries infective larvae in its muscles for years following the infection. Trichinella infection in humans may be asymptomatic, produce long-term muscular symptoms or even be fatal. The last detected case in humans in Finland was infection contracted from bear meat in 1977. Human infections may, however, be underdiagnosed, as no serological diagnostics of clinical samples is carried out in Finland and obscure symptoms in mild cases may remain undiagnosed.

The prevalence of trichinella infections among our country's wild animal population is markedly higher than that of elsewhere in the Western Europe: up to 50% of the foxes and raccoon dogs tested have been found to carry the infection. Trichinellae have also been isolated in, for example, bears, lynx, wild boars, wolves and rats. Infections in domestic animals are also being reported more frequently in Finland than in the other Member States of the EU, apart from Spain. Trichinella infection is isolated in a small number of pig farms and a few dozen pigs annually. The prevalence in farmed wild boars has been approximately 1% of tested animals. The growth in organic pig farming is likely to increase free ranging of the pigs and outdoor farming. This will probably increase the prevalence of trichinella infections in pigs, as animals farmed outdoors have more contact with wild animals. No trichinella infections have ever been detected in horses in Finland. Trichinella infected horse meat has caused several epidemics in the Southern and Central Europe.

Plenty of resources are invested in the monitoring and prevention of trichinellosis in Finland. Trichinella investigations according to the EU requirements are carried out to all known hosts of trichinella at meat inspection, e.g. pigs, horses, wild boars, bears and seals. If trichinellae are discovered at meat inspection, the carcass is rejected. Inspected meat is considered safe from the risk of infection to the consumers. Mandatory meat inspection does not apply to the meat from game consumed by the hunter himself. Thus, the largest group at risk are hunters who eat uninspected, undercooked game meat.

Trichinellosis is a zoonotic infection of statutory monitoring according to the new Zoonosis Directive. The trichinella investigations carried out at meat inspection in Finland meet the requirements for monitoring. The EU regulations regarding trichinella surveillance are also undergoing amendment. According to the proposal, trichinella investigation would not be required for pigs grown at so-called trichinella-free farms. Nevertheless, as trichinella infections are so common in Finland, the new regulation is likely to be impracticable here. There is good reason to continue with the epidemiological investigations regarding tricihinella in our country to trace back the epidemiological chain in order to prevent the spread of the infection to pig farms more efficiently.

5.2.14. vCJD or variant Creutzfeldt-Jacob’s disease and BSE

The cases of vCJD in humans are likely to be the result of the prion protein causing BSE which ends up in food. No vCJD has ever been detected in people in Finland. Approximately 130 cases altogether have been reported worldwide. The BSE scandal that originated in Britain and shook up the whole of Europe resulted in massive preventive action in Finland as well. According to EU regulations, for instance all bovines of 30 months of age or older to be used in the food industry are examined for BSE. So-called risk material is to be removed from the carcasses of cattle, sheep and goats, i.e. tissue with a high risk of containing the infective prion. Also the use of meat and bone meal in the feeds of all production animals is banned in order to minimise the risk of BSE. There was one reported case of BSE in Finnish bovines in 2001. The source of infection could not be traced.

The new Zoonoses Directive does not cover BSE, as separate EU legislation exists specifically designed for the prevention of BSE. The preventive measures for BSE have been criticised of being exaggerated in proportion to the actual risk of infection and BSE’s significance to public health. On the other hand, the necessity of preventive measures can be justified with an economic viewpoint: the measures are necessary to maintain the consumers’ trust, thus securing the production of beef.

5.2.15. Yersiniosis

Yersinias are bacteria commonly present in soil, water systems and intestines of animals. The most significant zoonotic strains of yersinia are *Y. enterocolitica* and *Y. pseudotuberculosis*. Yersinia is the third most commonly reported bacterium producing intestinal infections in the population of Finland, following the campylobacter and salmonella. Unlike the salmonella infections, the majority of yersinia infections are thought to be of domestic origin. The average incidence of yersinia infections is approximately 700 cases per annum. *Y. enterocolitica* infection is more common, but a slight downward trend can be observed. Approximately 560 cases were reported in 2001. The number of *Y. pseudotuberculosis* infections, on the other hand, has been increasing. In 1997 42 cases were reported whereas in 2001 the number of cases was 160. Yersinias are of great significance in long-term morbidity as well. Particularly in the Finns, the yersinia infections may induce reactive arthritis in a significant number of those infected.

Pig is thought to be the most important host for *Y. enterocolitica* and the most important source of infection are pigmeat and pigmeat products. It is common for pigs to carry the *Y. enterocolitica* bacterium in their tonsils. In a study carried out in 1995, *Y. enterocolitica* was detected in approximately 40% of the samples taken from pigs' tonsils. Yersinia can contaminate pigmeat at slaughter. A risk management procedure is tonsillectomy performed at the time of slaughter. This alone is not sufficient to prevent yersinia from spreading. Information regarding the prevalence of yersinia in pigmeat of domestic origin is scarce. In various studies, the bacterium has been isolated and verified by culture in approximately 2% of the pigmeat samples whilst the more sensitive PCR method has verified the bacterium in approximately 25% of the samples. Yersinia has been isolated in approximately 90% of the pig tongues tested.

Wild animals and birds as well as domestic pig and cat of domestic animals are regarded as reservoir for the *Y. pseudotuberculosis* bacterium. The reason for the upward trend in the number of *Y. pseudotuberculosis* cases in Finland is unknown. A similar rise has not taken place in the other Nordic countries. *Y. pseudotuberculosis* has been the causative agent for a number of food poisoning epidemics in Finland in recent years. Iceberg lettuce, Chinese cabbage and carrots have been proven as the sources of infection.

According to the new Zoonoses Directive, *yersinias* are zoonotic infections of statutory monitoring according to the epidemiological situation. Regular monitoring of yersinia would be justified in Finland, as the number of yersinia infections in the population is notable. Current monitoring practice of yersinia infections in the population ought to be tightened and the domestic/foreign ratio of the infections ought to be clarified. Monitoring the prevalence of the *Y. enterocolitica* bacterium in pigs ought to be considered together with increasing the research regarding the prevention of yersinia infections on the farms as well as at slaughter. Studies ought to be continued to determine the prevalence of *Y. pseudotuberculosis* bacterium in vegetables as well as how to further develop the preventive methods. A study to determine the natural reservoirs of the *Y. pseudotuberculosis* bacterium is also necessitated.

5.2.16. Viral infections

Viruses are probably the most common causes for intestinal infections in people. Viral diagnostics is far more difficult than that of bacteria; hence less attention has been paid to viruses. Due to lack of diagnostic methods, no accurate data exists on the prevalence of most viruses in foodstuffs or their role as causative agents of food poisonings. The most common foodborne and waterborne viruses in Finland are the norovirus and the hepatitis A virus. Neither of these viral infections are actual zoonoses. The infections originate in humans, but another method of transmission is seafood. The new Zoonoses Directive, however, classifies both viral infections as being statutorily monitored according to the epidemiological situation. Regular monitoring utilising both traditional electron microscopy and modern molecular techniques would be justified, but lack in routine diagnostics currently limits the investigations to epidemic situations only.

The norovirus is a member of the caliciviruses. It was previously called calicivirus or Norwalk-like virus. The norovirus causes enteritis of a sudden onset. The virus is highly contagious. Transmission takes place directly from one person to another or with the aid of food, drinking water or contact surface. The norovirus is our most commonly reported causative agent of both foodborne and waterborne epidemics. In foodborne epidemics, the identified sources of infection have been, for example, imported berries irrigated with contaminated water or sewage water. Oysters and mussels have also caused epidemics.

The hepatitis A virus is rarely the cause of epidemics in Finland, but in international standards, it is the most commonly reported cause for foodborne viral epidemics. The most typical of symptoms are elevated temperature and nausea, but in serious cases hepatitis may develop. Hepatitis A is normally transmitted directly between humans but the infection may also spread with the aid of contaminated water or food. Typical foods of transmission abroad are mussels grown in areas polluted by sewage water.

Food and waterborne viral epidemics can be combated by ensuring that waterworks are in good working order, the water treatment mechanisms are of appropriate standard and the workers of the food industry maintain the appropriate level of hygiene. The available methods of prevention are more limited in the case of imported items of food. The means for the importer to ensure the quality of the irrigation water used for the berries and vegetables are limited. The National Food Agency has recommended that deep-frozen berries of foreign origin should be thoroughly heated prior to their consumption. Attention ought to be paid to the quality of domestic irrigation water as well.

5.3. Zoonoses transmitted by other methods

Humans can also contract a zoonotic infection through contact with animal excrements, animal bite, through a vector or through the respiratory tract. Wild animals are often the sources of infection but pets and production animals or products of animal origin, e.g. hides, can transmit zoonotic infections.

An arthropod spreading an infection is called a vector. Mosquitoes and ticks are our typical vectors. Typical to the prevalence of these infections is fluctuation in their incidence according to the fluctuation in the numbers of the animal host species or the annual fluctuation of the vector. The most significant of the zoonoses transmitted by wild animals in Finland are borreliosis, Puumala virus infection, Pogosta disease and tularaemia.

The significance of vector-borne diseases as animal diseases varies. The influence on the host animal is negligent in some whereas others have an impact on the numbers of the animal population. Vector-borne diseases or other zoonoses transmitted by wild animals have not really been taken into consideration in the animal disease legislation because of the limited choice of methods for control and prevention. Rabies is the only disease transmitted by wild animals for which effective prophylactic methods exist in the animal population. For other diseases, the prevention of infections is based on informing the population about the disease and ways to protect against it.

Global warming may cause our tick population to grow, resulting in an increase in tick-borne diseases in Finland. Our mosquito population may evolve as well, resulting in new species of mosquitoes that spread zoonotic infectious previously unknown. Global warming also has an effect on the numbers of rodents acting as hosts to zoonotic microbes. The changes in climate, vectors and animal population ought to be monitored in an efficient manner, thus enabling us to predict the spread of diseases into Finland and in Finland. Research regarding the ecological interaction between the host animals, the pathogens and potential vectors would also be important. The possibilities for research regarding the epidemiology and prevalence of host animals and vectors have improved of late, along with more common use of the satellite remote sensing method.

A human can contract a zoonotic infection directly from a pet animal. Many zoonoses that are mainly foodborne can also be transmitted in direct contact with animals, e.g. salmonellosis, campylobacteriosis, yersiniosis and toxoplasmosis. There are various other zoonoses as well which can be transmitted by pet animals. Although in single cases a zoonotic infection spread by a pet animal can be serious, pet animals in general are not considered as a significant zoonotic risk to the population. Only a small proportion of zoonoses spread by pet animals are covered by the animal disease legislation, which deals with many of the zoonoses spread by production animals (e.g. salmonellosis, anthrax, swine erysipelas and avian influenza).

5.3.1. Borreliosis

Borreliae are bacteria of the group spirochetes. Borreliae prevalent in Finland belong to the subgroups *Borrelia burgdorferi* sensu lato, which causes the Lyme disease (Lyme borreliosis). A human gets infected through a tick bite. The prevalence of borreliae in ticks fluctuates greatly even in areas of close proximity. The most extensive study was carried out in the recreational grounds of Helsinki where approximately 30 % of the tick population was found to be carriers of borreliae. If the biting tick is a carrier, the risk of a human being infected is in the region of 10-20 %. Small rodents, the field mouse and bank vole in particular, are reservoir of borreliae in the wild.

The prevalence of Lyme borreliosis in the Finnish population varies between approximately 400-900 cases per annum, depending on the tick population. The disease is very common in the Åland Islands and the archipelago of Turku. In its acute stage, the infection produces a typical cutaneous reaction but in the chronic form causes long-term elevated temperature, arthritis, meningitis or even cerebral symptoms.

In prevention of borreliosis, informing the public of appropriate protection when in high-risk areas together with recognising the first signs of an infection are of essence. Borreliosis can be treated with antibiotics, but prophylactic treatment following a tick-bite is not recommended as the risk of infection is low. We can look forward to having a vaccination in the next few years for prophylaxis of borrelia infections in the population. The vaccination in question is already in use in the USA but due to the differences in the tick populations it cannot be introduced as such in Finland. One preventive measure for borreliosis is limiting the tick population by making its living conditions worse, for example, by destroying bushes and cutting the grass in popular recreational areas, but in general it is not thought possible to succeed in limiting the tick population.

According to the new Zoonoses Directive, borreliosis is a zoonotic infection of statutory monitoring according to the epidemiological situation. Monitoring the prevalence of the infections in the population ought to be increased. Global warming may increase the numbers of the tick and rodent populations, thus increasing the prevalence of the disease. Surveillance studies ought to be carried out regarding the prevalence of borrelia in the tick population. Similarly, research should be increased regarding the dynamics of borrelia in the community formed by ticks and rodents.

5.3.2. Echinococcosis

The echinococci are small tapeworms which in their adult form live as parasites in the intestines of carnivore mammals, their definitive hosts. The larval stage is developed in cysts in the organs of their intermediate hosts, usually herbivores. Humans can get infected by the eggs in the definitive hosts' faeces (e.g. fox and dog) but not by eating the organs of the intermediate hosts. A human can ingest the parasitic eggs in, for example, berries contaminated by the faeces of a fox, in vegetables or in drinking water. Transmission can also take place, for instance, through eggs stuck in the fur of an infected dog.

In an echinococcus infection, cysts are formed in the human organs. The symptoms and the gravity of the infection depend on the particular strain of the echinococcus. At its most serious form, the infection can be fatal. In recent years, the maximum of one case of echinococcosis per annum has been reported to the National Infectious Disease Register, and those cases have all been of foreign origin. On the other hand, the incubation period of the disease is very long, as the cysts take years to develop in the organs. Furthermore, pathological laboratories do not always report cases to the National Infectious Disease Register.

Echinococcus multilocularis infection can be severe in a human. *E. multilocularis* has never been detected in Finland but the incidence has increased elsewhere in Europe in recent years. The most typical definitive host of *E. multilocularis* is the fox and the intermediate host a type of vole. Finland may have been spared of *E. multilocularis* because the fox population is not dense enough to cause an epidemic. We monitor the prevalence of *Echinococcus multilocularis* in potential intermediate and definitive hosts. One additional risk management measure is the mandatory treatment of foreign dogs with antihelminthic drugs effective on tapeworms prior to importation, albeit the time limit for treatment is quite flexible. The spread of *E. multilocularis* to our country would have considerable implications, as the infection is dangerous to humans and it could easily spread through wild berries which are consumed unheated.

Infection by *E. granulosus* is considered less dangerous to humans than that by *E. multilocularis*. In our country, the parasite has been isolated from reindeesr, elks and wolves. For example, reindeer and other animals of the deer family can act as intermediate hosts for the *E. granulosus*, whilst dog and wolf are the definitive hosts. The prevalence of echinococci in intermediate hosts is monitored at meat inspection. The parasite has been detected in approximately 10 reindeers per annum. There have been sporadic findings of another strain of *E. granulosus* (or so-called equine echinococcus which is not considered to be a zoonotic pathogen) in imported horses. Approximately 30% of Finnish wolves tested for *E. granulosus* have been found positive. The parasite was isolated in a Finnish elk for the first time in 2001. A prophylactic antihelminthic treatment is recommended for hunting dogs and dogs of reindeer farming regions as a risk management procedure. It is also recommended that organs of reindeer and other animals of the reindeer family would not be fed to dogs raw.

Echinococcosis is a zoonosis of statutory monitoring according to the new Zoonoses Directive. Current monitoring procedures undertaken in connection with meat inspection and prevalence studies of the parasite are sufficient to comply with the Directive's requirements. The epidemiology and prevalence of echinococci in wild animals ought still to be studied. Informing dog owners and hunters is also important.

5.3.3. Tularemia

Tularemia is caused by the *Francisella tularensis* bacterium. Tularemia produces widespread epidemics every few years. The last sizeable epidemic occurred in 2000, when more than 900 infections were diagnosed in the population. Research findings regarding the methods of transmission and prophylactic measures are scarce. The most common method of transmission is a mosquito bite (prick), but an infection may occur by handling a sick animal or by inhaling dust containing particles of the bacterium. Tularemia transmitted via the respiratory tract is an occupational disease of farmers. Typical symptoms of tularemia are elevated temperature lasting for weeks together with lymphadenitis. Pneumonia is also possible. The disease rarely produces long-term illnesses. The strain prevalent in Finland causes rarely fatal infection. Some strains of *F. tularensis* are also suitable for use as biological weapons, but the Finnish strain is not virulent enough for such use.

Bank voles act as hosts for the pathogen in the wild. Lemmings, short-tailed voles and rabbits are prone to the infection and it is often fatal for them, but the role of these animals in the spread of the infection remains unclear for the present. A few dozen cases of tularaemia are detected in wild animals per annum. Tularemia in animals is a notifiable animal disease to be reported on a monthly basis. As it is typically prevalent in wild animals, only a fraction of the cases are reported.

As with all zoonoses spread by wild animals, combating tularemia is problematic. The most practical prophylactic measure is informing the public of the disease and ways of protection against it.

Tularemia is not mentioned separately in the new Zoonoses Directive. However, the disease is of great significance to the public health in Finland. Further investments ought to make in the research regarding the epidemiology of the disease.

5.3.4. Avian influenza

The influenza A virus is highly susceptible to genetic transformation. Its numerous variations can cause a disease in humans, birds, pigs and horses. If two subtypes of different species land in the same individual, a mutation of the virus may occur. This may alter the pathogenicity of the virus considerably. Influenza can cause massive pandemics or cross-continental epidemics. For example, the Spanish disease brought on by an influenza virus which emerged in 1918 caused 20-40 million deaths. Pandemics have been occurring every 10-40 years. The emergence of a new pandemic is unpredictable. Plans have been drawn up in the World Health Organization as well as in several countries to avert the threat of a pandemic and to prepare for one.

Avian influenza is a highly contagious animal disease causing significant losses to poultry production. Avian influenza is transmissible to humans but it is difficult to speculate whether it has potential to transform into a pandemic virus to humans. Two epidemics of avian influenza have occurred in Europe in the 21st century: an epidemic started in Italy in 2002 and one in Holland in 2003. In Holland the disease caused temporary conjunctivitis in the animal nursing staff but also the death of one veterinarian. Shortly after the outbreak of the epidemic in Holland, vaccinations against the human influenza of those working with birds were begun together with antiviral treatment following exposure. In the course of the epidemic, 30 million birds out of Holland's bird population of 100 million were culled in order to eradicate the disease from the area. The epidemic took place between February and June and resulted in significant financial losses to the country. A widespread epidemic of avian influenza was discovered in Asia at the turn of the years 2003-2004. At the conclusion of the Strategy the epidemic had spread to ten different Asian countries, resulting in extensive financial losses to the poultry industry of these countries. More than a dozen human victims had also been discovered, yet the virus had not transformed into a form directly transmissible between humans.

Avian influenza has never been diagnosed in poultry in Finland. An avian influenza survey was carried out in the EU in 2003 where the prevalence of avian influenza in the Member States was investigated. No signs of avian influenza virus have been detected in samples taken from poultry farms, farmed game birds or wild fowl in Finland. Out of 3,777 wild birds tested within the EU, nine were found to be carriers of the virus. Due to the dangerous nature of the virus, the avian influenza surveys will continue to be carried out within the EU. For the present, the decision regarding the implementation of a survey will be made on an annual basis.

5.3.5. West Nile encephalitis

The WestNile virus is transmitted to humans through mosquitoes. The infection in humans may be asymptomatic or in the form of a mild febrile disease. Occasionally, however, severe forms of meningitis are diagnosed which may prove fatal, particularly in those over 50 years of age. The main hosts of the virus are usually birds. WNV has been isolated in over 138 species of birds in North America. The virus has been isolated in a vast number of other animals as well: horses, cats, dogs, camels, bats, squirrels, rabbits, alligators etc. Humans and horses are so-called definitive hosts which normally do not spread the virus on. Many areas regarding the routes of transmission, however, remain very much unclear. It was discovered in connection with an epidemic in the USA that the virus was capable of spreading through blood donation and organ transplantation as well as passing the placenta from a mother to the foetus.

The virus has traditionally been prevalent particularly in Asia, Africa and Southern Europe. Following the first reported case in Uganda in 1937, there has been a constant stream of reported cases in Egypt, Israel, France and South Africa. Several epidemics have been discovered in the past five years, the best known have been those in Romania, Morocco, Italy, Russia, Israel and the USA. In these, cases have been detected in humans and/or horses. Unlike in the European epidemics, mass mortality of birds has been reported in connection with the epidemics in the USA and Israel. The west-Nile virus has never been reported in Finland or the other Nordic countries.

5.3.6. Epidemic nephrophathy

Puumala virus causes epidemic nephrophathy. The bank vole acts as the natural and asymptomatic host for the virus. The infected bank vole may excrete the virus in its urine and other excretions. Transmission into humans is normally air-borne by inhalation of dust contaminated by the excretions. Often 20-30% of large bank vole populations carry the virus, sometimes more than 80%.

Puumala virus infection is a significant zoonosis in Finland and other Nordic countries. In recent years, 750-2,600 cases have been detected annually. The number of human cases fluctuates according to the size of the bank vole population. Serological studies show that the number of actual infections is several times, five-fold by estimation, the number of the diagnosed cases. Hence, the conclusion has been drawn that possibly either a mere 20% suffers an acute illness or a large number of cases are mild.

The disease causes both acute and long-term illness. The symptoms of the acute phase include fever, headache, nausea and visual disturbances. A number of patients develop temporary renal insufficiency. Chronic forms of the disease may be renal insufficiency and elevated blood pressure, which may be of significance for the public health, but the prevalence of the complications requires further studies. The disease is also one of farmers' occupational diseases and is, in fact, one of the most significant zoonotic occupational diseases.

Prevention of Puumala virus infection is problematic, as no methods exist to influence the prevalence of the virus in the bank vole population. The surveillance of the vole populations carried out in the Forest Research Institute can be used when attempts are made to predict a forthcoming epidemic. Informing the public about different ways of protection against the infection is also possible.

Puumala virus is not mentioned separately in the new Zoonoses Directive. Puumala virus infection has a marked significance to the public health in Finland, therefore monitoring of the infections ought to be reinforced.

Other rodent-borne zoonotic viruses have been detected in Finland in addition to the Puumala virus, e.g. Saaremaa virus of hantaviruses, arenaviruses and the cowpox virus. To date, their significance has been far lesser than that of Puumala virus.

5.3.7. Anthrax

Anthrax is a generalized infection caused by the *Bacillus anthracis* bacterium. No infections have been detected in Finland for years. A human can be infected by a diseased animal, animal products harbouring bacterial spores (e.g. skins) or by contaminated soil via the respiratory tract, the alimentary tract or a cutaneous wound. Spores of the anthrax bacterium can also be used for bioterrorism.

The anthrax bacterium stays infective for long periods of time in the soil and it is known to be prevalent to a certain extent in the soil of Osthrobothnia. The last detected case of anthrax in an animal was in bovine cattle in 1988. The clinical picture of the disease is clear and a differential diagnosis relatively easy to make. In the legislation anthrax is a dangerous animal disease to be combated. To minimise the risk of transmission to humans, the animal disease regulations regarding anthrax are strict when suspecting a case.

Anthrax is not mentioned separately in the new Zoonoses Directive. As the disease is easily identifiable in animals and the risk of direct transmission from animals to humans is small, the current monitoring system is sufficient.

The significance of anthrax has re-emerged in recent years due to the threat of bioterrorism. Therefore, we must possess continuous readiness for laboratory diagnostics of anthrax.

5.3.8. Pogosta disease

The causative agent for the Pogosta disease is the Sindbis virus transmitted to humans by mosquitoes. The primary rotation in nature takes place between birds and bird mosquitoes (*Culex* and *Culiseta)* but various animal species can get infected. There have been regular widespread outbreaks every seven years, infecting up to thousands of people, with fewer infections in between. Incidence is highest in Eastern Finland but infections are prevalent in all parts of the country. Infections normally occur in August-September.

The first clinical symptom is normally pain in one or more joints, usually of the lower extremities. A cutaneous eruption then appears marked by pruritus and lesions, vesicles may also be present. The cutaneous reaction normally spreads all over the body and lasts for some days. The symptoms in joints may last for a longer period of time.

5.3.9. Tick-borne encephalitis (TBE)

Tick-borne encephalitis (TBE) is a viral infection spread by ticks. Insectivores and rodents are thought to harbour the virus in the wild, especially bank vole and yellow-necked field mouse. Migratory birds may also be significant. Most cases of TBE have been reported in the Åland Islands and the archipelago of Turku, but infections have been contracted also from the Isosaari of Helsinki, off Kokkola shore and in the region between the eastern border and the lake district of Saimaa. The proportion of infections of foreign origin is not known.

TBE virus is less common in our tick population than the *Borrelia* bacterium. Approximately 0.4% of the ticks are carriers of the virus in the endemic region. TBE virus is not necessarily prevalent in all areas of tick distribution. Under certain climatic conditions, which are becoming more common in Finland because of global warming, the natural rotation of the virus is possible when the larval and nymph stages of the tick attempt to feed on blood concurrently, which transfers the virus to the next tick generation in the skin of the rodent. An increase in the incidence has already been noticed in the Baltic region, including Finland and Sweden. Whereas only few cases of TBE per annum were diagnosed in Finland in the early 1990s, in recent years the number has risen to approximately 40 cases per annum.

An effective vaccination against the disease exists and is recommended for travellers, particularly ramblers who visit tick regions. It is currently under consideration whether population in areas of high-risk for TBE (mainly the Åland Islands) ought to be vaccinated against TBE infection.

TBE is a vector-borne zoonosis spread by arthropods and the new Zoonoses Directive classifies it as a zoonosis of statutory monitoring according to the epidemiological situation. In addition to monitoring the prevalence of the virus in our human population its prevalence in our tick population should also be under surveillance periodically.

5.3.10. Rabies

Rabies is a serious viral disease of the central nervous system and it is invariably fatal when clinically symptomatic. The most significant animals spreading rabies in Europe are dogs, cats, foxes, racoon dogs and bats, but other mammals can contract and spread the infection as well. Transmission normally occurs through a bite by an infected animal. There have been no detected cases in the Finnish population for years. The latest infection occurred in 1985 by a bat bite. The last cases of rabies in animals were reported in 1988-1989. The WHO declared Finland a rabies-free country in 1991. One rabies infection has been reported in a horse imported from Estonia in 2003, but the horse had been infected prior to entering Finland.

Due to the severe nature of the disease significant investments have been made to prevent it from re-emerging. Wild animals crossing the border from Russia form the greatest risk to rabies spreading to Finland. A bait vaccination programme has been implemented as a preventive measure, whereby vaccine baits are distributed into the regions of our southeast border every year, intended for small predators. Collaboration is done with the Russian authorities to combat the disease and the bait vaccinations were started on the Russian side in 2003. Continuous surveillance to verify the success of the vaccination programme has been taking place in the region of the vaccinations by antibody testing of blood samples from predators found dead or shot in the region. Approximately 500 wild animals are examined for rabies in the National Veterinary and Food Research Institute (EELA) every year. In addition, the population density, habitats, mobility and contacts of the animals known to spread the disease have been studied in order to assure the correct methods in averting a new epidemic.

Vaccinating pets is also essential in the prevention of rabies. Vaccinations are mandatory for hunting dogs as well as for imported dogs and cats and recommended for other dogs and cats.

According to the new Zoonoses Directive, rabies is a zoonosis to be monitored according to the epidemiological situation. There is an ongoing need to monitor and combat rabies in Finland in order to prevent it from re-entering the country.

5.3.11. SARS

Sudden Acute Respiratory Syndrome (SARS) is a new human infection caused by the SARS Corona virus (SARS-CoV). From November 2002 to the spring of 2003, SARS-CoV caused an epidemic in the East and South-East Asia together with Toronto, Canada, which started in Guangdong in China. According to molecular epidemiological investigations, it does not appear to be a close relative to any previously known coronavirus. According to the current research data, it may be either a new zoonotic virus generated in the animal population by a mutation or a previously unknown species of viruses transformed into a form virulent to humans. The virus has been isolated in a small number of wild animals caught for food (e.g. masked palm civet), where antibodies to the virus were also detected. It is possible, however, that humans or, for example, rodents have infected these animals.

The virus produces pneumonia, the mortality of which is high in the elderly and in persons with underlying diseases. SARS-CoV is transmitted directly between humans either through the respiratory tract via droplet infection or direct contact. Healthcare personnel looking after the diseased represented a significant proportion (up to 40-60% in the local epidemics) of the infected during the epidemic that came to an end in July 2003. Following the epidemic in the South-East and East Asia, two cases of SARS have been detected which have been traced back to being laboratory contaminations together with a small number of sporadic cases of unknown origin which have been verified by laboratory testing, all in the region of the original epidemic.

5.3.12. Erysipelas

Erysipelas is caused by the *Erysipelothrix rhusiopathiae* bacterium. The disease can cause a skin infection in humans and, less frequently, also lymphadenitis or symptoms of septicaemia. Transmission usually takes place through a cutaneous wound or scratch when handling infected animals. Thus, erysipelas is an occupational disease of butchers, meat-cutters, farmers and veterinarians. Cases of swine erysipelas are not reported in the National Infectious Disease Registry's database but its annual prevalence in Finland is thought to be a few dozen cases.

Erysipelas is relatively common in pigs and turkeys. 3,000-5,000 clinical cases of Erysipelas are diagnosed in pigs per annum. In addition, the disease is detected in a small number of poultry farms every year. Voluntary vaccinations are the most common prophylaxis in pigs and turkeys are vaccinated when a clinical disease is detected. Animals can, however, be asymptomatic carriers, thus infecting those working with animals. Erysipelas is an animal disease to be reported monthly. If skin changes in pigs, typical of swine erysipelas, are discovered at slaughter, the carcass is rejected.

Erysipelas is neither mentioned separately in the new Zoonoses Directive, nor does the need exist, based on the current knowledge, to increase its monitoring or preventive measures in animals. The prevalence in the population could be monitored by the occupational health system. The Finnish Register of Occupational Diseases of the Finnish Institute of Occupational Health collects information regarding cases of erysipelas reported as occupational disease.

5.3.13. Zoonotic fungal infections

Humans can contract a zoonotic fungal infection from both production and pet animals. Fungal infections in animals are not diseases to be combated under the law, but bovine trichophytosis is a notifiable animal disease. Currently, very little data exists regarding the prevalence of fungal infections in animals and their significance as the source of infection in humans. Veterinary medicine in Finland offers hardly any possibilities for the laboratory diagnostics of fungal infections.

Bovine trichophytosis is caused by the *Trichophyton verrucosum* fungus. It can cause dermatitis (tinea capaitis) in humans. The industry has introduced a voluntary prevention programme of the disease because of the economical losses it generates, e.g. slowing down growth and causing damage to the hide.

Of pet animals, cat is the most significant source of fungal infections in humans. Several different fungal infections exist that are prevalent in cats and spread easily, particularly in large catteries. Fungal infections are easily transmissible from cats to humans, particularly to children, causing dermatitis.

5.4. Antimicrobial resistance

Resistant microbes are capable of multiplying in the concentrations of the antimicrobial agent that is sufficient for stopping the growth or destroy susceptible microbes Factors mediating the resistance may transfer between microbes. For example, microbes in intestinal normal flora may act as reservoirs for resistance factors, whence the factors may transfer to animal or human pathogens. Some microbes may possess resistance factors against several antimicrobials. These microbes are called multiresistant.

The tolerance of the microbes has increased along with the increased use of antimicrobials. Increased resistance to antimicrobials cannot be overcome by developing new medicines. New medicines should possess new active mechanisms and finding such substances is markedly difficult. Therefore, maintaining the efficacy of antimicrobial agents is one of the biggest challenges of human and veterinary medicines in the next few years.

A working group appointed by the Ministry of Social Affairs and Health published a report regarding prevention of antimicrobial resistance and developing the policy on antimicrobial agents in 2000 (Working group report 2000:4, Ministry of Social Affairs and Health). The prevention of resistance in bacteria is based on critical use of antimicrobial agents together with the prevention of the spread of resistant bacteria. Recommendations are issued in the report regarding monitoring the resistance status, monitoring the consumption of antimicrobials and developing the recommendations for the use of antimicrobials. In addition to healthcare, the report covers the field of veterinary medicine.

Monitoring antimicrobial resistance has been included in the new Zoonoses Directive of the EU. The requirements cover monitoring the resistance of strains of salmonella and campylobacter isolated from production animals and products thereof as well as of strains of indicator bacteria.

From the international point of view, the resistance situation of microbes of domestic origin is very good in Finland. Maintenance of the situation calls for active measures. Effective means in combating the increase of resistance are prudent use of antimicrobials and other actions against infections, for example, improvement of environmental conditions and prophylactic means to prevent diseases.

Multiresistant strains of salmonella, in particular, have increased markedly worldwide in recent years. The phage type DT 104 of *Salmonella* Typhimurium has proven to be of particular significance. There have been only very sporadic findings of this particular strain together with other multiresistant salmonellas in Finnish animals and foodstuffs. It has been discovered occasionally in the human population. Another growing problem relating to the resistance of zoonotic agents worldwide is the campylobacters' increasing resistance to fluoroquinolones.

5.5. Availability of laboratory diagnostics for the identification of zoonotic microbes

The regional availability and level of diagnostics determine how well a particular zoonosis is identified in our country. Poor quality and deficient microbial diagnostics of specimens taken from humans, foodstuffs animals and/or feedingstuffs may significantly impair the planning and realisation of preventive methods of an infection.

Investigations on the human population

There are more than 500 clinical microbiology laboratories licensed by the State Provincial Offices to carry out at least one type of service test in the field of clinical microbiology in Finland. Only approximately 30 of these laboratories have a licence to analyse human specimens for zoonotic microbes. In addition, approximately 40 food and environmental laboratories have the licence to screen stool specimens of asymptomatic persons for salmonella for health certificate type purposes. The majority of the laboratories carrying out zoonotic microbe testing are public laboratories, whilst fewer than 10 are private. The vast majority of all these analyses are carried out in the clinical microbiology laboratories of the central hospitals. Our country is well covered by the network of laboratories carrying out these investigations and their availability is satisfactory. All laboratories participate in and their analyses are extremely well covered by the external quality assessment schemes arranged by independent parties. However, the quality of the analyses for some of the zoonotic bacteria needs to be improved.

The Association of Finnish Local and Regional Authorities maintains the Nomenclature for Laboratory Investigations which is an official and standardised list of the test requests aimed for the use of the attending physician. There is a separate term of request in the Nomenclature for some of the zoonotic pathogens. The physician uses the specific term when making a request if the patient's case history and clinical symptoms indicate a particular pathogen (e.g. EHEC culture, *Tularemia* antibodies, *Trichinella* antibodies, *Mycobacterium* staining) or in the case of screening asymptomatic carriers (e.g. *salmonella* culture). One particular pathogen cannot always be suspected on the basis of symptoms. This applies, for example, in cases of acute diarrhoea when the test request can refer to a larger choice of microbes: e.g. stool culture-1 always covers cultures for *Salmonella*, *Campylobacter*, *Yersinia* and *Shigella.* Ordinarily, however, the patient's symptoms (e.g. febrile generalised infection or purulent wound) refer to no specific pathogen. In such cases the request of a non-specific investigation (e.g. blood culture or exudate culture) has to be used. Many zoonotic microbes (e.g. *Listeria*, *Francisella*, *Erysipelothrix*) are detected almost exclusively by these non-specific microbiological laboratory investigations.

The clinical microbiology laboratories have to give data on the number of their investigations upon applying for the licence from the State Provincial Offices, as laid down by the Infectious Disease Act. These data are given every three years when the application for the licence is renewed and can be used as a rough estimate when f the resources needed for the identification of zoonoses are evaluated. The laboratories collect and report the data in a standardised manner using the Association of Local and Regional Authorities' Nomenclature. The data is collected in the Register of Licence-holders kept by the National Public Health Institute (KTL). The numbers of the investigations carried out for certain individual zoonotic microbes (like *Salmonella* culture, *Salmonella* antibodies) or groups of certain microbes (such as stool culture-1) describe in broad outline the availability and accessibility of the laboratory resources. By combining the annual figures of these specified tests, total numbers are reached, for example, for salmonella 204,000 salmonellosis investigations / year in 2001 or 67,500 investigations for campylobacteriosis (Table 3).

However, some of the zoonoses (e.g. listeriosis; 25 cases/year in 2001) are identified almost exclusively by the non-specific investigations (blood culture, cerebrospinal fluid culture) even if specified tests (Listeria culture, approx. 600/pa) are available (Table 3).

Investigations on food

There are 44 establishments authorised for food investigations by the food legislation in Finland. Their area of competence covers usually general indicator organisms and common food poisoning pathogens. Not many laboratories have the proficiency to investigate and determine others than the most common pathogens, such as the *Yersinia* or *Vibrio* bacteria. Approximately 72 laboratories are authorised by the hygiene legislation and many of them exist in connection with places of slaughter. Thus the tests carried out in them usually include salmonella, trichinellas and others connected with meat inspection.

Laboratory analyses of food are available in Finland but there is great regional variation in their availability. Investigations for salmonella and listeria are readily available in all parts of the country, whereas those for EHEC, campylobacter, yersinia and vibrios are insufficient.

Investigations on animals at slaughterhouses

Before meat is approved for general consumption it is inspected at the place of slaughter. Every carcass of a domestic animal together with both farmed and wild game animals is individually examined at meat inspection. This is the responsibility of a veterinary inspector. At meat inspection, the carcass is given a detailed examination and, when necessary, samples are taken for laboratory investigations. For example, severe generalised infections and other changes to general well being are noted at meat inspection. Based on the results of the meat inspection, the carcass will be accepted for general consumption as such or it may be ordered to undergo heat treatment or be rejected either in part or in whole and destroyed.

Signs of dangerous or hazardous pathogens, in particular, are sought after at meat inspection, including echinococci and certain other parasites, generalised infection caused by *Bacillus anthracis* bacterium (anthrax) as well as changes in the carcass and internal organs brought on by mycobacteria and *Erysipelothrix rhusiopathiae* (Swine erysipelas). A sample is taken from every carcass of a potential host to trichinellas (pig, horse, wild boar, bear, etc.) to exclude a possible infection. A sample is taken from all cattle of 30 months of age or older for testing for BSE. BSE (TSE) investigations are also carried out in suspected cases on younger bovines, as well as sheep and goats.

Meat approved at inspection may contain many bacteria and other pathogens that cannot be detected at meat inspection. Such infective agents include the protozoa toxoplasma and cryptospridium as well as all viruses. The EHEC, salmonella, listeria and yersinia bacteria are all identified in meat exclusively by specified bacteriological tests, not in routine meat inspection.

In addition to the examination given to each individual carcass at meat inspection, tests in connection with epidemiological surveillance are carried out at places of slaughter. The prevalence of salmonella is monitored by the National Salmonella Control Programme.

Investigations on the animal population

Samples of animal origin are generally tested in the National Veterinary and Food Research Institute (EELA). The Institute is capable of carrying out tests for all of the most significant zoonoses. Some of the zoonoses have been classified as animal diseases to be combated and controlled by the Animal Disease Act. The laboratory diagnostics for such diseases from animal samples may be carried out only in the Institute. Testing of samples taken from cattle, pigs and poultry (live animal samples) for the animal diseases to be combated and controlled under the law may be carried out in accredited establishments authorised by the Institute (currently 62 of them in total). All salmonella findings from animals and products of animal origin are sent to the Institute pending further investigations (e.g. serotyping). Other laboratories may carry out tests regarding such zoonoses which are not to be combated and controlled under the law. The laboratories must, however, conform to the general requirements for proficiency as stated by the Institute together with the stipulations set by the Department of Food and Health of the Ministry of Agriculture and Forestry. No exact data regarding the zoonoses tests carried out by these laboratories exist, but the operation is thought to be minimal.

The research group for viral zoonoses of the Department of Virology in the University of Helsinki acts in close cooperation with the Finnish Forest Research Institute (METLA) carrying out ample research regarding rodent-borne zoonoses. In addition to the rodent samples, some tests on tick and mosquito samples are also carried out in the Helsinki University Central Hospital.

Feed analyses for detection of zoonoses

The analyses in connection with the official control of feedingstuffs are concentrated in the Laboratory of Agricultural Chemistry of the Plant Production Inspection Centre. According to the current information, there are three laboratories accredited by the Centre for Metrology and Accreditation (MIKES) in Finland to carry out analyses as part of the own-check schemes of the feedingstuff manufacturers. Two of the laboratories are in the ownership of a city/federation of municipalities and one is a private laboratory. The vast majority of the analyses carried out to search for zoonotic agents concentrates on the detection of salmonella in feedingstuffs. The three laboratories carry out a small number of listeria investigations annually together with campylobacter investigations in feedingstuffs carried out occasionally by the laboratory of the Plant Production Inspection Centre.

Positive salmonella findings from different laboratories are sent either to the National Veterinary and Food Research Institute or the Plant Production Inspection Centre for serotyping. All *S. Typhimurium* and *S. Enteritidis* serotypes are then sent on to the National Public Health Institute for phage-typing. All salmonella serotypes rare in Finland are also sent there for verification. It would benefit the entire process of feedingstuff control if all of the salmonella serotyping, including samples taken in connection with the own-check schemes, was concentrated in the laboratory of the Plant Production Inspection Centre, where the serotyping of salmonella strains from imported feedingstuff materials is carried out. The feed analyses and the salmonella serotyping require prompt action, as the feed industry needs to be able to start manufacturing the raw material as quickly as possible. Hence, the Plant Production Inspection Centre's laboratory carries out salmonella analyses seven days a week.

Table 3. Indicatory numbers (pcs) of tests carried out for the detection of zoonotic microbes in Finland in 2001

Pathogen	Tests on the population[a]	Tests on foods	Tests at slaughter	Other animal tests [c]	Feed analyses
Bacillus anthracis	0		*	20	
Borrelia burgdorferii	41 000			340	
Brucella abortus	200			15 800	
Campylobacter-bacteria	67 500		1 069 broiler flocks	220	
EHEC bacterium	800	224	300	540[b]	
Erysipelothrix rhusiopathiae	0		*		
Francisella tularensis	1 300			10	
Listeria monocytogenes	1 300	3 846		280	
Mycobacterium-bacteria	76 000		*	50	
Salmonella-bacteria	204 000	4 242	9 789	52 500[b]	8 400
Yersinia-bacteria	77 500			120	
Puumalavirus	7 000			1 500	
Tick-borne encephalitis virus	1 850				
Cryptosporidium parvum	250			270	
Echinococcus parasites	10		*	790	
Giardia lamblia	26 000				
Toxoplasma gondii	10 600			40	
Trichinella parasites	0		2 069 237	290	
vCJD / BSE -prion			BSE 24 120 (slaughtered)	BSE 3 880 (died of natural causes)	A

[a] Includes specific cultures, nucleic acid-based analyses , antibody and specific staining tests for the detection of certain pathogens. Does not include so-called open (non-specific) tests, used for the detection of some of the pathogens (e.g. *Listeria* is primarily found by non-specific blood culture).
Source: National Public Health Institute, Register of Licence-holders (approximate annual figures).

[b] Surface swab samples of carcasses not included

[c] Animal tests include non-specific tests in addition to tests in column [a]. Table does not include animal tests carried out by laboratories other than that of the National Veterinary and Food Research Institute, except for tests in connection with the national salmonella control programme (according to numbers reported) together with trichinella testing carried out by a research group of the Faculty of Veterinary Medicine

***** Tests carried out at meat inspection in slaughterhouses and other places of slaughter. Animals slaughtered in total in 2001: 345 561 bovines, 2 066 505 pigs, 39 111 sheep/goats, 53 676 683 birds of poultry, 1 619 horses, 50 669 reindeer and 3 100 farmed or wild game animals.

Feeds are also examined for prevalence of tissue of animal origin. In 2001, examinations were carried out on 720 cases for meat and bone meal and on 520 cases for fish meal.

The cost-effectiveness of some of the investigations can roughly be estimated by taking into account the number of new identified cases (for example 2,740 cases of salmonellosis/yr 2001, 3,970 cases of campylobacteriosis/yr 2001) and the number of investigations carried out (Table 3). The National Public Health Institute has also collected more accurate information from the food laboratories by a separate survey regarding salmonella investigations in the population. According to the results, approximately 810,000 screening tests were carried out in our country over a period of 15 years in order to identify asymptomatic salmonella carriers. Asymptomatic carriers were detected in only 0.1% of the routine occupational health checks, at the beginning of a work contract and upon annual check-ups, while foreign travel increased the positive findings more than 30-fold. Results clearly indicate where the focus of salmonella screening amongst food industry workers ought to be.

The number of positive findings, however, is not always significant to the cost-effectiveness. This applies particularly to many investigations performed from specimens collected from food and animals.. A very good example is the trichinella investigations carried out at slaughter, more than 2 million of them in 2001 (Table 3). No cases of trichinellosis have been found in Finland for years, but the situation might not be as favourable without the quite extensive screening tests carried out. Evidence for this can be found in some other countries.

Investigations on foodstuffs are based on the laboratories' reports on food testing carried out by the surveillance authorities. Information regarding the tests and prevalence of pathogenic bacteria in different food groups has been collected since 1998 in support of risk assessment (the National Food Agency and the National Veterinary and Food Research Institute). At first, data collection included only salmonella and listeria, but it has been expanded annually. The aim is to include investigations for all pathogens in the data collection. In 2001, information regarding the EHEC bacterium was also collected, in addition to salmonella and listeria. Most of the tests were carried out on salmonella (N=4242). Almost half of salmonella tests were directed at meat or meat products, which were also the only food group from which salmonella was isolated from. The prevalence of salmonella in meat and meat products, however, was low (0.7%). The majority of salmonella positive findings originated from fresh poultry meat. The second largest group of pathogens tested was *Listeria monocytogenes* (N=3846). One third of listeria investigations were directed at fish and fish products, of which the vacuum packed products are considered high-risk products. The prevalence of listeria in that group was 9%. Quite high listeria content (max 25.000 cfu/g) was discovered in a number of products. The EHEC bacterium was tested mainly in minced meat. No positive findings were discovered. Data regarding samples tested and their results within the own-check systems are not included in the figures presented in the table.

The laboratory diagnostics regarding the most significant bacterial zoonoses carried out on animals is currently readily available and the testing capacity is quite satisfactory. Of viral zoonoses, rabies diagnostics is adequate for the current situation. To date, it has not been considered necessary to offer diagnostic services for certain other viral zoonoses (e.g. rodent-borne) in the National Veterinary and Food Research Institute (EELA). Surveys and studies regarding the prevalence of some viruses are carried out within the independent research projects of research institutes and universities. Should the epidemiogical situation change or the need for testing increase considerably (needs emerging as a result of recent research data, threat of intentional spread, etc.), further input is called for in both bacterial and viral diagnostics. The availability of parasitic analyses is already quite low, and further input is required in that field already under the current circumstances. Laboratory diagnostics for fungal infections in animals is almost non-existent in Finland.

Both the current availability of diagnostics for feedingstuffs and the number of investigations for salmonella are adequate. In the feedingstuff sector, it is not justified for the present to extend the routine-type testing to other zoonotic agents other than salmonella. In the official salmonella investigations carried out in the Plant Production Inspection Centre (KTTK), according to the monitoring programme of 2002, no salmonella positive samples were discovered among domestic mixed feeds of cattle, pigs, poultry, pet animals or fish. Two types of salmonella were detected in fur animal feeds. Salmonella positive test results were found in 5.8% of mainly imported dog treats. Of the tested feed consignments from the internal market of the EU, 10% of fish meal, 5.0% of wheat, 18.0% of rape seeds and 11.8% of soy meal turned out to be salmonella positive. The cost-effectiveness of salmonella control for feeds has not been studied in Finland. A cost-benefit analysis ought to be carried out promptly for the development of the monitoring, together with justification for the need to amend the EU legislation.

6. CONCLUSIONS ON THE ZOONOSES SITUATION IN FINLAND

Upon the completion of the evaluation regarding the present zoonoses situation and the operating environment in Finland, together with the changes taking place within them, the working group has drawn the following conclusions from the current overall situation:

The occurrence of zoonoses in Finland

1. Zoonoses, in other words diseases transmissible between animals and humans, cause significant problems to the public health, also in Finland.
2. On the grounds of present day statistics, however, Finland's current zoonoses situation remains in many respects better than the European average. The prevalence of salmonella bacteria and BSE in the food production chain is low. Brucellosis, bovine tuberculosis or *Echinococcus multilocularis* have not been detected in the human or animal populations in Finland for decades, some never.
3. Based on the number of human reported cases verified by laboratory tests, the most significant zoonoses in Finland are campylobacteriosis, salmonellosis, Puumalavirus, yersiniosis, borreliosis, giardiosis, tularaemia and Pogosta disease. Due to the serious nature of cases, listeriosis and the EHEC infection are also significant, albeit the number of identified cases remain at only some dozen per annum.
4. Food- or water-borne zoonotic epidemics are detected in Finland every year, the most common causative agents of which are salmonella, campylobacter and yersinia. Zoonoses spread by wild animals also cause epidemics annually, e.g. tularemia, Puumalavirus and borreliosis.

Combating zoonoses

5. In addition to problems to the public health, the occurrence of a zoonotic agent in products may also result in heavy economic losses to the industry. This may happen even when no infections are identified amongst the population. Therefore, considerable investments are made in the prevention of zoonoses every year.
6. In Finland the inputs in the prevention of zoonoses cover the entire food production chain, and the primary stages of production in particular. Most of the work is directed at the prevention of salmonellosis, BSE, trichinellosis, brucellosis, bovine tuberculosis and echinococcosis. The preventive work remains, however, insufficient for the part of certain zoonoses prevalent in production animals (campylobacter together with the EHEC and yersinia bacteria).
7. The prevention of zoonoses has concentrated primarily on foodborne infections spread by foodstuffs of animal origin, which have traditionally been the most significant sources of infection. Again, the preventive action against zoonoses spread by plants, insects and wild animals has been somewhat scarce, apart from the prevention of rabies. It is probable that the research and developing diagnostic methods will result in the discovery of new zoonoses in wild animals.
8. The own-checking systems within the industry hold a key role in the combating of zoonoses. It is important, nevertheless, to develop the realisation and controlling of the own-checking systems further.
9. Very little comparable data regarding the implications of different zoonoses for the society or the industry is available. Facts regarding the prevalence of infections at different stages of production are often insufficient as well. This complicates the allocation of the resources. Improved allocation of the resources requires multidisciplinary cooperation and scientific research, together with assessments of the risks and economic impacts.
10. Cooperation with different authorities, research institutes and universities has increased and changed significantly in recent years. Developing the combating of zoonoses further requires clarification as to how the responsibilities are distributed as well as formal agreements between organisations in addition to the current, often informal, collaboration.

<u>Changes in the operating environment</u>

11. The globalisation of food production, food trade and the human relations together with the changes in the structure of production, industry and retail level as well as the consumer habits all set growing demands, for both Finland and the enlarging EU, for their action to control zoonoses. The risk will grow for the emergence of exotic zoonoses and zoonoses which have not been detected in Finland for decades.
12. The changes in acquiring and keeping pet and hobby animals are likely to increase the animal owners' risk of zoonoses, particularly with the more exotic species.
13. Certain zoonoses are also suited for the detrimental use of microbes (for example bioterrorism). Should this menace become reality, significant resources will be needed in many governing bodies to control the situation.

Many significant changes have taken place in the Finnish agriculture, food trade and people's behaviour, which influences our zoonoses situation. We can already predict some notable changes in the next five years, which will have an effect on the prevalence of different zoonoses and on how they can be controlled in Finland. The strengths, weaknesses, opportunities and threats of zoonoses' control and prevention measures have been analysed by means of a SWOT analysis shown in Annex 4.

7. STRATEGIC OUTLINE

7.1. Vision on the zoonoses situation in Finland in 2008

Despite the increasing threats in the operating environment, the zoonoses situation in Finland is better than that of 2003. The control of the risks due to the most significant zoonoses has been carried out effectively and economically based on scientific evidence and in close cooperation with different authorities, research institutes, universities and the industry.

7.2. Strategic fields of operation in combating zoonoses

It is important in developing the monitoring, control and prevention of zoonoses to work on the following three areas:

1. **Directing the work done in Finland in the prevention of zoonoses at the most significant zoonoses in an efficient and cost-effective manner.** This means that the work done in Finland in the prevention of zoonoses is based on adequate knowledge regarding the prevalence of zoonoses in the production chain, wild animals and the humans as well as on the knowledge regarding the effect of different measures on the risks of zoonoses together with assessment of the economic impact of measures available or methods already chosen.

2. **Managing the risks of imported feedingstuffs, animals and foodstuffs.** This means that the raw material, animals and products arriving in Finland do not impair the Finnish zoonoses situation and that officials as well as the industry have had an active role in this within the international collaboration.

3. **Developing the cooperation relating to zoonoses in the entire field of operation.** This means that every operator involved in the control and prevention of zoonoses is aware of his/her responsibility and knows the other operators' principles and goals thoroughly enough and that the organisational structures are in support of multidisciplinary cooperation.

8. STRATEGIC OBJECTIVES

8.1. Focusing the work done in Finland in the prevention of zoonoses at the most significant zoonoses in an efficient and cost-effective manner

8.1.1. Key problems

There is need for improvement within the national systems for the monitoring, surveillance and prevention of zoonotic infections in feedingstuffs, animals, foodstuffs and the population.

A key problem in the prevention of zoonoses is that very few assessments have been made regarding their significance to the public health. In order to know whether to direct the preventive work of a certain zoonosis at domestic food production or at informing those who intend to travel abroad, we ought to know the country of origin of the identified human cases. At present, this data is collected only for salmonella and currently also for campylobacter as a pilot project. People's own action is often a crucial factor through which many zoonotic infections could be prevented. This applies to many areas of operation including occupational health and safety, food preparation at home, the handling of wild animals as well as those who keep animals as a hobby. At present, neither the public nor the occupational safety organisations have adequate information regarding the prevention of zoonoses. Every consumer, hunter, berry-picker and hobby animal owner has the power to influence their personal risk of a zoonotic infection through their own actions. Advice directed at different high-risk groups has been scarce and limited and new methods should be sought after to raise the awareness.

Many zoonoses are well covered by the extensive and persistent work done in Finland for the prevention, monitoring and control of zoonoses (e.g. salmonella, bovine tuberculosis, brucellosis and rabies). The situation for the part of these zoonoses is exceptionally favourable compared to international situation.. In order for the export to benefit from this information the monitoring must continue to be extensive and the data regarding it easily obtainable for the industry as well. The monitoring, however, has concentrated on just a small number of the most significant zoonoses and the monitoring and control systems for certain zoonoses (for example, campylobacter together with yersinia, listeria and the EHEC bacteria) currently remain either poorly developed or are non-existent in the case of animals or foodstuffs.

Traditionally, the work in connection with zoonoses has concentrated on animal production and foodstuffs of animal origin. In recent years, however, an increasing amount of data has been obtained regarding the significance of the roles of foodstuffs of plant origin and water in spreading zoonoses whose original sources are animals or humans. The occurrence of zoonotic agents, however, is currently not under any kind of surveillance in foodstuffs of plant origin, apart from sampling of random nature. Data on zoonoses spread by wild animals are also often quite inadequate.

The assessment of the efficacy of the prevention of zoonoses is often complicated by the fragmentary data regarding the prevalence of zoonoses and the related factors, the underdeveloped use of scientific risk assessment in aid of decision-making as well as the absence of a systematic budgeting. It is essential to know how the resources ought to be allocated in order to manage the overall risk.

As the zoonoses are diseases transmissible between animals and humans, ending up in humans through foodstuffs, direct contact, insects or the environment, the work on prevention of zoonoses is extremely multidisciplinary and requires extensive knowledge in a variety of fields. Scientific, multidisciplinary data, however, are inadequate and no structures have existed in support of this in the research funding to make more extensive, multidisciplinary research possible. In the absence of such data it is difficult to determine which zoonoses are the most significant for the public health and the economy in Finland and, consequently, where to direct the investments in the fields of monitoring and surveillance.

A special problem is the increasing resistance to antimicrobials of certain zoonoses, such as salmonella.

8.1.2. Objectives

Action is needed to support and further develop the Finnish control, monitoring and prevention of zoonoses concerning feedingstuffs, animals, foodstuffs and the human population in order to reach the following targets:

1. The significance of the most important zoonoses for the public health is known.
2. The monitoring, epidemiological tracing and prevention of the population’s zoonotic infections are stronger than currently.
3. Awareness of work-related risks posed by zoonoses, together with ways to combat them, has grown.
4. Direct communication to the public regarding zoonotic infections and how to prevent them has been improved.
5. No zoonotic agents are spread by feedingstuffs, fertilisers or plants.

6. The prevalence of campylobacter together with the EHEC, salmonella and yersinia bacteria as well as TSE diseases will remain at current level or even be reduced.
7. The monitoring, control and prevention of zoonoses in the production of food or household water is more efficient than at present.
8. The prevalence of the most significant zoonoses in the food production chain and the nature is known well enough in order to develop and assess preventive measures.
9. Assessments of risks and economic impacts are of high standard and useful.
10. The knowledge regarding zoonoses possessed by food businesses and workers within the food industry is at an adequate level.
11. The National Quality Strategy for the Food Sector contributes to developing the preventive work against zoonoses further.
12. The export of foodstuffs, products and operations based on zoonoses know-how is profitable.
13. The research funding will emphasize multidisciplinary research on zoonoses.
14. The monitoring and control of antimicrobial resistance will function effectively and zoonotic bacteria of domestic origin are susceptible to the antimicrobials used in treatment.

8.2. Managing the risks of zoonoses in imported feedingstuffs, animals and foodstuffs

8.2.1. Key problems

Along with Finland's EU membership, and already prior to it, feedingstuffs, animals and foodstuffs have been imported to Finland from countries with a less favourable zoonoses situation. In future, along with growing liberalization of world trade together with the globalization of the food industry and food trade, import is expected to continue to grow. International cooperation is needed when the EU enlarges in 2004 as well as in wider contexts (e.g. WTO, FAO, WHO, Codex, OIE, IPPC) in order to be able to influence the zoonosis situation in the importing countries.

Finland has the status of a so-called disease-free country for the part of certain zoonoses (bovine tuberculosis, rabies and brucellosis), which means that imported animals can be examined and none of these infective agents should be identified. This protects the Finnish animals and consumers from the diseases in question. Additional guarantees, made possible by the national salmonella control programme, protect at least to an extent against the importation of salmonella. The risk of importing BSE in feed material is currently managed by the bans on the use of animal protein in feed material and by examining the imported bovines for BSE after their death. It is not possible to require investigations for other zoonoses nationally; hence these zoonoses may end up in Finland unless the industry voluntarily undertakes the import protection for the part of them. Thus, the working group appointed to discuss the combating of animal diseases proposes in its report of 31 December 2003 that the guidance and coordination of the combating of other animal diseases than those required by legislation together with the individual combating policies pertaining to certain animal diseases ought to be the conjoint responsibility of the National Veterinary and Food Research Institute (EELA), the Association for Animal Disease Prevention (ETT) and the National Animal Healthcare System (ETU).

In addition to the risk in connection with foodstuff import, wild animals as potential carriers of an infection entering the country from areas adjacent to Finland generate the risk of spreading the disease. The import of animals kept as a hobby (dogs, cats, birds, reptiles and horses) may also make the zoonoses situation in Finland's animal population less favourable.

8.2.2. Objectives

1. No zoonoses arrive in Finland that currently do not exist here.
2. The EU area has committed to "from farm to table" principle and the zoonoses control within the EU is effective.
3. The zoonoses situation in other countries will improve through international action.

8.3. Developing cooperation within the entire field of operation involved with zoonoses

8.3.1. Key problems

There are many operators within the fields of monitoring, control, prevention and research of zoonoses. The operation of the state authorities is regulated by the Ministry of Agriculture and Forestry (MMM), the Ministry of Social Affairs and Health (STM), the Ministry of Trade and Industry (KTM), the Ministry of Finance (VM), and the Ministry of the Interior (SM). Central administrative bodies for the control are the National Food Agency (EVI) and the Plant Production Inspection Centre (KTTK). Research within the field is carried out in a number of state research institutes: National Veterinary and Food Research Institute (EELA), National Public Health Institute (KTL), Agrifood Research Finland (MTT), Finnish Forest Research Institute (METLA), Finnish Game and Fisheries Research Institute (RKTL), Technical Research Center of Finland (VTT) and National Technology Agency TEKES together with several universities and polytechnics. The entire food production chain and all the entrepreneurs within "from farm to table" are responsible for their own part for the zoonoses situation in Finland. This versatility and diversity generates problems in communication and practical arrangements. Despite the attempts to improve the standard of outbreak investigation by means of training and cooperation, problems continue to exist in the cooperation between different fields, which reduces the productivity of the investigation work carried out.

8.3.2. Objectives

1. Different organizations responsible for the prevention and monitoring of zoonoses are in support of active cooperation.
2. The investigation, surveillance and reporting systems for food borne outbreaks and other epidemics are more effective than the current ones.

9. ACTION PLAN

9.1. Key implementors

Input and cooperation from the state authorities and public institutes, entrepreneurs and associations of the industry together with representative bodies of the public are needed in order to bring the planned measures into practice. In the questions regarding legislation and its application together with guidance within the field, the main responsibility rests with the Ministry of Agriculture and Forestry (MMM), the Ministry of Social Affairs and Health (STM) and the Ministry of Trade and Industry (KTM). Important central authorities are the National Food Agency (EVI) and the Plant Production Inspection Centre (KTTK). Important operators among the state research institutes in the field of zoonoses are the National Veterinary and Food Research Institute (EELA), the National Public Health Institute (KTL), Agrifood Research Finland (MTT), the Finnish Forest Research Institute (METLA) and the Finnish Game and Fisheries Research Institute (RKTL). Other important operators are the municipal governments, municipalities, Employment and Economic Development Centres, occupational health and safety districts, healthcare districts, the Finnish Institute of Occupational Health, the National Agency for Medicines, the Faculty of Veterinary Medicine of the University of Helsinki together with the Haartman Institute, as well as other universities and educational institutions within the field.

Representatives of the industry and the public include, for example, the Association for Animal Disease Prevention (ETT), the Finnish Food and Drink Industries' Federation, the Finnish Food Marketing Association, consumer organisations as well as many other associations and unions within the industry.

9.2. Implementation

The most essential measures, the operators responsible for them as well as the categories for their urgency / importance are presented in the table in Annex 5. The scaling for the categories is as follows: (1) most urgent, immediate action required, (2) urgent, action to be taken within a year, (3) important, action to be started approximately within the next two years. Urgent action means that prompt action needs to be taken to improve or make current action more effective, important action means that current measures are nearly adequate, but further work is still needed.

9.3. Key measures

The realisation of the following measures in 2004-2008 is considered of vital importance in order to attain the objectives of the Strategy:

1. Creating a national system for monitoring and/or surveillance of campylobacter, yersinia, listeria and the EHEC bacterium

- The systems must conform to the requirements set by the new EU Zoonoses Directive. Regular monitoring of production animals or foodstuffs will be launched in 2004, for yersinia in 2005.
- In 2004, a system regarding these zoonoses conforming to the requirements of the EU's surveillance network of communicable diseases will be set up within the National Register on Infectious Diseases, which will aid the collection of information regarding the country of origin of the infections together with other information relevant to tracing back the source of infection.
- The identification of the epidemics caused by the infective microbes of these most significant zoonoses will be made more efficient by increasing and coordinating the serotyping of infective strains isolated from patients or from the food production chain.

- Responsible operators: MMM, STM, EELA, EVI, KTL, provinces, municipalities, industry

2. Drafting plans of action for the zoonoses regarded as the most significant in consideration to public health, animal production and the national economy

- In 2004, the permanent working group for zoonoses will lay the foundation for the principles for comparing the different zoonoses' significance for the public health and the economy.
- The most significant zoonoses will be assessed according to these principles. In addition, the effectiveness and economics of possible risk management action taken in the prevention of these zoonoses will be evaluated in practice.
- The permanent working group for zoonoses will create plans of action for the most significant zoonoses in 2005-2008.
- Responsible operators: MMM, STM, EELA, EVI, KTL, KTTK, METLA, RKTL, MTT, the Finnish Institute of Occupational Health, universities, the National Technology Agency of Finland, the Academy of Finland

3. Increased funding for multidisciplinary research in support of further developments in the combating of zoonoses

- The significance of campylobacter, EHEC, listeria and yersinia on the public health and the economy together with the significance of different sources of infection are examined by investing in epidemiological research, risk assessment and economic evaluations
- Other extensive zoonoses-related multidisciplinary research projects are supported so as to direct the risk management actions more efficiently.
- Responsible operators: MMM, STM, EELA, EVI, KTL, KTTK, METLA, RKTL, MTT, the Finnish Institute of Occupational Health, universities, the National Technology Agency of Finland, the Academy of Finland

4. Improved risk management in connection with the import of feedingstuffs, animals and foodstuffs

- An active role in further developing zoonoses-related legislation in the EU.
- The industry is to develop further its own risk management methods concerning zoonoses.
- Responsible operators: MMM, STM, EELA, EVI, KTL, KTTK, provinces, municipalities, the industry

5. Creating a network-like zoonoses centre between the central organisations

- By the year 2006, a network-like zoonoses centre is to be created within the organisations in the administrative sectors of the Ministry of Agriculture and Forestry (MMM) and the Ministry of Social Affairs and Health (STM), both of which participate in the monitoring and control of zoonoses.
- In 2004, the permanent working group for zoonoses of the Department of Food and Health of the Ministry of Agriculture and Forestry, (MMMELO) will determine the means available for organising the zoonoses centre together with its tasks and the additional requirements for staff and other resources.
- Responsible operators: MMM, STM, EELA, EVI, KTL, KTTK

10. ECONOMIC IMPLICATIONS OF THE STRATEGY

The total costs generated by zoonoses to the various operators within society are not known, apart from a small number of individual evaluations. Hence, assessing the economic implications of attaining the strategic objectives is difficult. The direction of the costs may also change as a result of the action taken, for example, diminished sickness expenditure may require further investments in food production. Despite these difficulties in assessment, a broad outline regarding the economic implications of this Strategy can be drawn for the most essential measures.

1. **New monitoring systems.** Creating new surveillance and/or monitoring systems will in any case become topical when the new zoonosis legislation enters into force in 2004. The better the information regarding the true prevalence of zoonoses and the influences of different risk management methods on which the new systems are based, the more effective and economic methods can be constructed. If possible, when carrying out the necessary examination, an assessment can be made to determine how the economic effects as a whole are distributed and what the relation of improving the monitoring/surveillance is to the expenditure of the work on public health. In other words, complying with the recommendation of this Strategy will not increase the already expected total costs.
2. **Plan of action for the most significant zoonoses.** Assessment of the significance of different zoonoses together with assessing in practice the effectiveness and economics of possible risk management procedures is already applied. The realisation of the assessments will require financial resources in carrying out studies and examinations.
3. **Managing the import risks.** The majority of the further developments of this operation can be carried out by means of resources already in use through directing operations so that the issue is given enough attention. A great deal has already been accomplished within this area but emerging pressures in the operating environment is setting new demands for it.
4. **A network-like zoonoses centre.** The objective is to establish the centre by rearranging current resources. However, some new staff will be needed in order for the establishment to bring along sufficient influence whilst increasing the efficiency of the organisations within the field of zoonoses. Any exact prediction of the needed resources is difficult to make until an organisational model for the centre has been determined, together with its central tasks. Based on the experiences from other Nordic zoonoses centres, the need for new staff would be in the region of 6-8 persons. Allocating these resources would take place within the framework of government expenditure.

The vast majority of the remaining proposed measures can be attained by developing current procedures further and taking the zoonoses viewpoint into consideration in everyday work. There will be, however, a need for further resources for different types of information campaigns, surveys and studies.

11. MONITORING THE STRATEGY

11.1. Organising the monitoring

The Zoonoses Strategy will be put to practice in different sectors under the Ministry of Agriculture and Forestry and the Ministry of Social Affairs and Health in cooperation with different operators. The Strategy will also be implemented through the planning of the ministries' operating and financial plans as well as through the administration's performance monitoring.

The permanent working group for zoonoses assesses the attaining of the objectives and application of the measures in practice on an annual basis, together with the need for changes in the Strategy. The working group reports on the results of its assessments to the Ministry of Agriculture and Forestry and the Ministry of Social Affairs and Health.

11.2. Measuring progress

Measuring effectiveness:

The numbers of reported cases produced by the following systems for data collection and statistics are used as indicators for the effectiveness of the Strategy in terms of public health:

- The National Register on Infectious Diseases (KTL)
- The National Register on Food Poisoning Epidemics (EVI)
- Results of population-based studies (KTL)

For the part of foodborne and household water-borne epidemics, the criteria for success are, in particular:

- The number of salmonella, campylobacter, listeria, yersinia and EHEC infections of domestic origin will decrease and the number of infections of foreign origin will remain, in the least, unchanged.
- No domestic cases of vCJD are identified.
- No listeria or EHEC epidemics.
- The total number of food poisoning epidemics will not increase.
- No domestic strains resistant to antimicrobials exist.

When assessing the impact of the Strategy on food safety (=prevalence of zoonotic agents in foodstuffs) and animal health, the following statistics are used as indicators:

- Results of the salmonella control programme (EVI, EELA)
- Statistics of the zoonoses report (EELA, EVI, KTTK, HY, METLA)

Criteria for success are, in particular:

- The prevalence of salmonella in production animals and foodstuffs of animal origin remains below 1 %
- The number of bovine EHEC infections stays low
- The number of campylobacter infections in fowl will decrease
- The prevalence of listeria in fishery products decreases
- No cases of bovine tuberculosis or brucellosis are detected in animals.
- No cases of rabies or *Echinococcus multilocularis* are detected in animals

In measuring the economic effectiveness of the Strategy, the results of the cost-benefit analyses and other financial analyses are utilised.

Measuring the implementation of the action

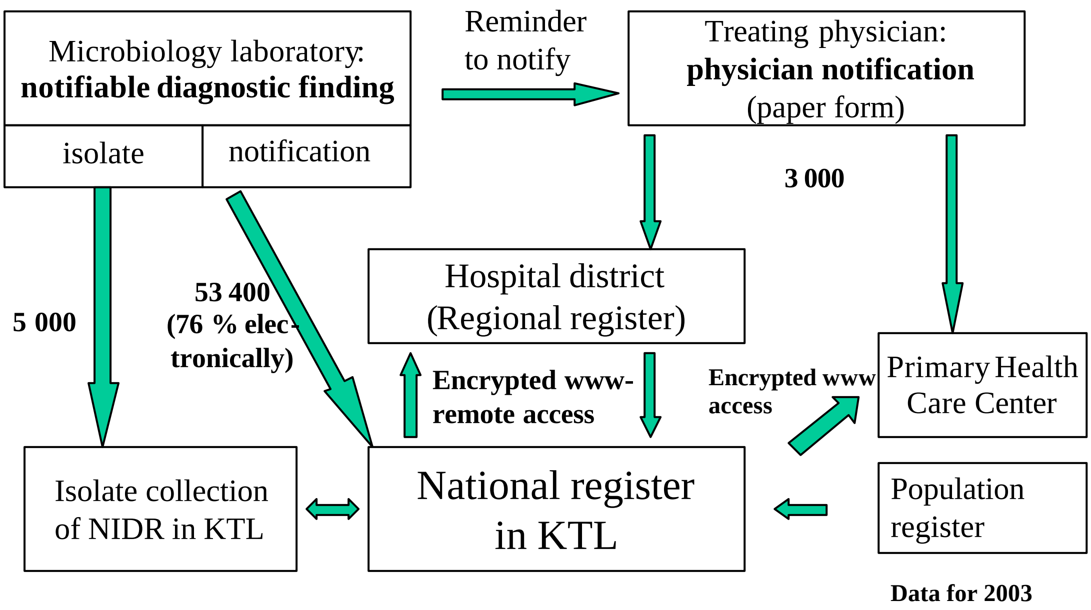
The implementation of the proposed measures within the Strategy will be examined in connection with the annual assessment.

12. FURTHER INFORMATION

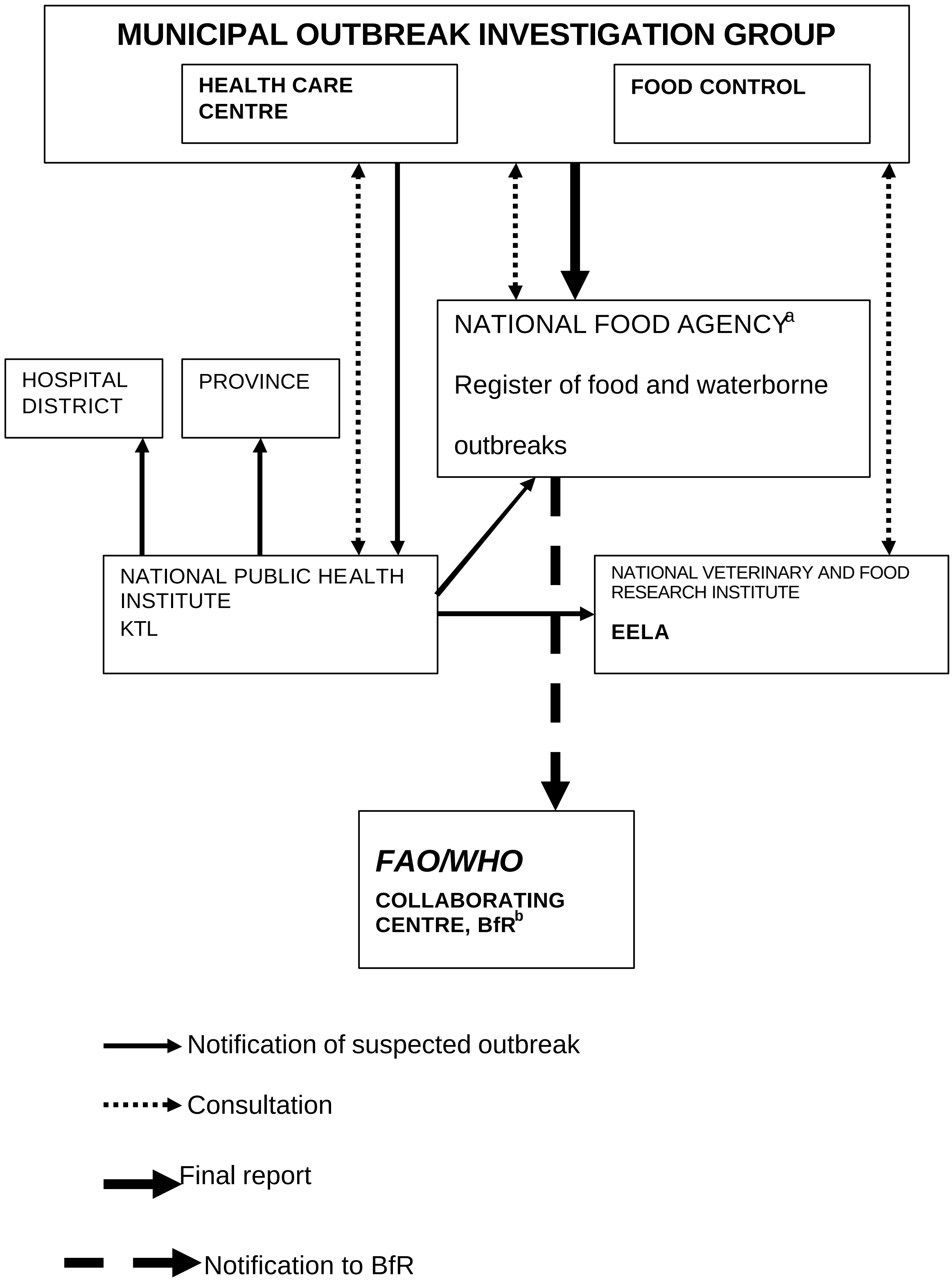
- The Ministry of Agriculture and Forestry. 2001. Zoonoses in Finland in1995–1999.
- The Ministry of Agriculture and Forestry. 2003. Trends and sources of zoonotic agents in animals, feedingstuffs, food and man in Finland in 2002.
- The National Public Health Institute. 2000. Infectious diseases in Finland in 1995-1999.
- The National Public Health Institute. 2003. Infectious diseases in Finland in 2002.
- The National Food Agency, the National Veterinary and Food Research Institute, the National Public Health Institute. 2003. Food poisonings in Finland in 2002.
- The National Food Agency, the National Veterinary and Food Research Institute, the Ministry of Agriculture and Forestry. 2003. Prevalence of salmonella in animals and foodstuffs of animal origin in 2000-2002.
- The Ministry of Agriculture and Forestry. 2003. Animal diseases and welfare in Finland in 2002.
- The National Food Agency, the National Veterinary and Food Research Institute. 2003. Manual of microbiological hazards connected with food and drinking water.

Annex 1.

Flow of data and information in the national infectious disease register (NIDR)



Annex 2. Notification of suspected food and waterborne outbreak, consultation and reporting.



[a] The National Food Agency sends the final report to the National Veterinary and Food Research Institute and to the Public Health Institute.

[b] The National Food Agency sends a report on food and waterborne outbreaks in Finland annually to the German Federal Institute for Risk Assessment, Berlin.

Annex 3. Most important zoonoses referred to in veterinary legislation and legislation on communicable diseases and their classification (E = Act on Animal Diseases and T = Act on Infectious Diseases).

ZOONOSIS	CLASSIFICATION									
	1	2	3	4	5	6	7	8	9	10
Brucellosis *Brucella abortus, B.melitensis, B.ovis, B.suis**		**E**					**E**			**T**
EHEC infection Enterohemorrhagic *E. coli* *						**	**	**T**		
Echinococcosis *Echinococcus multilocularis/granulosus* *			**E**						**T**	
Tularemia *Francisella tularensis* *						**E**	**E**			**T**
Campylobacteriosis *Campylobacter jejuni/coli*						**E**				**T**
Cryptosporidiosis *Cryptosporidium* spp.										**T**
Leptospirosis *Leptospira* spp.					**E**		**E**			**T**
Listeriosis *Listeria monocytogenes*						**E**			**T**	
Puumalavirus *Puumalavirus* *										**T**
Anthrax *Bacillus anthracis* *		**E**					**E**	**T**		
Psittacosis *Chlamydia psittaci* *										**T**
Sheep and poultry					**E**		**E**			
Other animals						**E**	**E**			
Rabies		**E**					**E**	**T**		
Salmonellosis *Salmonella enterica*								**T**		
Bovines, pigs and poultry				**E**			**E**			
Other animals						**E**				
SARS - corona virus infection								**T**		
Erysipelas *Erysipelothrix rhusiopathiae*										
Pigs						**E**				
Trichinellosis *Trichinella spp.*										**T**
Pigs				**E**						
Other animals						**E**				
Toxosplasmosis *Toxoplasma gondii*										**T**
Animals other than rabbits, hares or rodents						**E**				
Tuberculosis										
*Mycobacterium tuberculosis**		**E**					**E**	**T**		
Mycobacterium bovis *		**E**					**E**	**T**		
Mycobacterium avium						**E**			**T**	
Other mycobacteria						**E**			**T**	
vCJD								**T**		
BSE		**E**								
Yersiniosis										**T**
Yersinia enterocolitica						**E**				
Yersinia pseudotuberculosis animals other than rabbits, hares or rodents						**E**				

***** By a Decision of the Ministry of Labour the pathogen belongs to risk category 3, other zoonoses in this table belong to category 2 by the same Decision.
** To be included in the legislation during 2004.

1. Easily spreading animal diseases
2. Dangerous animal diseases
3. Controllable animal disease immediately notifiable to the Department of Food and Health of the Ministry of Agriculture and Forestry
4. Animal diseases subject to control to be reported monthly to the Department of Food and Health of the Ministry of Agriculture and Forestry
5. Other infectious animal diseases to be reported immediately
6. Other animal diseases to be reported monthly
7. Zoonoses to be reported immediately to other health authorities
8. Generally dangerous infectious diseases (Decree on Infectious Diseases; report from medical practitioners and laboratories required)
9. Infectious diseases to be reported (Decree on Infectious Diseases; report from medical practitioners and laboratories required)
10. Other infectious diseases (Decree on Infectious Diseases, report from laboratories required according to instructions by the Ministry of Social Affairs and Health)

Annex 4. SWOT analysis of the strengths and weaknesses in the control and prevention of zoonoses in Finland, opportunities for developing the activities and factors threatening the zoonoses situation.

Strengths	Weaknesses
- prevention of certain significant zoonoses carried out for a long time based on "from farm to table" principle - quite sufficient data on incidence of these zoonoses (salmonella, brucella, tuberculosis, rabies, trichinellosis and cysticercosis) in animals and salmonella in feedingstuffs - one of world's best monitoring systems for infectious diseases in the population - good animal health situation - controlled use of antimicrobials in livestock production - protective import requisites for salmonella, brucella and bovine tuberculosis - quite strict legislation for certain zoonoses - extensive control of feedingstuffs and livestock production - close cooperation among the industry and authorities - industry active in preventing certain zoonoses - increased research on zoonoses spread by wild animals	- control concentrates only on part of the most significant zoonoses and mainly production of foodstuffs of animal origin - weak control and traceability for zoonoses transmitted by plant products - for the part of new zoonoses little national-level data available on their incidence in the production chain (campylobacteriosis, EHEC, listeria, yersinias) - country of origin of zoonosis infections known only for salmonella and now based on preliminary study for campylobacteriosis - little statistical data available on zoonosis situation of imported foodstuffs - little multidisciplinary research on zoonoses - resource allocation is not always based on cost-efficiency and zoonoses situation as a whole - little education on zoonoses in certain fields - control does not cover pets and hobby animals
Opportunities	**Threats**
- utilisation of good cooperation traditions - development of cooperation between experts in agriculture and healthcare - increased use of public health indicators in decision making on prevention programmes - National Quality Strategy (development of databases and exchange of information) - utilising the good zoonoses situation in food export - tracing the country of origin of the disease for the most significant zoonoses - developing research work - reform of food and feed control in the EU - impacts of the By-Products Regulation in reducing zoonoses - reform of the common agricultural policy of the EU (CAP) - Use of research, risk assessment and economic assessment in support of decision making - WTO Agreement on Sanitary and Phytosanitary Measures (SPS Agreement) - cooperation with neighbouring regions setting of microbiological food safety objectives (FSO)	- deterioration of the general zoonoses situation in the EU - EU enlargement in 2004 - WTO negotiations and internationalisation of trade - increased import of feedingstuffs, animals, plants and foodstuffs and/or change in the importing country profile - tightening competition in food production - new production technologies - consequences of recycling and e.g. By-Products Regulation in zoonoses situation due to environmental requirements - changes in consumer behaviour in eating habits, tourism, outdoor and wildlife activities, etc. - weakening zoonoses situation of pets and hobby animals - increase in the share of population which is susceptible to infection (elderly, immunocompromised individuals) - shortage of water and deterioration of the quality of water - bioterrorism - new zoonoses - shortage of research funding and allocation to other projects

Annex 5. Table of measures

Objectives	**Measures**	**Responsible organisations**	**Urgency**
1. Targeting of work to combat zoonoses in Finland to the most significant ones cost-effectively and economically			
1.1. The significance of most important zoonoses for public health is known	Organisation and support of research on intestinal infections to find out the sources of infection (especially campylobacter and yersinia infections)	STM, KTL	1
	Study of the significance of the underdiagnostis of waterborne protozoon infections (Giardia, Cryptosporidium)	STM, KTL	2
	Support for reseach on the impacts on public health and risk factors especially for the part of Puumalavirus, tularemia and borreliosis	STM, KTL, HY	2
	Study of the incidence and prevention of work-induced zoonosis infections	STM, KTL, TTL	3
1.2. Monitoring, epidemiological examination and prevention of zoonotic infections in the population is stronger than at present	Extending the monitoring of the data on the country of origin of infections to other most important zoonoses, in addition to salmonellosis	STM, KTL	1
	Developing laboratory diagnostics	STM, KTL, laboratories	2
	Evaluation of the testing system of employees for salmonella infection	STM, KTL, EVI	3
1.3. Increased awareness of the work-related risks caused by zoonoses and means to prevent these	Provision of advice and information packages on work-related risks caused by zoonoses and their prevention in agriculture, food industry and laboratories.	STM, KTL, TTL	2
1.4. Developing communication so that people know more about zoonotic infections and their prevention	Increasing consumer information on food safety and factors influencing this	MMM, STM, EELA, EVI, KTL	2
	Dissemination of information on risk of zoonotis infections related to travel	STM, KTL	2
	Increased awareness on zoonoses (especially trichinellosis, echinococcosis, Puumalavirus, tularemia, borreliosis and TBE) among people who engage frequently in outdoor activities (e.g. hunters)	MMM, STM, EELA, EVI, KTL, RKTL, METLA	2
	Communication on zoonoses transmitted via pets	MMM, STM, EELA, EVI, KTL, KTTK	2

1.5. No zoonootic agents spread via feedingstuffs, fertilisers and plant products	Developing the prevention of zoonoses in primary production of plant products especially for the part of cultivation conditions, irrigation water and other risk factors	MMM, KTTK, EVI	2
	Including substances spread on arable land not covered by the Fertiliser Act into its scope of application (aika kimurantti lause, vaikea ymmärtää)	MMM, KTTK	2
	Improving the hygiene and control of fur animal and pet feeds	MMM, KTTK	2
	Continuation of the salmonella control of feed	MMM, KTTK	3
	Continuation of the control of BSE risk feeds	MMM, KTTK, EVI	3
1.6. Rate of campylobacter, EHEC, salmonella and yersinia bacteria and TSE infections in production animals stays on the current level or is even lowered	Developing monitoring and control measures concerning campylobacter infections in poultry, EHEC infections in bovines and yersinia infections in pigs	MMM, STM, EELA, EVI, KTL, provinces, municipalities, industry, Tekes, Academy of Finland	1
	Prevention of zoonoses is taken into account in developing the animal healthcare system	MMM, EELA, EVI, ETT	2
	Continuation of the national salmonella control programme in pork, beef, egg and poultry meat production	MMM, EELA, EVI, ETT	3
	Continuation of the prevention of TSEs in accordance with the EU regulations	MMM, EVI, EELA, KTTK, industry	3
1.7. Monitoring, control and prevention of zoonoses in the production of foodstuffs and household water is more efficient than at present	Developing monitoring and control measures concerning listeria in foodstuffs which are consumed as such	MMM, STM, EELA, EVI, KTL, provinces, municipalities, industry, Tekes, Academy of Finland	1
	Developing the traceability of foodstuffs	MMM, STM, EVI, KTTK, EELA	2
	Developing the own-checks of companies in the whole food production chain	MMM, STM, EVI, KTTK, EELA	2
	Developing meat inspection and slaughtering methods	MMM, EVI, EELA, industry	2
	Ensuring the functioning of the methods for treating household water to prevent zoonosis infections	STM, KTL	2

1.8. Incidence of the most significant zoonoses in the food production chain and nature is known well enough for the development and evaluation of appropriate means of prevention	Examination of incidence, sources of infection and risk factors for the part of the following zoonotic agents: campylobacter in poultry and household water, EHEC bacterium in bovines and yersinia bacterium in pigs and plant products	MMM, STM, EELA, EVI, KTTK, KTL	1
	Examination of the incidence of listeria bacterium and prevention possibilities in foodstuffs consumed as such	MMM, STM, EELA, EVI, KTTK, KTL	1
	Examination of the significance and incidence of zoonoses in feedingstuffs, organic fertilisers, seeds, irrigation water of plants and drinking water of animals	MMM, STM, EELA, EVI, KTTK, KTL	2
	Examination of the role of wild animals as source of zoonoses in humans	MMM, STM, EELA, EVI, KTTK, KTL, HY, METLA	2
1.9. Risk assessment and assessment of the economic impacts of zoonoses are of high standard and useful	Continuation and development of risk assessment of zoonoses from primary production to consumers (especially salmonella, campylobacter, EHEC, listeria, BSE and yersinia infections)	MMM, STM, EELA, EVI, KTL	1
	Carrying out economic analyses on the management of the risks due to the most important foodborne zoonoses	MMM, STM, EELA, EVI, MTT, KTL	1
	Launching risk assessment work on zoonoses spread via drinking water	STM, KTL	2
	Ensuring the suitability of data collected in research and monitoring programmes for risk assessment	MMM, STM, EELA, EVI, KTL	2
1.10. Food companies and their employees posses sufficient knowledge and skills relating to zoonoses	Control and development of the hygiene skills system for employees in the food sector	STM, MMM, EVI, food industry, trade	3
	Ensuring sufficient know-how of people responsible for companies' own-checks	STM, MMM, EVI, food industry, trade	2
	Prevention of zoonoses taken into account in preparing hygiene guides	STM, MMM, EVI, food industry, trade	2
1.11. National Quality Strategy for the Food Sector contributes to the development of the prevention of zoonoses	Developing quality work in the food sector to take account of the prevention of zoonoses	MMM, EVI, EELA, KTTK, industry, trade, producers, ETT	2
1.12. Export of foodstuffs, products and actions based on zoonosis know-how is profitable	Developing export opportunities of products relating to the diagnostics and prevention of zoonoses	MMM, KTM, UM, Tekes, Academy of Finland	2
	Creating a reliable and readily available reporting system on the zoonoses situation	MMM, KTM, UM,	3

1.13. Focus on multidisciplinary research on zoonoses in research funding	Increasing the funding for research on zoonoses from the Ministries of Social Affairs and Health, Agriculture and Forestry and Education and other main organisations for research funding	MMM, STM, KTL, EELA, EVI, KTTK, MTT, RKTL, METLA, TEKES, VTT, OPM, Academy of Finland, universities, foundations	1
	Support for multidisciplinary and coordinated research		1
	Improving the possibilities for research on zoonoses caused by parasites		2
	Emphasising research on the incidence data and risk factors as well as impacts of different risk management measures in financing decisions		1
1.14. Monitoring and control of antimicrobial resistance function efficiently	Organisation of systematic collection and comparison of data on antimicrobial resistance between strains isolated from the production chain and humans	STM, MMM, KTL, EELA, Lääkelaitos, KELA	1
	Creating a monitoring system on the quantities and distribution of antimicrobials used for animals and humans	STM, MMM, KTL, EELA, Agency for Medicines, KELA	2
	Updating the recommendations for use of antimicrobials for animals	MMM, EELA, Agency for Medicines	3
2. Managing the zoonosis risks of imported feedingstuffs, animals and foodstuffs			
2.1. No zoonoses are introduced to Finland which at present are not occur in the country	Continuation of the monitoring of bovine tuberculosis and brucellosis to maintain the disease-free status of Finland	MMM, EELA	3
	Maintaining the freedom from rabies through vaccinations and increased cooperation with Russia and the Baltic States	MMM, EELA	3
	Preventing the entry of *Echinococcus multilocularis* parasite to Finland through medication of imported pets against tapeworm and systematic organisation of the monitoring of the situation	MMM, EELA, RKTL	2
	Developing diagnostic preparedness for new zoonoses	MMM, EELA, HY, METLA	2
	Supporting voluntary actions of the industry in containing risks relating to the import of animals	MMM, EELA, industry	2
	Reform of the legislation and instructions concerning the primary points of call	MMM, EVI	2
	More efficient targeting of the sampling plans in the veterinary border inspection and guidance of border inspection veterinarians	MMM	3
	Informing the importers of feedingstuffs, animals and foodstuffs and travellers	MMM, EELA, EVI, KTTK	3

2.2. The EU area is committed to the "from farm to table" principle and zoonosis control of the EU is efficient	Influencing the preparation and efficient implementation of EU legislation especially for the part of the following statutes: Zoonoses Directive and Regulation Regulation on microbiological criteria Hygiene regulations Legislation on fertilisers Surveillance network for communicable diseases	MMM, STM, EVI, KTTK, KTL	1
2.3. Zoonoses situation in other countries improves through international actions	Preventing zoonoses is taken into account in international cooperation relating to food and communicable diseases (Codex/OIE/WHO/FAO/IPPC/Nordic cooperation/cooperation with neighbouring areas/European Centre for Communicable Diseases)	MMM, STM, KTM, EELA, KTL, KTTK	2
	Creating an information system so that information on Finland's zoonoses situation is readily available to experts participating in international forums	MMM, STM, KTM, EELA, KTL, KTTK	2
	Know-how on surveillance of zoonoses and food poisonings incorporated in projects relating to agriculture and public health in neighbouring areas and developing countries	MMM, STM, KTM, EELA, KTL, KTTK	3
	Study of the possibilities for setting up an epidemiological centre for zoonoses required by the Zoonoses Directive and a reference laboratory for campylobacter in Finland	MMM, STM, KTM, EELA, KTL, KTTK	2
	Active participation in the work of the European Centre for Communicable Diseases and European Food Safety Authority (EFSA) and utilisation of the Finnish risk assessment network (FIRAS)	MMM, STM, EELA, EVI, KTL, KTTK, MTT	2

3. Developing cooperation in the whole field relating to zoonoses			
3.1. Organisations of parties responsible for prevention and monitoring of zoonoses support active cooperation	Creation of a zoonosis centre as a network between the central organisations	MMM, STM, EELA, EVI, KTL, KTTK	1
	Ensuring the conditions for cooperation on zoonoses as the operations of EVI, EELA and KTTK and certain operations of MMM are transferred to the new organisation	MMM, STM, EELA, EVI, KTTK	1
3.2. More efficient examination, monitoring and reporting systems for food poisonings and other epidemics	Development of cooperation in examination of food poisonings and other epidemics in municipalities continues	STM, MMM, KTL, EELA, EVI, KTTK, municipalities, provinces	2
	Increased efficiency in rapid detection of epidemics and reacting to health hazards	EVI, KTL, EELA, KTTK	2
	Possibility to compare the most significant strains of pathogens in the whole production chain	EELA, KTL, KTTK	2
	Zoonoses taken into account in the contingency plans as well	MMM, STM, EELA, EVI, KTL, KTTK	2
	Defining the responsibilities of different actors for the part of microbiological and parasitological analyses, especially concerning the illegitimate use of zoonotic agents	EELA, KTL, KTTK, universities, Defence Forces, PLM, SM	2

Abbreviations

FAO	Food and Agriculture Organization of the UN
EELA	National Veterinary and Food Research Institute
EFSA	European Food Safety Authority
ELO	Department of Food and Health of MMM (earlier EEO)
EEO	Veterinary and Food Department of MMM (now ELO)
EVI	National Food Agency
ETT	Association for Animal Disease Prevention
ETU	Animal Healthcare System
IPPC	International Plant Protection Convention
KELA	Social Insurance Institution of Finland
KTL	National Public Health Institute
KTM	Ministry of Trade and Industry
KTTK	Plant Production Inspection Centre
METLA	Finnish Forest Research Institute
MMM	Ministry of Agriculture and Forestry
MTT	Agrifood Research Finland
OIE	Office International des Epizooties (World Organisation for Animal Health)
OPM	Ministry of Education
PLM	Ministry of Defence
RKTL	Finnish Game and Fisheries Research Institute
SM	Ministry of the Interior
STM	Ministry of Social Affairs and Health
Tekes	National Technology Agency
TTL	Finnish Institute of Occupational Health FIOH
VM	Ministry of Finance
VTT	Technical Research Centre of Finland
WHO	World Health Organization
WTO	World Trade Organization

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