

## FINLAND

The Report referred to in Article 9 of Directive 2003/99/EC

### TRENDS AND SOURCES OF ZOONOSES AND ZOOTIC AGENTS IN HUMANS, FOODSTUFFS, ANIMALS AND FEEDINGSTUFFS

including information on foodborne outbreaks,  
antimicrobial resistance in zoonotic agents and some  
pathogenic microbiological agents.

## IN 2012

## INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Country: Finland

Reporting Year: 2012

Laboratory name	Description	Contribution
Finnish Zoonosis Centre	Finnish Zoonosis Centre forms a cooperation body between Finnish Food Safety Authority Evira and the National Institute for Health and Welfare (THL). The Centre ensures a close cooperation between relevant experts in the field of animal health, human health, and food and feed safety.	General coordination and officering of the report
Finnish Food Safety Authority Evira	The operation of Evira is focused on ensuring the safety of food, promoting the health and welfare of animals and providing the required preconditions for plant and animal production as well as plant health. Evira is a central competent authority for food and feed control as well as for animal health and welfare control. The duties of Evira also include scientific research and risk assessment on food safety and animal diseases. Evira operates also as a national reference laboratory in its own field.	Texts and tables: animals, foodstuffs, feedstuffs, antimicrobial resistance, foodborne outbreaks, data on slaughtered animals
Ministry of Agriculture and Forestry (MAF) - Food and Health Department	Food and Health Department is concerned with veterinary issues in general, prevention and combating of animal diseases and zoonoses, animal welfare, hygiene of foodstuffs of animal origin, animal medication, production inputs used in agriculture and plant health.	Some texts

**INFORMATION ON THE REPORTING AND MONITORING SYSTEM**

Laboratory name	Description	Contribution
Information Centre of the Ministry of Agriculture and Forestry (Tike)	Tike provides administrative, informative and data management services to the MAF and other administrative organizations within its branch. Tike develops national official statistics in the field of food safety in co-operation with control authorities. At the moment, Tike compiles most of the statistics on agriculture and food production in Finland.	Data on animal populations (holdings and live animals)

## PREFACE

This report is submitted to the European Commission in accordance with Article 9 of Council Directive 2003/99/ EC\*. The information has also been forwarded to the European Food Safety Authority (EFSA).

The report contains information on trends and sources of zoonoses and zoonotic agents in Finland during the year 2012 .

The information covers the occurrence of these diseases and agents in humans, animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and commensal bacteria as well as information on epidemiological investigations of foodborne outbreaks. Complementary data on susceptible animal populations in the country is also given. The information given covers both zoonoses that are important for the public health in the whole European Community as well as zoonoses, which are relevant on the basis of the national epidemiological situation.

The report describes the monitoring systems in place and the prevention and control strategies applied in the country. For some zoonoses this monitoring is based on legal requirements laid down by the Community Legislation, while for the other zoonoses national approaches are applied.

The report presents the results of the examinations carried out in the reporting year. A national evaluation of the epidemiological situation, with special reference to trends and sources of zoonotic infections, is given. Whenever possible, the relevance of findings in foodstuffs and animals to zoonoses cases in humans is evaluated.

The information covered by this report is used in the annual Community Summary Report on zoonoses that is published each year by EFSA.

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\* Directive 2003/ 99/ EC of the European Parliament and of the Council of 12 December 2003 on the monitoring of zoonoses and zoonotic agents, amending Decision 90/ 424/ EEC and repealing Council Directive 92/ 117/ EEC, OJ L 325, 17.11.2003, p. 31

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## 1. ANIMAL POPULATIONS

The relevance of the findings on zoonoses and zoonotic agents has to be related to the size and nature of the animal population in the country.

## A. Information on susceptible animal population

### Sources of information

Data on holdings and live animals (except goats):

Tike, Information Centre of the Ministry of Agriculture and Forestry: Farm Register

Data on holdings and goats:

Evira, Register of sheep and goats

Data on horses:

Suomen Hippos, the Finnish Trotting and Breeding Association

Data on reindeers:

Statistics of the Reindeer Herders' Association

Data on farmed deer:

Provincial veterinary offices

Data on slaughtered animals:

Meat inspection statistics of Finnish Food Safety Authority Evira

### Dates the figures relate to and the content of the figures

Data on holdings and live animals:

Final data, situation as of 1 May 2012 (cattle, sheep, goats), 1 April (pigs, poultry).

Data on reindeers:

Final data, 2011/2012, reindeer herding year: 1 June-31 May.

Data on slaughtered animals: All animals slaughtered in 2012.

### Definitions used for different types of animals, herds, flocks and holdings as well as the types covered by the information

Fattening pigs contain all pigs except boars and sows. In national statistics pigs are divided in the following categories: boars over 50 kg, sows over 50 kg, fattening pigs over 50 kg, pigs 20-50 kg and piglets under 20 kg.

Ducks and geese are included in the other poultry in Finland in 2012 and due of this they are included in the group mixed flocks of Gallus gallus (fowl).

### National evaluation of the numbers of susceptible population and trends in these figures

The number of bovine animals in 2012 was 912 440 and ten years earlier there were 1 025 379 bovine animals. During the last ten years there is a decrease of 11%. Main part of the decrease comes from the number of dairy cows. Number of farms having bovine animals has decreased more, 46%. In 2002 there were 39 bovine animals per farm and ten years later number was 65, so there is very large increase in the number of animals per farm.

Number of pigs has been at the level 1.3 million during last ten years. However, number per farms has doubled.

Number of poultry has been at the level 10 million during last ten years. However, number per farms has doubled.

### Geographical distribution and size distribution of the herds, flocks and holdings

Livestock production is concentrated in certain areas and, thus, there are large differences in livestock numbers between different parts of the country. Dairy farms are particularly common in the Northern Finland, and fattening pigs in the Southern and Western parts of the country. The differences are most marked in poultry production which are mostly located nearby the slaughter houses and processors.





Table Susceptible animal populations

\* Only if different than current reporting year

Animal species	Category of animals	Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
		Data	Year*	Data	Year*	Data	Year*	Data	Year*
Cattle (bovine animals)	meat production animals					119355		6444	
	dairy cows and heifers					411729		10552	
	calves (under 1 year)					302867		13404	
	mixed herds					78489		2810	
	- in total <sup>1)</sup>			263665		912440		14138	
Deer	farmed - in total							11	
Ducks	- in total			3216					
Gallus gallus (fowl)	parent breeding flocks, unspecified - in total			527400		497720		293	
	laying hens			67649		3916045		935	
	broilers			61038679		6038340		124	
	mixed flocks/holdings <sup>2)</sup>					13839		131	
	- in total			61633728		10465944		1121	
Geese	- in total			6407					

Table Susceptible animal populations

Animal species	Category of animals	Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
		Data	Year*	Data	Year*	Data	Year*	Data	Year*
Goats	- in total					7166		796	
Pigs	breeding animals			49637		135810		1025	
	fattening pigs			2108797		1154553		1702	
	- in total <sup>3)</sup>			2158434		1290363		1747	
Reindeers	farmed - in total			65101		191920		4530	
Sheep	- in total			40856		130005		1472	
Solipeds, domestic	horses - in total			1865		74100		16000	
Turkeys	- in total			910656		294635		61	
Wild boars	farmed - in total			292					
Ostriches	farmed - in total			40					
Pheasants	meat production flocks - in total			600					

## Comments:

<sup>1)</sup> One holding can have different kind of bovine animals. So, the total number of holdings is not a sum of the numbers of different categories.

<sup>2)</sup> contains also ducks and geese in 2012

Table Susceptible animal populations

Comments:

<sup>3)</sup> One holding can have different kind of pigs. So, the total number of holdings is not a sum of the numbers of different categories.

## 2. INFORMATION ON SPECIFIC ZONOSSES AND ZOOBOTIC AGENTS

Zoonoses are diseases or infections, which are naturally transmissible directly or indirectly between animals and humans. Foodstuffs serve often as vehicles of zoonotic infections. Zoonotic agents cover viruses, bacteria, fungi, parasites or other biological entities that are likely to cause zoonoses.

## 2.1 SALMONELLOSIS

### 2.1.1 General evaluation of the national situation

#### A. General evaluation

##### History of the disease and/or infection in the country

The Finnish situation regarding Salmonella in feedingstuffs, animals and food of animal origin has been very favourable for years. Majority of human salmonellosis cases have been acquired abroad.

##### National evaluation of the recent situation, the trends and sources of infection

## 2.1.2 Salmonella in foodstuffs

### A. Salmonella spp. in broiler meat and products thereof

#### Monitoring system

##### Sampling strategy

At slaughterhouse and cutting plant

At slaughterhouses: carcasses are sampled according to the requirements of the Regulation 2073/2005.  
Cutting plants not connected to the slaughterhouses: meat batches are sampled according to the requirements of the Regulation 2073/2005.

At meat processing plant

Minced meat, meat preparations and meat products; according to the Regulation 2073/2005

##### Frequency of the sampling

At slaughterhouse and cutting plant

At slaughterhouses: at least one sampling session (neck skin of 15 birds) must be carried out each week.  
Small slaughterhouses (less than 150 000 birds slaughtered annually) may reduce sampling frequency.  
At cutting plants: according to the Regulation 2073/2005.

At meat processing plant

Minced meat, meat preparations and meat products; according to the Regulation 2073/2005

##### Type of specimen taken

At slaughterhouse and cutting plant

At slaughterhouse; neck skin  
At cutting plant: fresh meat

At meat processing plant

According to the Regulation 2073/2005

##### Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: neck skins from 15 poultry carcasses are sampled at random during each sampling session. A piece of approximately 10 g from neck skin shall be obtained from each poultry carcass. The neck skin samples from three poultry carcasses from the same flock of origin shall be pooled before examination in order to form 5 x 25 g final samples.

At cutting plants: five samples of at least 25 g of the same batch are collected and analysed separately.

At meat processing plant

According to the Regulation 2073/2005

##### Definition of positive finding

At slaughterhouse and cutting plant

Batch is considered to be positive when Salmonella spp is isolated from a sample

At meat processing plant

Batch is considered to be positive when Salmonella spp is isolated from a sample

### Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: ISO 6579:2002 or NMKL No 71:1999 or NMKL No 187/2007

### Preventive measures in place

All flocks must be tested for Salmonella before slaughter. If the flock is Salmonella positive, meat must be heat treated in an approved establishment.

### Control program/mechanisms

The control program/strategies in place

The Finnish Salmonella Control Programme, approved by Commission Decision 94/968/EC of 28 December 1994.

Recent actions taken to control the zoonoses

In 2012, the sampling system at slaughterhouses and cutting plants was totally amended. Before 2012, the sampling was not compulsory at the slaughterhouses, and at the cutting plants samples taken were single crushed meat samples instead of batch based sampling. The reason for this amendment was the amendment of the Regulation 2073/2005. Earlier the Salmonella criterion for broiler meat was a process hygiene criterion, and crushed meat sampling at the cutting plants was assessed to be equivalent to the sampling of neck skin samples at the slaughterhouses. When a food safety criterion based on neck skin samples was introduced, the sampling of crushed meat was not any more considered to be equivalent. In 2012, also the data collection from the samplings by food business operators of batches of minced meat and meat preparation started at the central level. Because the year 2012 was the first year when this own-check data was collected, the information might be incomplete.

### Measures in case of the positive findings or single cases

The positive batch is rejected/withdrawn from the market. In addition, after a positive salmonella result increased sampling is carried out in the establishment. The origin of contamination must be traced back, if possible. Effective cleaning and disinfection of the premises and equipment. The measures are the same for all Salmonella serovars.

### Notification system in place

Laboratory has to notify the positive result to the competent authority and to the food business operator.

### Results of the investigation

Salmonella spp. was not detected in domestic broiler meat in 2012.

### National evaluation of the recent situation, the trends and sources of infection

Salmonella situation in domestic broiler meat has been favourable for years.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Domestic broiler meat is not considered to be an important source of human salmonellosis cases in Finland.



## B. Salmonella spp. in pig meat and products thereof

### Monitoring system

#### Sampling strategy

At slaughterhouse and cutting plant

The Finnish Salmonella Control Programme:

- at slaughterhouses: 3000 carcasses of fattening pigs and sows are sampled each year randomly from the populations. Sampling is carried out by food business operator under supervision of the official veterinarian.

- at cutting plants:

Sampling is compulsory for all cutting plants.

Random sampling, frequency is depending on production capacity of the cutting plant.

Sampling is carried out by food business operator under supervision of official veterinarian.

#### Frequency of the sampling

At slaughterhouse and cutting plant

Sampling distributed evenly throughout the year

#### Type of specimen taken

At slaughterhouse and cutting plant

At slaughterhouse: surface of carcass, at cutting plant: fresh meat

#### Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: 3 surface swab samples are taken from a carcass before chilling. A total area of 1400 cm<sup>2</sup> is swabbed. Sampling sites: the upper inner part of hind legs including the pelvic entrance; the cut surface area of the abdomen and the chest; and the cheek.

Cutting plants: A sample consists of at least 25 grams of crushed meat taken from a cleaning tool of a conveyer belt, from tables or from similar point.

#### Definition of positive finding

At slaughterhouse and cutting plant

Foodstuff is considered to be positive when Salmonella spp is isolated from a sample

#### Diagnostic/analytical methods used

At slaughterhouse and cutting plant

ISO 6579:2002 or NMKL No 71:1999 or NMKL No 187/2007

### Control program/mechanisms

#### The control program/strategies in place

The Finnish Salmonella Control Programme, approved by Commission Decision 94/968/EC of 28 December 1994.

### Measures in case of the positive findings or single cases

After a positive salmonella result increased sampling is carried out at the slaughterhouse or at the cutting plant. The origin of contamination must be traced back, if possible. Effective cleaning and disinfection of the premises and equipment.

### Notification system in place

Laboratory has to notify the positive result to the competent authority and to the food business operator.

### Results of the investigation

Salmonella spp. was not detected in carcass swab samples (6412 samples) or cutting plant samples (1464) in 2012.

### National evaluation of the recent situation, the trends and sources of infection

Salmonella situation in Finnish pig meat is very favourable.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Domestic pig meat is not considered to be an important source of human salmonellosis cases in Finland.

## C. Salmonella spp. in bovine meat and products thereof

### Monitoring system

#### Sampling strategy

At slaughterhouse and cutting plant

The Finnish Salmonella Control Programme:

- at slaughterhouses: together 3000 carcasses are sampled each year randomly from the cattle population. Sampling is carried out by food business operator under supervision of the official veterinarian.

- at cutting plants:

Sampling is compulsory for all cutting plants.

Random sampling, frequency is depending on production capacity of the cutting plant.

Sampling is carried out by food business operator under supervision of official veterinarian.

#### Frequency of the sampling

At slaughterhouse and cutting plant

Sampling distributed evenly throughout the year

#### Type of specimen taken

At slaughterhouse and cutting plant

At slaughterhouse: surface of carcass, at cutting plant: fresh meat

#### Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: 2 surface swab samples are taken from a carcass before chilling. A total area of 1400 cm<sup>2</sup> is swabbed. Sampling sites: the upper inner part of hind legs including the pelvic entrance and the cut surface area of the abdomen and the chest.

Cutting plants: A sample consists of at least 25 grams of crushed meat taken from a cleaning tool of a conveyer belt, from tables or from similar point.

#### Definition of positive finding

At slaughterhouse and cutting plant

Foodstuff is considered to be positive when Salmonella spp is isolated from a sample

#### Diagnostic/analytical methods used

At slaughterhouse and cutting plant

ISO 6579:2002 or NMKL No 71:1999 or NMKL N:o 187:2007

### Control program/mechanisms

#### The control program/strategies in place

The Finnish Salmonella Control Programme, approved by Commission Decision 94/968/EC of 28 December 1994.

### Measures in case of the positive findings or single cases

After a positive salmonella result increased sampling is carried out at the slaughterhouse or at the cutting plant. The origin of contamination must be traced back, if possible. Effective cleaning and disinfection of the premises and equipment.

### Notification system in place

Laboratory has to notify the positive result to the competent authority and to the food business operator.

### Results of the investigation

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Salmonella spp. was not detected in carcass swab samples (3058 samples) or cutting plant samples (2110) in 2012.

### National evaluation of the recent situation, the trends and sources of infection

Salmonella situation in domestic bovine meat is very favourable.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Domestic bovine meat is not considered to be an important source of human salmonellosis cases in Finland.

## D. Salmonella spp. in turkey meat and products thereof

### Monitoring system

#### Sampling strategy

##### At slaughterhouse and cutting plant

At slaughterhouses: carcasses are sampled according to the requirements of the Regulation 2073/2005.

Cutting plants not connected to the slaughterhouses: meat batches are sampled according to the requirements of the Regulation 2073/2005.

##### At meat processing plant

Minced meat, meat preparations and meat products; according to the Regulation 2073/2005

#### Frequency of the sampling

##### At slaughterhouse and cutting plant

At slaughterhouses: at least one sampling session (neck skin of 15 birds) must be carried out each week.

Small slaughterhouses (less than 150 000 birds slaughtered annually) may reduce sampling frequency.

At cutting plants: according to the Regulation 2073/2005.

##### At meat processing plant

Minced meat, meat preparations and meat products; according to the Regulation 2073/2005

#### Type of specimen taken

##### At slaughterhouse and cutting plant

At slaughterhouse; neck skin

At cutting plant: fresh meat

#### Methods of sampling (description of sampling techniques)

##### At slaughterhouse and cutting plant

At slaughterhouse: neck skins from 15 poultry carcasses are sampled at random during each sampling session. A piece of approximately 10 g from neck skin shall be obtained from each poultry carcass. The neck skin samples from three poultry carcasses from the same flock of origin shall be pooled before examination in order to form 5 x 25 g final samples.

At cutting plants: five samples of at least 25 g of the same batch are collected and analysed separately.

#### Definition of positive finding

##### At slaughterhouse and cutting plant

Batch is considered to be positive when *Salmonella* spp is isolated from a sample.

##### At meat processing plant

Batch is considered to be positive when *Salmonella* spp is isolated from a sample.

#### Diagnostic/analytical methods used

##### At slaughterhouse and cutting plant

ISO 6579:2002 or NMKL No 71:1999 or NMKL No 187/2007

#### Preventive measures in place

All flocks must be tested for *Salmonella* before slaughter, if the flock is positive meat is heat treated in an approved establishment.

#### Control program/mechanisms

##### The control program/strategies in place

The Finnish Salmonella Control Programme, approved by Commission Decision 94/968/EC of 28 December 1994.

#### Recent actions taken to control the zoonoses

In 2012, the sampling system at slaughterhouses and cutting plants was totally amended. Before 2012, the sampling was not compulsory at the slaughterhouses, and at the cutting plants samples taken were single crushed meat samples instead of batch based sampling. The reason for this amendment was the amendment of the Regulation 2073/2005. Earlier the Salmonella criterion for turkey meat was a process hygiene criterion, and crushed meat sampling at the cutting plants was assessed to be equivalent to the sampling of neck skin samples at the slaughterhouses. When a food safety criterion based on neck skin samples was introduced, the sampling of crushed meat was not any more considered to be equivalent. In 2012, also the data collection from the samplings by food business operators of batches of minced meat and meat preparation started at the central level. Because the year 2012 was the first year when this own-check data was collected, the information might be incomplete.

#### Measures in case of the positive findings or single cases

The positive batch is rejected/withdrawn from the market. In addition, after a positive salmonella result increased sampling is carried out in the establishment. The origin of contamination must be traced back, if possible. Effective cleaning and disinfection of the premises and equipment. The measures are the same for all Salmonella serovars.

#### Notification system in place

Laboratory has to notify the positive results to the competent authority and to the food business operator.

#### Results of the investigation

Salmonella spp. was not detected in domestic turkey meat in 2012.

#### National evaluation of the recent situation, the trends and sources of infection

Salmonella situation in domestic turkey meat has been favourable for years.

#### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Domestic turkey meat is not considered to be an important source of human salmonellosis in Finland.

## E. Salmonella in Food - Survey - national survey

### Monitoring system

#### Sampling strategy

National survey 2010-2011. Samples were taken randomly by local authorities at retail.

#### Type of specimen taken

Lettuce, sprouts and fresh herbs

#### Methods of sampling (description of sampling techniques)

Single package/sales unit was taken as a sample

#### Definition of positive finding

Salmonella spp. detected in the sample

#### Diagnostic/analytical methods used

ISO 6579:2002 or

NMKL 71:1999 or

ISO 6579, Amendment 2007 validated for vegetable samples or

NMKL 187:2007 validated for vegetable samples

### Results of the investigation

Altogether 1109 samples were analysed for Salmonella spp. All samples were negative for Salmonella.

Table Salmonella in poultry meat and products thereof

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Meat from broilers (Gallus gallus) - meat preparation - intended to be eaten cooked - at processing plant - Surveillance	Evira		HACCP and own checks	food sample > meat		Batch	5 x 25 g	46	0		
Meat from broilers (Gallus gallus) - minced meat - intended to be eaten cooked - at processing plant - Surveillance	Evira		HACCP and own checks	food sample > meat		Batch	5 x 25 g	44	0		
Meat from turkey - fresh - at processing plant - Surveillance	Evira		HACCP and own checks	food sample > meat		Batch	5 x 25 g	12	0		
Meat from broilers (Gallus gallus) - carcase - at slaughterhouse - Control and eradication programmes	Evira	Objective sampling	Industry sampling	food sample > neck skin		Batch	15 x 10 g	195	0		
Meat from turkey - carcase - at slaughterhouse - Control and eradication programmes	Evira	Objective sampling	Industry sampling	food sample > neck skin		Batch	15 x 10 g	65	0		
Meat from turkey - meat preparation - intended to be eaten cooked - at processing plant - Surveillance	Evira		HACCP and own checks	food sample > meat		Batch	5 x 25 g	23	0		
Meat from turkey - minced meat - intended to be eaten cooked - at processing plant - Surveillance	Evira		HACCP and own checks	food sample > meat		Batch	5 x 25 g	33	0		
	S. 1,4,[5],12:i:-		Salmonella spp., unspecified								
Meat from broilers (Gallus gallus) - meat preparation - intended to be eaten cooked - at processing plant - Surveillance											



Table Salmonella in poultry meat and products thereof

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Meat from broilers (Gallus gallus) - minced meat - intended to be eaten cooked - at processing plant - Surveillance		
Meat from turkey - fresh - at processing plant - Surveillance		
Meat from broilers (Gallus gallus) - carcass - at slaughterhouse - Control and eradication programmes		
Meat from turkey - carcass - at slaughterhouse - Control and eradication programmes		
Meat from turkey - meat preparation - intended to be eaten cooked - at processing plant - Surveillance		
Meat from turkey - minced meat - intended to be eaten cooked - at processing plant - Surveillance		

Table Salmonella in red meat and products thereof

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Meat from bovine animals - carcass - at slaughterhouse - Control and eradication programmes	Evira	Objective sampling	Industry sampling	food sample > carcass swabs		Single	1400cm <sup>2</sup>	3058	0		
Meat from bovine animals - fresh - at cutting plant - Control and eradication programmes	Evira	Objective sampling	Industry sampling	food sample > meat		Single	25 g	2110	0		
Meat from pig - carcass - at slaughterhouse - Control and eradication programmes	Evira	Objective sampling	Industry sampling	food sample > carcass swabs		Single	1400cm <sup>2</sup>	6412	0		
Meat from pig - fresh - at cutting plant - Control and eradication programmes	Evira	Objective sampling	Industry sampling	food sample > meat		Single	25 g	1464	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Meat from bovine animals - carcass - at slaughterhouse - Control and eradication programmes		
Meat from bovine animals - fresh - at cutting plant - Control and eradication programmes		
Meat from pig - carcass - at slaughterhouse - Control and eradication programmes		
Meat from pig - fresh - at cutting plant - Control and eradication programmes		

Table Salmonella in red meat and products thereof

## 2.1.3 Salmonella in animals

### A. Salmonella spp. in Gallus Gallus - breeding flocks

#### Monitoring system

##### Sampling strategy

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

The Finnish Salmonella Control Programme:

Day-old chicks are sampled by the food business operator after arrived to the holding. Rearing flocks are sampled at the holding by the food business operator at four weeks old and two weeks before moving to laying unit or phase. Once a year samples are taken by the official veterinarian at each holding.

Adult breeding flocks - egg production line:

Flocks are sampled every third week at the holdings by the food business operator and twice during the production cycle by the official veterinarians.

Adult breeding flocks - meat production line:

Flocks are sampled every second week at the holdings by the food business operator and twice during the production cycle by the official veterinarian.

In addition, the rearing and adult flock is always sampled by the official veterinarian if there is any reason to suspect that the flock is positive for Salmonella spp.

#### Frequency of the sampling

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Every flock is sampled

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Every flock is sampled at age of four weeks and two weeks before moving to laying unit

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Egg production line: Every flock is sampled at the holding every third week

Meat production line: Every flock is sampled at the holding every second week

#### Type of specimen taken

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Internal linings of delivery boxes

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Socks/ boot swabs

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

socks/boot swabs and dust sample

#### Methods of sampling (description of sampling techniques)

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Internal linings are collected from ten delivery boxes. Five papers are pooled together. If papers are not

used swab samples from ten delivery boxes are taken. Five swab samples are pooled together.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Two pairs of socks/ boot swabs samples are taken. Both pairs are analysed separately.

Breeding flocks: Production period

One pair of socks/boot swabs samples and one dust sample collected by swab are taken. Both samples are analysed separately.

#### Case definition

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Flock is considered to be positive when *Salmonella* spp. is isolated from any sample.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Flock is considered to be positive when *Salmonella* spp. is isolated from any sample.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Flock is considered to be positive when *Salmonella* spp. is isolated from any sample.

#### Diagnostic/analytical methods used

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Bacteriological method: ISO 6579:2002/Amd 1:2007

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Bacteriological method: ISO 6579:2002/Amd 1:2007

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Bacteriological method: ISO 6579:2002/Amd 1:2007

#### Vaccination policy

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Vaccination against *Salmonella* is not allowed in Finland.

#### Other preventive measures than vaccination in place

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Strict biosecurity and production hygiene at holdings. *Salmonella* control of feedstuffs.

#### Control program/mechanisms

The control program/strategies in place

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

The Finnish *Salmonella* Control Programme, approved by Commission Decision 2007/849/EC.

Recent actions taken to control the zoonoses

*Salmonella* control programme for breeding flocks was amended in the beginning of the year 2010 for adult flocks of meat production line and in 2012 for adult flocks of egg production line. Earlier the adult breeding flocks were sampled at the hatcheries, now at the holdings. The sampling method at the holdings is amended. One pair of socks/boot swabs and one swab dust sample are taken instead of five pairs of socks/boot swabs.

#### Measures in case of the positive findings or single cases

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Positive flock is destructed or slaughtered and meat heat treated. Hatching eggs are destructed or heat treated. All the other flocks at the holding are sampled by the official veterinarian. The holding is cleaned

and disinfected, official environmental samples are taken, negative results are required before restocking. Official epidemiological investigation is carried out. Feedingstuffs are analysed for Salmonella. The measures are the same for all Salmonella serovars.

#### Notification system in place

The laboratory has to notify positive result to the competent authority and to the food business operator. Salmonella has been notifiable since 1995.

#### Results of the investigation

Salmonella was not detected in Gallus gallus breeding flocks.

#### National evaluation of the recent situation, the trends and sources of infection

Salmonella situation has been very favourable in Gallus Gallus breeding flocks for years.

#### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Breeding flocks are not considered to be an important source of human salmonellosis cases in Finland.

## B. Salmonella spp. in Gallus Gallus - broiler flocks

### Monitoring system

#### Sampling strategy

##### Broiler flocks

The Finnish Salmonella Control Programme:

All broiler flocks are sampled at the holdings within three weeks before slaughter.

Sampling is carried out by the official veterinarian once a year at each holding otherwise the sampling is carried out by the food business operator.

In addition, the flock is sampled by the official veterinarian every time when there is a reason to suspect that the flock is positive for Salmonella spp.

#### Frequency of the sampling

Broiler flocks: Before slaughter at farm

Within three weeks before slaughter

#### Type of specimen taken

Broiler flocks: Before slaughter at farm

Samples taken by the food business operator; two pairs of socks/boot swabs

Samples taken by the official veterinarian; one pair of socks/boot swabs and one dust sample

#### Methods of sampling (description of sampling techniques)

Broiler flocks: Before slaughter at farm

Sampling by the food business operator: two pairs of socks/boot swabs samples are taken. Both pairs are analysed separately.

Sampling by the official veterinarian: one pair of socks/boot swabs and one dust sample collected by swab are taken. Both samples are analysed separately.

#### Case definition

Broiler flocks: Before slaughter at farm

Flock is considered to be positive when Salmonella spp. is isolated from any sample.

#### Diagnostic/analytical methods used

Broiler flocks: Before slaughter at farm

Bacteriological method: ISO 6579:2002/Amd 1:2007

### Vaccination policy

#### Broiler flocks

Vaccination against Salmonella is not allowed in Finland.

### Other preventive measures than vaccination in place

#### Broiler flocks

Strict biosecurity and production hygiene at holdings. Salmonella control of feedstuffs.

90% of flocks are treated with a competitive exclusion product as day-old chicks.

### Control program/mechanisms

#### The control program/strategies in place

##### Broiler flocks

The Finnish Salmonella Control Programme, approved by Commission Decision 2008/815/EC

#### Recent actions taken to control the zoonoses

Salmonella control programme for broiler flocks was amended from the beginning of the year 2010. Two pairs of socks/boot swabs or one pair of socks/boot swabs and one dust sample are taken instead of five pairs of socks/boot swabs.

#### Measures in case of the positive findings or single cases

##### Broiler flocks: Before slaughter at farm

In case of positive finding the flock is destructed or slaughtered and meat heat treated. The holding is cleaned and disinfected, official environmental samples are taken, negative results are required before restocking. Official epidemiological investigation is carried out. Feedingstuffs are analysed for Salmonella. The measures are the same for all salmonella serovars.

#### Notification system in place

The laboratory has to notify the positive result to the competent authority and to the food business operator. Salmonella has been notifiable since 1995.

#### Results of the investigation

Salmonella was not detected in broiler flocks in 2012.

#### National evaluation of the recent situation, the trends and sources of infection

Salmonella situation has been very favourable in broiler flocks for years. The year 2012 was the first year when Salmonella was not detected in any broiler flock. In 2011, there was one positive broiler flock.

#### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Domestic broiler meat is not considered to be an important source of human salmonellosis cases in Finland.



## C. Salmonella spp. in Gallus Gallus - flocks of laying hens

### Monitoring system

#### Sampling strategy

##### Laying hens flocks

The Finnish Salmonella Control Programme:

Day-old chicks are sampled at the holding after arrived by the food business operator.

Rearing flocks are sampled at the holding two weeks before laying period by the food business operator.

Production flocks are sampled at the holdings every 15 weeks by the food business operator.

Sampling is carried out by the official veterinarian once a year at each rearing and laying holding.

In addition, the flock is sampled by the official veterinarian every time when there is a reason to suspect that the flock is positive for Salmonella spp.

There are specific national rules also for farms which deliver only small amount of eggs directly to the final consumers. At these farms, the flocks are sampled twice a year by the operator and every second year by the official veterinarian.

#### Frequency of the sampling

##### Laying hens: Day-old chicks

Every flock is sampled

##### Laying hens: Rearing period

Every flock is sampled two weeks before laying period

##### Laying hens: Production period

Every 15 weeks

#### Type of specimen taken

##### Laying hens: Day-old chicks

Internal linings of delivery boxes

##### Laying hens: Rearing period

faeces or sock samples / boot swabs

##### Laying hens: Production period

faeces or sock samples / boot swabs, dust

#### Methods of sampling (description of sampling techniques)

##### Laying hens: Day-old chicks

Five internal lining papers are collected from delivery baskets and pooled together. If papers are not used five swab samples are taken.

##### Laying hens: Rearing period

Two pairs of boot swabs/sock samples are taken and pooled to one.

In cage flocks: two samples of 150 g of naturally mixed faeces are collected and pooled to one.

##### Laying hens: Production period

Two pairs of boot swabs/sock samples are taken and pooled to one.

In cage flocks: two samples of 150 g of naturally mixed faeces are collected and pooled to one.

In official sampling also a dust sample (250 ml, 100 g) is taken.

#### Case definition

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### Laying hens: Day-old chicks

Flock is considered to be positive if *Salmonella* spp. is isolated from any sample.

### Laying hens: Rearing period

Flock is considered to be positive if *Salmonella* spp. is isolated from any sample.

### Laying hens: Production period

Flock is considered to be positive if *Salmonella* spp. is isolated from any sample.

## Diagnostic/analytical methods used

### Laying hens: Day-old chicks

Bacteriological method: ISO 6579:2002/Amd 1:2007

### Laying hens: Rearing period

Bacteriological method: ISO 6579:2002/Amd 1:2007

### Laying hens: Production period

Bacteriological method: ISO 6579:2002/Amd 1:2007

## Vaccination policy

### Laying hens flocks

Vaccination against *Salmonella* is not allowed in Finland.

## Other preventive measures than vaccination in place

### Laying hens flocks

Strict biosecurity and production hygiene at holdings. *Salmonella* control of feedstuffs.

## Control program/mechanisms

### The control program/strategies in place

#### Laying hens flocks

The Finnish *Salmonella* Control Programme, approved by Commission Decision 2007/849/EC

## Measures in case of the positive findings or single cases

### Laying hens flocks

In case of positive finding the flock is destructed or slaughtered and meat heat treated. Eggs are destructed or heat treated. All the other flocks at the holding are sampled by the official veterinarian. The holding is cleaned and disinfected, official environmental samples are taken, negative results are required before restocking. Official epidemiological investigation is carried out. Feedingstuffs are analysed for *Salmonella*. The measures are the same for all *Salmonella* serovars.

## Notification system in place

The laboratory has to notify the positive result to the competent authority and to the food business operator. *Salmonella* has been notifiable since 1995.

## Results of the investigation

*Salmonella* was detected in three commercial flocks of laying hens (*S. Typhimurium*).

In addition *S. Typhimurium* was detected in one backyard holding delivering eggs only directly to the final consumers.

## National evaluation of the recent situation, the trends and sources of infection

*Salmonella* situation has been very favourable in flocks of laying hens for years. Usually 0-2 positive

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flocks have been detected yearly. *S. Typhimurium* has been the most common serovar. In 2012, three positive commercial flocks and one positive backyard flock were detected. So, the year 2012 was slightly worse than usual.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Flocks of laying hens or eggs are not considered to be important source of human salmonellosis cases in Finland.

## D. Salmonella spp. in bovine animals

### Monitoring system

#### Sampling strategy

The Finnish Salmonella Control Programme:

- Together 3000 animals are sampled each year randomly from the cattle population at the slaughterhouses. Sampling is carried out by the food business operator under supervision of the official veterinarian.
- Herds of origin of AI-bulls are sampled at farm before the transfer of the AI-bull by the food business operator.
- Suspected herds (clinical symptoms or positive finding at slaughterhouse or other suspicion) are sampled at the farm by the official veterinarian
- After a Salmonella finding herds are sampled several times by the operator during the sanitation and eradication process and at least twice by the official veterinarian before the restrictions are lifted.

Note! All sampling at slaughterhouses has an animal based approach, not herd based.

#### Frequency of the sampling

Animals at slaughter (herd based approach)

Sampling distributed evenly throughout the year

#### Type of specimen taken

Animals at farm

Routine sampling: faeces

Suspect sampling and sampling before restrictions are lifted: faeces and environmental swab samples

Animals at slaughter (herd based approach)

Lymph nodes

#### Methods of sampling (description of sampling techniques)

Animals at farm

Sampling of herds of origin of AI bulls:

The number of faecal samples is dependent on the number of animals in the herd. In the herds with less than 40 animals all the animals are sampled. In the herds with 40-200 animals all the youngest 40 animals are sampled and from the rest animals every second is sampled. In the herds with over 200 animals all the youngest 40 animals are sampled, from the next youngest 160 animals every second is sampled and from the rest animals every fifth. Maximum of 20 samples may be pooled together.

Sampling of suspected herds:

Faecal sampling is carried out as described above. In addition, 5-50 environmental swab samples are taken from different areas of the premises.

If there is a suspicion that feedstuffs are contaminated with Salmonella swab samples are also taken from the feed systems.

Sampling of salmonella positive herds for lifting the restrictions:

A faecal sample is collected from each animal. Maximum of 20 samples may be pooled together. In addition, 10-100 environmental swab samples are taken from different areas of the premises.

Animals at slaughter (herd based approach)

From each carcass five ileo-caecal lymphnodes are taken. Lymph nodes are divided into two equal parts. Lymph nodes parts from five animals are pooled together for analyse. If the sample is positive each of the five individually samples are analysed separately.

#### Case definition

##### Animals at farm

Herd is positive if Salmonella spp. has been isolated from one or more faecal or environmental samples.

##### Animals at slaughter (herd based approach)

Animal is positive if Salmonella spp. has been isolated from a sample.

#### Diagnostic/analytical methods used

##### Animals at farm

Bacteriological method: ISO 6579:2002/Amd 1:2007

##### Animals at slaughter (herd based approach)

ISO 6579:2002 or NMKL No 71:1999 or ISO 6579:2002 / Amendment 1:2007

#### Vaccination policy

Vaccination against Salmonella is not allowed in Finland.

#### Other preventive measures than vaccination in place

Biosecurity and production hygiene measures at holdings. Salmonella control of feedstuffs.

#### Control program/mechanisms

##### The control program/strategies in place

The Finnish Salmonella Control Programme, approved by Commission Decision 94/968/EC of 28 December 1994.

##### Recent actions taken to control the zoonoses

National Decree on Salmonella control of cattle was amended in 2011. The sensitivity was improved in samplings of suspected herds and of positive herds before restrictions are lifted. The number of faecal samples was increased and environmental samples were added to the sampling protocol.

#### Measures in case of the positive findings or single cases

At slaughterhouse: If a positive lymph node sample is detected in the slaughterhouse, the herd of origin is sampled by the official veterinarian.

At farm: Official restrictions: no trade of live animals except to slaughterhouse (meat is heat treated), milk is allowed to deliver only to an approved establishment for pasteurization. Sanitation and eradication is carried out according to the holding specific plan. Restrictions are lifted after herd has been negative in two consecutive sampling sessions with interval of 3-4 weeks. Epidemiological investigation is carried out by the official veterinarian. Contact herds are sampled. Feedingstuffs are analysed for Salmonella.

#### Notification system in place

The laboratory has to notify the positive result to the competent authority and to the food business operator.

#### Results of the investigation

See table Salmonella in other animals.

#### National evaluation of the recent situation, the trends and sources of infection

Salmonella situation in cattle has been favourable for years.

#### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a

source of infection)

Cattle is not considered to be an important source of human salmonellosis cases in Finland.

## E. Salmonella spp. in pigs

### Monitoring system

#### Sampling strategy

##### Breeding herds

The Finnish Salmonella Control Programme:

- All nucleus and multiplier herds are sampled at the holding once a year by the operators.
- Together 3000 sows are sampled each year randomly from the sow population at the slaughterhouses. Sampling is carried out by the food business operator under supervision of the official veterinarian.
- Suspected herds (clinical symptoms or positive finding at slaughterhouse or other suspicion) are sampled at the holding by the official veterinarian.
- After a Salmonella finding herds are sampled several times by the operator during the sanitation and eradication process and at least twice by the official veterinarian before the restrictions are lifted.

Note! All sampling at slaughterhouses has an animal based approach, not herd based.

##### Multiplying herds

##### Fattening herds

The Finnish Salmonella Control Programme:

- Together 3000 fattening pigs are sampled each year randomly from the population at the slaughterhouses. Sampling is carried out by the food business operator under supervision of the official veterinarian.
- Suspected herds (clinical symptoms or positive finding at slaughterhouse or other suspicion) are sampled at the holding by the official veterinarian.
- After a Salmonella finding herds are sampled several times by the operator during the sanitation and eradication process and at least twice by the official veterinarian before the restrictions are lifted.

Note! All sampling at slaughterhouses has an animal based approach, not herd based.

#### Frequency of the sampling

##### Breeding herds

At slaughterhouses: sampling distributed evenly throughout the year. At holdings: nucleus and multiplier herds once a year

##### Fattening herds at slaughterhouse (herd based approach)

Sampling distributed evenly throughout the year

#### Type of specimen taken

##### Breeding herds

At holding: Routine sampling: faeces

Suspect sampling and sampling before restrictions are lifted: faeces and environmental swab samples

At slaughterhouse: lymph nodes

Fattening herds at farm

Faeces and environmental swab samples

Fattening herds at slaughterhouse (herd based approach)

Lymph nodes

Methods of sampling (description of sampling techniques)

Breeding herds

At holding:

Routine sampling of nucleus and multiplier herds:

Sows: One composite sample is taken from every 100 sows or part of 100 sows. However, the maximum number of composite samples is ten. Samples are preferably taken from sows with piglets. Faecal samples of maximum of 20 animals may be pooled to one composite sample.

Growers, young breeding animals or weaned piglets (if present): Two faecal samples are taken from a group of 10-15 animals. Maximum of 20 samples may be pooled to one composite sample. The number of composite samples is dependent on the number of sows at the holding. Maximum number of composite samples is 15.

Suspected herds:

Adult animals: Faecal sample is taken from every second sow with piglets. From other adult animals one composite sample is taken from every 100 animals or part of 100 animals. Faecal samples of maximum of 20 animals may be pooled to one composite sample.

Young animals: Two faecal samples are taken from each group of 10-15 animals. Maximum of 20 samples may be pooled.

In addition, 5-50 environmental swab samples are taken from different areas of the premises.

If there is a suspicion that feedstuffs are contaminated with Salmonella swab samples are also taken from the feed systems.

Sampling of salmonella positive herds for lifting the restrictions:

Adult animals: Faecal sample is collected from every animal. Maximum of 20 samples may be pooled.

Young animals: Two faecal samples are collected from each group of 10-15 animals. Maximum of 20 samples may be pooled.

In addition, 10-100 environmental swab samples are taken from different areas of the premises.

Slaughterhouse:

From each carcass five ileo-caecal lymphnodes are taken. Lymph nodes are divided into two equal parts.

Lymph nodes parts from five animals are pooled together for analyse. If the sample is positive each of the five individually samples are analysed separately.

Fattening herds at farm

Suspected herds:

One faecal sample is collected from each group of 10-15 animals. Maximum of 20 samples may be pooled. In addition, 5-50 environmental swab samples are taken from different areas of the premises.

If there is a suspicion that feedstuffs are contaminated with Salmonella swab samples are also taken from the feed systems.

Sampling of salmonella positive herds for releasing the restrictions:

Two faecal samples are collected from each group of 10-15 animals. Maximum of 20 samples may be pooled. In addition, 10-100 environmental swab samples are taken from different areas of the premises.



#### Fattening herds at slaughterhouse (herd based approach)

From each carcass five ileo-caecal lymphnodes are taken. Lymph nodes are divided into two equal parts. Lymph nodes parts from five animals are pooled together for analyse. If the sample is positive each of the five individually samples are analysed separately.

### Case definition

#### Breeding herds

Herd is positive if Salmonella spp. has been isolated from one or more fecal or environmental samples.

#### Fattening herds at farm

Herd is positive if Salmonella spp. has been isolated from one or more fecal or environmental samples.

#### Fattening herds at slaughterhouse (herd based approach)

Animal is positive if Salmonella spp. has been isolated from a sample.

### Diagnostic/analytical methods used

#### Breeding herds

Bacteriological method: ISO 6579:2002/Amd 1:2007

#### Fattening herds at farm

Bacteriological method: ISO 6579:2002/Amd 1:2007

#### Fattening herds at slaughterhouse (herd based approach)

ISO 6579:2002 or NMKL No 71:1999 or ISO 6579:2002 / Amendment 1:2007

### Vaccination policy

#### Breeding herds

Vaccination against salmonella is not allowed in Finland.

#### Fattening herds

Vaccination against salmonella is not allowed in Finland.

### Other preventive measures than vaccination in place

#### Breeding herds

Strict biosecurity and production hygiene at holdings. Salmonella control of feedstuffs.

#### Fattening herds

Strict biosecurity and production hygiene at holdings. Salmonella control of feedstuffs.

### Control program/mechanisms

#### The control program/strategies in place

##### Breeding herds

The Finnish Salmonella Control Programme, approved by Commission Decision 94/968/EC of 28 December 1994.

##### Fattening herds

The Finnish Salmonella Control Programme, approved by Commission Decision 94/968/EC of 28 December 1994.

#### Recent actions taken to control the zoonoses

National Decree on Salmonella control of pigs was amended in 2011. The sensitivity was improved in samplings of suspected herds and of positive herds before restrictions are lifted. The number of fecal samples was increased and environmental samples were added to the sampling protocol.

### Measures in case of the positive findings or single cases

At slaughterhouse: If a positive lymph node sample is detected in the slaughterhouse, the herd of origin is sampled by the official veterinarian.

At farm: Official restrictions: no trade of live animals except to slaughterhouse (meat is heat treated).

Sanitation and eradication is carried out according to the holding specific plan. Restrictions are released after herd has been negative in two consecutive sampling sessions with 3-4 weeks intervals.

Epidemiological investigation is carried out by the official veterinarian. Contact herds are sampled.

Feedingstuffs are analysed for Salmonella.

### Notification system in place

Laboratory has to notify the positive result to the competent authority and to the food business operator.

### Results of the investigation

See table Salmonella in other animals.

### National evaluation of the recent situation, the trends and sources of infection

Salmonella situation in pigs has been very favourable for years.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Pigs are not considered to be an important source of human salmonellosis cases in Finland.

## F. Salmonella spp. in turkey - breeding flocks and meat production flocks

### Monitoring system

#### Sampling strategy

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

The Finnish Salmonella Control Programme:

Day-old chicks are sampled by the food business operator after arrived to the holding.

Rearing flocks are sampled at the holding by the food business operator at four weeks old and two weeks before moving to laying unit or phase. Once a year samples are taken by the official veterinarian at each holding.

Adult breeding flocks are sampled at the holding every second week by the food business operator. Once a year samples are taken by the official veterinarian at each holding.

In addition, the rearing and adult breeding flock is always sampled by the official veterinarian if there is any reason to suspect that the flock is positive for Salmonella spp.

Meat production flocks

The Finnish Salmonella Control Programme:

All meat production flocks are sampled at the holding within three weeks before slaughter. The sampling result is valid for three weeks except for small producers the result is valid for six weeks. At each holding sampling is carried out by the official veterinarian once a year, otherwise sampling is carried out by the food business operator.

In addition, the flock is always sampled by the official veterinarian if there is any reason to suspect that the flock is positive for Salmonella spp.

#### Frequency of the sampling

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Every flock is sampled

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Every flock is sampled at age of 4 weeks and 2 weeks before moving to the laying unit

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Every flock is sampled at the holding every second week.

Meat production flocks: Before slaughter at farm

Every flock is sampled within three weeks before slaughter

#### Type of specimen taken

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Internal linings of delivery boxes

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Socks/ boot swabs

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

One pair of socks/boot swabs and one dust sample

Meat production flocks: Before slaughter at farm

Samples taken by the food business operator; two pairs of socks/boot swabs

Samples taken by the official veterinarian; one pair of socks/boot swabs and one dust sample

#### Methods of sampling (description of sampling techniques)

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Internal linings are collected from ten delivery boxes. Five papers are pooled together. If papers are not used swab samples from ten delivery boxes are taken. Five swab samples are pooled together.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Two pairs of socks/ boot swabs samples are taken. Both pairs are analysed separately.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

One pair of socks/boot swabs samples and one dust sample collected by swab are taken. Both samples are analysed separately.

Meat production flocks: Before slaughter at farm

Sampling by the food business operator: two pairs of socks/boot swabs samples are taken. Both pairs are analysed separately.

Sampling by the official veterinarian: one pair of socks/boot swabs and one dust sample collected by swab are taken. Both samples are analysed separately.

#### Case definition

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Flock is considered to be positive when *Salmonella* spp. is isolated from any sample.

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Flock is considered to be positive when *Salmonella* spp. is isolated from any sample.

Meat production flocks: Before slaughter at farm

Flock is considered to be positive when *Salmonella* spp. is isolated from any sample.

#### Diagnostic/analytical methods used

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Day-old chicks

Bacteriological method: ISO 6579:2002/Amd 1:2007

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Rearing period

Bacteriological method: ISO 6579:2002/Amd 1:2007

Breeding flocks (separate elite, grand parent and parent flocks when necessary): Production period

Bacteriological method: ISO 6579:2002/Amd 1:2007

Meat production flocks: Before slaughter at farm

Bacteriological method: ISO 6579:2002/Amd 1:2007

#### Vaccination policy

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Vaccination against salmonella is not allowed in Finland.

Meat production flocks

Vaccination against salmonella is not allowed in Finland.

#### Other preventive measures than vaccination in place

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

Strict biosecurity and production hygiene in holdings. Competitive exclusion. Feedstuff control.

Meat production flocks

Strict biosecurity and production hygiene in holdings. Competitive exclusion. Feedstuff control.

### Control program/mechanisms

#### The control program/strategies in place

Breeding flocks (separate elite, grand parent and parent flocks when necessary)

The Finnish Salmonella Control Programme, approved by Commission Decision 2009/771/EC.

#### Meat production flocks

The Finnish Salmonella Control Programme, approved by Commission Decision 2009/771/EC.

#### Recent actions taken to control the zoonoses

Salmonella control programme for breeding and meat production flocks of turkeys was amended from the beginning of the year 2010. Earlier the adult breeding flocks were sampled every second week at the hatcheries, now at the holdings. One pair of socks/boot swabs and one swab dust sample are taken instead of five pairs of socks/boot swabs. For meat production flocks two pairs of socks/boot swabs or one pair of socks/boot swabs and one dust sample are taken instead of five pairs of socks/boot swabs.

### Measures in case of the positive findings or single cases

In case of positive finding the flock is destructed or slaughtered and meat heat treated. Hatching eggs are destructed or heat treated. All the other flocks at the holding are sampled by the official veterinarian. The holding is cleaned and desinfected, official environmental samples are taken, negative results are required before restocking. Official epidemiological investigation is carried out. Feedingstuffs are analysed for Salmonella. The measures are the same for all Salmonella serovars.

### Notification system in place

Laboratory has to notify the positive result to the competent authority and to the food bussines operator. Salmonella has been notifiable since 1995.

### Results of the investigation

Salmonella spp. was not detected in breeding flocks of turkeys.

One fattening flock out of 342 (0,3 %) was positive for Salmonella (S. Typhmiurium).

### National evaluation of the recent situation, the trends and sources of infection

Salmonella situation in turkey flocks has been favourable for years.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Domestic turkey meat is not considered to be an important source of human salmonellosis cases in Finland.

Table Salmonella in breeding flocks of Gallus gallus

	No of flocks under control programme	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Target Verification	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis
Gallus gallus (fowl) - breeding flocks, unspecified - adult - Control and eradication programmes			Census	Official and industry sampling			yes				
Gallus gallus (fowl) - parent breeding flocks for egg production line - day-old chicks - Control and eradication programmes	5	Evira	Census	Industry sampling				Flock	5	0	
Gallus gallus (fowl) - parent breeding flocks for egg production line - during rearing period - Control and eradication programmes	7	Evira	Census	Official and industry sampling				Flock	7	0	
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult - Control and eradication programmes	16	Evira	Census	Official and industry sampling			yes	Flock	16	0	
Gallus gallus (fowl) - grandparent breeding flocks for egg production line - day-old chicks - Control and eradication programmes	1	Evira	Census	Industry sampling				Flock	1	0	
Gallus gallus (fowl) - grandparent breeding flocks for egg production line - during rearing period - Control and eradication programmes	1	Evira	Census	Official and industry sampling				Flock	1	0	
Gallus gallus (fowl) - grandparent breeding flocks for egg production line - adult - Control and eradication programmes	2	Evira	Census	Official and industry sampling			yes	Flock	2	0	
Gallus gallus (fowl) - parent breeding flocks for broiler production line - day-old chicks - Control and eradication programmes	67	Evira	Census	Industry sampling				Flock	67	0	
Gallus gallus (fowl) - parent breeding flocks for broiler production line - during rearing period - Control and eradication programmes	82	Evira	Census	Official and industry sampling				Flock	82	0	

Table Salmonella in breeding flocks of Gallus gallus

	No of flocks under control programme	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Target Verification	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult - Control and eradication programmes	136	Evira	Census	Official and industry sampling			yes	Flock	136	0	
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - day-old chicks - Control and eradication programmes	3	Evira	Census	Industry sampling				Flock	3	0	
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - during rearing period - Control and eradication programmes	3	Evira	Census	Official and industry sampling				Flock	3	0	
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - adult - Control and eradication programmes	11	Evira	Census	Official and industry sampling			yes	Flock	11	0	
		S. Hadar	S. Infantis	S. Typhimurium	S. Virchow	S. 1,4,[5],12:i:-		Salmonella spp., unspecified			
Gallus gallus (fowl) - breeding flocks, unspecified - adult - Control and eradication programmes											
Gallus gallus (fowl) - parent breeding flocks for egg production line - day-old chicks - Control and eradication programmes											
Gallus gallus (fowl) - parent breeding flocks for egg production line - during rearing period - Control and eradication programmes											

Table Salmonella in breeding flocks of Gallus gallus

	S. Hadar	S. Infantis	S. Typhimurium	S. Virchow	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult - Control and eradication programmes						
Gallus gallus (fowl) - grandparent breeding flocks for egg production line - day-old chicks - Control and eradication programmes						
Gallus gallus (fowl) - grandparent breeding flocks for egg production line - during rearing period - Control and eradication programmes						
Gallus gallus (fowl) - grandparent breeding flocks for egg production line - adult - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - day-old chicks - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - during rearing period - Control and eradication programmes						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult - Control and eradication programmes						
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - day-old chicks - Control and eradication programmes						
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - during rearing period - Control and eradication programmes						



Table Salmonella in breeding flocks of Gallus gallus

	S. Hadar	S. Infantis	S. Typhimurium	S. Virchow	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - adult - Control and eradication programmes						

Table Salmonella in other animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	S. 1,4,[5],12:i:-
Cattle (bovine animals) - breeding bulls - at farm - Control and eradication programmes (Herds of origin of AI-bulls)	Evira	Census	Industry sampling	animal sample > faeces		Herd	131	0			
Cattle (bovine animals) - unspecified - at farm - Control and eradication programmes	Evira	Suspect sampling	Official sampling			Herd	84	12	1	10	
Cattle (bovine animals) - unspecified - at slaughterhouse - Control and eradication programmes	Evira	Objective sampling	Industry sampling	animal sample > lymph nodes		Animal	3154	3		3	
Pigs - breeding animals - at farm - Control and eradication programmes (Nucleus and multiplier herds)	Evira	Census	Industry sampling	animal sample > faeces		Herd	68	0			
Pigs - breeding animals - at slaughterhouse - Control and eradication programmes	Evira	Objective sampling	Industry sampling	animal sample > lymph nodes		Animal	3168	2		1	
Pigs - fattening pigs - at slaughterhouse - Control and eradication programmes	Evira	Objective sampling	Industry sampling	animal sample > lymph nodes		Animal	3257	1		1	
Pigs - unspecified - at farm - Control and eradication programmes	Evira	Suspect sampling	Official sampling			Herd	21	2			
Pigs - unspecified - at farm - Monitoring (Breeding herds (other than nucleus and multiplier), mixed herds, fattening pig herds)	Evira, Sikava	Unspecified	Industry sampling	animal sample > faeces		Herd	90	0			

Table Salmonella in other animals

	Salmonella spp., unspecified	S. Kisarawe	S. Muenchen	S. Rissen	S. Tennessee
Cattle (bovine animals) - breeding bulls - at farm - Control and eradication programmes (Herds of origin of AI-bulls)					
Cattle (bovine animals) - unspecified - at farm - Control and eradication programmes			1	1	
Cattle (bovine animals) - unspecified - at slaughterhouse - Control and eradication programmes					
Pigs - breeding animals - at farm - Control and eradication programmes (Nucleus and multiplier herds)					
Pigs - breeding animals - at slaughterhouse - Control and eradication programmes		1			
Pigs - fattening pigs - at slaughterhouse - Control and eradication programmes					
Pigs - unspecified - at farm - Control and eradication programmes					2
Pigs - unspecified - at farm - Monitoring (Breeding herds (other than nucleus and multiplier), mixed herds, fattening pig herds)					

Table Salmonella in other poultry

	No of flocks under control programme	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Target Verification	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis
Gallus gallus (fowl) - laying hens - day-old chicks - Control and eradication programmes	148	Evira	Census	Industry sampling				Flock	148	0	
Gallus gallus (fowl) - laying hens - during rearing period - Control and eradication programmes	352	Evira	Census	Official and industry sampling				Flock	352	0	
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes	704	Evira	Census	Official and industry sampling			yes	Flock	704	3	
Gallus gallus (fowl) - broilers - before slaughter - at farm - Control and eradication programmes	3200	Evira		Official sampling				Flock	476	0	
Gallus gallus (fowl) - broilers - before slaughter - at farm - Control and eradication programmes	3200	Evira		Industry sampling				Flock	2724	0	
Gallus gallus (fowl) - broilers - before slaughter - at farm - Control and eradication programmes	3200	Evira	Census	Official and industry sampling			yes	Flock	3200	0	
Turkeys - fattening flocks - before slaughter - at farm - Control and eradication programmes	342	Evira	Census	Official and industry sampling			yes	Flock	342	1	
Gallus gallus (fowl) - laying hens - at farm - Control and eradication programmes (Small holdings outside the scope of Regulation 2160/2003, selling eggs only directly to final consumers.)		Evira	Unspecified	Official and industry sampling			no	Flock	21	1	
Turkeys - parent breeding flocks - adult - at farm - Control and eradication programmes	8	Evira	Census	Official and industry sampling			yes	Flock	8	0	
Turkeys - parent breeding flocks - day-old chicks - at farm - Control and eradication programmes	5	Evira	Census	Industry sampling				Flock	5	0	

Table Salmonella in other poultry

	No of flocks under control programme	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Target Verification	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis
Turkeys - parent breeding flocks - during rearing period - at farm - Control and eradication programmes	17	Evira	Census	Official and industry sampling				Flock	17	0	
		S. Typhimurium	S. 1,4,[5],12:i-	Salmonella spp., unspecified							
Gallus gallus (fowl) - laying hens - day-old chicks - Control and eradication programmes											
Gallus gallus (fowl) - laying hens - during rearing period - Control and eradication programmes											
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes	3										
Gallus gallus (fowl) - broilers - before slaughter - at farm - Control and eradication programmes											
Gallus gallus (fowl) - broilers - before slaughter - at farm - Control and eradication programmes											
Gallus gallus (fowl) - broilers - before slaughter - at farm - Control and eradication programmes											
Turkeys - fattening flocks - before slaughter - at farm - Control and eradication programmes	1										
Gallus gallus (fowl) - laying hens - at farm - Control and eradication programmes (Small holdings outside the scope of Regulation 2160/2003, selling eggs only directly to final consumers.)	1										

Table Salmonella in other poultry

	S. Typhimurium	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Turkeys - parent breeding flocks - adult - at farm - Control and eradication programmes			
Turkeys - parent breeding flocks - day-old chicks - at farm - Control and eradication programmes			
Turkeys - parent breeding flocks - during rearing period - at farm - Control and eradication programmes			

## 2.1.4 Salmonella in feedingstuffs

### A. Salmonella spp. in feed

#### History of the disease and/or infection in the country

In Finland, animal feed has been controlled for Salmonella on the basis of animal feed legislation for more than 50 years. Control of imported feedingstuffs and domestic manufacturing has efficiently limited and prevented the spread of Salmonella from factories to farms. The strict liability principle in the animal feed legislation and the indemnity liability have contributed to the willingness of feedmills to develop their operations towards eliminating risks of Salmonella. The animal feed industry has also accepted its responsibility for the cleanliness of the national food chain by developing its own quality control systems.

Salmonella outbreaks originating from feed are rare on Finnish livestock farms. In 1995, the feed-borne *S. Infantis* outbreak was discovered on cattle farms. During the outbreak, approximately 0.7% of Finnish cattle farms were infected. In the spring of 2009, the feed-borne *S. Tennessee* outbreak spread to poultry and pig farms. Approximately 4 % of Finnish laying hen holdings and about 2 % of Finnish pig holdings were infected.

Foreign feedingstuffs of plant origin are considered particularly risky in terms of Salmonella. During the last ten years, an average of 370 million kilograms of plant-derived feedingstuffs has been imported into Finland annually, and an average of almost 6 % of it has been found to be contaminated by Salmonella. The majority - approximately 79 % - of plant-derived feedingstuffs has been oil plant seed products or by-products, such as post-extraction soya and rapeseed meal. Almost 8 % of these have been found to be contaminated by Salmonella. The most common serotypes established in plant-derived feedingstuffs have been *S. Tennessee*, *S. Agona*, *S. Senftenberg* and *S. Mbandaka*.

In the last ten years, Salmonella findings have been relatively rare in feed materials and compound feedingstuffs manufactured in Finland, i.e. on average in two samples annually. Salmonella has been found five times in feed materials of plant origin from the year 2002 to 2012. In feed materials of animal origin, Salmonella was found in two samples of meat-and-bone meal in 2005 and in one sample in 2010. Compound feedingstuffs that were salmonella-positive were almost without exception compound feedingstuffs intended for fur animals. Salmonella has not been found in samples taken in conjunction with the manufacturing of pet food.

The most common Salmonellas isolated from the control samples of domestic feed materials and compound feedingstuffs manufacturing have been *S. Agona* and *S. Poona*. In the 2009 Salmonella outbreak, compound feedingstuffs were contaminated with *S. Tennessee*.

The majority of salmonella tests for feed on the market have been carried out on pet food and sunflower seeds intended for outdoor birds. In samples taken from dried pig ears intended for dogs and from other similar products, an average of 4,1 % was found to be contaminated by salmonella. The contaminated feed has been mainly manufactured outside Finland.

The most common serotypes isolated from dried pig ears intended for dogs and other corresponding products have been *S. Typhimurium*, *S. Derby*, *S. Anatum* and *S. Havana*.

#### Additional information

Finnish Food Safety Authority Evira carries out inspections of feedingstuffs concerning manufacturing, marketing, distribution and import.

The Regulation of the Ministry of Agriculture and Forestry on undesirable substances, products and organisms in animal feed (No 11/2010) includes requirements for hygienic quality of feedingstuffs. According to this decision, feeds should not contain salmonella. According to the Finnish Feed Act (No 86/2008), the feed operator is obligated to pay compensation for damages caused by salmonella-contaminated feeds.

All feed business operators must inform Evira when salmonella is found in feeds, feed materials or manufacturing processes.

- Import from EU or third countries:

Imported lots of plant origin feeds are sampled according to the risk-based annual control plan.

Salmonella analyses are made in Evira or in laboratories with which Evira has made an agreement (4 laboratories, 24.5.2013). Custom is responsible for the documentary checks and to carry out the import quarantine restrictions on feeds of plant origin originating from third countries.

Feeds of animal origin from third countries are imported via designated BIPs, where they are submitted for veterinary border inspection. The border control veterinarians carry out official controls of feeds of animal origin from third countries to verify compliance with aspects of Feedingstuffs Act in accordance with Regulation (EC) 882/2004.

- Marketing control:

Evira provides the inspectors of Employment and Economic Development Centres with a sampling programme for the whole year in which the types of operators, the number of visits, the types of feed and the number of samples to be taken are specified.

- Control of domestic production:

Regulation (EC) No 1831/2003 of the European Parliament and of the Council laying down requirements for feed hygiene describes general rules on feed hygiene, conditions and arrangements ensuring traceability of feed and conditions for registration and approval of establishments. The sampling of production is risk-based and targeted to specified feeds. The amount of production, the type of operator, the hygienic risk and the feed materials used have an impact on the amount so samples taken annually from the production.

- Measures in case of positive findings:

When salmonella is found in import control or from market, a prohibition concerning the lot, from which the sample was taken, is immediately issued. If salmonella is found in domestic feed production, the production line is stopped and disinfected.

Evira may upon request grant a permission to decontaminate the lot of feed material containing salmonella. The decontamination must be carried out according to instructions of Evira. After decontamination, Evira will resample the lot and if the lot is verified to be free from salmonella, Evira gives a permission to use the lot as feed.

In market control, the shop, where the salmonella was found, is contacted. The importer or the representative is also immediately informed, and the shop and the importer or representative are responsible for withdrawal of the product from market according to instructions of Evira

- Sampling:

Sampling for official control is carried out according to Evira's written directions which are based on the Commission Regulation (EC) No 152/2009 of January 2009 laying down the methods of sampling and analysis for the official control of feed.



- Analysis method:

In Evira salmonella is analysed mainly as described in the ISO 6579:2002 with some minor modifications.

Analysis methods used in approved laboratories are ISO 6579:2002, NMKL No 71:1999 and NMKL No 187:2007. Serotyping is performed when salmonella is detected in a sample.

Table Salmonella in compound feedingstuffs

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Compound feedingstuffs for cattle - final product - at feed mill - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	128	0		
Compound feedingstuffs for pigs - final product - at feed mill - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	96	0		
Compound feedingstuffs for poultry (non specified) - final product - at feed mill - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	66	0		
Compound feedingstuffs for cattle - final product - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Single	25 g	1	0		
Compound feedingstuffs for cattle - final product - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	2	0		
Compound feedingstuffs for fish - final product - at feed mill - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	3	0		
Compound feedingstuffs for fur animal - final product - at feed mill - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	36	0		
Compound feedingstuffs for horses - final product - at feed mill - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	5	0		
Compound feedingstuffs for horses - final product - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	2	0		
Compound feedingstuffs for pigs - final product - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	1	0		
Compound feedingstuffs for reindeers - final product - at feed mill - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	1	0		
Compound feedingstuffs for sheep - final product - at feed mill - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	2	0		

Table Salmonella in compound feedingstuffs

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Compound feedingstuffs, not specified - final product - at feed mill - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	17	0		
Compound feedingstuffs, not specified - final product - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	1	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Compound feedingstuffs for cattle - final product - at feed mill - Surveillance		
Compound feedingstuffs for pigs - final product - at feed mill - Surveillance		
Compound feedingstuffs for poultry (non specified) - final product - at feed mill - Surveillance		
Compound feedingstuffs for cattle - final product - at border control - Surveillance		
Compound feedingstuffs for cattle - final product - at retail - Surveillance		
Compound feedingstuffs for fish - final product - at feed mill - Surveillance		
Compound feedingstuffs for fur animal - final product - at feed mill - Surveillance		
Compound feedingstuffs for horses - final product - at feed mill - Surveillance		

Table Salmonella in compound feedingstuffs

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified
Compound feedingstuffs for horses - final product - at retail - Surveillance		
Compound feedingstuffs for pigs - final product - at retail - Surveillance		
Compound feedingstuffs for reindeers - final product - at feed mill - Surveillance		
Compound feedingstuffs for sheep - final product - at feed mill - Surveillance		
Compound feedingstuffs, not specified - final product - at feed mill - Surveillance		
Compound feedingstuffs, not specified - final product - at retail - Surveillance		

Table Salmonella in feed material of animal origin

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Feed material of land animal origin - animal fat - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	3	0		
Feed material of land animal origin - dairy products - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	37	0		
Feed material of land animal origin - meat and bone meal - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	12	0		
Feed material of land animal origin - meat meal - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	6	0		
Feed material of marine animal origin - fish meal - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	1	0		
Feed material of marine animal origin - fish meal - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Imported from outside EU	Batch	25 g	3	0		

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Dublin	S. Give	S. Indiana	S. Newport
Feed material of land animal origin - animal fat - at processing plant - Surveillance						
Feed material of land animal origin - dairy products - at processing plant - Surveillance						
Feed material of land animal origin - meat and bone meal - at processing plant - Surveillance						
Feed material of land animal origin - meat meal - at processing plant - Surveillance						

Table Salmonella in feed material of animal origin

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Dublin	S. Give	S. Indiana	S. Newport
Feed material of marine animal origin - fish meal - at border control - Surveillance						
Feed material of marine animal origin - fish meal - at border control - Surveillance						

Table Salmonella in other feed matter

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Feed material of cereal grain origin - barley derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	18	0		
Feed material of cereal grain origin - barley derived - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	3	0		
Feed material of cereal grain origin - maize derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	40	0		
Feed material of cereal grain origin - oat derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	2	0		
Feed material of cereal grain origin - oat derived - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	7	0		
Feed material of cereal grain origin - oat derived - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	1	0		
Feed material of cereal grain origin - other cereal grain derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	5	0		
Feed material of cereal grain origin - other cereal grain derived - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	14	0		
Feed material of cereal grain origin - other cereal grain derived - by-products of brewing and distilling - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Imported from outside EU	Batch	25 g	12	0		
Feed material of cereal grain origin - other cereal grain derived - by-products of brewing and distilling - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	26	0		
Feed material of cereal grain origin - wheat derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	51	0		

Table Salmonella in other feed matter

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Feed material of cereal grain origin - wheat derived - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	31	0		
Feed material of cereal grain origin - wheat derived - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	1	0		
Feed material of oil seed or fruit origin - groundnut derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	2	0		
Feed material of oil seed or fruit origin - groundnut derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Imported from outside EU	Batch	25 g	1	0		
Feed material of oil seed or fruit origin - linseed derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	18	0		
Feed material of oil seed or fruit origin - linseed derived - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	6	0		
Feed material of oil seed or fruit origin - linseed derived - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	1	0		
Feed material of oil seed or fruit origin - rape seed derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Imported from outside EU	Batch	25 g	10	2		
Feed material of oil seed or fruit origin - rape seed derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	108	3		
Feed material of oil seed or fruit origin - rape seed derived - at farm - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	3	0		
Feed material of oil seed or fruit origin - rape seed derived - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	53	0		
Feed material of oil seed or fruit origin - rape seed derived - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	1	0		



Table Salmonella in other feed matter

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Feed material of oil seed or fruit origin - soya (bean) derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	99	4		
Feed material of oil seed or fruit origin - soya (bean) derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Imported from outside EU	Batch	25 g	22	0		
Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	4	0		
Feed material of oil seed or fruit origin - sunflower seed derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	8	0		
Feed material of oil seed or fruit origin - sunflower seed derived - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Imported from outside EU	Batch	25 g	2	0		
Feed material of oil seed or fruit origin - sunflower seed derived - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	1	0		
Feed material of oil seed or fruit origin - sunflower seed derived - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	25	0		
Other feed material - at processing plant - Surveillance <sup>1)</sup>	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	1	0		
Other feed material - at processing plant - Surveillance <sup>2)</sup>	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	20	0		
Other feed material - at retail - Surveillance <sup>3)</sup>	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	19	0		
Other feed material - forages and roughages - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	1	0		

Table Salmonella in other feed matter

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium
Other feed material - forages and roughages - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	1	0		
Other feed material - legume seeds and similar products - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	2	0		
Other feed material - miscellaneous - at farm - Surveillance <sup>4)</sup>	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	1	0		
Other feed material - miscellaneous - at processing plant - Surveillance <sup>5)</sup>	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	22	0		
Other feed material - other seeds and fruits - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	2	0		
Other feed material - tubers, roots and similar products - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Imported from outside EU	Batch	25 g	1	0		
Other feed material - tubers, roots and similar products - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	8	0		
Other feed material - tubers, roots and similar products - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	32	0		
Other feed material - yeast - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Intra EU trade	Batch	25 g	2	0		
Other feed material - yeast - at border control - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Imported from outside EU	Batch	25 g	64	0		
Pet food - dog snacks (pig ears, chewing bones) - at retail - Surveillance <sup>6)</sup>	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	74	2		
Pet food - final product - at processing plant - Surveillance	Evira	Selective sampling	Official sampling	feed sample	Domestic	Single	25 g	22	0		
Pet food - final product - at retail - Surveillance	Evira	Selective sampling	Official sampling	feed sample		Single	25 g	37	0		

Table Salmonella in other feed matter

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Agona	S. Dublin	S. Give	S. Havana	S. Indiana	S. Livingstone	S. Mbandaka	S. Newport	S. Tennessee
Feed material of cereal grain origin - barley derived - at border control - Surveillance											
Feed material of cereal grain origin - barley derived - at processing plant - Surveillance											
Feed material of cereal grain origin - maize derived - at border control - Surveillance											
Feed material of cereal grain origin - oat derived - at border control - Surveillance											
Feed material of cereal grain origin - oat derived - at processing plant - Surveillance											
Feed material of cereal grain origin - oat derived - at retail - Surveillance											
Feed material of cereal grain origin - other cereal grain derived - at border control - Surveillance											
Feed material of cereal grain origin - other cereal grain derived - at processing plant - Surveillance											
Feed material of cereal grain origin - other cereal grain derived - by-products of brewing and distilling - at border control - Surveillance											
Feed material of cereal grain origin - other cereal grain derived - by-products of brewing and distilling - at processing plant - Surveillance											
Feed material of cereal grain origin - wheat derived - at border control - Surveillance											
Feed material of cereal grain origin - wheat derived - at processing plant - Surveillance											

Table Salmonella in other feed matter

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Agona	S. Dublin	S. Give	S. Havana	S. Indiana	S. Livingstone	S. Mbandaka	S. Newport	S. Tennessee
Feed material of cereal grain origin - wheat derived - at retail - Surveillance											
Feed material of oil seed or fruit origin - groundnut derived - at border control - Surveillance											
Feed material of oil seed or fruit origin - groundnut derived - at border control - Surveillance											
Feed material of oil seed or fruit origin - linseed derived - at border control - Surveillance											
Feed material of oil seed or fruit origin - linseed derived - at processing plant - Surveillance											
Feed material of oil seed or fruit origin - linseed derived - at retail - Surveillance											
Feed material of oil seed or fruit origin - rape seed derived - at border control - Surveillance											2
Feed material of oil seed or fruit origin - rape seed derived - at border control - Surveillance			1					1			1
Feed material of oil seed or fruit origin - rape seed derived - at farm - Surveillance											
Feed material of oil seed or fruit origin - rape seed derived - at processing plant - Surveillance											
Feed material of oil seed or fruit origin - rape seed derived - at retail - Surveillance											
Feed material of oil seed or fruit origin - soya (bean) derived - at border control - Surveillance			1			2			1		

Table Salmonella in other feed matter

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Agona	S. Dublin	S. Give	S. Havana	S. Indiana	S. Livingstone	S. Mbandaka	S. Newport	S. Tennessee
Feed material of oil seed or fruit origin - soya (bean) derived - at border control - Surveillance											
Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - Surveillance											
Feed material of oil seed or fruit origin - sunflower seed derived - at border control - Surveillance											
Feed material of oil seed or fruit origin - sunflower seed derived - at border control - Surveillance											
Feed material of oil seed or fruit origin - sunflower seed derived - at processing plant - Surveillance											
Feed material of oil seed or fruit origin - sunflower seed derived - at retail - Surveillance											
Other feed material - at processing plant - Surveillance <sup>1)</sup>											
Other feed material - at processing plant - Surveillance <sup>2)</sup>											
Other feed material - at retail - Surveillance <sup>3)</sup>											
Other feed material - forages and roughages - at border control - Surveillance											
Other feed material - forages and roughages - at retail - Surveillance											

Table Salmonella in other feed matter

	S. 1,4,[5],12:i:-	Salmonella spp., unspecified	S. Agona	S. Dublin	S. Give	S. Havana	S. Indiana	S. Livingstone	S. Mbandaka	S. Newport	S. Tennessee
Other feed material - legume seeds and similar products - at border control - Surveillance											
Other feed material - miscellaneous - at farm - Surveillance <sup>4)</sup>											
Other feed material - miscellaneous - at processing plant - Surveillance <sup>5)</sup>											
Other feed material - other seeds and fruits - at processing plant - Surveillance											
Other feed material - tubers, roots and similar products - at border control - Surveillance											
Other feed material - tubers, roots and similar products - at border control - Surveillance											
Other feed material - tubers, roots and similar products - at processing plant - Surveillance											
Other feed material - yeast - at border control - Surveillance											
Other feed material - yeast - at border control - Surveillance											
Pet food - dog snacks (pig ears, chewing bones) - at retail - Surveillance <sup>6)</sup>				1	1		1			1	
Pet food - final product - at processing plant - Surveillance											
Pet food - final product - at retail - Surveillance											

Comments:

Table Salmonella in other feed matter

Comments:

- 1) Feed for wild birds
- 2) Feed additives
- 3) Feed for wild birds
- 4) By-product of food production
- 5) Inter alia by-products of food production
- 6) In one positive unit three serotypes isolated

## 2.1.5 Salmonella serovars and phagetype distribution

The methods of collecting, isolating and testing of the Salmonella isolates are described in the chapters above respectively for each animal species, foodstuffs and humans. The serotype and phagetype distributions can be used to investigate the sources of the Salmonella infections in humans. Findings of same serovars and phagetypes in human cases and in foodstuffs or animals may indicate that the food category or animal species in question serves as a source of human infections. However as information is not available from all potential sources of infections, conclusions have to be drawn with caution.

Table Salmonella serovars in animals

Serovar	Cattle (bovine animals)				Pigs				Gallus gallus (fowl)				Other poultry
	Control program	Monitoring	Clinical	Surveillance	Control program	Monitoring	Clinical	Surveillance	Control program	Monitoring	Clinical	Surveillance	Control program
Sources of isolates													
Number of isolates in the laboratory	16				5				4				1
Number of isolates serotyped	16				5				4				1
Number of isolates per serovar													
S. Typhimurium - DT 1	6												
S. Typhimurium - DT 104	1												
S. Typhimurium - DT 126	1												
S. Typhimurium - DT 135													1
S. Typhimurium - DT 195	1								2				
S. Typhimurium - DT 40	1												



Table Salmonella serovars in animals

Serovar	Cattle (bovine animals)				Pigs				Gallus gallus (fowl)				Other poultry
	Control program	Monitoring	Clinical	Surveillance	Control program	Monitoring	Clinical	Surveillance	Control program	Monitoring	Clinical	Surveillance	Control program
Sources of isolates													
Number of isolates in the laboratory	16				5				4				1
Number of isolates serotyped	16				5				4				1
Number of isolates per serovar													
S. Typhimurium - DT 41	3												
S. Typhimurium - DT RDNC					2								
S. Enteritidis - PT 8	1												
S. Kisarawe					1								
S. Muenchen	1												
S. Rissen	1												
S. Tennessee					2								
S. Typhimurium - U 277									2				

Table Salmonella serovars in animals

Serovar	Other poultry		
	Monitoring	Clinical	Surveillance
Sources of isolates			
Number of isolates in the laboratory			
Number of isolates serotyped			
Number of isolates per serovar			
S. Typhimurium - DT 1			
S. Typhimurium - DT 104			
S. Typhimurium - DT 126			
S. Typhimurium - DT 135			
S. Typhimurium - DT 195			
S. Typhimurium - DT 40			
S. Typhimurium - DT 41			
S. Typhimurium - DT RDNC			
S. Enteritidis - PT 8			
S. Kisarawe			
S. Muenchen			

Table Salmonella serovars in animals

Serovar	Other poultry		
	Monitoring	Clinical	Surveillance
Sources of isolates			
Number of isolates in the laboratory			
Number of isolates serotyped			
Number of isolates per serovar			
S. Rissen			
S. Tennessee			
S. Typhimurium - U 277			

Table Salmonella serovars in feed

Serovar	Compound feedingstuffs for pigs		Feed material of oil seed or fruit origin - rape seed derived - at border control - Surveillance		Feed material of oil seed or fruit origin - soya (bean) derived - at border control - Surveillance		Pet food - dog snacks (pig ears, chewing bones) - at retail - Surveillance	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
Sources of isolates								
Number of isolates in the laboratory			5		4		4	
Number of isolates serotyped			5		4		4	
Number of isolates per serovar								
S. Agona			1		1			
S. Dublin							1	
S. Give							1	
S. Havana					2			
S. Indiana							1	
S. Livingstone			1					
S. Mbandaka					1			
S. Newport							1	
S. Tennessee			3					

Table Salmonella serovars in feed

Table Salmonella serovars in food

Serovar	Meat from bovine animals		Meat from pig		Meat from broilers (Gallus gallus)		Meat from other poultry species		Other products of animal origin	
	Monitoring	Surveillance	Monitoring	Surveillance	Monitoring	Surveillance	Monitoring	Surveillance	Monitoring	Surveillance
Sources of isolates										
Number of isolates in the laboratory		1								
Number of isolates serotyped		1								
Number of isolates per serovar										
S. Typhimurium - U 302		1								

Table Salmonella Enteritidis phage types in animals

Phage type	Cattle (bovine animals)				Pigs				Gallus gallus (fowl)				Other poultry
	Control program	Monitoring	Clinical	Surveillance	Control program	Monitoring	Clinical	Surveillance	Control program	Monitoring	Clinical	Surveillance	Control program
Sources of isolates													
Number of isolates in the laboratory	1												
Number of isolates phagetyped	1	0	0	0	0	0	0	0	0	0	0	0	0
Number of isolates per phage type													
PT 8	1												

Phage type	Other poultry		
	Monitoring	Clinical	Surveillance
Sources of isolates			
Number of isolates in the laboratory			
Number of isolates phagetyped	0	0	0
Number of isolates per phage type			
PT 8			

Table Salmonella Typhimurium phage types in animals

Phagetype	Cattle (bovine animals)				Pigs				Gallus gallus (fowl)				Other poultry
	Control program	Monitoring	Clinical	Surveillance	Control program	Monitoring	Clinical	Surveillance	Control program	Monitoring	Clinical	Surveillance	Control program
Sources of isolates													
Number of isolates in the laboratory	13				2				4				1
Number of isolates phagetyped	13	0	0	0	2	0	0	0	4	0	0	0	1
Number of isolates per phagetype													
DT 1	6												
DT 104	1												
DT 126	1												
DT 135													1
DT 195	1								2				
DT 40	1												
DT 41	3												
DT RDNC					2								
U 277									2				



Table Salmonella Typhimurium phagetypes in animals

Phagetype	Other poultry		
	Monitoring	Clinical	Surveillance
Sources of isolates			
Number of isolates in the laboratory			
Number of isolates phagetyped	0	0	0
Number of isolates per phagetype			
DT 1			
DT 104			
DT 126			
DT 135			
DT 195			
DT 40			
DT 41			
DT RDNC			
U 277			

Table Salmonella Typhimurium phagetypes in food

Phagetype	Meat from bovine animals		Meat from pig		Meat from broilers (Gallus gallus)		Meat from other poultry species		Other products of animal origin	
	Monitoring	Surveillance	Monitoring	Surveillance	Monitoring	Surveillance	Monitoring	Surveillance	Monitoring	Surveillance
Sources of isolates										
Number of isolates in the laboratory		1								
Number of isolates phagetyped	0	1	0	0	0	0	0	0	0	0
Number of isolates per phagetype										
U 302		1								

## 2.1.6 Antimicrobial resistance in Salmonella isolates

### A. Antimicrobial resistance in Salmonella in cattle

#### Sampling strategy used in monitoring

##### Frequency of the sampling

See Salmonella spp. in bovine animals.

##### Type of specimen taken

Details of sampling are described in the text Salmonella spp. in bovine animals.

##### Methods of sampling (description of sampling techniques)

Methods of sampling are described in the text Salmonella spp. in bovine animals.

##### Procedures for the selection of isolates for antimicrobial testing

The samples were taken as a part of the National Control Programme

##### Methods used for collecting data

The strains were isolated and identified in local laboratories and the diagnosis was confirmed in Evira.

#### Laboratory methodology used for identification of the microbial isolates

Details of the laboratory methodology are described in the text Salmonella spp. in bovine animals.

#### Laboratory used for detection for resistance

##### Antimicrobials included in monitoring

VetMIC broth microdilution method (NVI, Sweden); testing performed according to CLSI Document M31-A3 Vol. 28 No 8. Quality control according to the CLSI standards; Escherichia coli ATCC 25922 was used as a quality control strain.

Microbiology Unit is accredited according to standard SFS-EN ISO/IEC 17025 to perform the antimicrobial susceptibility testing. The department participates regularly in proficiency tests.

##### Cut-off values used in testing

Epidemiological cut-off values were used.

#### Preventive measures in place

See Salmonella spp. in bovine animals.

#### Control program/mechanisms

##### The control program/strategies in place

See Salmonella spp. in bovine animals.

#### Results of the investigation

Alltogether 19 bovine salmonella isolates were obtained; 16 were of serotype S. typhimurium. Fourteen of these were obtained in monitoring and 2 related to clinical investigations. Other serotypes found were S. Enteritidis, S. Muenchen and S. Rissen, one of each. Five S. Typhimurium isolates were resistant to both ampicillin and sulphamethoxazole; three to trimethoprim and one to tetracyclines.

National evaluation of the recent situation, the trends and sources of infection

The situation continues to be very favourable

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Findings in foodstuffs related to those in animals

## B. Antimicrobial resistance in Salmonella in pigs

### Sampling strategy used in monitoring

#### Frequency of the sampling

Samples originate from the Finnish Salmonella control programme.

#### Type of specimen taken

Details of sampling are described in the text Salmonella spp in pigs.

#### Methods of sampling (description of sampling techniques)

Methods of sampling are described in the text Salmonella spp in pigs.

#### Procedures for the selection of isolates for antimicrobial testing

The sampling frequency is determined in the national control programme

#### Methods used for collecting data

Primary isolation and identification was performed in local laboratories and the diagnosis was confirmed in Evira.

### Laboratory methodology used for identification of the microbial isolates

Details of the laboratory methodology are described in the text Salmonella spp in pigs.

### Laboratory used for detection for resistance

#### Antimicrobials included in monitoring

VetMIC broth microdilution method (NVI, Sweden); testing performed according to CLSI Document M31-A3 Vol. 28 No 8. Quality control according to the CLSI standards; Escherichia coli ATCC 25922 was used as a quality control strain.

Microbiology Unit is accredited according to standard SFS-EN ISO/IEC 17025 to perform the antimicrobial susceptibility testing. The unit participates regularly in proficiency tests.

#### Cut-off values used in testing

Epidemiological cut-off values were used.

### Preventive measures in place

See Salmonella spp. in pigs.

### Control program/mechanisms

#### The control program/strategies in place

See Salmonella spp. in pigs.

### Results of the investigation

Five salmonella isolates were obtained; two S. Typhimurium, two S. Tennessee and one S. Kisarawe. One S. typhimurium was resistant to ampicillin and cefotaxim. All the other isolates were fully sensitive to the antimicrobials tested

### National evaluation of the recent situation, the trends and sources of infection

The overall salmonella situation and antimicrobial resistance in pigs is very favourable.



## C. Antimicrobial resistance in Salmonella in poultry

### Sampling strategy used in monitoring

#### Frequency of the sampling

See Salmonella spp. in Gallus gallus - breeding flocks, flocks of laying hens and broiler flocks + and Salmonella spp. in turkey breeding flocks and meat production flocks

#### Type of specimen taken

See Salmonella spp. in Gallus gallus - breeding flocks, flocks of laying hens and broiler flocks + Salmonella spp. in turkey breeding flocks and meat production flocks

#### Methods of sampling (description of sampling techniques)

See Salmonella spp. in Gallus gallus - breeding flocks, flocks of laying hens and broiler flocks + and Salmonella spp. in turkey breeding flocks and meat production flocks

#### Procedures for the selection of isolates for antimicrobial testing

One isolate from each production batch was included.

#### Methods used for collecting data

Isolates were collected from local laboratories and tested in Evira.

### Laboratory methodology used for identification of the microbial isolates

Details of the laboratory methodology are described in the texts Salmonella spp in Gallus gallus and turkey.

### Laboratory used for detection for resistance

#### Antimicrobials included in monitoring

VetMIC broth microdilution method (NVI, Sweden); testing performed according to CLSI Document Version M31-A3 Vol. 28 No 8. Quality control according to the CLSI standards; Escherichia coli ATCC 25922 was used as a quality control strain.

Microbiology Research Unit is accredited according to standard SFS-EN ISO/IEC 17025 to perform the antimicrobial susceptibility testing. The department participates regularly in proficiency tests.

#### Cut-off values used in testing

Epidemiological cut-off values were used.

### Control program/mechanisms

#### The control program/strategies in place

See Salmonella spp. in Gallus gallus and turkeys.

### Results of the investigation

One and five S. Typhimurium isolations were made from turkey meat production and laying hen egg production flocks, respectively; the isolates were fully susceptible.

### National evaluation of the recent situation, the trends and sources of infection

The overall antimicrobial resistance situation in salmonella isolates from poultry continues to be favourable.

## D. Antimicrobial resistance in Salmonella in foodstuff derived from cattle

### Sampling strategy used in monitoring

#### Frequency of the sampling

See Salmonella spp. in bovine animals.

#### Type of specimen taken

Details of sampling are described in the text Salmonella spp. in bovine animals.

#### Methods of sampling (description of sampling techniques)

Methods of sampling are described in the text Salmonella spp. in bovine animals.

#### Procedures for the selection of isolates for antimicrobial testing

Samples were taken as a part of the National Control Programme, and in HACCP/owns check

#### Methods used for collecting data

The strains were isolated and identified in local laboratories and the diagnosis was confirmed in Evira.

### Laboratory methodology used for identification of the microbial isolates

VetMIC broth microdilution method (NVI, Sweden); testing performed according to CLSI Document M31-A3 Vol. 28 No 8. Quality control according to the CLSI standards; Escherichia coli ATCC 25922 was used as a quality control strain.

### Laboratory used for detection for resistance

#### Antimicrobials included in monitoring

VetMIC broth microdilution method (NVI, Sweden); testing performed according to CLSI Document M31-A3 Vol. 28 No 8. Quality control according to the CLSI standards; Escherichia coli ATCC 25922 was used as a quality control strain.

#### Cut-off values used in testing

Epidemiological cut-off values were used.

### Preventive measures in place

See Salmonella spp. in bovine animals.

### Control program/mechanisms

#### The control program/strategies in place

See Salmonella spp. in bovine animals.

### Results of the investigation

S. Typhimurium was detected in one cattle-derived foodstuff item (minced meat) of domestic origin. The isolate was fully susceptible.

### National evaluation of the recent situation, the trends and sources of infection

Figures too low to permit extensive analysis. A slight increase is suggested

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Findings in foodstuffs apparently associated to those in animals



## E. Antimicrobial resistance in Salmonella in foodstuff derived from pigs

### Sampling strategy used in monitoring

#### Frequency of the sampling

See Salmonella spp. in pig meat and products thereof.

#### Type of specimen taken

See Salmonella spp. in pig meat and products thereof.

#### Methods of sampling (description of sampling techniques)

See Salmonella spp. in pig meat and products thereof.

#### Methods used for collecting data

Isolates are collected from local laboratories and tested in Evira.

### Laboratory methodology used for identification of the microbial isolates

See Salmonella spp. in pig meat and products thereof.

### Laboratory used for detection for resistance

#### Antimicrobials included in monitoring

VetMIC broth microdilution method (NVI, Sweden); testing performed according to CLSI Document M31-A3 Vol. 28 No 8. Quality control according to the CLSI standards; Escherichia coli ATCC 25922 was used as a quality control strain.

Microbiology Unit is accredited according to standard SFS-EN ISO/IEC 17025 to perform the antimicrobial susceptibility testing. The department participates regularly in proficiency tests.

#### Cut-off values used in testing

Epidemiological cut-off were used.

### Preventive measures in place

See Salmonella spp. in pig meat and products thereof.

### Control program/mechanisms

#### The control program/strategies in place

See Salmonella spp. in pig meat and products thereof.

### Results of the investigation

No isolates of domestic origin were obtained.

### National evaluation of the recent situation, the trends and sources of infection

The antimicrobial resistance situation of Salmonella in foodstuff derived from domestically raised pigs is very favourable.

## F. Antimicrobial resistance in Salmonella in foodstuff derived from poultry

### Sampling strategy used in monitoring

#### Frequency of the sampling

Determined in the decree 20/EEO/2001 of the Ministry of Agriculture and Forestry

#### Type of specimen taken

Samples of turkey meat in cutting plants, in HACCP/owns check

#### Methods used for collecting data

The strains were isolated and identified in a local laboratory and the diagnosis was confirmed in Evira.

### Laboratory methodology used for identification of the microbial isolates

Details of the laboratory methodology are described in the texts Salmonella spp in Gallus gallus and turkey.

### Laboratory used for detection for resistance

#### Antimicrobials included in monitoring

VetMIC broth microdilution method (NVI, Sweden); testing performed according to CLSI Document M31-A3 Vol. 28 No 8. Quality control according to the CLSI standards; Escherichia coli ATCC 25922 was used as a quality control strain.

Microbiology Research Unit is accredited according to standard SFS-EN ISO/IEC 17025 to perform the antimicrobial susceptibility testing. The department participates regularly in proficiency tests.

#### Cut-off values used in testing

Epidemiological cut-off values were used.

### Results of the investigation

No salmonella isolates of domestic foodstuff origin were isolated

### National evaluation of the recent situation, the trends and sources of infection

The situation in domestic poultry meat production continues to be very favourable.

**Table Antimicrobial susceptibility testing of S. Typhimurium in Meat from bovine animals - minced meat - at retail - Monitoring - Objective sampling - Official sampling - food sample - meat - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Meat from bovine animals - minced meat - at retail - Monitoring																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	1	0													1											
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	0											1													

S. Typhimurium	Meat from bovine animals - minced meat - at retail - Monitoring	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	2	0												1	1											
Fluoroquinolones - Ciprofloxacin	0.064	2	0							2																	
Penicillins - Ampicillin	4	2	1											1						1							

S. Typhimurium	Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring																										
	Isolates out of a monitoring program (yes/no)																										
Antimicrobials:	Number of isolates available in the laboratory																										
	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	1	0													1											
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	0											1													

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring	
Antimicrobials:	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Industry sampling - environmental sample - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium  Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring																										
	unknown																										
	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	1	0												1												
Fluoroquinolones - Ciprofloxacin	0.064	1	0						1																		
Penicillins - Ampicillin	4	1	0										1														

S. Typhimurium  Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring	
	unknown	
	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - meat production animals - suckler cows - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium		Cattle (bovine animals) - meat production animals - suckler cows - at farm - Monitoring																									
		unknown																									
Antimicrobials:		Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048
Amphenicols - Chloramphenicol		16	2	0												1	1										
Fluoroquinolones - Ciprofloxacin		0.064	2	0							2																
Penicillins - Ampicillin		4	2	0											2												

S. Typhimurium		Cattle (bovine animals) - meat production animals - suckler cows - at farm - Monitoring	
Antimicrobials:		lowest	highest
Amphenicols - Chloramphenicol		2	256
Fluoroquinolones - Ciprofloxacin		0.008	1
Penicillins - Ampicillin		0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring - Objective sampling - Industry sampling - environmental sample - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium		Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring																									
		unknown																									
Antimicrobials:		Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048
Amphenicols - Chloramphenicol		16	1	0													1										
Fluoroquinolones - Ciprofloxacin		0.064	1	0						1																	
Penicillins - Ampicillin		4	1	0											1												

S. Typhimurium		Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring	
		unknown	
Antimicrobials:		lowest	highest
Amphenicols - Chloramphenicol		2	256
Fluoroquinolones - Ciprofloxacin		0.008	1
Penicillins - Ampicillin		0.5	64



**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring																										
	Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory																										
Antimicrobials:	unknown																										
	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	1	0													1											
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	0											1													

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring	
	Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium		Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring																										
		unknown																										
Antimicrobials:		Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol		16	1	0												1												
Fluoroquinolones - Ciprofloxacin		0.064	1	0							1																	
Penicillins - Ampicillin		4	1	1																	1							

S. Typhimurium		Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring	
		unknown	
Antimicrobials:		lowest	highest
Amphenicols - Chloramphenicol		2	256
Fluoroquinolones - Ciprofloxacin		0.008	1
Penicillins - Ampicillin		0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - meat production animals - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium		Cattle (bovine animals) - meat production animals - at farm - Monitoring																									
		unknown																									
Antimicrobials:		Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048
Amphenicols - Chloramphenicol		16	1	0												1											
Fluoroquinolones - Ciprofloxacin		0.064	1	0							1																
Penicillins - Ampicillin		4	1	0											1												

S. Typhimurium		Cattle (bovine animals) - meat production animals - at farm - Monitoring	
Antimicrobials:		lowest	highest
Amphenicols - Chloramphenicol		2	256
Fluoroquinolones - Ciprofloxacin		0.008	1
Penicillins - Ampicillin		0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring - Selective sampling - HACCP and own checks - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium		Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring																									
		unknown																									
Antimicrobials:		Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048
Amphenicols - Chloramphenicol		16	1	0													1										
Fluoroquinolones - Ciprofloxacin		0.064	1	0							1																
Penicillins - Ampicillin		4	1	1																	1						

S. Typhimurium		Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring	
Antimicrobials:		lowest	highest
Amphenicols - Chloramphenicol		2	256
Fluoroquinolones - Ciprofloxacin		0.008	1
Penicillins - Ampicillin		0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at slaughterhouse - Monitoring																										
	Isolates out of a monitoring program (yes/no)																										
Antimicrobials:	Number of isolates available in the laboratory																										
	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	2	0													2											
Fluoroquinolones - Ciprofloxacin	0.064	2	0						1	1																	
Penicillins - Ampicillin	4	2	0										1	1													

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at slaughterhouse - Monitoring	
	Isolates out of a monitoring program (yes/no)	
Antimicrobials:	Number of isolates available in the laboratory	
	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows and heifers - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium		Cattle (bovine animals) - dairy cows and heifers - at slaughterhouse - Monitoring																										
		unknown																										
Antimicrobials:		Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Isolates out of a monitoring program (yes/no)																												
Number of isolates available in the laboratory																												
Amphenicols - Chloramphenicol		16	1	0													1											
Fluoroquinolones - Ciprofloxacin		0.064	1	0							1																	
Penicillins - Ampicillin		4	1	0										1														

S. Typhimurium		Cattle (bovine animals) - dairy cows and heifers - at slaughterhouse - Monitoring	
		unknown	
Antimicrobials:		lowest	highest
Isolates out of a monitoring program (yes/no)			
Number of isolates available in the laboratory			
Amphenicols - Chloramphenicol		2	256
Fluoroquinolones - Ciprofloxacin		0.008	1
Penicillins - Ampicillin		0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring																										
	Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory																										
Antimicrobials:	unknown																										
	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	2	0												1	1											
Fluoroquinolones - Ciprofloxacin	0.064	2	0						1	1																	
Penicillins - Ampicillin	4	2	0											2													

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring	
	Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of S. Typhimurium in Meat from bovine animals - minced meat - at retail - Monitoring - Objective sampling - Official sampling - food sample - meat (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium		Meat from bovine animals - minced meat - at retail - Monitoring (0)																										
		unknown																										
Antimicrobials:		Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Isolates out of a monitoring program (yes/no)																												
Number of isolates available in the laboratory																												
Aminoglycosides - Gentamicin		2	1	0											1													
Aminoglycosides - Kanamycin		16	1	0													1											
Aminoglycosides - Streptomycin		32	1	0															1									
Amphenicols - Florfenicol		16	1	0													1											
Cephalosporins - Cefotaxime		0.5	1	0								1																
Quinolones - Nalidixic acid		16	1	0													1											
Tetracyclines - Tetracycline		8	1	0												1												
Trimethoprim		2	1	0									1															
Sulfonamides - Sulfamethoxazole		256	1	0																1								

S. Typhimurium		Meat from bovine animals - minced meat - at retail - Monitoring (0)	
Isolates out of a monitoring program (yes/no)			
Number of isolates available in the laboratory		unknown	
Antimicrobials:		lowest	highest
Aminoglycosides - Gentamicin		0.25	32
Aminoglycosides - Kanamycin		0.5	16
Aminoglycosides - Streptomycin		2	256



Table Antimicrobial susceptibility testing of S. Typhimurium in Meat from bovine animals - minced meat - at retail - Monitoring - Objective sampling - Official sampling - food sample - meat (0) - quantitative data [Dilution method]

S. Typhimurium	Meat from bovine animals - minced meat - at retail - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of *S. Typhimurium* in *Gallus gallus* (fowl) - laying hens - during rearing period - flocks under control programme - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Gallus gallus (fowl) - laying hens - during rearing period - flocks under control programme - at farm - Monitoring																										
	unknown																										
Isolates out of a monitoring program (yes/no)																											
Number of isolates available in the laboratory																											
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	2	0													2											
Cephalosporins - Cefotaxime	0.5	2	0							2																	
Fluoroquinolones - Ciprofloxacin	0.064	2	0							2																	
Penicillins - Ampicillin	4	2	0											2													

S. Typhimurium	Gallus gallus (fowl) - laying hens - during rearing period - flocks under control programme - at farm - Monitoring	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	unknown	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Cephalosporins - Cefotaxime	0.06	8
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

Table Antimicrobial susceptibility testing of S. Typhimurium in Gallus gallus (fowl) - laying hens - during rearing period - flocks under control programme - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces - quantitative data [Dilution method]

**Table Antimicrobial susceptibility testing of *S. Typhimurium* in *Gallus gallus* (fowl) - laying hens - adult - at farm - Monitoring - Objective sampling - Industry sampling - environmental sample - dust - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0							1																	
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	0											1													

S. Typhimurium	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Cephalosporins - Cefotaxime	0.06	8
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of *S. Typhimurium* in *Gallus gallus* (fowl) - laying hens - adult - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring																										
	Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory																										
Antimicrobials:	unknown																										
	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	2	0													2											
Fluoroquinolones - Ciprofloxacin	0.064	2	0							2																	
Penicillins - Ampicillin	4	2	0										2														

S. Typhimurium	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring	
	Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of *S. Rissen* in Cattle (bovine animals) - meat production animals - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Rissen	Cattle (bovine animals) - meat production animals - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0													1											
Aminoglycosides - Streptomycin	32	1	0														1										
Amphenicols - Chloramphenicol	16	1	0													1											
Amphenicols - Florfenicol	16	1	0														1										
Cephalosporins - Cefotaxime	0.5	1	0									1															
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	0											1													
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0												1												
Trimethoprim	2	1	0										1														
Sulfonamides - Sulfamethoxazole	256	1	0																1								

**Table Antimicrobial susceptibility testing of S. Rissen in Cattle (bovine animals) - meat production animals - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

S. Rissen	Cattle (bovine animals) - meat production animals - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256
Amphenicols - Chloramphenicol	2	256
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Muenchen in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Muenchen	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)																											
	Isolates out of a monitoring program (yes/no)																											
	Number of isolates available in the laboratory																											
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048		
Aminoglycosides - Gentamicin	2	1	0											1														
Aminoglycosides - Kanamycin	16	1	0												1													
Aminoglycosides - Streptomycin	32	1	0														1											
Amphenicols - Chloramphenicol	16	1	0													1												
Amphenicols - Florfenicol	16	1	0													1												
Cephalosporins - Cefotaxime	0.5	1	0								1																	
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																		
Penicillins - Ampicillin	4	1	0											1														
Quinolones - Nalidixic acid	16	1	0													1												
Tetracyclines - Tetracycline	8	1	0											1														
Trimethoprim	2	1	0									1																
Sulfonamides - Sulfamethoxazole	256	1	0															1										



**Table Antimicrobial susceptibility testing of S. Muenchen in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

S. Muenchen	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256
Amphenicols - Chloramphenicol	2	256
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Kisarawe in Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Kisarawe	Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0												1												
Aminoglycosides - Streptomycin	32	1	0													1											
Amphenicols - Chloramphenicol	16	1	0													1											
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0							1																	
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	0										1														
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0											1													
Trimethoprim	2	1	0										1														
Sulfonamides - Sulfamethoxazole	256	1	0																1								

Table Antimicrobial susceptibility testing of *S. Kisarawe* in Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring - Objective sampling  
- Official sampling - animal sample - lymph nodes (0) - quantitative data [Dilution method]

S. Kisarawe	Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256
Amphenicols - Chloramphenicol	2	256
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - meat production animals - suckler cows - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - meat production animals - suckler cows - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	2	0											2													
Aminoglycosides - Kanamycin	16	2	0													2											
Aminoglycosides - Streptomycin	32	2	0															2									
Amphenicols - Florfenicol	16	2	0												1	1											
Cephalosporins - Cefotaxime	0.5	2	0							1	1																
Quinolones - Nalidixic acid	16	2	0													2											
Tetracyclines - Tetracycline	8	2	0											1	1												
Trimethoprim	2	2	0									2															
Sulfonamides - Sulfamethoxazole	256	2	0																2								

S. Typhimurium	Cattle (bovine animals) - meat production animals - suckler cows - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - meat production animals - suckler cows - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

<b>S. Typhimurium</b>	Cattle (bovine animals) - meat production animals - suckler cows - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	unknown	
<b>Antimicrobials:</b>	lowest	highest
Aminoglycosides - Streptomycin	2	256
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of *S. Typhimurium* in Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring - Suspect sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0												1												
Aminoglycosides - Streptomycin	32	1	0															1									
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0							1																	
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0												1												
Trimethoprim	2	1	0									1															
Sulfonamides - Sulfamethoxazole	256	1	1																						1		

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring - Suspect sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of *S. Typhimurium* in Turkeys - meat production flocks - during rearing period - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Turkeys - meat production flocks - during rearing period - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0													1											
Aminoglycosides - Streptomycin	32	1	0															1									
Amphenicols - Florfenicol	16	1	0													1											
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0											1													
Trimethoprim	2	1	0									1															
Sulfonamides - Sulfamethoxazole	256	1	0															1									

S. Typhimurium	Turkeys - meat production flocks - during rearing period - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256
Amphenicols - Florfenicol	2	32



Table Antimicrobial susceptibility testing of *S. Typhimurium* in Turkeys - meat production flocks - during rearing period - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]

S. Typhimurium	Turkeys - meat production flocks - during rearing period - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
Number of isolates available in the laboratory	unknown	
Antimicrobials:	lowest	highest
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of *S. Typhimurium* in Cattle (bovine animals) - dairy cows and heifers - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - dairy cows and heifers - at slaughterhouse - Monitoring (0)																									
	Isolates out of a monitoring program (yes/no)																									
	Number of isolates available in the laboratory																									
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048
Aminoglycosides - Gentamicin	2	1	0											1												
Aminoglycosides - Kanamycin	16	1	0													1										
Aminoglycosides - Streptomycin	32	1	0																1							
Amphenicols - Florfenicol	16	1	0													1										
Cephalosporins - Cefotaxime	0.5	1	0								1															
Quinolones - Nalidixic acid	16	1	0													1										
Tetracyclines - Tetracycline	8	1	0												1											
Trimethoprim	2	1	0									1														
Sulfonamides - Sulfamethoxazole	256	1	0																	1						

S. Typhimurium	Cattle (bovine animals) - dairy cows and heifers - at slaughterhouse - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows and heifers - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes (0) - quantitative data [Dilution method]**

S. Typhimurium	Cattle (bovine animals) - dairy cows and heifers - at slaughterhouse - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring - Objective sampling - Industry sampling - environmental sample (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0												1												
Aminoglycosides - Streptomycin	32	1	0															1									
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0							1																	
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0											1													
Trimethoprim	2	1	0									1															
Sulfonamides - Sulfamethoxazole	256	1	0														1										

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	unknown	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

Table Antimicrobial susceptibility testing of *S. Typhimurium* in Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring - Objective sampling - Industry sampling - environmental sample (0) - quantitative data [Dilution method]

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of *S. Typhimurium* in *Gallus gallus* (fowl) - laying hens - during rearing period - flocks under control programme - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Gallus gallus (fowl) - laying hens - during rearing period - flocks under control programme - at farm - Monitoring (0)																											
	Isolates out of a monitoring program (yes/no)																											
	Number of isolates available in the laboratory																											
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048		
Aminoglycosides - Gentamicin	2	2	0											2														
Aminoglycosides - Kanamycin	16	2	0												1	1												
Aminoglycosides - Streptomycin	32	2	0															2										
Amphenicols - Florfenicol	16	2	0													2												
Quinolones - Nalidixic acid	16	2	0													2												
Tetracyclines - Tetracycline	8	2	0												2													
Trimethoprim	2	2	0										2															
Sulfonamides - Sulfamethoxazole	256	2	0																		2							

S. Typhimurium	Gallus gallus (fowl) - laying hens - during rearing period - flocks under control programme - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16

Table Antimicrobial susceptibility testing of S. Typhimurium in Gallus gallus (fowl) - laying hens - during rearing period - flocks under control programme - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]

S. Typhimurium	Gallus gallus (fowl) - laying hens - during rearing period - flocks under control programme - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
	unknown	
<b>Antimicrobials:</b>	lowest	highest
Aminoglycosides - Streptomycin	2	256
Amphenicols - Florfenicol	2	32
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of *S. Typhimurium* in *Gallus gallus* (fowl) - laying hens - adult - at farm - Monitoring - Objective sampling - Industry sampling - environmental sample - dust (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0													1											
Aminoglycosides - Streptomycin	32	1	0																1								
Amphenicols - Florfenicol	16	1	0													1											
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0											1													
Trimethoprim	2	1	0										1														
Sulfonamides - Sulfamethoxazole	256	1	0																	1							

S. Typhimurium	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256
Amphenicols - Florfenicol	2	32



Table Antimicrobial susceptibility testing of *S. Typhimurium* in *Gallus gallus* (fowl) - laying hens - adult - at farm - Monitoring - Objective sampling  
 - Industry sampling - environmental sample - dust (0) - quantitative data [Dilution method]

<b>S. Typhimurium</b>  Isolates out of a monitoring program (yes/no)  Number of isolates available in the laboratory	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring (0)	
	unknown	
	lowest	highest
<b>Antimicrobials:</b>		
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Industry sampling - environmental sample (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0													1											
Aminoglycosides - Streptomycin	32	1	0															1									
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0								1																
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0												1												
Trimethoprim	2	1	0										1														
Sulfonamides - Sulfamethoxazole	256	1	0																1								

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Industry sampling - environmental sample (0) - quantitative data [Dilution method]**

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Suspect sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)																											
	Isolates out of a monitoring program (yes/no)																											
	Number of isolates available in the laboratory																											
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048		
Aminoglycosides - Gentamicin	2	1	0										1															
Aminoglycosides - Kanamycin	16	1	0												1													
Aminoglycosides - Streptomycin	32	1	0														1											
Amphenicols - Florfenicol	16	1	0													1												
Cephalosporins - Cefotaxime	0.5	1	0							1																		
Quinolones - Nalidixic acid	16	1	0													1												
Tetracyclines - Tetracycline	8	1	0											1														
Trimethoprim	2	1	0										1															
Sulfonamides - Sulfamethoxazole	256	1	1																						1			

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
Number of isolates available in the laboratory	unknown	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Suspect sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Suspect sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring																										
	unknown																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	1	0												1												
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	1																	1							

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring	
	unknown	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of *S. Enteritidis* in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration ( $\mu\text{g/ml}$ ), number of isolates with a concentration of inhibition equal to

S. Enteritidis	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0										1														
Aminoglycosides - Kanamycin	16	1	0												1												
Aminoglycosides - Streptomycin	32	1	0													1											
Amphenicols - Chloramphenicol	16	1	0													1											
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0							1																	
Fluoroquinolones - Ciprofloxacin	0.064	1	0						1																		
Penicillins - Ampicillin	4	1	0											1													
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0											1													
Trimethoprim	2	1	0									1															
Sulfonamides - Sulfamethoxazole	256	1	0															1									

**Table Antimicrobial susceptibility testing of S. Enteritidis in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

S. Enteritidis	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256
Amphenicols - Chloramphenicol	2	256
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024



**Table Antimicrobial susceptibility testing of S. Tennessee in Pigs - breeding animals - unspecified - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Tennessee	Pigs - breeding animals - unspecified - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0													1											
Aminoglycosides - Streptomycin	32	1	0																1								
Amphenicols - Chloramphenicol	16	1	0													1											
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0								1																
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	0										1														
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0												1												
Trimethoprim	2	1	0										1														
Sulfonamides - Sulfamethoxazole	256	1	0																1								

Table Antimicrobial susceptibility testing of *S. Tennessee* in Pigs - breeding animals - unspecified - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]

S. Tennessee	Pigs - breeding animals - unspecified - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
	unknown	
<b>Antimicrobials:</b>	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256
Amphenicols - Chloramphenicol	2	256
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring - Suspect sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	1	0													1											
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	1																	1							

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of *S. Typhimurium* in Turkeys - meat production flocks - during rearing period - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Turkeys - meat production flocks - during rearing period - at farm - Monitoring																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Amphenicols - Chloramphenicol	16	1	0												1												
Cephalosporins - Cefotaxime	0.5	1	0							1																	
Fluoroquinolones - Ciprofloxacin	0.064	1	0							1																	
Penicillins - Ampicillin	4	1	0											1													

S. Typhimurium	Turkeys - meat production flocks - during rearing period - at farm - Monitoring	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Chloramphenicol	2	256
Cephalosporins - Cefotaxime	0.06	8
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64

**Table Antimicrobial susceptibility testing of S. Tennessee in Pigs - fattening pigs - unspecified - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Tennessee	Pigs - fattening pigs - unspecified - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0										1														
Aminoglycosides - Kanamycin	16	1	0												1												
Aminoglycosides - Streptomycin	32	1	0															1									
Amphenicols - Chloramphenicol	16	1	0													1											
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0								1																
Fluoroquinolones - Ciprofloxacin	0.064	1	0						1																		
Penicillins - Ampicillin	4	1	0											1													
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0											1													
Trimethoprim	2	1	0										1														
Sulfonamides - Sulfamethoxazole	256	1	0															1									

**Table Antimicrobial susceptibility testing of S. Tennessee in Pigs - fattening pigs - unspecified - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

S. Tennessee	Pigs - fattening pigs - unspecified - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256
Amphenicols - Chloramphenicol	2	256
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	0.5	64
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0													1											
Aminoglycosides - Streptomycin	32	1	1																			1					
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0								1																
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	1																			1					
Trimethoprim	2	1	1																			1					
Sulfonamides - Sulfamethoxazole	256	1	1																							1	

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024



**Table Antimicrobial susceptibility testing of S. Typhimurium in Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	2	0											2													
Aminoglycosides - Kanamycin	16	2	0												2												
Aminoglycosides - Streptomycin	32	2	0														1	1									
Amphenicols - Florfenicol	16	2	0												1	1											
Cephalosporins - Cefotaxime	0.5	2	1							1								1									
Quinolones - Nalidixic acid	16	2	0													2											
Tetracyclines - Tetracycline	8	2	0											2													
Trimethoprim	2	2	0										2														
Sulfonamides - Sulfamethoxazole	256	2	0																1	1							

S. Typhimurium	Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

Table Antimicrobial susceptibility testing of S. Typhimurium in Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes (0) - quantitative data [Dilution method]

S. Typhimurium	Pigs - fattening pigs - unspecified - at slaughterhouse - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - meat production animals - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium		Cattle (bovine animals) - meat production animals - at farm - Monitoring (0)																										
		unknown																										
Antimicrobials:		Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Isolates out of a monitoring program (yes/no)																												
Number of isolates available in the laboratory																												
Aminoglycosides - Gentamicin		2	1	0											1													
Aminoglycosides - Kanamycin		16	1	0												1												
Aminoglycosides - Streptomycin		32	1	0															1									
Amphenicols - Florfenicol		16	1	0													1											
Cephalosporins - Cefotaxime		0.5	1	0						1																		
Quinolones - Nalidixic acid		16	1	0													1											
Tetracyclines - Tetracycline		8	1	0											1													
Trimethoprim		2	1	0									1															
Sulfonamides - Sulfamethoxazole		256	1	0															1									

S. Typhimurium		Cattle (bovine animals) - meat production animals - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)			
Number of isolates available in the laboratory		unknown	
Antimicrobials:		lowest	highest
Aminoglycosides - Gentamicin		0.25	32
Aminoglycosides - Kanamycin		0.5	16
Aminoglycosides - Streptomycin		2	256

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - meat production animals - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

S. Typhimurium	Cattle (bovine animals) - meat production animals - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0													1											
Aminoglycosides - Streptomycin	32	1	0															1									
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0								1																
Quinolones - Nalidixic acid	16	1	0														1										
Tetracyclines - Tetracycline	8	1	0											1													
Trimethoprim	2	1	0										1														
Sulfonamides - Sulfamethoxazole	256	1	0															1									

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	unknown	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

<b>S. Typhimurium</b>  Isolates out of a monitoring program (yes/no)  Number of isolates available in the laboratory	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring (0)	
	unknown	
	lowest	highest
<b>Antimicrobials:</b>		
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring - Selective sampling - HACCP and own checks - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	1	0											1													
Aminoglycosides - Kanamycin	16	1	0													1											
Aminoglycosides - Streptomycin	32	1	1																			1					
Amphenicols - Florfenicol	16	1	0													1											
Cephalosporins - Cefotaxime	0.5	1	0								1																
Quinolones - Nalidixic acid	16	1	0													1											
Tetracyclines - Tetracycline	8	1	0												1												
Trimethoprim	2	1	1																		1						
Sulfonamides - Sulfamethoxazole	256	1	1																							1	

S. Typhimurium	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring (0)	
Antimicrobials:	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring - Selective sampling - HACCP and own checks - animal sample - faeces (0) - quantitative data [Dilution method]**

<b>S. Typhimurium</b>  Isolates out of a monitoring program (yes/no)  Number of isolates available in the laboratory	Cattle (bovine animals) - calves (under 1 year) - for slaughter - at farm - Monitoring (0)	
	unknown	
	lowest	highest
<b>Antimicrobials:</b>		
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024



**Table Antimicrobial susceptibility testing of *S. Typhimurium* in *Gallus gallus* (fowl) - laying hens - adult - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring (0)																											
	Isolates out of a monitoring program (yes/no)																											
	Number of isolates available in the laboratory																											
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048		
Aminoglycosides - Gentamicin	2	2	0											2														
Aminoglycosides - Kanamycin	16	2	0													2												
Aminoglycosides - Streptomycin	32	2	0																2									
Amphenicols - Florfenicol	16	2	0													2												
Cephalosporins - Cefotaxime	0.5	2	0							2																		
Quinolones - Nalidixic acid	16	2	0													2												
Tetracyclines - Tetracycline	8	2	0												2													
Trimethoprim	2	2	0										2															
Sulfonamides - Sulfamethoxazole	256	2	0																2									

S. Typhimurium	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

Table Antimicrobial susceptibility testing of *S. Typhimurium* in *Gallus gallus* (fowl) - laying hens - adult - at farm - Monitoring - Objective sampling  
 - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]

S. Typhimurium	Gallus gallus (fowl) - laying hens - adult - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	2	0											2													
Aminoglycosides - Kanamycin	16	2	0												1	1											
Aminoglycosides - Streptomycin	32	2	0														1	1									
Amphenicols - Florfenicol	16	2	0													2											
Cephalosporins - Cefotaxime	0.5	2	0							1	1																
Quinolones - Nalidixic acid	16	2	0													2											
Tetracyclines - Tetracycline	8	2	0											2													
Trimethoprim	2	2	0										2														
Sulfonamides - Sulfamethoxazole	256	2	0														1	1									

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Industry sampling - animal sample - faeces (0) - quantitative data [Dilution method]

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium		Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)																										
		unknown																										
Antimicrobials:		Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Isolates out of a monitoring program (yes/no)																												
Number of isolates available in the laboratory																												
Aminoglycosides - Gentamicin		2	1	0												1												
Aminoglycosides - Kanamycin		16	1	0													1											
Aminoglycosides - Streptomycin		32	1	0																1								
Amphenicols - Florfenicol		16	1	0													1											
Cephalosporins - Cefotaxime		0.5	1	0								1																
Quinolones - Nalidixic acid		16	1	0													1											
Tetracyclines - Tetracycline		8	1	0											1													
Trimethoprim		2	1	0										1														
Sulfonamides - Sulfamethoxazole		256	1	0																		1						

S. Typhimurium		Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
Isolates out of a monitoring program (yes/no)			
Number of isolates available in the laboratory		unknown	
Antimicrobials:		lowest	highest
Aminoglycosides - Gentamicin		0.25	32
Aminoglycosides - Kanamycin		0.5	16
Aminoglycosides - Streptomycin		2	256

Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring - Objective sampling - Official sampling - animal sample - faeces (0) - quantitative data [Dilution method]

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at farm - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes (0) - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at slaughterhouse - Monitoring (0)																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	2	0											2													
Aminoglycosides - Kanamycin	16	2	0													2											
Aminoglycosides - Streptomycin	32	2	0																2								
Amphenicols - Florfenicol	16	2	0													2											
Cephalosporins - Cefotaxime	0.5	2	0							1	1																
Quinolones - Nalidixic acid	16	2	0													2											
Tetracyclines - Tetracycline	8	2	0											2													
Trimethoprim	2	2	0									2															
Sulfonamides - Sulfamethoxazole	256	2	0																	2							

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at slaughterhouse - Monitoring (0)	
Isolates out of a monitoring program (yes/no)		
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.25	32
Aminoglycosides - Kanamycin	0.5	16
Aminoglycosides - Streptomycin	2	256

**Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - dairy cows - adult - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - lymph nodes (0) - quantitative data [Dilution method]**

S. Typhimurium	Cattle (bovine animals) - dairy cows - adult - at slaughterhouse - Monitoring (0)	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
Antimicrobials:	lowest	highest
Amphenicols - Florfenicol	2	32
Cephalosporins - Cefotaxime	0.06	8
Quinolones - Nalidixic acid	2	256
Tetracyclines - Tetracycline	0.5	64
Trimethoprim	0.25	32
Sulfonamides - Sulfamethoxazole	8	1024



Table Cut-off values for antibiotic resistance testing of Salmonella in Animals

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		32	
Amphenicols	Chloramphenicol		16	
Cephalosporins	Cefotaxime		0.5	
Fluoroquinolones	Ciprofloxacin		0.06	
Penicillins	Ampicillin		4	
Quinolones	Nalidixic acid		16	
Sulfonamides	Sulfonamides		256	
Tetracyclines	Tetracycline		8	
Trimethoprim	Trimethoprim		2	

Table Cut-off values for antibiotic resistance testing of Salmonella in Feed

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		32	
Amphenicols	Chloramphenicol		16	
Cephalosporins	Cefotaxime		0.5	
Fluoroquinolones	Ciprofloxacin		0.06	
Penicillins	Ampicillin		4	
Quinolones	Nalidixic acid		16	
Sulfonamides	Sulfonamides		256	
Tetracyclines	Tetracycline		8	
Trimethoprim	Trimethoprim		2	

Table Cut-off values for antibiotic resistance testing of Salmonella in Food

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		32	
Amphenicols	Chloramphenicol		16	
Cephalosporins	Cefotaxime		0.5	
Fluoroquinolones	Ciprofloxacin		0.06	
Penicillins	Ampicillin		4	
Quinolones	Nalidixic acid		16	
Sulfonamides	Sulfonamides		256	
Tetracyclines	Tetracycline		8	
Trimethoprim	Trimethoprim		2	

## 2.2 CAMPYLOBACTERIOSIS

### 2.2.1 General evaluation of the national situation

#### A. Thermophilic Campylobacter general evaluation

##### History of the disease and/or infection in the country

During the last 20 years the annual number of human cases has shown a rising overall trend with some exceptions. Since 1998 campylobacters have been more commonly reported cause of enteritis than salmonellas.

All Finnish broiler slaughterhouses have voluntarily monitored the prevalence of campylobacter in broilers at slaughter as a part of the own-check programme since the 1990's. From 1999 to 2002 the flock prevalence was on average 7.9% between June and September and 1.1% during the other months.

##### National evaluation of the recent situation, the trends and sources of infection

Thermophilic campylobacters, especially *Campylobacter jejuni*, are the most common bacterial cause of human enteric infections in Finland. A strong seasonal variation is typical for the incidence of campylobacteriosis, which is consistently highest in July. A high percentage of human campylobacter infections reported in Finland originate from travel abroad. However, the proportion of domestically acquired infections peaks in the summer season.

Since the implementation of a national campylobacter monitoring programme for broilers in 2004, the average prevalence of campylobacters in broiler slaughter batches has been on average 5.8% during June-October and 1.1% during the rest of the year.

##### Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

In late summer thermophilic campylobacters are detected in 20 to 30% of retail poultry meat of domestic origin. Poultry meat is considered as a source of campylobacters in part of the sporadic cases.

Contaminated drinking water caused six large outbreaks in the years 1999 - 2007. Unpasteurized milk, imported turkey meat, chicken and strawberries have been suspected as sources of few small outbreaks. In 2012, consumption of raw milk caused a campylobacteriosis outbreak. *C. jejuni* isolates from patients and raw milk represented identical genotypes in PFGE with two restriction enzymes. In another small outbreak raw milk or contact with cattle was suspected as the origin of infection.

##### Recent actions taken to control the zoonoses

The Finnish campylobacter monitoring programme for broilers was introduced in June 2004. All broiler slaughter batches between June and October are sampled and examined for thermophilic campylobacters. Between January and May, and in November and December random samples are taken according to a specific sampling plan.

## 2.2.2 Campylobacter in animals

### A. Thermophilic Campylobacter in Gallus gallus

#### Monitoring system

##### Sampling strategy

A compulsory monitoring programme for broilers was introduced in June 2004. From June to October, when the prevalence is known to be highest, all broiler slaughter batches are sampled at slaughter. From January to May and from November to December, when the prevalence has consistently been low, random sampling of slaughter batches is performed according to a particular sampling scheme. Since 2008 the number of batches sampled is calculated with the following criteria: expected prevalence 1 %, accuracy 1 %, confidence level 95%.

##### Frequency of the sampling

###### At slaughter

Other: All broiler slaughter batches between June and October; random sampling (expected prevalence 1%, accuracy 1%, confidence level 95%) between January and May, and in November and December.

##### Type of specimen taken

###### At slaughter

Caecum samples

##### Methods of sampling (description of sampling techniques)

###### At slaughter

Intact caeca from ten birds are taken. Caecal contents are pooled into one sample in the laboratory.

##### Case definition

###### At slaughter

A case is defined as a slaughter batch, that is positive for *Campylobacter jejuni* or *C. coli*.

##### Diagnostic/analytical methods used

###### At slaughter

NMKL No 119 with modifications (no enrichment)

##### Vaccination policy

There is no vaccination against campylobacter in Finland.

##### Other preventive measures than vaccination in place

Strict biosecurity measures and production hygiene in holdings.

##### Control program/mechanisms

###### The control program/strategies in place

The Finnish campylobacter monitoring programme was introduced in June 2004. It is compulsory for all broiler slaughterhouses.

### Measures in case of the positive findings or single cases

If campylobacters are detected in two consecutive growing batches from the same holding, all the flocks from the holding will be slaughtered at the end of the day until slaughter batches from two consecutive growing batches are negative. Special attention to the production hygiene in the holding will be paid in cooperation with the local municipal veterinarian.

### Notification system in place

All positive flocks in the monitoring programme are reported to the authorities.

### Results of the investigation

A total of 1534 slaughter batches were examined for thermophilic campylobacters between June and October 2012 in the monitoring programme. Campylobacters were detected in 82 (5.3%) of these slaughter batches. Campylobacter jejuni was detected in 81 slaughter batches and C. coli in one batch. In January-May and November-December, the samples were taken from 321 slaughter batches in total. Thermophilic campylobacters were detected in 5 (1.6%) of these slaughter batches.

### National evaluation of the recent situation, the trends and sources of infection

The prevalence of campylobacter in Finnish broiler slaughter batches has been consistently low. Since the implementation of a national campylobacter monitoring programme for broilers in 2004, the average prevalence of campylobacters in broiler slaughter batches has been on average 5.8% during June-October and 1.1% during the rest of the year.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Consumption of poultry meat is considered as a source of campylobacter in part of the sporadic domestic human cases during the seasonal peak in summer.

Table Campylobacter in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Campylobacter	C. coli	C. jejuni	C. lari
Gallus gallus (fowl) - broilers - at slaughterhouse - Control and eradication programmes (Sampling in January-May and in November-December)	Evira	Objective sampling	Industry sampling	animal sample > caecum	Domestic	Slaughter batch	321	5		5	
Gallus gallus (fowl) - broilers - at slaughterhouse - Control and eradication programmes (Sampling in June-October)	Evira	Census	Industry sampling	animal sample > caecum	Domestic	Slaughter batch	1534	82	1	81	
	C. upsaliensis	Thermophilic Campylobacter spp., unspecified									
Gallus gallus (fowl) - broilers - at slaughterhouse - Control and eradication programmes (Sampling in January-May and in November-December)											
Gallus gallus (fowl) - broilers - at slaughterhouse - Control and eradication programmes (Sampling in June-October)											

## 2.2.3 Antimicrobial resistance in Campylobacter isolates

### A. Antimicrobial resistance in Campylobacter jejuni and coli in cattle

#### Sampling strategy used in monitoring

##### Frequency of the sampling

Samples originate from the FINRES-Vet Programme (Finnish Veterinary Antimicrobial Resistance Monitoring and Consumption of Antimicrobial Agents). In 2012 bacteria were isolated from healthy cattle.

##### Type of specimen taken

Faeces

##### Methods of sampling (description of sampling techniques)

The number of samples was 330. The total number of C.jejuni isolates was 72.

##### Procedures for the selection of isolates for antimicrobial testing

One isolate C.jejuni from each sample, if available, was tested for antimicrobial susceptibility

##### Methods used for collecting data

Isolation and antimicrobial susceptibility testing was performed by the Finnish Food Safety Authority Evira.

#### Laboratory methodology used for identification of the microbial isolates

Modified standard NMKL 119:2007

#### Laboratory used for detection for resistance

##### Antimicrobials included in monitoring

VetMIC broth microdilution method (Department of Antibiotics, National Veterinary Institute, Sweden) was used and the testing performed according to the CLSI standards; Campylobacter jejuni ATCC 33560 was used as a quality control strain. The antimicrobials tested are listed in the tables.

##### Cut-off values used in testing

EUCAST cut-off values were used.

#### Control program/mechanisms

##### The control program/strategies in place

FINRES-Vet monitoring programme

##### Recent actions taken to control the zoonoses

No specific actions

#### Results of the investigation

Overall, resistance among C.jejuni strains was in a fairly favourable level. No or low resistance was found to the majority of the antimicrobials tested.

#### National evaluation of the recent situation, the trends and sources of infection

The resistance levels in C.jejuni from cattle have remained almost at the same level than in previous years.



## B. Antimicrobial resistance in Campylobacter jejuni and coli in poultry

### Sampling strategy used in monitoring

#### Frequency of the sampling

1 Jun - 31 Oct every production batch is sampled; 1 Nov - 31 May the frequency is set annually pending on production volume. Details of the sampling are described in 'Thermophilic Campylobacter in Gallus gallus'.

#### Type of specimen taken

10 intact caeca per batch, taken at slaughterhouse

#### Methods of sampling (description of sampling techniques)

Caeca are delivered refrigerated to the laboratory and the caecal contents are pooled into one sample in the laboratory.

#### Procedures for the selection of isolates for antimicrobial testing

All isolates were tested for antimicrobial susceptibility. Susceptibility results were obtained for 83 C. jejuni isolates.

#### Methods used for collecting data

Susceptibility testing was performed in Evira.

### Laboratory methodology used for identification of the microbial isolates

Modified standard NMKL 119:2007

### Laboratory used for detection for resistance

#### Antimicrobials included in monitoring

VetMIC broth microdilution method (Department of Antibiotics, National Veterinary Institute, Sweden) was used and the testing performed according to the CLSI standards; Campylobacter jejuni ATCC 33560 was used as a quality control strain. The antimicrobials tested are listed in the tables.

#### Cut-off values used in testing

EUCAST cut-off values were used.

### Control program/mechanisms

#### The control program/strategies in place

According to the MAF Act 10/EEO/2007

### Measures in case of the positive findings or single cases

If Campylobacter are detected repeatedly, official inspection of the facilities and revision of the management procedures. Batches from positive farms are slaughtered at the end of day. No specific measures for detection of antimicrobial resistance.

### Results of the investigation

Resistance situation in broilers is favourable; 90% of the C.jejuni strains are fully susceptible. The most common resistant trait in C.jejuni is resistance to streptomycin: 7% of the strains are streptomycin-resistant.

### National evaluation of the recent situation, the trends and sources of infection

Resistance among C. jejuni was almost as low as in previous years.

Table Antimicrobial susceptibility testing of Campylobacter in Gallus gallus (fowl) - broilers - before slaughter - at slaughterhouse - Monitoring - Selective sampling - Official sampling - animal sample - faeces

Campylobacter	C. jejuni - C. jejuni subsp. jejuni	
	Isolates out of a monitoring program (yes/no)	yes
Number of isolates available in the laboratory	83	
Antimicrobials:	N	n
Aminoglycosides - Gentamicin	83	0
Aminoglycosides - Streptomycin	83	6
Fluoroquinolones - Ciprofloxacin	83	2
Quinolones - Nalidixic acid	83	2
Tetracyclines - Tetracycline	83	2
Macrolides - Erythromycin	83	0
Resistant to 1 antimicrobial	83	4
Resistant to 2 antimicrobials	83	4
Resistant to 3 antimicrobials	83	0
Resistant to 4 antimicrobials	83	0
Resistant to >4 antimicrobials	83	0

Table Antimicrobial susceptibility testing of Campylobacter in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces

Campylobacter	C. jejuni - C. jejuni subsp. jejuni	
	Isolates out of a monitoring program (yes/no)	yes
Number of isolates available in the laboratory	72	
Antimicrobials:	N	n
Aminoglycosides - Gentamicin	72	0
Aminoglycosides - Streptomycin	72	10
Fluoroquinolones - Ciprofloxacin	72	10
Quinolones - Nalidixic acid	72	10
Tetracyclines - Tetracycline	72	2
Macrolides - Erythromycin	72	0
Resistant to 1 antimicrobial	72	8
Resistant to 2 antimicrobials	72	9
Resistant to 3 antimicrobials	72	2
Resistant to 4 antimicrobials	72	0
Resistant to >4 antimicrobials	72	0

**Table Antimicrobial susceptibility testing of *C. jejuni* - *C. jejuni* subsp. *jejuni* in *Gallus gallus* (fowl) - broilers - before slaughter - at slaughterhouse - Monitoring - Selective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

C. jejuni subsp. jejuni	Gallus gallus (fowl) - broilers - before slaughter - at slaughterhouse - Monitoring																										
	Isolates out of a monitoring program (yes/no) yes																										
	Number of isolates available in the laboratory 83																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	1	83	0								2	25	40	16													
Aminoglycosides - Streptomycin	2	83	6										4	22	51	1	2				3						
Fluoroquinolones - Ciprofloxacin	1	83	2							4	44	28	5				2										
Quinolones - Nalidixic acid	16	83	2												7	52	19	3			2						
Tetracyclines - Tetracycline	2	83	2								77	3		1		1	1										
Macrolides - Erythromycin	4	83	0										78	5													

C. jejuni subsp. jejuni	Gallus gallus (fowl) - broilers - before slaughter - at slaughterhouse - Monitoring	
	Isolates out of a monitoring program (yes/no) yes	
	Number of isolates available in the laboratory 83	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.12	16
Aminoglycosides - Streptomycin	0.5	64
Fluoroquinolones - Ciprofloxacin	0.06	8
Quinolones - Nalidixic acid	1	64
Tetracyclines - Tetracycline	0.12	16
Macrolides - Erythromycin	0.5	64

Table Antimicrobial susceptibility testing of *C. jejuni* - *C. jejuni* subsp. *jejuni* in *Gallus gallus* (fowl) - broilers - before slaughter - at slaughterhouse  
- Monitoring - Selective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]

**Table Antimicrobial susceptibility testing of *C. jejuni* - *C. jejuni* subsp. *jejuni* in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

C. jejuni subsp. jejuni	Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	1	72	0									15	52	5													
Aminoglycosides - Streptomycin	2	72	10										2	30	30	4					6						
Fluoroquinolones - Ciprofloxacin	1	72	10							5	42	13	2			1	5	4									
Quinolones - Nalidixic acid	16	72	10												3	24	27	8		1	9						
Tetracyclines - Tetracycline	2	72	2								64	6					1		1								
Macrolides - Erythromycin	4	72	0										69	3													

C. jejuni subsp. jejuni	Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring	
Isolates out of a monitoring program (yes/no)	yes	
	72	
Antimicrobials:	lowest	highest
	Aminoglycosides - Gentamicin	0.12
Aminoglycosides - Streptomycin	0.5	64
Fluoroquinolones - Ciprofloxacin	0.06	8
Quinolones - Nalidixic acid	1	64
Tetracyclines - Tetracycline	0.12	16
Macrolides - Erythromycin	0.5	64

Table Antimicrobial susceptibility testing of *C. jejuni* - *C. jejuni* subsp. *jejuni* in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]

Table Cut-off values used for antimicrobial susceptibility testing of C. coli in Animals

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		1	
Macrolides	Erythromycin		16	
Tetracyclines	Tetracycline		2	



Table Cut-off values used for antimicrobial susceptibility testing of C. coli in Feed

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		1	
Macrolides	Erythromycin		16	
Tetracyclines	Tetracycline		2	

Table Cut-off values used for antimicrobial susceptibility testing of C. coli in Food

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		4	
Fluoroquinolones	Ciprofloxacin		1	
Macrolides	Erythromycin		16	
Tetracyclines	Tetracycline		2	

Table Cut-off values used for antimicrobial susceptibility testing of *C. jejuni* in Animals

Test Method Used
Broth dilution

Standard methods used for testing
NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin	EFSA	1	
	Streptomycin	EFSA	2	
Fluoroquinolones	Ciprofloxacin	EFSA	1	
Macrolides	Erythromycin	EFSA	4	
Quinolones	Nalidixic acid		16	
Tetracyclines	Tetracycline	EFSA	2	

Table Cut-off values used for antimicrobial susceptibility testing of C. jejuni in Feed

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		1	
	Streptomycin		2	
Fluoroquinolones	Ciprofloxacin		1	
Macrolides	Erythromycin		4	
Tetracyclines	Tetracycline		2	

Table Cut-off values used for antimicrobial susceptibility testing of C. jejuni in Food

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		1	
	Streptomycin		2	
Fluoroquinolones	Ciprofloxacin		1	
Macrolides	Erythromycin		4	
Tetracyclines	Tetracycline		2	

## 2.3 LISTERIOSIS

### 2.3.1 General evaluation of the national situation

#### A. Listeriosis general evaluation

##### History of the disease and/or infection in the country

Since 1995 18-70 human listeriosis cases have been recorded annually.

##### National evaluation of the recent situation, the trends and sources of infection

The annual incidence in humans has been 0,2-1,2 per 100 000. The actual source of infection is usually not identified but most cases are believed to be food-borne. Cold-smoked and gravad fishery products are considered to be risk foodstuffs. Food business operators monitor occurrence of *Listeria* according to the Regulation 2073/2005, and also municipal food control authorities take samples for *Listeria* analyses. Evira carries out special surveys for *Listeria*, but not annually.

## 2.3.2 Listeria in animals

### A. L. monocytogenes in animal - All animals

#### Monitoring system

##### Sampling strategy

L. monocytogenes causes most commonly neural and visceral infections and abortions in animals. The bacterium can also cause iritis in cattle. Mastitis caused by L. monocytogenes is rare. Samples are usually taken from diseased animals in post mortem examination but sometimes also from diseased live animals.

##### Case definition

Listeriosis diagnosis can be made by histopathological examination and/or microbiologically by isolation of the causative agent. Histopathological findings in brain tissue are so specific to neural listeriosis that diagnosis can also be made solely based on these findings without isolation of the bacterium. In other forms of Listeria infections diagnosis is based on isolation of causative agent.

##### Diagnostic/analytical methods used

Histopathology and/or cultivation.

#### Notification system in place

Listeriosis is classified as a monthly notifiable other infectious disease in the Decision N:o 1346/1995 of the Veterinary and Food Department of the Ministry of Agriculture and Forestry. It is therefore obligatory for any veterinarian to notify monthly any occurrence of listeriosis.

#### Results of the investigation

Listeria monocytogenes bacteria were isolated from 8 cases in 4 different animal species in 2012.

Listeriosis was diagnosed in 4 sheep, in 1 bovine animal, in 2 dogs and in 1 wild hare.

#### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

The relevance of findings in animals to findings in foodstuffs is negligible. Consumed milk and milk used in dairy products is mainly pasteurised. Other forms of listeriosis than mastitis in animals do not pose a public health risk.

Table Listeria in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Listeria	L. monocytogenes	Listeria spp., unspecified
Cattle (bovine animals) - Clinical investigations	Evira	Suspect sampling		animal sample		Animal	unknown	1	1	
Dogs - pet animals - Clinical investigations	Evira	Suspect sampling		animal sample		Animal	unknown	2	2	
Hares - wild - Clinical investigations	Evira	Suspect sampling		animal sample		Animal	unknown	1	1	
Sheep - Clinical investigations	Evira	Suspect sampling		animal sample		Animal	unknown	4	4	

## Footnote:

The number of tested animals cannot be given as listeriosis diagnosis can be made histopathologically (brain tissue) and/or by general bacteriological aerobic cultivation on blood agar as well as by cultivation on selective media. So all animal species from which samples are examined histopathologically and/or by cultivation on blood agar or on selective media should be counted. For the same reason only the data of those species from which listeriosis diagnosis is made is reported.



## 2.4 E. COLI INFECTIONS

### 2.4.1 General evaluation of the national situation

#### A. Verotoxigenic Escherichia coli infections general evaluation

##### History of the disease and/or infection in the country

Before 1996, only sporadic human cases of VTEC were diagnosed. The reporting of VTEC in humans was voluntary until 1994. An enhanced surveillance of bloody diarrhoea was initiated in 1996-1997 which resulted in 8 diagnosed cases. The first Finnish outbreak of VTEC (E. coli O157) occurred in 1997. The outbreak was associated with swimming in a shallow lake in western Finland and involved 14 confirmed cases. The incidence of VTEC in humans has varied from 0.06 (1990) to 1.0 (1997), being lower than 0.4/100,000 inhabitants in the 2000's. Most human cases are sporadic. Family outbreaks or sporadic cases have been associated with consumption of unpasteurised milk or contact with a cattle farm.

Prevalence studies in slaughter cattle were performed in 1997 and 2003. The prevalence of E. coli O157 in cattle faeces in 1997 was 1.3%. In the latter study the prevalence of E. coli O157 in cattle faeces was 0.4%, in carcass surface samples 0.07%. The prevalence of non-O157 VTEC in cattle faeces was 30%, in carcass samples 11%.

A compulsory control programme for all bovine slaughterhouses started in January 2004. The total number of bovines sampled in a year is calculated with the following criteria: expected prevalence 1 %, accuracy 0,5 %, confidence level 95 %. The total number is divided between the different slaughterhouses depending on their slaughter capacity. The sampling is evenly distributed throughout the year.

##### National evaluation of the recent situation, the trends and sources of infection

The number of cases has been quite stable during the recent years although under-reporting might exist. Non-O157 serotypes have increased partly due to the development of laboratory methods. Cattle contact remains a risk of infection, especially for young children.

##### Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

The figures of VTEC cases are relatively low but the disease caused can be severe and lead to death which makes VTEC a serious zoonosis. Cattle seem to be the major reservoir of VTEC. Same PFGE subtypes are detected in strains of human cases and cattle which suggests a common source. More information is needed on the potential control strategies especially on farms and at slaughter level.

In the year 2012, a major outbreak with 14 cases associated with consumption of unpasteurized milk originating from one farm occurred. Sorbitol-fermenting VTEC O157 (vtx2 and eae positive) was isolated from patients, unpasteurized milk, farm environment and cattle feces. Patient, farm environment and cattle feces isolates showed indistinguishable genotypes in PFGE analysis. However, the milk isolates differentiated from the patient isolates in PFGE.

Furthermore, four human EHEC cases representing serotype O157, two cases of sorbitol-fermenting O157 and one case of serotype O145 potentially associated with cattle farm visits were detected in the year 2012. Samples were taken from the suspected farms and analyzed for the presence of these serotypes. The isolated strains were genotyped by PFGE. The source of the infection could be verified by

PFGE in four O157 cases. In cases representing serotype O145 and sorbitol-fermenting serotype O157, the source of the infection could not be verified by sampling.

### Recent actions taken to control the zoonoses

The Association for Animal Disease Prevention (industrial association) has launched on 2002 guidelines: General hygienic guidelines for bovine holdings to prevent faecal transmitted infections (Salmonella, VTEC, Campylobacter, Listeria).

In 2003, common guidelines were established by the authorities and by the industry. The guidelines give recommendations of how to prevent spreading of VTEC in bovine holdings and slaughterhouses. According to the recommendations a special risk management plan is planned by a official municipal veterinarian and health care veterinarian for the holding where VTEC is detected in animals. The purpose of the plan is to minimize the spreading of the infection to other animals in the holding, to neighbouring holdings and to people.

In 2011 a survey on seeds and sprouts was conducted.

## 2.4.2 Escherichia coli, pathogenic in foodstuffs

### A. Escherichia coli, pathogenic in Food - Surveillance

#### Monitoring system

##### Sampling strategy

National survey 2011-2012. Samples were taken randomly at retail and at processing plant. Sampling was conducted in a research project.

##### Type of specimen taken

Meat and meat products: 74 samples, milk and milk products: 58 samples, and vegetables: 171 samples.

##### Definition of positive finding

VTEC O157 bacteria detected in the sample.

##### Diagnostic/analytical methods used

NMKL 196:2005, modified.

Confirmation: ISO 16654:2001, modified, and multiplex-PCR.

#### Measures in case of the positive findings or single cases

Positive findings were notified to the competent authority and the producer.

#### Results of the investigation

Altogether 303 samples were analyzed. There was one VTEC O157 positive sample (bovine minced meat).

Table VT E. coli in food

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Analytical Method	Sampling unit	Sample weight	Units tested	Total units positive for Verotoxigenic E. coli (VTEC)	Verotoxigenic E. coli (VTEC) - VTEC O157
Cheeses made from cows' milk - at retail - Survey - national survey	Evira	Convenience sampling		food sample	Imported from outside EU	NMKL 164:2005	Single		13	0	
Cheeses made from cows' milk - at retail - Survey - national survey	Evira	Convenience sampling		food sample	Intra EU trade	NMKL 164:2005	Single		28	0	
Cheeses made from cows' milk - at retail - Survey - national survey	Evira	Convenience sampling		food sample	Domestic	NMKL 164:2005	Single		5	0	
Cheeses made from goats' milk - at retail - Survey - national survey	Evira	Convenience sampling		food sample	Imported from outside EU	NMKL 164:2005	Single		1	0	
Cheeses made from goats' milk - at retail - Survey - national survey	Evira	Convenience sampling		food sample	Intra EU trade	NMKL 164:2005	Single		12	0	
Meat from bovine animals - at retail - Survey - national survey	Evira	Convenience sampling		food sample > meat	Domestic	NMKL 164:2005	Single		32	0	
Meat from bovine animals - at retail - Survey - national survey	Evira	Convenience sampling		food sample > meat	Intra EU trade	NMKL 164:2005	Single		4	0	
Meat from bovine animals - at retail - Survey - national survey	Evira	Convenience sampling		food sample > meat	Imported from outside EU	NMKL 164:2005	Single		1	0	
Meat from bovine animals - minced meat - at retail - Survey - national survey	Evira	Convenience sampling		food sample > meat	Domestic	NMKL 164:2005	Single		37	1	1
Milk, cows' - raw milk - at retail - Survey - national survey	Evira	Convenience sampling		food sample > milk	Domestic	NMKL 164:2005	Single		1	0	
Vegetables - at processing plant - Survey - national survey	Evira	Convenience sampling		food sample	Domestic	NMKL 164:2005	Single		2	0	
Vegetables - at retail - Survey - national survey	Evira	Convenience sampling		food sample	Domestic	NMKL 164:2005	Single		171	0	

Table VT E. coli in food

	Verotoxigenic E. coli (VTEC) - VTEC non- O157	Verotoxigenic E. coli (VTEC) - VTEC, unspecified
Cheeses made from cows' milk - at retail - Survey - national survey		
Cheeses made from cows' milk - at retail - Survey - national survey		
Cheeses made from cows' milk - at retail - Survey - national survey		
Cheeses made from goats' milk - at retail - Survey - national survey		
Cheeses made from goats' milk - at retail - Survey - national survey		
Meat from bovine animals - at retail - Survey - national survey		
Meat from bovine animals - at retail - Survey - national survey		
Meat from bovine animals - at retail - Survey - national survey		
Meat from bovine animals - minced meat - at retail - Survey - national survey		
Milk, cows' - raw milk - at retail - Survey - national survey		
Vegetables - at processing plant - Survey - national survey		
Vegetables - at retail - Survey - national survey		

Table VT E. coli in food

## 2.4.3 Escherichia coli, pathogenic in animals

### A. Verotoxigenic Escherichia coli in cattle (bovine animals)

#### Monitoring system

##### Sampling strategy

A compulsory control programme for all bovine slaughterhouses started in January 2004. Samples are taken from slaughtered bovines by the industry. The total number of bovines sampled in a year is calculated with the following criteria: expected prevalence 1 %, accuracy 0,5 %, confidence level 95 %. The total number is divided between the different slaughterhouses depending on their slaughter capacity. The sampling is evenly distributed throughout the year.  
Note! Sampling at slaughter has an animal based approach, not herd based.

##### Frequency of the sampling

Animals at slaughter (herd based approach)

Sampling distributed evenly throughout the year

##### Type of specimen taken

Animals at farm

Faeces

Animals at slaughter (herd based approach)

Faeces

##### Methods of sampling (description of sampling techniques)

Animals at farm

If possible, 50 g of faeces is taken from the rectum and placed to plastic container and cooled to a temperature of 4 (+/-2)C. The sample is sent to Evira laboratory for analysis.

Animals at slaughter (herd based approach)

50 g of faeces is taken from the rectum and placed to plastic container and cooled to a temperature of 4 (+/-2)C. The sample is sent to an approved local laboratory for analysis. If VTEC is isolated at the local laboratory, the isolate is sent for confirmation and further typing to Evira.

##### Case definition

Animals at farm

Animal/herd is considered to be positive when E.coli O157 strain with the capacity of producing shigatoxin (stx I and/or stx II) and adhesion genes (eae) or an other VTEC-strain which has been connected to human cases is isolated from a sample.

Animals at slaughter (herd based approach)

An animal is considered to be positive when E.coli O157 strain with the capacity of producing shigatoxin (stx I and/or stx II) and adhesion genes (eae) is isolated from a sample.

##### Diagnostic/analytical methods used

Animals at farm

E. coli O157 was isolated according to ISO 16654:2001. Other VTEC were analysed using PCR method

detecting the genes of stx1, stx2, ehxA and saa.

Animals at slaughter (herd based approach)

NMKL 164:2005

### Other preventive measures than vaccination in place

Evira has published in 2006 an updated guideline for the prevention of VTEC on farms and slaughterhouses.

### Control program/mechanisms

#### The control program/strategies in place

A compulsory control/monitoring programme for bovine slaughterhouses started in 2004.

In addition it is compulsory to sample all bovine holdings which are suspected to have a connection to human VTEC cases. Sampling is carried out by the official municipal veterinarian.

#### Recent actions taken to control the zoonoses

In 2003, common guidelines were established by the authorities and by the industry. The guidelines were updated in 2006. They give recommendations of how to prevent spreading of VTEC in bovine holdings and slaughterhouses. According to the recommendations a special risk management plan is planned by the official municipal veterinarian and health care veterinarian for the holding where VTEC is detected in animals. The purpose of the plan is to minimize the spreading of the infection to other animals in the holding, to neighbouring holdings and to people.

### Measures in case of the positive findings or single cases

In case of the positive finding at the slaughterhouse the herd of origin is sampled by the official municipal veterinarian.

In case of positive finding at the holding the risk management plan is launched (see above). If the farmer does not follow the plan, the animals from the holding are slaughtered at the end of the working day with special attention to slaughter hygiene. Milk is allowed to deliver only to establishments for pasteurization. The access of visitors to the farm is restricted (especially children).

### Notification system in place

National reference laboratory Evira notifies all the positive results to the competent authorities.

### Results of the investigation

See Table VT E.coli in animals

### National evaluation of the recent situation, the trends and sources of infection

VTEC is regarded as a serious zoonosis. Cattle are considered a reservoir of these organisms. Most human infections are sporadic and the source remains unclear. Farm-associated small outbreaks have occurred. The first Finnish outbreak was swimming-associated. One outbreak in 2001 was traced to eating imported kebab meat. The number of reported human cases has been at a relatively constant level during the recent years.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Direct or indirect contact with cattle is an important risk factor. Same PFGE subtypes are detected in strains of human cases and cattle which suggests a common source.



Table VT E. coli in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Analytical Method	Sampling unit	Sample weight	Units tested	Total units positive for Verotoxigenic E. coli (VTEC)	Verotoxigenic E. coli (VTEC) - VTEC O157
Cattle (bovine animals) - unspecified - at slaughterhouse - Control and eradication programmes	Evira	Objective sampling	Industry sampling	animal sample > faeces		ISO 16654:2001	Animal	10 g	1553	27	27
		Verotoxigenic E. coli (VTEC) - VTEC non-O157	Verotoxigenic E. coli (VTEC) - VTEC, unspecified								
Cattle (bovine animals) - unspecified - at slaughterhouse - Control and eradication programmes											

Footnote:

The samples are tested for VTEC O157 only (not for VTEC non-O157)

## 2.5 TUBERCULOSIS, MYCOBACTERIAL DISEASES

### 2.5.1 General evaluation of the national situation

#### A. Tuberculosis general evaluation

##### History of the disease and/or infection in the country

M. bovis was eradicated to a large extent during the 1960's. The last case of M. bovis infection in cattle in Finland was detected in one herd in 1982.

Finland has been granted the officially tuberculosis free status of bovine herds according to Council Directive 64/432/EEC. The disease status was established by Commission Decision 94/959/EC of 28 December 1994, confirmed by Commission Decision 2000/69/EC in 2000.

##### National evaluation of the recent situation, the trends and sources of infection

The national situation remains favourable.

##### Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

The risk of introducing infection from animals, feedingstuffs or foodstuffs to humans remains negligible.

## 2.5.2 Mycobacterium in animals

### A. Mycobacterium bovis in bovine animals

#### Status as officially free of bovine tuberculosis during the reporting year

The entire country free

Finland has been granted the officially tuberculosis free status of bovine herds by a Commission Decision 94/959/EC of 28 December 1994, confirmed by Commission Decision 2003/467/EC.

#### Monitoring system

##### Sampling strategy

All AI-bulls are tested by intradermal tuberculin test not more than 30 days before moving to AI-station and annually thereafter.

Clinical suspect cases are investigated by pathological examination of suspect lymph nodes or lesions.

All slaughtered animals are inspected for tuberculous lesions.

##### Frequency of the sampling

AI bulls are tested annually. In addition, samples are taken from all suspected cases.

##### Type of specimen taken

lymph nodes or tuberculous lesions.

##### Methods of sampling (description of sampling techniques)

Testing in live animals is done by intradermal tuberculin testing.

In suspect cases, biopsy of a lymph node or a whole lymph node is taken from a living animal. One or more tuberculous lesions are collected from a dead animal. These samples are divided into two parts, one of which is sent without preservatives and the other part in 10 % buffered formalin solution.

##### Case definition

Confirmation of an inconclusive or positive intradermal testing is done by comparative intradermal tuberculin testing. Comparative testing is considered positive if bovine tuberculin injection site reaction is more than 4 mm thicker than avian tuberculin injection site when skin fold is measured or if there are clinical symptoms related to bovine tuberculin injection. Case is also considered positive if *M. bovis* is isolated. The whole herd is investigated as defined above in case of a suspicion in one animal.

##### Diagnostic/analytical methods used

Histology, Ziehl-Neelsen staining, cultivation.

##### Vaccination policy

Vaccination of animals against tuberculosis is prohibited in Finland.

##### Control program/mechanisms

###### The control program/strategies in place

Continuous monitoring by Decision 2/EEO/95 of the Ministry of Agriculture and Forestry. Culling of positive animals.

##### Measures in case of the positive findings or single cases

Movement restrictions, quarantine of suspect animals and orders as regards use of milk are given by official veterinarian. Culling of positive animals in case of confirmed findings.

##### Notification system in place

*M. bovis* and *M. tuberculosis* infections are immediately notifiable and classified as dangerous animal disease in the Decision No 1346/95 of the Veterinary and Food Department, 28 November 1995. Possible cases of avian tuberculosis are also notifiable according to the same decision.

### Results of the investigation

No cases of *M. bovis* were detected in cattle in 2012.

263665 bovine animals were slaughtered and subject to a routine post mortem examination. Sample from one suspicious animal at autopsy was collected and sent to the Finnish Food Safety Authority Evira for examination. It was negative.

A total of 869 intradermal tuberculin tests were performed on AI bulls.

### National evaluation of the recent situation, the trends and sources of infection

The situation remains favourable.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

The relation between human cases of tuberculosis and Finnish cattle population seems to be close to zero.

## B. Mycobacterium bovis in farmed deer

### Monitoring system

#### Sampling strategy

Post mortem examination is performed on all slaughtered animals and samples are sent for examination if there is a suspicion of tuberculosis.

Deer in the farms that are in the voluntary control program are tested regularly with intradermal comparative test. An official veterinarian is responsible for performing these tests.

Imported deer are tested before import.

Clinically ill deer are killed and tested if tuberculosis is suspected.

#### Frequency of the sampling

In the voluntary control program the intradermal comparative testing is initially done three times during 12 to 24 months, then repeated at 24 to 30 months interval.

#### Type of specimen taken

Intradermal comparative test. In suspect cases and post mortem examination lymph nodes.

#### Methods of sampling (description of sampling techniques)

At meat inspection, lymph nodes are collected from suspected animals.

When tuberculosis is suspected at farm, a whole animal or its head and organs including lymph nodes from chest, abdomen and groin are sent for examination.

#### Case definition

The intradermal test is considered positive if the bovine tuberculin injection site is more than 2,5 mm thicker than the first measure or at least the size of the avian tuberculin injection site or there are other clinical signs of positive reaction. Case is also considered positive if *M. bovis* is isolated.

#### Diagnostic/analytical methods used

Histology, Ziehl-Neelsen stain, cultivation.

### Vaccination policy

Vaccination against tuberculosis is prohibited.

### Control program/mechanisms

#### The control program/strategies in place

Continuous monitoring by Decision 22/2010 of the Ministry of Agriculture and Forestry. Positive animals are culled and movement restrictions for the infected farm are implemented. There is also a voluntary programme with regular testing of animals.

### Measures in case of the positive findings or single cases

The whole deer farm is classified as tuberculosis positive farm. Following measures include restrictive orders, killing of positive animals, re-testing of remaining animals, epidemiological investigation and investigations in contact herds. Investigations also includes investigating presence of tuberculosis in wild fauna around the deer farm.

### Notification system in place

*M. bovis* and *M. tuberculosis* infections are immediately notifiable and classified as dangerous animal disease in the Decision No 1346/95 of the Veterinary and Food Department, 28 November 1995. Possible cases of avian tuberculosis are also notifiable according to the same decision.

### Results of the investigation

No tuberculosis was detected in farmed deer in 2012.

Samples of 4 farmed deer were sent for laboratory examination and they were negative.

National evaluation of the recent situation, the trends and sources of infection

The situation remains favourable.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

The relevance seems to be negligible.

## Table Tuberculosis in farmed deer

If present, the row "Total -1" refers to analogous data of the previous year.

Region	Total number of existing farmed deer		Free herds		Infected herds		Routine tuberculin testing		Number of tuberculin tests carried out before the introduction into the herds	Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological examinations	Number of animals detected positive in bacteriological examination
	Herds	Animals	Number of herds	%	Number of herds	%	Interval between routine tuberculin tests	Number of animals tested			
Suomi / Finland	11		11	100	0	0				4	0
Total : <sup>1)</sup>	11	0	11	100	0	0	N.A.	0	0	4	0

### Comments:

<sup>1)</sup> N.A.

Table Bovine tuberculosis in countries and regions that do not receive Community co-financing for eradication programmes

If present, the row "Total -1" refers to analogous data of the previous year.

Region	Total number of existing bovine		Officially free herds		Infected herds		Routine tuberculin testing		Number of tuberculin tests carried out before the introduction into the herds (Annex A(I)(2)(c) third indent (1) of Directive 64/432/EEC)	Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological	Number of animals detected positive in bacteriological examination
	Herds	Animals	Number of herds	%	Number of herds	%	Interval between routine tuberculin tests	Number of animals tested			
Suomi / Finland	14138	912440	14138	100	0	0	no routine test			1	0
Total : <sup>1)</sup>	14138	912440	14138	100	0	0	N.A.	0	0	1	0

## Comments:

<sup>1)</sup> N.A.



## 2.6 BRUCELLOSIS

### 2.6.1 General evaluation of the national situation

#### A. Brucellosis general evaluation

##### History of the disease and/or infection in the country

The last case of *Brucella abortus* in Finland was recorded in 1960. Ovine and caprine brucellosis or porcine brucellosis have never been detected.

Finland is officially free from bovine, ovine and caprine brucellosis.

##### National evaluation of the recent situation, the trends and sources of infection

The situation remains favourable.

##### Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

Brucellosis has no relevance to public health in Finland.

## 2.6.2 Brucella in animals

### A. Brucella abortus in bovine animals

#### Status as officially free of bovine brucellosis during the reporting year

The entire country free

Finland has been granted the officially brucellosis free status of bovine herds according to Council Directive 64/432/EEC. The disease free status was established by Commission Decision 94/960/EC of 28 December 1994, confirmed by Commission Decision 2003/467/EC.

#### Monitoring system

##### Sampling strategy

1. Breeding animals: samples are taken at the AI station and from the herds of the origin sending bulls to the AI stations
2. Suspicious animals due to abortions.

##### Frequency of the sampling

1. Continuous
2. On suspicion

##### Type of specimen taken

Other: \_\_blood, milk and/or tissue samples due to abortions\_\_

##### Methods of sampling (description of sampling techniques)

Samples are taken from living animals at the AI station or at the farm.

##### Case definition

The animal is seropositive, if confirmation test is positive.

##### Diagnostic/analytical methods used

Screening: RBT, ELISA milk. Confirmation: CFT, culture

#### Vaccination policy

Vaccination against brucellosis is prohibited.

#### Control program/mechanisms

##### The control program/strategies in place

Continuous surveillance based on the Decision No 14/95 of the Veterinary and Food Department, 12 May 1995.

#### Measures in case of the positive findings or single cases

Measures include notification measures, investigation of all suspected cases by veterinary authorities by serological testing on blood samples and microbiological testing in case of abortions, isolation of suspect cases and herd restrictions, killing of positive herds and disinfection of the shed.

#### Notification system in place

The disease is obligatorily notifiable according to the Finnish veterinary legislation (Decision No 1346/95 of the Veterinary and Food Department, 28 November 1995). Brucellosis is classified as a dangerous animal disease.

#### Results of the investigation

## Finland - 2012 Report on trends and sources of zoonoses

No cases of brucellosis were recorded in 2012.

832 blood samples from AI bulls and 88 milk samples from farms selling animals to AI were tested for brucellosis. In addition, 251 bacteriological examinations and 344 serological tests were performed due to abortion or neonatal death.

### National evaluation of the recent situation, the trends and sources of infection

The situation remains favourable.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

There is no relevance to human cases.

## B. Brucella melitensis in goats

### Status as officially free of caprine brucellosis during the reporting year

The entire country free

Finland has been granted the officially brucellosis free status of caprine herds established by Commission Decision 94/965/EC of 28 December 1994.

### Monitoring system

#### Sampling strategy

Individual blood samples are collected from caprine herds according to the Council Directive 91/68/EEC, which provides for random checks to be carried out on goat holdings in order to maintain the officially brucellosis free status with regard to B. melitensis.

#### Frequency of the sampling

Continuous

#### Type of specimen taken

Blood

#### Methods of sampling (description of sampling techniques)

Blood samples are taken from living animals at the farm.

#### Case definition

The animal is seropositive, if the confirmation test is positive

#### Diagnostic/analytical methods used

Screening: Rose Bengal test, Confirmation: CF

### Vaccination policy

Vaccination is prohibited.

### Control program/mechanisms

#### The control program/strategies in place

Detailed instructions concerning combating brucellosis in ovine and caprine animals are in the Decision No 7/1997 of the Veterinary and Food Department, 31 January 1997.

### Measures in case of the positive findings or single cases

Notification procedures, investigation of all suspected cases by veterinary authorities, isolation of suspected cases and herd restrictions, killing and destruction of herds.

### Notification system in place

The disease is classified as a dangerous animal disease and obligatorily notifiable (Decision No 1346/95 of the Veterinary and Food Department, 28 November 1995)

### Results of the investigation

In 2012 1853 animals were tested, all with negative results.

1853 random blood samples from healthy animals were tested. Three clinical suspect cases due to abortion were investigated bacteriologically with negative results.

### National evaluation of the recent situation, the trends and sources of infection

The situation remains favourable.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

There is no relevance to human cases.

## C. Brucella melitensis in sheep

### Status as officially free of ovine brucellosis during the reporting year

The entire country free

Finland has been granted the officially brucellosis free status of ovine herds established by Commission Decision 94/965/EC of 28 December 1994.

### Monitoring system

#### Sampling strategy

Individual blood samples from ovine herds are taken according to Council Directive 91/68/EEC, which provides for random checks to be carried out on sheep holdings in order to maintain the officially brucellosis free status with regard to B. melitensis. An official veterinarian takes the blood samples.

#### Frequency of the sampling

Continuous

#### Type of specimen taken

Blood

#### Methods of sampling (description of sampling techniques)

Blood samples are taken from living animals at the farm.

#### Case definition

The animal is seropositive, if the confirmation test is positive.

#### Diagnostic/analytical methods used

Screening: Rose Bengal test, Confirmation: CFT

### Vaccination policy

Vaccination is prohibited.

### Control program/mechanisms

#### The control program/strategies in place

The control program is included in the national veterinary legislation, where brucellosis is classified as a dangerous animal disease. Detailed instructions are in the Decision No 7/1997 of the Veterinary and Food Department, 31 January 1997.

### Measures in case of the positive findings or single cases

Notification procedures, investigation of all suspected cases by veterinary authorities, isolation of suspected cases and herd restrictions, killing and destruction of all ovine and caprine animals in the herd.

### Notification system in place

The disease is obligatorily notifiable (Decision No 1346/95 of the Veterinary and Food Department, 28 November 1995)

### Results of the investigation

In 2012, 3183 random blood samples from healthy sheep were tested, all with negative results. In addition 40 samples from clinical suspect cases due to abortion was investigated bacteriologically and one sample serologically, all with negative results.

### National evaluation of the recent situation, the trends and sources of infection

The situation remains favourable.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a

source of infection)

There is no relevance to human cases.

## D. B. suis in animal - Pigs

### Monitoring system

#### Sampling strategy

All boars are sampled at the AI quarantine station before transfer to AI station. All boars at the AI station are sampled annually and at the time of slaughter.

All suspected animals tested due to abortion are tested also for brucellosis.

All pigs sent for slaughter from progeny testing stations are sampled for B. suis.

Herds belonging to the Finnish SPF (specific pathogen free) system for breeding herds and multiplying herds were monitored.

#### Frequency of the sampling

Annual sampling at AI stations. Periodical or continuous sampling of the SPF herds.

#### Type of specimen taken

Blood

#### Methods of sampling (description of sampling techniques)

Blood samples are collected for prevalence studies and in suspect cases. In suspect cases placental tissue and vaginal mucus is collected from sows that have aborted. Also whole piglets with skeletal or joint problems should be sent for laboratory examination if possible.

#### Case definition

The animal is considered seropositive, if one of the confirmation tests is positive.

#### Diagnostic/analytical methods used

Screening: Rose Bengal test (RB). Confirmation: RB or CF

### Vaccination policy

Vaccination against brucellosis is prohibited in Finland.

### Measures in case of the positive findings or single cases

Measures include herd restrictions and killing of all animals of positive herds. A herd is construed as positive if at least one animal is found positive of brucellosis.

### Notification system in place

The disease is compulsorily notifiable according to the Decision No 1346/95 of the Veterinary and Food Department, 28 November 1995. Brucellosis in all animals is classified as a dangerous animal disease.

### Results of the investigation

Altogether 2126 serological samples were tested for Brucella suis in 2012, all with negative results. In addition 45 animals from 16 herds were tested microbiologically due to abortions with negative results.

### National evaluation of the recent situation, the trends and sources of infection

The situation remains favourable.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

The relevance seems to be negligible.





Table Brucellosis in other animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Brucella	B. abortus	B. melitensis	B. suis
Pigs	Evira	Selective sampling	Official sampling	animal sample > blood	Domestic	Animal	2126	0			
Dogs - pet animals - in total - Unspecified (Dogs for export, AI and suspicion of disease. )	Evira	Unspecified	Official sampling	animal sample > blood	Domestic	Animal	49	0			
Pigs - unspecified - at farm - Clinical investigations	Evira	Suspect sampling	Official sampling	animal sample > foetus/stillbirth	Domestic	Animal	45	0			

	Brucella spp., unspecified
Pigs	
Dogs - pet animals - in total - Unspecified (Dogs for export, AI and suspicion of disease. )	
Pigs - unspecified - at farm - Clinical investigations	

## Footnote:

In the row "pigs", the number of units tested (2126) contains boars for AI purpose, and animals at SPF herds.

**Table Ovine or Caprine Brucellosis in countries and regions that do not receive Community co-financing for eradication programme**

If present, the row "Total -1" refers to analogous data of the previous year.

Region	Total number of existing		Officially free herds		Infected herds		Surveillance			Investigations of suspect cases				
	Herds	Animals	Number of herds	%	Number of herds	%	Number of herds tested	Number of animals tested	Number of infected herds	Number of animals tested with serological blood tests	Number of animals positive serologically	Number of animals examined microbiologically	Number of animals positive microbiologically	Number of suspended herds
Suomi / Finland	1472	137171	1472	100	0	0	343	5036	0	1	0	43	0	0
Total : <sup>1)</sup>	1472	137171	1472	100	0	0	343	5036	0	1	0	43	0	0

**Comments:**

<sup>1)</sup> N.A.

**Footnote:**

Investigations of suspect cases: The number indicates the number of abortions, from which samples were submitted to the laboratory on voluntary basis and due to Schmallemberg virus-project to clarify the reason for the abortion, where a brucella-examination was carried out among other examinations.

Table Bovine brucellosis in countries and regions that do not receive Community co-financing for eradication programme

If present, the row "Total -1" refers to analogous data of the previous year.

Region	Total number of existing bovine		Officially free herds		Infected herds		Surveillance						Investigations of suspect cases								
	Herds	Animals	Number of herds	%	Number of herds	%	Serological tests			Examination of bulk milk			Information about			Epidemiological investigation					
							Number of bovine herds tested	Number of animals tested	Number of infected herds	Number of bovine herds tested	Number of animals or pools tested	Number of infected herds	Number of notified abortions whatever cause	Number of isolations of Brucella infection	Number of abortions due to Brucella abortus	Number of animals tested with serological blood tests	Number of suspended herds	Number of positive animals		Number of animals examined microbiologically	Number of animals positive microbiologically
																		Sero logically	BST		
Suomi / Finland	14138	912440	14138	100	0	0	280	832	0	88	88	0	326	0	0	344	0	0	0	251	0
Total : <sup>1)</sup>	14138	912440	14138	100	0	0	280	832	0	88	88	0	326	0	0	344	0	0	0	251	0

## Comments:

<sup>1)</sup> N.A.

## Footnote:

Investigation of suspect cases: the number indicate the number of abortions, from which samples were submitted to the laboratory on voluntary basis and due to Shmallenberg virus-project to clarify the reason for the abortion, where a brucella-examination was carried out among other examinations.

## 2.7 YERSINIOSIS

### 2.7.1 General evaluation of the national situation

#### A. Yersinia enterocolitica general evaluation

##### History of the disease and/or infection in the country

The number of reported cases of human yersiniosis has been between 400 -600 per year, most of which are caused by *Yersinia enterocolitica*.

##### National evaluation of the recent situation, the trends and sources of infection

Most of the reported human cases are presumed to be of domestic origin. The number of cases is higher than the number of domestic salmonella infections. A decreasing trend in number of cases caused by *Yersinia enterocolitica* has been detected.

##### Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

In Finland the most common bio/serotype is 4/O:3, which is found in human cases as well as in pigs and pork. Pathogenic *Y. enterocolitica* biotypes have also been detected in faeces of cats and dogs in Finland.

## 2.8 TRICHINELLOSIS

### 2.8.1 General evaluation of the national situation

#### A. Trichinellosis general evaluation

##### History of the disease and/or infection in the country

In Finland, domestic pork examination for *Trichinella* was initiated during the 1860s. In 1923, meat inspection including *Trichinella* examination of swine carcasses became mandatory in municipalities with more than 4000 inhabitants, and later in the entire country. Three cases of human trichinellosis originating from imported pork were diagnosed around 1890. The last autochthonous human cases (three) originated from eating bear meat in 1977. The first diagnosis in domestic swine was made in 1954. There were very few pig cases until 1981 when the number of *Trichinella* positive pigs started to increase reaching even over one hundred of infected swine a year. In the 2000's, however, the number of diagnosed cases in pigs decreased again to a couple of animals a year, and in 2005-2009 no cases were found. In 2010, only one positive pig was found. The reason for the recent change is not known.

The infection was known in the brown bear and other wildlife during the 1950s, but since the 1980s trichinellosis has been found to be prevalent among wild carnivores especially in the southern part of the country, where all the four European species (*Trichinella spiralis*, *T. nativa*, *T. britovi* and *T. pseudospiralis*) have been reported. The raccoon dog *Nyctereutes procyonoides* has been recognised as the central host species harbouring all the four *Trichinella* species.

##### National evaluation of the recent situation, the trends and sources of infection

It appears that the *Trichinella* situation in Finland has been changing with decreasing incidence in swine. However, no sign of such change in wildlife has been seen. The apparent change in swine may be due to the pig production becoming more intensive with bigger industrialized units. In wildlife, a big proportion of infections are caused by *T. nativa*, the arctic species, which does not readily infect swine.

##### Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

Because meat inspection of swine is mandatory to all commercial pork production, no human infection derived from domestic swine has been diagnosed even though sometimes swine have been infected. Therefore, pig meat inspection for *Trichinella* is essential. Moreover, hunters need to be continuously educated about the risks of eating undercooked bear, badger, lynx, wild boar or other carnivore or omnivore meat.

##### Recent actions taken to control the zoonoses

The *Trichinella* species present in Finland have been identified and the work on the epidemiology of different *Trichinella* species will continue. Understanding the epidemiology of the various *Trichinella* species will help in controlling of the risk .

## 2.8.2 Trichinella in animals

### A. Trichinella in horses

#### Monitoring system

##### Sampling strategy

Every single slaughtered horse is examined for trichinella at meat inspection.

##### Frequency of the sampling

Trichinella examination is mandatory for horses at meat inspection. All slaughtered horses are introduced to official meat inspection.

##### Type of specimen taken

Muscle sample of 10 grams from tongue, masseters or diaphragm.

##### Methods of sampling (description of sampling techniques)

Sampling and analysing is done according to 2075/2005 EU.

##### Case definition

Positive result from examination according to 2075/2005 EU.

##### Diagnostic/analytical methods used

Methods in use are the magnetic stirrer method for pooled sample digestion and mechanically assisted pooled sample digestion method, accordant with regulation 2075/2005.

#### Results of the investigation including the origin of the positive animals

Equine trichinellosis has never been found in Finland.

#### Control program/mechanisms

##### The control program/strategies in place

Trichinella examination at meat inspection is mandatory.

#### Notification system in place

Positive result in Trichinella examination at meat inspection has to be notified and confirmed at National Reference Laboratory in Evira. The trichinella testing has been included in meat inspection of horses since 1990.

## B. Trichinella in pigs

### Monitoring system

#### Sampling strategy

##### General

Every single pig is examined for trichinellosis at obligatory, official meat inspection in slaughterhouse. The sampling is 100%.

#### Frequency of the sampling

##### General

All pigs are sampled at meat inspection.

#### Type of specimen taken

##### General

The sample for trichinella test from pigs is taken primarily from diaphragm muscle and secondarily from tongue, masseter or abdominal muscles.

#### Methods of sampling (description of sampling techniques)

##### General

Muscle sample is taken according to 2075/2005 at meat inspection.

#### Case definition

##### General

Positive case is a pig from which the trichinella test (2075/2005) is positive i.e. trichinella larva has been detected at test from a pooled muscle sample and/or a single sample. All positive results have to be sent to national reference laboratory Evira for confirmation and identification of the species.

#### Diagnostic/analytical methods used

##### General

Diagnostic methods used are in accordance with 2075/2005. In Finland the methods used are the magnetic stirrer method with pooled samples and mechanically assisted pooled sample digestion method (Stomacher).

### Control program/mechanisms

#### Recent actions taken to control the zoonoses

No recent action has been taken. Current routine meat inspection eliminates infected carcasses from human consumption.

#### Measures in case of the positive findings or single cases

If a pig is found infected with *Trichinella*, the carcass will be destroyed. The competent authority will investigate the farm of origin, source and possible spread of infection and decide about further action.

### Results of the investigation including description of the positive cases and the verification of the *Trichinella* species

No confirmed *Trichinella* infections were found in pigs in 2012.

#### Fattening pigs raised under controlled housing conditions in integrated production system

No confirmed *Trichinella* infections were found in fattening pigs in 2012.

#### Breeding sows and boars

No *Trichinella* infections were found in breeding sows and boars in 2012.



### National evaluation of the recent situation, the trends and sources of infection

It appears that *Trichinella* infection incidence and prevalence in swine in Finland has been decreasing in spite of its persisting abundance in wildlife. This may be caused by the change in swine husbandry, which has become more industrialized. Therefore, the number of small family farms with old pighouses has decreased.

### Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

The risk of obtaining trichinellosis from pig meat is negligible.

Table Trichinella in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Units tested	Total units positive for Trichinella	T. spiralis	Trichinella spp., unspecified	T. nativa
Pigs - fattening pigs - not raised under controlled housing conditions - at slaughterhouse - Surveillance	Evira	Census	Official sampling	animal sample > organ/tissue	Domestic	Animal	2108797	0			
Pigs - breeding animals - not raised under controlled housing conditions - sows and boars - at slaughterhouse - Surveillance	Evira	Census	Official sampling	animal sample > organ/tissue	Domestic	Animal	49637	0			
Solipeds, domestic - horses - at slaughterhouse - Surveillance	Evira	Census	Official sampling	animal sample > organ/tissue	Domestic	Animal	1865	0			
Wild boars - farmed - Surveillance	Evira	Unspecified	HACCP and own checks	animal sample	Domestic	Animal	311	4			
Wild boars - wild - Surveillance	Evira	Unspecified	HACCP and own checks	animal sample	Domestic	Animal	9	0			
Bears - Surveillance	Evira	Unspecified	HACCP and own checks	animal sample	Domestic	Animal	46	1			1
Foxes - Monitoring	Evira	Unspecified	Not applicable	animal sample	Domestic	Animal	152	27		27	
Raccoon dogs - Monitoring	Evira	Unspecified	Not applicable	animal sample	Domestic	Animal	259	85		85	
Badgers - wild - Monitoring	Evira	Unspecified	Not applicable	animal sample	Domestic	Animal	14	1		1	
Lynx - wild	Evira	Unspecified	Not applicable	animal sample	Domestic	Animal	414	205		205	
Wolverine - wild - Monitoring	Evira	Unspecified	Not applicable	animal sample	Domestic	Animal	2	1		1	
Wolves - wild	Evira	Unspecified	Not applicable	animal sample	Domestic	Animal	33	7		7	

Table Trichinella in animals

	T. pseudospiralis
Pigs - fattening pigs - not raised under controlled housing conditions - at slaughterhouse - Surveillance	
Pigs - breeding animals - not raised under controlled housing conditions - sows and boars - at slaughterhouse - Surveillance	
Solipeds, domestic - horses - at slaughterhouse - Surveillance	
Wild boars - farmed - Surveillance	4
Wild boars - wild - Surveillance	
Bears - Surveillance	
Foxes - Monitoring	
Raccoon dogs - Monitoring	
Badgers - wild - Monitoring	
Lynx - wild	
Wolverine - wild - Monitoring	
Wolves - wild	

## 2.9 ECHINOCOCCOSIS

### 2.9.1 General evaluation of the national situation

#### A. Echinococcus spp. general evaluation

##### History of the disease and/or infection in the country

*Echinococcus granulosus* was endemic in reindeer husbandry (reindeer -reindeer herding dog -cycle) but disappeared because of control action by authorities, and because of the changes in reindeer husbandry rendering herding dogs redundant.

In the early 1990's, echinococcosis started to re-emerge, then in the southeastern part of the Finnish reindeer husbandry area. The cycle involves reindeer, elk (moose) and wolves. Hitherto, no other definitive hosts have been identified although dogs, red foxes and raccoon dogs have been examined in hundreds during the last few years.

*Echinococcus multilocularis* has never been diagnosed in Finland.

The rodent scientists at Finnish Forest Research Institute (METLA) perform long-term surveys twice a year at least on 50 locations to detect fluctuations of small mammal populations. Longest data sets cover more than 50 years. All animals are dissected, and their gross parasitological conditions checked. In addition, other researches send liver samples from small mammals if they find something suspicious (usually Taenid cysts) to the METLA rodent scientists. In the METLA survey in 2012, about 300 small mammals were studied which indicates a predictable crash in rodent population density. Generally, animals are sampled from high-density habitat patches, preferred by foxes as hunting grounds. Species include bank vole *Myodes glareolus* (whole Finland), red and grey-sided voles *M. rutilus* and *M. rufocanus* (Lapland), field vole *Microtus agrestis* (whole Finland), sibling vole *M. rossiaemeridionalis* (south-central Finland), root vole *M. oeconomus* (Lapland), Norway lemming *Lemmus lemmus* (Lapland) and water vole *Arvicola amphibius*. Also common shrews *Sorex araneus* (whole Finland), masked shrews *S. caecutiens* (Northern Finland) and pygmy shrews *S. minutus* were studied. Because of the rodent population crash, sample size was exceptionally small in 2012.

##### National evaluation of the recent situation, the trends and sources of infection

The low endemic *E. granulosus* strain in Finland has been described as G10 (Fennoscandian cervid strain). Its host spectrum is not well-known. It can be assumed that if the wolf population in Finland grows and expands its distribution, the parasite will benefit. New intermediate hosts may be identified in new biotopes. So far the zoonotic infection risk is to be characterized as very low, but if dogs get infected, the situation may change. Therefore, active surveillance is needed.

Surveillance is also needed for *E. multilocularis*, which is known to occur in neighbouring Estonia and was recently diagnosed in southern Sweden.

##### Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

Human infection risk from wildlife (wolf faeces) is regarded as very low. In any case, not much can be done to reduce the prevalence in wildlife. However, it is recommended to treat hunting dogs with anticestodal drugs both prior to and after hunting season. Moreover, it is recommended that cervid offals are only given to dogs following thorough cooking.



## 2.9.2 Echinococcus in animals

### A. Echinococcus spp. in animal

#### Monitoring system

##### Sampling strategy

- Mandatory meat inspection covers all known potential intermediate hosts slaughtered. In post mortem inspection, lungs are palpated and incised to discover hydatid cysts. The cysts are sent to Evira for confirmation.
- METLA performs long-term surveys of small mammal populations (see text in general evaluation chapter)
- Evira performs surveillance of possible definitive hosts (dogs, foxes, wolves, raccoon dogs)

##### Frequency of the sampling

Continuous sampling

##### Type of specimen taken

Faeces and intestine

##### Methods of sampling (description of sampling techniques)

In connection of post mortem examination, a piece of rectum containing faeces is taken for sample. Intestine is saved in freezer (-80 degrees Celsius) for possible confirmation of infection.

##### Case definition

Definitive host: adult Echinococcus worms found in intestine.

Intermediate host: positive protoscolex finding in microscopic examination of cyst fluid or typical histology of cysts.

##### Diagnostic/analytical methods used

Copro Elisa test and sedimentation and counting method.

#### Other preventive measures than vaccination in place

Imported dogs must be treated against echinococcosis 1-5 days before entering Finland. Alternatively, dogs can be treated regularly every 28 days. Dogs must have a microchip for identification and a pet passport in which treatments are marked.

#### Control program/mechanisms

##### The control program/strategies in place

Mandatory official meat inspection.

#### Measures in case of the positive findings or single cases

Organs with cystic echinococcosis are condemned in meat inspection.

#### Notification system in place

Echinococcosis is a notifiable disease in all animals.

#### Results of the investigation

In 2012, hydatid cysts of Echinococcus granulosus (E. canadensis) were found in three slaughtered reindeer and in one wild Finnish forest reindeer (Rangifer tarandus fennicus). Five wolves out of 35 examined were found positive for Echinococcus granulosus (E. canadensis). No echinococcus infections were found in foxes or raccoon dogs.

### National evaluation of the recent situation, the trends and sources of infection

*Echinococcus granulosus* persists in the wolves and cervids of eastern Finland. The geographical distribution has apparently not changed during the last decades.

Table Echinococcus in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Region	Units tested	Total units positive for Echinococcus	E. granulosus	E. multilocularis
Cattle (bovine animals) - at slaughterhouse - Surveillance	Evira	Census			Domestic	Animal		263665	0		
Sheep - at slaughterhouse - Surveillance	Evira	Census			Domestic	Animal		40856	0		
Pigs - at slaughterhouse - Surveillance	Evira	Census			Domestic	Animal		2158434	0		
Solipeds, domestic - horses - at slaughterhouse - Surveillance	Evira	Census			Domestic	Animal		1865	0		
Reindeers - at slaughterhouse - Surveillance	Evira	Census			Domestic	Animal		65101	3	3	
Raccoon dogs	Evira	Convenience sampling		animal sample > faeces	Domestic	Animal		259	0		
Dogs	Evira	Unspecified		animal sample > faeces	Domestic	Animal		3	0		
Foxes - Monitoring	Evira	Convenience sampling		animal sample > faeces	Domestic	Animal		234	0		
Deer - wild - at slaughterhouse - Surveillance	Evira	Census			Domestic	Animal		175	0		
Moose - wild - at slaughterhouse - Surveillance	Evira	Census			Domestic	Animal		89	0		
Reindeers - wild - natural habitat - Unspecified	Evira	Unspecified		animal sample	Domestic	Animal		1	1	1	
Voles - wild - natural habitat - Monitoring	Finnish Forest Research Institute (Metla)	Convenience sampling		animal sample	Domestic	Animal		300	0		
Wolves - wild	Evira	Convenience sampling		animal sample	Domestic	Animal		35	5	5	



Table Echinococcus in animals

	Echinococcus spp., unspecified
Cattle (bovine animals) - at slaughterhouse - Surveillance	
Sheep - at slaughterhouse - Surveillance	
Pigs - at slaughterhouse - Surveillance	
Solipeds, domestic - horses - at slaughterhouse - Surveillance	
Reindeers - at slaughterhouse - Surveillance	
Raccoon dogs	
Dogs	
Foxes - Monitoring	
Deer - wild - at slaughterhouse - Surveillance	
Moose - wild - at slaughterhouse - Surveillance	
Reindeers - wild - natural habitat - Unspecified	
Voies - wild - natural habitat - Monitoring	
Wolves - wild	

## 2.10 TOXOPLASMOSIS

### 2.10.1 General evaluation of the national situation

#### A. Toxoplasmosis general evaluation

##### History of the disease and/or infection in the country

From 30 to 50 human cases have been reported yearly.

##### National evaluation of the recent situation, the trends and sources of infection

*Toxoplasma gondii* is endemic in Finland, although the prevalence seems to be lower than in central Europe.

##### Additional information

*Toxoplasma gondii* can cause a severe disease in children whose mother has been infected during pregnancy. Also immunocompromised persons, like AIDS patients, may develop a severe disease. Screening of pregnant women is currently not done in Finland.

## 2.10.2 Toxoplasma in animals

### A. T. gondii in animal

#### Monitoring system

##### Sampling strategy

Toxoplasma gondii is a notifiable disease in all animals except in wildlife. The occurrence of toxoplasmosis is based on diagnosis at necropsy on animals sent to the Finnish Food Safety Authority Evira for determination of cause of death and/or illness.

There is no active monitoring programme at present.

##### Type of specimen taken

Organs/tissues: brain, muscle, heart, liver, lung, kidneys, spleen, adrenal glands, thyroid glands, placenta.

##### Case definition

Laboratory diagnosis is based on demonstration of typical cysts in tissues examined histologically during routine necropsy, when necessary other methods are used for confirmation (immunohistochemistry, PCR).

##### Diagnostic/analytical methods used

Laboratory diagnosis is based on demonstration of typical cysts in tissues examined histologically during routine necropsy, when necessary other methods are used for confirmation (immunohistochemistry, PCR).

#### Measures in case of the positive findings or single cases

None

#### Notification system in place

Toxoplasma gondii is a notifiable disease in all animals except hares, rabbits and rodents.

Table Toxoplasma in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Analytical Method	Sampling unit	Units tested	Total units positive for Toxoplasma	T. gondii	Toxoplasma spp., unspecified
Sheep - at farm - Clinical investigations	1)	Evira	Unspecified	Not applicable	animal sample	Domestic	Histology	Animal	166	0	
Goats - at farm - Clinical investigations	2)	Evira	Unspecified	Not applicable	animal sample	Domestic	Histology	Animal	21	0	
Dogs - Clinical investigations	3)	Evira	Unspecified	Not applicable	animal sample	Domestic	Histology	Animal	739	0	
Cats - Clinical investigations	4)	Evira	Unspecified	Not applicable	animal sample	Domestic	Histology	Animal	335	4	4
Finches - unspecified - Clinical investigations	5)	Evira	Unspecified	Not applicable	animal sample	Domestic	Histology	Animal	5	2	2
Hares - unspecified - Clinical investigations	6)	Evira	Unspecified	Not applicable	animal sample	Domestic	Histology	Animal	96	10	10

## Comments:

- 1) Also IHC & PCR  
 2) Also IHC & PCR  
 3) Also IHC & PCR  
 4) Also IHC & PCR  
 5) Also IHC & PCR  
 6) Also IHC & PCR

## 2.11 RABIES

### 2.11.1 General evaluation of the national situation

#### A. Rabies general evaluation

##### History of the disease and/or infection in the country

Rabies was common in the Finnish dog population at the beginning of the 20th century but the disease was eradicated from the country by vaccinating local dog populations during the 1950's. In April 1988, a local spot of essentially sylvatic rabies was discovered in south-eastern Finland. Between April 1988 and February 1989 a total of 66 virologically verified cases were recorded within a geographical area of 1 700 km<sup>2</sup>. As a first measure the local dog population in the area, some 8 000 animals, were vaccinated against rabies at the expense of the state. At the same time it was also highly recommended to vaccinate all the other dogs. In co-operation with the WHO surveillance centre in Tübingen, Germany, a field campaign of oral vaccination of raccoon dogs and foxes was started in September 1988. During four distribution operations, the last one in the autumn 1990, a total of 200 000 Tübingen baits were distributed. In accordance with the WHO standards, Finland was declared rabies free in March 1991 after two years with no cases of rabies.

Rabies in bats was suspected for the first time in 1985 when a bat researcher died. He had handled bats in several countries during the previous year and it could not be concluded where the researcher had become infected. Despite an epidemiological study in bats 1986 and subsequent rabies surveillance, bat rabies was not detected until 2009. The European Bat Lyssavirus-2 (EBLV-2) was isolated from the bat.

##### National evaluation of the recent situation, the trends and sources of infection

Finland is rabies-free country since 1991, except two import cases (a horse from Estonia in 2003 and a dog from India in 2007) and rabies in bats, but those cases do not affect to the rabies-free status of Finland. However, the infection pressure in wild carnivores species in Russia is high and it poses a continuous risk for the reintroduction of the disease. The present control of wildlife rabies appears successful and important. Rabies in bats and the import of animals from endemic areas, however, remains a risk, which can be reduced by increasing public awareness of the disease.

##### Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases (as a source of infection)

Two cases of EBLV-2 infection in humans have been confirmed, one in Finland and one in the UK, both were bat researchers. However, the health risk to the general public, which has little contact with bats, is low. As no sylvatic rabies cases were detected, the risk for humans is very low at this moment. Currently the infection pressure in wild carnivores species in Russia is, however, high and it poses a continuous risk for the reintroduction of the disease. There might be a risk for the introduction of rabies through imported animals which could also pose a risk for humans.

##### Recent actions taken to control the zoonoses

Rabies bait vaccination campaigns for wildlife have been continued along the south eastern border against Russia. Since 2004 distribution is carried out biannually, in spring and in autumn. Continuous surveillance and monitoring for rabies is carried out by Evira in Finland. Dogs that are used in hunting, guide dogs, sniffer dogs, and dogs that are used by the police, the frontier guard and the army must be vaccinated against rabies.

### Suggestions to the European Union for the actions to be taken

Oral vaccination campaigns and control program should be continued annually

## 2.11.2 Lyssavirus (rabies) in animals

### A. Rabies in dogs

#### Monitoring system

##### Sampling strategy

The monitoring of rabies in pets is based on the detection of clinical signs, background information, and laboratory testing.

##### Frequency of the sampling

On suspicion

##### Type of specimen taken

brains

##### Methods of sampling (description of sampling techniques)

Thalamus, pons and medulla

##### Case definition

When the cell culture (and/or RT-PCR test) is positive.

##### Diagnostic/analytical methods used

FAT, cell culture (and RT-PCR, sequencing)

#### Vaccination policy

Vaccination against rabies is recommended for all dogs and cats. Dogs that are used in hunting, guide dogs, sniffer dogs, and dogs that are used by the police, the frontier guard and the army must be vaccinated against rabies (Decision No 9/EEO/1999, 12.5.1999). Dogs, cats and ferrets entering Finland shall be vaccinated against rabies in accordance with the Regulation (EC) No 998/2003 of the European Parliament and of the Council.

#### Other preventive measures than vaccination in place

Infected animals will be destroyed.

#### Control program/mechanisms

##### The control program/strategies in place

The measures for control of rabies are in the Decision No 9/EEO/1999 of the Veterinary and Food Department (12 May 1999) including investigation of all suspected cases by the veterinary authorities, notification procedures and vaccination. In case of suspicion the animal must be isolated for two weeks or killed and sent to Evira for laboratory analysis.

#### Measures in case of the positive findings or single cases

Epidemiological studies and information campaigns will be started. Infected animals will be destroyed and measures taken to prevent further cases.

#### Notification system in place

According to the Finnish legislation rabies has been notifiable and controlled since 1922 (Act 338/22, 29 Dec 1922). Rabies is classified as a dangerous animal disease according to Decision No 1346/1995 of the Veterinary and Food Department (28 Nov 1995).

### Results of the investigation

In 2012, 24 dogs were investigated, all with negative results.

### National evaluation of the recent situation, the trends and sources of infection

Indigenous rabies has not been detected in dogs since 1988. Illegal import of pet animals could pose a risk for the introduction of rabies.



## B. Rabies virus in animal - Wildlife

### Monitoring system

#### Sampling strategy

Sampling is a part of permanent monitoring scheme. Wild animals that are found dead in the nature and suspected animals are sent to the Finnish Food Safety Authority Evira for examination free of charge. The tests carried out include an examination for rabies. Samples are sent by local veterinarians, hunters etc. The efficacy of rabies oral vaccination campaigns are evaluated by measuring the antibody response and bait uptake after vaccination in small carnivores, which are sent to Evira from the vaccination area.

#### Frequency of the sampling

Random, about 500 animals per year.

#### Type of specimen taken

brains, blood, teeth / bone of the jaw

#### Case definition

Samples are considered positive if the cell culture (and/or RT-PCR) test is positive.

#### Diagnostic/analytical methods used

FAT. Cell culture (and RT-PCR) if the animal has bitten a human or other animal or is suspected.

### Vaccination policy

An annual programme for the immunisation of wild carnivores is carried out since 1989 in the south eastern border area. In 2011, 80 000 bait vaccines were distributed aerially in April-May and 180 000 vaccines in September-October over a 20-40 km wide and 450 km long zone along the south eastern border against Russia. In 2012, 180 000 baits were delivered in the spring and 180 000 baits in the autumn.

### Control program/mechanisms

#### The control program/strategies in place

The measures for control of rabies are in the Decision No 9/EEO/1999 of the Veterinary and Food Department (12 May 1999) including post mortem examination of wildlife found dead in the nature and investigations of all suspected cases in Evira.

#### Recent actions taken to control the zoonoses

Since 2004 bait vaccine distribution is carried out biannually, in spring and in autumn.

### Measures in case of the positive findings or single cases

Epidemiological studies and information campaigns will be started. Infected animals will be destroyed and measures taken to prevent further cases.

### Notification system in place

According to the Finnish legislation rabies has been notifiable and controlled since 1922 (Act 338/22, 29 Dec 1922). Rabies is classified as a dangerous animal disease according to Decision No 1346/1995 of the Veterinary and Food Department (28 Nov 1995).

### Results of the investigation

In 2012 a total of 672 wild animals were examined for rabies, rabies was not detected in these samples.

### National evaluation of the recent situation, the trends and sources of infection

No indigenous sylvatic rabies cases (genotype 1) have been found after February 1989. The infection pressure in wild carnivores in Russia is however high and it poses a risk for the reintroduction of the

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disease.

Table Rabies in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Region	Units tested	Total units positive for Lyssavirus (rabies)	Rabies virus (RABV)	EBLV-1
Solipeds, domestic	Evira	Suspect sampling	Official sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	1	0		
Bats - wild - Monitoring	Evira	Suspect sampling	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	32	0		
Foxes - wild - Monitoring	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	155	0		
Raccoon dogs - wild - Monitoring	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	248	0		
Wolves - wild - Monitoring	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	30	0		
Badgers - wild - from hunting - Surveillance	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	13	0		
Bears - wild	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	5	0		
Cats - pet animals	Evira	Suspect sampling	Official sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	11	0		
Dogs - pet animals	Evira	Suspect sampling	Official sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	24	0		
Lynx - wild	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	127	0		
Marten - wild	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	23	0		

Table Rabies in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Region	Units tested	Total units positive for Lyssavirus (rabies)	Rabies virus (RABV)	EBLV-1
Minks - wild	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	19	0		
Other carnivores - wild	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	1	0		
Otter - wild	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	12	0		
Polecats - wild	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	4	0		
Squirrels - wild	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	1	0		
Wolverine - wild	Evira	Census	Official and industry sampling	animal sample > brain	Domestic	Animal	Suomi / Finland	2	0		

	EBLV-2	Lyssavirus (unspecified virus)
Solipeds, domestic		
Bats - wild - Monitoring		
Foxes - wild - Monitoring		
Raccoon dogs - wild - Monitoring		
Wolves - wild - Monitoring		
Badgers - wild - from hunting - Surveillance		

Table Rabies in animals

	EBLV-2	Lyssavirus (unspecified virus)
Bears - wild		
Cats - pet animals		
Dogs - pet animals		
Lynx - wild		
Marten - wild		
Minks - wild		
Other carnivores - wild		
Otter - wild		
Polecats - wild		
Squirrels - wild		
Wolverine - wild		

## 2.12 STAPHYLOCOCCUS INFECTION

### 2.12.1 General evaluation of the national situation

### 2.12.2 Staphylococcus in animals

#### A. Staphylococcus in Animals

##### Monitoring system

###### Sampling strategy

Sampling was based on a decree 3/EEO/2011 of Ministry of Agriculture and Forestry. The samples were taken from all 68 pig breeding holdings which had the special pathogen-free (SPF) certification from the Association for Animal Disease Prevention ETT ra. The SPF holdings observe more extensive sanitary measures than ordinary holdings. The samples were taken on the farms by the local municipal veterinarians.

###### Frequency of the sampling

Every holding was sampled once between October 2011 and March 2013.

###### Type of specimen taken

Nasal swabs from 60 randomly selected pigs per holding. Boot swabs from every unit of the holding.

###### Diagnostic/analytical methods used

MRSA isolation according to the EURL-AR recommendations.

##### Vaccination policy

No vaccination

##### Other preventive measures than vaccination in place

No preventive measures (not a notifiable disease)

##### Control program/mechanisms

###### The control program/strategies in place

Biosecurity measures in animal sheds, recommendations to prevent and control MRSA infections in animals given by Evira in 2010.

##### Measures in case of the positive findings or single cases

Information of the owners, respective municipal and district veterinarians

##### Results of the investigation

None of the holdings were positive for the MRSA.

##### National evaluation of the recent situation, the trends and sources of infection

The MRSA situation in the SPF holdings seems favorable. However, earlier MRSA findings in 2009-2010 indicate that MRSA is present in other types of farms, e.g. finishing or farrow-to-finish farms, in Finland.

Table Staphylococcus in Animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Sampling unit	Sample weight	Units tested	Total units positive for Staphylococcus	S. aureus, methicillin resistant (MRSA)	S. aureus, methicillin resistant (MRSA) - spa-type t011
Pigs - breeding animals - at farm - Survey - national survey	Evira	Census	Official sampling	animal sample > nasal swab	Domestic	Holding		68	0		
Pigs - breeding animals - at farm - Survey - national survey	Evira	Census	Official sampling	environmental sample > boot swabs	Domestic	Holding		68	0		
										S. aureus, methicillin resistant (MRSA) - spa-type t108	S. aureus, methicillin resistant (MRSA) - spa-type t034
Pigs - breeding animals - at farm - Survey - national survey											
Pigs - breeding animals - at farm - Survey - national survey											

Footnote:

Only the prevalence of methicillin-resistant Staphylococcus aureus was studied in pig breeding farms with a special pathogen-free (SPF) certificate.

## 2.13 Q-FEVER

### 2.13.1 General evaluation of the national situation

#### A. Coxiella burnetii (Q-fever) general evaluation

##### History of the disease and/or infection in the country

No domestic human cases have ever been detected in Finland. Testing of farm animals for Q-fever has taken place earlier only in connection with export. Related to export, *C. burnetii* antibodies were found in Finland for the first time, in 2008, in bovine animals at one dairy farm. No clinical cases were detected at this farm. After that surveys have been conducted to study the prevalence of *C. burnetii* antibodies in dairy cattle, as well as in the goat and sheep population. There has never been reported suspicion for Q-fever in animals based on disease symptoms. After 2008 passive surveillance has been in place by testing of sheep, goats and bovine animals due to abortion.

##### National evaluation of the recent situation, the trends and sources of infection

The relevance seems to be negligible both to humans and animals.



## 2.13.2 Coxiella (Q-fever) in animals

### A. C. burnetii in animal

#### Monitoring system

##### Sampling strategy

1. Clinical suspicion due to abortions: bovine, sheep and goats
2. Export purposes

##### Frequency of the sampling

1. and 2. Continuous;

##### Type of specimen taken

serum

##### Methods of sampling (description of sampling techniques)

1. and 2. Samples are taken from living animals at farm;

##### Case definition

The animal is seropositive if ELISA test is positive

##### Diagnostic/analytical methods used

ELISA-test

Detection of the agent by PCR

#### Control program/mechanisms

##### The control program/strategies in place

Q-fever is classified as immediately notifiable other disease under zoonosis in the national legislation

#### Notification system in place

Immediately notifiable since 1995.

#### Results of the investigation

During year 2012 293 cattle from 65 farms, 8 sheep from 2 farms were tested, all animals except one with negative results. One cattle tested due to export was seropositive, but the animal hadn't symptoms of disease and no clinical cases were detected at the farm.

#### National evaluation of the recent situation, the trends and sources of infection

There is low prevalence (0,2% in 2010) of Q-fever antibodies in bulk milk of dairy cattle, and Q-fever antibodies have never been detected in sheep and goats.

In 2011 a survey for antibodies in sheep and goats was conducted. Around 6,6% of all the sheep and 16,7% of all goat herds in Finland was included in the survey and all tested samples were negative.

#### Additional information



Table *Coxiella burnetii* (Q fever) in animals

	Source of information	Sampling strategy	Sampler	Sample type	Sample origin	Analytical Method	Sampling unit	Units tested	Total units positive for <i>Coxiella</i> (Q-fever)	<i>C. burnetii</i>	No of clinically affected herds
Cattle (bovine animals) - at farm - Clinical investigations	Evira	Suspect sampling	Official sampling	animal sample > blood	Domestic	ELISA	Animal	292	0		0
Cattle (bovine animals) - at farm - Monitoring	Evira	Objective sampling	Industry sampling	animal sample > blood	Domestic	ELISA	Animal	1	1	1	0
Sheep - at farm - Clinical investigations	Evira	Suspect sampling	Official sampling	animal sample > blood	Domestic	ELISA	Animal	8	0		0

## 2.14 WEST NILE VIRUS INFECTIONS

### 2.14.1 General evaluation of the national situation

### 3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE

## 3.1 ESCHERICHIA COLI, NON-PATHOGENIC

### 3.1.1 General evaluation of the national situation

#### A. Escherichia coli general evaluation

##### History of the disease and/or infection in the country

Monitoring of antimicrobial resistance in indicator Escherichia coli from cattle, pigs and broilers is a part of the FINRES-Vet monitoring programme (Finnish Veterinary Antimicrobial Resistance Monitoring and Consumption of Antimicrobial Agents). One animal species per year is included in the programme. In 2012 the target species was cattle (bovine animals).

##### National evaluation of the recent situation, the trends and sources of infection

According to the results of the FINRES-Vet programme prevalence of antimicrobial resistance in indicator E. coli from cattle has been low.

### 3.1.2 Antimicrobial resistance in *Escherichia coli*, non-pathogenic

#### A. Antimicrobial resistance of *E.coli*, non-pathogenic, unspecified in Animals Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring

##### Sampling strategy used in monitoring

###### Frequency of the sampling

Samples originate from the FINRES-Vet Programme (Finnish Veterinary Antimicrobial Resistance Monitoring and Consumption of Antimicrobial Agents). In 2012 bacteria were isolated from healthy cattle.

###### Type of specimen taken

Faeces

###### Methods of sampling (description of sampling techniques)

The number of samples was 330. If two *E.coli* were isolated from the same sample, only one was tested for susceptibility. The total number of *E.coli* isolates was 295.

###### Procedures for the selection of isolates for antimicrobial testing

One isolate *E.coli* from each sample, if available, was tested for antimicrobial susceptibility.

###### Methods used for collecting data

Isolation and antimicrobial susceptibility testing was performed by the Finnish Food Safety Authority Evira.

##### Laboratory methodology used for identification of the microbial isolates

The sample was diluted in peptone-saline broth; after mixing, of the suspension was spread on Brilliance™ *E.coli*/Coliform Selective Agar (Oxoid) and incubated overnight at 37°C. One purple colony per sample was randomly selected for susceptibility testing.

##### Laboratory used for detection for resistance

###### Antimicrobials included in monitoring

VetMIC broth microdilution method (Department of Antibiotics, National Veterinary Institute, Sweden) was used and the testing performed according to the CLSI standards; *Escherichia coli* ATCC 25922 was used as a quality control strain. The antimicrobials tested are listed in the tables.

###### Cut-off values used in testing

If available, cut-off values recommended by the EUCAST were primarily used with the exception of ciprofloxacin, for which a higher cut-off value was used.

##### Preventive measures in place

No preventive measures are applied to indicator bacteria from healthy animals.

##### Results of the investigation

Overall prevalence of resistance was low or very low to many of the antibiotics tested and 91% of the isolates were fully susceptible.

##### National evaluation of the recent situation, the trends and sources of infection

According to the results of the FINRES-Vet programme the prevalence of antimicrobial resistance in indicator *E.coli* has been low. This trend continues in 2012.

Table Antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces

Escherichia coli, non-pathogenic  Isolates out of a monitoring program (yes/no)  Number of isolates available in the laboratory	E.coli, non-pathogenic, unspecified	
	yes	
	295	
Antimicrobials:	N	n
Aminoglycosides - Gentamicin	295	1
Aminoglycosides - Kanamycin	295	8
Aminoglycosides - Streptomycin	295	16
Amphenicols - Chloramphenicol	295	0
Amphenicols - Florfenicol	295	0
Cephalosporins - Cefotaxime	295	0
Fluoroquinolones - Ciprofloxacin	295	1
Penicillins - Ampicillin	295	5
Quinolones - Nalidixic acid	295	0
Sulfonamides	295	10
Tetracyclines - Tetracycline	295	7
Trimethoprim	295	4
Fully sensitive	295	268
Polymyxins - Colistin	295	0
Resistant to 1 antimicrobial	295	14
Resistant to 2 antimicrobials	295	4
Resistant to 3 antimicrobials	295	7
Resistant to 4 antimicrobials	295	2



**Table Antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces**

Escherichia coli, non-pathogenic	E.coli, non-pathogenic, unspecified	
	Isolates out of a monitoring program (yes/no)	yes
Number of isolates available in the laboratory	295	
<b>Antimicrobials:</b>	N	n
Resistant to >4 antimicrobials	295	0

**Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

E.coli, non-pathogenic, unspecified  Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring																										
	yes																										
	295																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	2	295	1										37	225	32	1											
Aminoglycosides - Kanamycin	8	295	8														287	8									
Aminoglycosides - Streptomycin	16	295	16													17	203	59		1	5	5	5				
Amphenicols - Chloramphenicol	16	295	0												5	122	166	2									
Amphenicols - Florfenicol	16	295	0													89	192	14									
Cephalosporins - Cefotaxime	0.25	295	0						16	189	87	3															
Fluoroquinolones - Ciprofloxacin	0.06	295	1					3	122	169	1																
Penicillins - Ampicillin	8	295	5											42	196	52						5					
Quinolones - Nalidixic acid	16	295	0											4	111	177	3										
Sulfonamides	256	295	10														283	1	1								10
Tetracyclines - Tetracycline	8	295	7											145	136	7				5	2						
Trimethoprim	2	295	4								2	39	137	105	8				4								
Polymyxins - Colistin	2	295	0										217	73	5												

**Table Antimicrobial susceptibility testing of E.coli, non-pathogenic, unspecified in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

E.coli, non-pathogenic, unspecified	Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring	
	Isolates out of a monitoring program (yes/no)	
	Number of isolates available in the laboratory	
	yes	
	295	
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	0.12	16
Aminoglycosides - Kanamycin	8	16
Aminoglycosides - Streptomycin	2	256
Amphenicols - Chloramphenicol	2	64
Amphenicols - Florfenicol	4	32
Cephalosporins - Cefotaxime	0.016	2
Fluoroquinolones - Ciprofloxacin	0.008	1
Penicillins - Ampicillin	1	128
Quinolones - Nalidixic acid	1	128
Sulfonamides	8	1024
Tetracyclines - Tetracycline	1	128
Trimethoprim	0.12	16
Polymyxins - Colistin	0.5	4

Table Cut-off values used for antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Animals

Test Method Used	Standard methods used for testing
Broth dilution	NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin	EFSA	2	
	Kanamycin		8	
	Streptomycin	EFSA	16	
Amphenicols	Chloramphenicol	EFSA	16	
	Florfenicol		16	
Cephalosporins	Cefotaxime	EFSA	0.25	
Fluoroquinolones	Ciprofloxacin	NON-EFSA	0.06	
Penicillins	Ampicillin	EFSA	8	
Quinolones	Nalidixic acid	EFSA	16	
Sulfonamides	Sulfonamides	EFSA	256	
Tetracyclines	Tetracycline	EFSA	8	
Trimethoprim	Trimethoprim	EFSA	2	
Polymyxins	Colistin		2	

Table Cut-off values used for antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Animals

Table Cut-off values used for antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Feed

Test Method Used		Standard methods used for testing		

  

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		16	
Amphenicols	Chloramphenicol		16	
Cephalosporins	Cefotaxime		0.25	
Fluoroquinolones	Ciprofloxacin		0.03	
Penicillins	Ampicillin		8	
Quinolones	Nalidixic acid		16	
Sulfonamides	Sulfonamides		256	
Tetracyclines	Tetracycline		8	
Trimethoprim	Trimethoprim		2	

Table Cut-off values used for antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Food

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		2	
	Streptomycin		16	
Amphenicols	Chloramphenicol		16	
Cephalosporins	Cefotaxime		0.25	
Fluoroquinolones	Ciprofloxacin		0.03	
Penicillins	Ampicillin		8	
Quinolones	Nalidixic acid		16	
Sulfonamides	Sulfonamides		256	
Tetracyclines	Tetracycline		8	
Trimethoprim	Trimethoprim		2	

## 3.2 ENTEROCOCCUS, NON-PATHOGENIC

### 3.2.1 General evaluation of the national situation

### 3.2.2 Antimicrobial resistance in Enterococcus, non-pathogenic isolates

#### A. Antimicrobial resistance of E. faecalis in Animals Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring

##### Sampling strategy used in monitoring

###### Frequency of the sampling

Samples originate from the FINRES-Vet Programme (Finnish Veterinary Antimicrobial Resistance Monitoring and Consumption of Antimicrobial Agents). In 2012 bacteria were isolated from healthy cattle.

###### Type of specimen taken

Faeces

###### Methods of sampling (description of sampling techniques)

The number of samples was 330. If two E.faecalis were isolated from the same sample, only one was tested for susceptibility. The total number of E.faecalis isolates was 93.

###### Procedures for the selection of isolates for antimicrobial testing

One isolate E.faecalis and E.faecium from each sample, if available, was tested for antimicrobial susceptibility.

###### Methods used for collecting data

Isolation and antimicrobial susceptibility testing was performed in Evira.

##### Laboratory methodology used for identification of the microbial isolates

Isolation of enterococci: dilution in peptone-saline broth. Cultivation on Slanetz-Bartley agar and incubation at  $37.0 \pm 1.0^\circ\text{C}$  /  $48 \pm 4$  h. One or two randomly chosen typical colonies were sub-cultured on bile-esculine agar and blood agar ( $37.0 \pm 1.0^\circ\text{C}$  / overnight). Colonies with a positive esculine reaction were further identified as E.faecium or E.faecalis with a mannitol plate test and by pcr (Dutka-Malen et al. 1996).

##### Laboratory used for detection for resistance

###### Antimicrobials included in monitoring

VetMIC broth microdilution method (Department of Antibiotics, National Veterinary Institute, Sweden) was used and the testing performed according to the CLSI standards; Enterococcus faecalis ATCC 29212 was used as a quality control strain. The antimicrobials tested are listed in the tables.

###### Cut-off values used in testing

If available, cut-off values recommended by the EUCAST were used.

##### Preventive measures in place

No preventive measures are in place regarding indicator bacteria from healthy animals.

##### Results of the investigation

Overall, resistance among E.faecalis strains was in favourable level. No or low resistance was found to the majority of the antimicrobials tested. Resistance to erythromycin that had been the most common resistant trait in E.faecalis before had now decreased from 20 to only 2 %.



### National evaluation of the recent situation, the trends and sources of infection

According to the results of the FINRES-Vet programme, the resistance levels in indicator enterococci from cattle in 2012 have remained almost at the same level than in previous years.

## B. Antimicrobial resistance of E. faecium in Animals Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring

### Sampling strategy used in monitoring

#### Frequency of the sampling

Samples originate from the FINRES-Vet Programme (Finnish Veterinary Antimicrobial Resistance Monitoring and Consumption of Antimicrobial Agents). In 2012 bacteria were isolated from healthy cattle.

#### Type of specimen taken

Faeces

#### Methods of sampling (description of sampling techniques)

The number of samples was 330. If two *E. faecium* were isolated from the same sample, only one was tested for susceptibility. The total number of *E. faecium* isolates was 155.

#### Procedures for the selection of isolates for antimicrobial testing

One isolate *E. faecalis* and *E. faecium* from each sample, if available, was tested for antimicrobial susceptibility.

#### Methods used for collecting data

Isolation and antimicrobial susceptibility testing was performed in Evira.

### Laboratory methodology used for identification of the microbial isolates

Isolation of enterococci: dilution in peptone-saline broth. Cultivation on Slanetz-Bartley agar and incubation at  $37.0 \pm 1.0^\circ\text{C}$  /  $48 \pm 4$  h. One or two randomly chosen typical colonies were sub-cultured on bile-esculine agar and blood agar ( $37.0 \pm 1.0^\circ\text{C}$  / overnight). Colonies with a positive esculine reaction were further identified as *E. faecium* or *E. faecalis* with a mannitol plate test and by pcr (Dutka-Malen et al. 1996).

### Laboratory used for detection for resistance

#### Antimicrobials included in monitoring

VetMIC broth microdilution method (Department of Antibiotics, National Veterinary Institute, Sweden) was used and the testing performed according to the CLSI standards; *Enterococcus faecalis* ATCC 29212 was used as a quality control strain. The antimicrobials tested are listed in the tables.

#### Cut-off values used in testing

If available, cut-off values recommended by the EUCAST were used.

### Preventive measures in place

No preventive measures are in place regarding indicator bacteria from healthy animals.

### Results of the investigation

Overall, resistance among *E. faecium* strains was in favourable level. No or low resistance was found to the majority of the antimicrobials tested. Resistance to erythromycine was the most common resistant trait in *E. faecium* (39 %). Not a single vancomycin resistant isolate of *E. faecium* was found.

### National evaluation of the recent situation, the trends and sources of infection

According to the results of the FINRES-Vet programme, the resistance levels in indicator enterococci from cattle in 2012 have remained almost at the same level than in previous years. Its worth noticing though that no VRE strains were isolated year 2012.

**Table Antimicrobial susceptibility testing of Enterococcus, non-pathogenic in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces**

Enterococcus, non-pathogenic  Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	E. faecalis		E. faecium	
	yes		yes	
	93		155	
Antimicrobials:	N	n	N	n
Aminoglycosides - Gentamicin	93	0	155	1
Aminoglycosides - Kanamycin	93	0	155	0
Aminoglycosides - Streptomycin	93	3	155	1
Amphenicols - Chloramphenicol	93	0	155	0
Penicillins - Ampicillin	93	0	155	0
Tetracyclines - Tetracycline	93	11	155	9
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	93	3	155	4
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	93	0	155	0
Ionophores - Narasin	93	0	155	0
Macrolides - Erythromycin	93	2	155	61
Oxazolidines - Linezolid	93	0	155	0
Resistant to 1 antimicrobial	93	13	155	70
Resistant to 2 antimicrobials	93	3	155	3
Resistant to 3 antimicrobials	93	0	155	0
Resistant to 4 antimicrobials	93	0	155	0
Resistant to >4 antimicrobials	93	0	155	0
Streptogramins - Virginiamycin	93	0	155	1

Table Antimicrobial susceptibility testing of Enterococcus, non-pathogenic in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces

**Table Antimicrobial susceptibility testing of *E. faecalis* in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

E. faecalis	Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring																										
	yes																										
	93																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	32	93	0														16	71	6								
Aminoglycosides - Kanamycin	1024	93	0																7	68	16	1	1				
Aminoglycosides - Streptomycin	512	93	3																2	10	69	9					3
Amphenicols - Chloramphenicol	32	93	0													18	73	2									
Penicillins - Ampicillin	4	93	0										17	76													
Tetracyclines - Tetracycline	2	93	11										58	24				5	6								
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	32	93	3													9	45	35	1			3					
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	4	93	0											22	69	2											
Ionophores - Narasin	2	93	0								8	61	24														
Macrolides - Erythromycin	4	93	2										17	26	28	20	2										
Oxazolidines - Linezolid	4	93	0											5	81	7											
Streptogramins - Virginiamycin	32	93	0										2	1	2	3	32	50	3								

**Table Antimicrobial susceptibility testing of *E. faecalis* in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

E. faecalis	Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring	
	Isolates out of a monitoring program (yes/no)	yes
	Number of isolates available in the laboratory	93
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	2	256
Aminoglycosides - Kanamycin	16	2048
Aminoglycosides - Streptomycin	8	1024
Amphenicols - Chloramphenicol	0.5	64
Penicillins - Ampicillin	0.25	32
Tetracyclines - Tetracycline	0.5	64
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	1	128
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	128
Ionophores - Narasin	0.12	16
Macrolides - Erythromycin	0.5	64
Oxazolidines - Linezolid	0.5	16
Streptogramins - Virginiamycin	0.5	64

**Table Antimicrobial susceptibility testing of *E. faecium* in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

Concentration (µg/ml), number of isolates with a concentration of inhibition equal to

E. faecium	Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring																										
	Isolates out of a monitoring program (yes/no)																										
	Number of isolates available in the laboratory																										
Antimicrobials:	Cut-off value	N	n	<=0.002	<=0.004	0.008	0.015	0.016	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	>4096	1024	2048	
Aminoglycosides - Gentamicin	32	155	1												1	15	98	38	2	1							
Aminoglycosides - Kanamycin	1024	155	0																3	42	65	32	13				
Aminoglycosides - Streptomycin	128	155	1														1		41	77	35	1					
Amphenicols - Chloramphenicol	32	155	0												1	63	84	7									
Penicillins - Ampicillin	4	155	0									8	23	99	25												
Tetracyclines - Tetracycline	2	155	10										140	5		1			4	5							
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	32	155	4											2		3	33	61	52	3		1					
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	4	155	0											125	26	4											
Ionophores - Narasin	4	155	0									23	97	34	1												
Macrolides - Erythromycin	4	155	61										23	5	13	53	38	22	1								
Oxazolidines - Linezolid	4	155	0											2	81	72											
Streptogramins - Virginiamycin	4	155	1										50	32	64	8	1										

**Table Antimicrobial susceptibility testing of *E. faecium* in Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring - Objective sampling - Official sampling - animal sample - faeces - quantitative data [Dilution method]**

E. faecium	Cattle (bovine animals) - mixed herds - at slaughterhouse - Monitoring	
	Isolates out of a monitoring program (yes/no)	yes
	Number of isolates available in the laboratory	155
Antimicrobials:	lowest	highest
Aminoglycosides - Gentamicin	2	256
Aminoglycosides - Kanamycin	16	2048
Aminoglycosides - Streptomycin	8	1024
Amphenicols - Chloramphenicol	0.5	64
Penicillins - Ampicillin	0.25	32
Tetracyclines - Tetracycline	0.5	64
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	1	128
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	1	128
Ionophores - Narasin	0.12	16
Macrolides - Erythromycin	0.5	64
Oxazolidines - Linezolid	0.5	16
Streptogramins - Virginiamycin	8	1024



Table Cut-off values for antibiotic resistance of *E. faecalis* in Animals

Test Method Used	Standard methods used for testing
Broth dilution	NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin	EFSA	32	
	Streptomycin	EFSA	512	
	Kanamycin		1024	
Amphenicols	Chloramphenicol	EFSA	32	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin	EFSA	4	
	Bacitracin		32	
Macrolides	Erythromycin	EFSA	4	
Oxazolidines	Linezolid	EFSA	4	
Penicillins	Ampicillin	EFSA	4	
Streptogramins	Quinupristin/Dalfopristin	EFSA	32	
	Virginiamycin		32	
Tetracyclines	Tetracycline	EFSA	2	
Ionophores	Narasin		2	

Table Cut-off values for antibiotic resistance of E. faecalis in Animals

Table Cut-off values for antibiotic resistance of E. faecalis in Feed

Test Method Used

Standard methods used for testing

		Concentration (microg/ml)		Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		512	
Amphenicols	Chloramphenicol		32	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	
Streptogramins	Quinupristin/Dalfopristin		32	
Tetracyclines	Tetracycline		2	

Table Cut-off values for antibiotic resistance of E. faecalis in Food

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		512	
Amphenicols	Chloramphenicol		32	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	
Streptogramins	Quinupristin/Dalfopristin		32	
Tetracyclines	Tetracycline		2	

Table Cut-off values for antibiotic resistance of *E. faecium* in Animals

Test Method Used	Standard methods used for testing
Broth dilution	NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin	EFSA	32	
	Streptomycin	EFSA	128	
	Kanamycin		1024	
Amphenicols	Chloramphenicol	EFSA	32	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin	EFSA	4	
	Bacitracin		32	
Macrolides	Erythromycin	EFSA	4	
Oxazolidines	Linezolid	EFSA	4	
Penicillins	Ampicillin	EFSA	4	
Streptogramins	Quinupristin/Dalfopristin	EFSA	1	
	Virginiamycin		4	
Tetracyclines	Tetracycline	EFSA	2	
Ionophores	Narasin		4	

Table Cut-off values for antibiotic resistance of E. faecium in Animals

Table Cut-off values for antibiotic resistance of *E. faecium* in Feed

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		128	
Amphenicols	Chloramphenicol		32	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	
Streptogramins	Quinupristin/Dalfopristin		1	
Tetracyclines	Tetracycline		2	

Table Cut-off values for antibiotic resistance of E. faecium in Food

Test Method Used

Standard methods used for testing

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Gentamicin		32	
	Streptomycin		128	
Amphenicols	Chloramphenicol		32	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Oxazolidines	Linezolid		4	
Penicillins	Ampicillin		4	
Streptogramins	Quinupristin/Dalfopristin		1	
Tetracyclines	Tetracycline		2	



## 4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS

## 4.1 ENTEROBACTER SAKAZAKII

4.1.1 General evaluation of the national situation

## 4.2 HISTAMINE

4.2.1 General evaluation of the national situation

## 4.3 STAPHYLOCOCCAL ENTEROTOXINS

4.3.1 General evaluation of the national situation

## 5. FOODBORNE

Foodborne outbreaks are incidences of two or more human cases of the same disease or infection where the cases are linked or are probably linked to the same food source. Situation, in which the observed human cases exceed the expected number of cases and where a same food source is suspected, is also indicative of a foodborne outbreak.

## A. Foodborne outbreaks

### System in place for identification, epidemiological investigations and reporting of foodborne outbreaks

Systematic collection of information about foodborne outbreaks in Finland began in 1975. The local food control and health officials are responsible for investigating and reporting the food poisoning outbreaks in their area. Collection of information takes place on the basis of the Food Act (23/2006), the Health Protection Act (763/1994), the Communicable Disease Act (583/86), the Decree (1365/2011) concerning the follow-up and reporting of food poisoning and foodborne infections and the Communicable Diseases Decree (786/86). Physicians have to notify all cases of communicable diseases to the National Institute for Health and Welfare (THL). The data is recorded in the National Infectious Diseases Register in Finland. The municipality local outbreak investigation group has to notify THL in case an outbreak is suspected. The municipality local outbreak investigation groups are responsible for investigation of every suspected food- and waterborne outbreak and for its reporting to the Finnish Food Safety Authority Evira. The notification and final investigation reports are submitted by an electronic reporting system, which provides the data simultaneously to all relevant authorities involved in or supporting the outbreak investigation. The system also stores the data in the National Food Poisoning Register. The system has been in use from the beginning of 2010. Evira evaluates each final municipal report in co-operation with THL in order to classify the outbreaks based on the strength of evidence. The data is recorded in the National Food Poisoning Register and a national summary report on outbreaks is published by Evira. There have not been any major differences in the reporting activity at the national level compared to previous years. By the introduction of the new electronic reporting system, the pick lists used for the collection of data into the National Food Poisoning Register have been harmonized according to data collection on EU level by EFSA.

### Description of the types of outbreaks covered by the reporting:

All general domestic food- and waterborne outbreaks are to be reported in Finland. Illness of more than two persons from a single source is considered a cluster and a suspected outbreak. Sporadic cases (except for botulism) and infections acquired abroad are not included in the food poisoning register, whereas they are included in the infectious disease register. Family outbreaks are reported if commercial foodstuffs are suspected of being the source of illness or several persons are at risk. Obligatory reporting involves definite communicable diseases and traditional foodborne agents such as those causing intoxications.

### National evaluation of the reported outbreaks in the country:

#### Trends in numbers of outbreaks and numbers of human cases involved

In 2012, the municipal food control authorities notified 45 food- and water borne outbreaks, of which 43 were associated with food and two with drinking water. The total number of outbreaks decreased by 13 % compared to the previous year. The food poisoning notification and reporting system was revised in Finland in 1997. This improved the reporting of food poisoning and increased the number of outbreaks recorded. In 1997, twice the number of outbreaks was reported and in 1998 three times the number, compared to previous years throughout the 1990s. So far the highest number of 95 reported outbreaks was recorded in 1998. The criteria for classification of epidemics were developed further in 1998 and became based on the strength of evidence. Since then, the number of recorded outbreaks has been constantly lower compared to 1998. After 1998, the number of outbreaks decreased for five consecutive years. Since 2001, the number of annually reported outbreaks has fluctuated between 32 and 59 with a few year intervals. So far the lowest number of 32 outbreaks was recorded in 2007, being 66% less than in 1998. Most of the reported outbreaks are foodborne (87 % in 2011). The number of human cases follows the number of outbreaks varying from 1000 to 2000 disease cases annually. Usually about 50 % of the reported outbreaks have been medium size by number of cases per outbreak (11-100 persons

infected). A few large waterborne outbreaks with a very large number of human cases have been reported. Due to contaminated drinking water a total of 5350, 6809, 6445, and >8000 persons became ill in outbreaks in 1989, 1998, 2000, and 2008, respectively.

#### Relevance of the different causative agents, food categories and the agent/food category combinations

During the last ten years the most common reported causative agent was norovirus. In 2012 norovirus caused 12 (28%) foodborne outbreaks. *Cryptosporidium* caused the largest outbreak in several restaurants. *Listeria monocytogenes* caused one hospital outbreak and several single cases throughout Finland were linked to it by PFGE typing. EHEC caused one severe small outbreak. Classic food poisoning bacteria like *Bacillus cereus* (5), *Staphylococcus aureus* (2), *Salmonella* (2) and *Campylobacter* (4) from different sources caused 13 foodborne outbreaks. Copper and histamine caused one foodborne outbreak each. In 12 (28 %) of the foodborne outbreaks the causative agent remained unknown. In these cases however, the investigations showed descriptive epidemiological association between eating a certain food, meal or drinking water and becoming ill. The most common vehicle (33%) reported in 2012 was a buffet meal where no specific food item was determined as the cause of the outbreak. The investigations revealed a specific food to be the vehicle in only 22 (49 %) outbreaks. Of these, vegetables and juices and other products thereof and meat and meat products were the most common vehicles (5; 11 % each), whereas the second most common vehicle was milk (4; 9 %).

#### Relevance of the different type of places of food production and preparation in outbreaks

In 19 (42 %) outbreaks 2012, the place of exposure was a restaurant, followed by 10 outbreaks (22 %) households. In 24 (53 %) outbreaks the place of origin of problem was in a restaurant. Infected food handler caused 12 (27%) of the outbreaks and 100 % of the norovirus outbreaks. In 22 % of the outbreaks the factors contributing to food poisonings were connected with temperature abuse including inadequate cooling, inadequate heating or reheating and improper storage temperature of food.

#### Evaluation of the severity and clinical picture of the human cases

Altogether 1411 persons were reported to fall ill in food- and waterborne outbreaks, in 2012. The number of patients afflicted by food poisonings was 1166 persons (83 %), while 245 persons (17 %) were infected through contaminated drinking water. According to the reports 44 persons were hospitalized in 12 outbreaks. The most severe case in 2012, involved 20 people with listeriosis of which three died.

#### Descriptions of single outbreaks of special interest

In July 2012, a total of ten cases with *L. monocytogenes* serotype IIa PFGE type 225 were identified in one ward of a municipal hospital. All cases presented with diarrhea and two of them with septicemia. One patient died 20 days after the onset of gastrointestinal listeriosis. Meat jelly was considered to be the probable source of the infection since the outbreak was limited to the wards where this product had been served.

Other food items were widely served in the other wards of the hospital but these were not affected by the outbreak. According to staff interviews only a half of a meat jelly package was consumed after opening, and the other half was served within 24 h or destroyed. However, the staff recalls that in July one opened package was stored in the refrigerator and was still used for serving one week later. No pathogens were found in any food or environmental samples taken at the hospital. From the middle of June to the middle of August 2012, ten cases with *L. monocytogenes* serotype IIa PFGE type 225 were reported from various municipalities across Finland. Stool testing or diarrheal symptoms were not mentioned in the medical records of these cases. Two patients died within 4-5 days after the onset of illness. Among the ten cases, seven had been in institutional care during June and July 2012. Local health inspectors reported that all seven had had a possibility to consume the suspected meat jelly product at the care facility. The sliced meat jelly was produced in 500 kg batches on a biweekly basis and delivered to customers across the country through a distribution company. Internal quality control samples had yielded negative results for listeria at the production plant in March – May 2012 except for one finding of *L. monocytogenes* different from the outbreak strain. During an inspection by the local food safety authority in the beginning of August

2012, a pooled sample taken from a floor drain and a wagon wheel in the food processing environment was found positive for the outbreak strain of *L. monocytogenes*.

Salad produced in the EU was suspected of having caused a large cryptosporidium outbreak in 5 different restaurants in 4 towns. Salad samples (frozen) were sent to the EURL in Italy, but all results were negative. Some patient samples were positive for *Cryptosporidium* sp. Trace back investigations found the salad to be the common food source in all of the restaurants.

Three outbreaks were associated with unpasteurized milk purchased directly from farms. Two outbreaks were caused by *Campylobacter* and one by *VTEC*.

#### Control measures or other actions taken to improve the situation

In general, all food- and waterborne outbreaks are investigated by local food control and health officials. In case of widespread epidemics central administration is in charge of coordinating the investigations. An investigation comprises an epidemiological investigation, detection of contributing factors, sampling and revision of the in-house control system. Information received about foodborne outbreaks, contributory factors and causative agents are analyzed and actively used in the education and training of food business operators. Since January 2005, all food handlers whose work entails special risks related to food hygiene or who handle unpacked, perishable foodstuffs have to demonstrate their proficiency either by obtaining a hygiene proficiency certificate or a certificate of vocational qualification. Independent Proficiency Examiners accredited by the Finnish Food Safety Authority Evira organize hygiene proficiency examinations in different parts of the country. Information and recommendations about identified causative agents, risk foods or raw material are given to entrepreneurs, producers and consumers. The Finnish Salmonella control program has successfully ensured salmonella free foodstuffs in the market and only a minor part of human salmonellosis are domestically acquired. Other control programs have been established and other measures taken in order to control epidemics caused by the most important zoonoses. The prevailing national system for monitoring and surveillance of *Campylobacter*, *Yersinia*, *Listeria* and the EHEC bacterium in production animals and foodstuffs are one of the key actions to be taken by the Finnish Strategy on Zoonoses, given in 2004. The network-like Finnish Zoonosis Centre between the national organizations; the Finnish Food Safety Authority Evira and the National Institute for Health and Welfare, have ensured the collaborative efforts of both the veterinary and the health sector for monitoring and prevention of diseases transmitted between animals and people, since 2007.

#### Suggestions to the European Union for the actions to be taken

Possible measures or legal proposals on foodborne viruses.

Table Foodborne Outbreaks: summarised data

	Weak evidence or no vehicle outbreaks			Strong evidence Number of Outbreaks	Total number of outbreaks	
	Number of outbreaks	Human cases	Hospitalized			Deaths
Salmonella - S. Typhimurium	0	unknown	unknown	unknown	0	0
Salmonella - S. Enteritidis	0	unknown	unknown	unknown	0	0
Salmonella - Other serovars	1	13	2	0	1	2
Campylobacter	1	3	0	0	3	4
Listeria - Listeria monocytogenes	0	unknown	unknown	unknown	1	1
Listeria - Other Listeria	0	unknown	unknown	unknown	0	0
Yersinia	0	unknown	unknown	unknown	0	0
Escherichia coli, pathogenic - Verotoxigenic E. coli (VTEC)	0	unknown	unknown	unknown	1	1
Bacillus - B. cereus	2	50	0	0	3	5
Bacillus - Other Bacillus	0	unknown	unknown	unknown	0	0
Staphylococcal enterotoxins	1	4	0	0	1	2
Clostridium - Cl. botulinum	0	unknown	unknown	unknown	0	0
Clostridium - Cl. perfringens	0	unknown	unknown	unknown	0	0

	Weak evidence or no vehicle outbreaks				Strong evidence Number of Outbreaks	Total number of outbreaks
	Number of outbreaks	Human cases	Hospitalized	Deaths		
Clostridium - Other Clostridia	0	unknown	unknown	unknown	0	0
Other Bacterial agents - Brucella	0	unknown	unknown	unknown	0	0
Other Bacterial agents - Shigella	0	unknown	unknown	unknown	0	0
Other Bacterial agents - Other Bacterial agents	1	4	0	0	0	1
Parasites - Trichinella	0	unknown	unknown	unknown	0	0
Parasites - Giardia	0	unknown	unknown	unknown	0	0
Parasites - Cryptosporidium	0	unknown	unknown	unknown	1	1
Parasites - Anisakis	0	unknown	unknown	unknown	0	0
Parasites - Other Parasites	0	unknown	unknown	unknown	0	0
Viruses - Norovirus	4	50	1	0	8	12
Viruses - Hepatitis viruses	0	unknown	unknown	unknown	0	0
Viruses - Other Viruses	0	unknown	unknown	unknown	2	2
Other agents - Histamine	1	28	0	0	0	1
Other agents - Marine biotoxins	0	unknown	unknown	unknown	0	0
Other agents - Other Agents	0	unknown	unknown	unknown	0	0



Unknown agent

Weak evidence or no vehicle outbreaks				Strong evidence Number of Outbreaks	Total number of outbreaks
Number of outbreaks	Human cases	Hospitalized	Deaths		
12	156	5	0	1	13

Table Foodborne Outbreaks: detailed data for Bacillus

Please use CTRL for multiple selection fields

**B. cereus**

Value

FBO Code	216
Number of outbreaks	1
Number of human cases	3
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Bovine meat and products thereof
More food vehicle information	kebab meat
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food vehicle or its component - Symptoms and onset of illness pathognomonic to causative agent
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Restaurant/Café/Pub/Bar/Hotel/Catering service
Origin of food vehicle	Domestic
Contributory factors	Inadequate chilling;Storage time/temperature abuse
Mixed Outbreaks (Other Agent)	
Additional information	

## B. cereus

Value

FBO Code	213
Number of outbreaks	1
Number of human cases	5
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Bakery products
More food vehicle information	Ham sandwich cake
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food vehicle or its component - Symptoms and onset of illness pathognomonic to causative agent
Outbreak type	General
Setting	Household / domestic kitchen
Place of origin of problem	Restaurant/Café/Pub/Bar/Hotel/Catering service
Origin of food vehicle	Domestic
Contributory factors	Storage time/temperature abuse
Mixed Outbreaks (Other Agent)	
Additional information	

## B. cereus

Value

FBO Code	179
Number of outbreaks	1
Number of human cases	5
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Fish and fish products
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food vehicle or its component - Symptoms and onset of illness pathognomonic to causative agent
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Restaurant/Café/Pub/Bar/Hotel/Catering service
Origin of food vehicle	Unknown
Contributory factors	Storage time/temperature abuse
Mixed Outbreaks (Other Agent)	
Additional information	

Table Foodborne Outbreaks: detailed data for Campylobacter

Please use CTRL for multiple selection fields

## C. jejuni

Value

FBO Code	246
Number of outbreaks	1
Number of human cases	18
Number of hospitalisations	3
Number of deaths	0
Food vehicle	Milk
More food vehicle information	raw milk
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food vehicle or its component - Detection of indistinguishable causative agent in humans
Outbreak type	General
Setting	Household / domestic kitchen
Place of origin of problem	Farm (primary production)
Origin of food vehicle	Domestic
Contributory factors	Unprocessed contaminated ingredient
Mixed Outbreaks (Other Agent)	
Additional information	

## C. jejuni

Value

FBO Code	228
Number of outbreaks	1
Number of human cases	4
Number of hospitalisations	2
Number of deaths	0
Food vehicle	Milk
More food vehicle information	raw milk
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food vehicle or its component - Detection of indistinguishable causative agent in humans
Outbreak type	General
Setting	Household / domestic kitchen
Place of origin of problem	Farm (primary production)
Origin of food vehicle	Domestic
Contributory factors	Unprocessed contaminated ingredient
Mixed Outbreaks (Other Agent)	
Additional information	

## C. jejuni

Value

FBO Code	218
Number of outbreaks	1
Number of human cases	22
Number of hospitalisations	1
Number of deaths	0
Food vehicle	Buffet meals
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Household / domestic kitchen
Place of origin of problem	Household / domestic kitchen
Origin of food vehicle	Unknown
Contributory factors	Unknown
Mixed Outbreaks (Other Agent)	
Additional information	

Table Foodborne Outbreaks: detailed data for Escherichia coli, pathogenic

Please use CTRL for multiple selection fields

## Verotoxigenic E. coli (VTEC) - VTEC O157:H7

Value

FBO Code	258
Number of outbreaks	1
Number of human cases	8
Number of hospitalisations	6
Number of deaths	0
Food vehicle	Milk
More food vehicle information	raw milk
Nature of evidence	Analytical epidemiological evidence;Descriptive epidemiological evidence;Detection of causative agent in food chain or its environment - Detection of indistinguishable causative agent in humans
Outbreak type	General
Setting	Household / domestic kitchen
Place of origin of problem	Farm (primary production)
Origin of food vehicle	Domestic
Contributory factors	Unprocessed contaminated ingredient
Mixed Outbreaks (Other Agent)	
Additional information	



Table Foodborne Outbreaks: detailed data for Listeria

Please use CTRL for multiple selection fields

## L. monocytogenes

Value

FBO Code	ep. 302
Number of outbreaks	1
Number of human cases	20
Number of hospitalisations	20
Number of deaths	3
Food vehicle	Other or mixed red meat and products thereof
More food vehicle information	Meat jelly
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food chain or its environment - Detection of indistinguishable causative agent in humans
Outbreak type	General
Setting	Hospital/medical care facility
Place of origin of problem	Processing plant
Origin of food vehicle	Domestic
Contributory factors	Cross-contamination
Mixed Outbreaks (Other Agent)	

## Value

Additional information	<p>In July a total of 10 cases with <i>L. monocytogenes</i> serotype IIa PFGE type 225 were identified in one ward of a municipal hospital. All cases presented with diarrhea and two of them with septicemia. One patient died 20 days after the onset of gastrointestinal listeriosis. Meat jelly was considered to be the probable source of the infection since the outbreak was limited to the wards where this product had been served. According to staff interviews only a half of a meat jelly package was consumed after opening, and the other half was served within 24 h or destroyed. However, the staff recalls that in July one opened package was stored in the refrigerator and was still used for serving one week later. No pathogens were found in any food or environmental samples taken at the hospital. From the middle of June to the middle of August, ten cases with the same <i>L. monocytogenes</i> serotype were reported from various municipalities across Finland. Stool testing or diarrheal symptoms were not mentioned in the medical records of these cases. Two patients died within 4-5 days after the onset of illness. Among the ten cases, seven had been in institutional care during June and July. Local health inspectors reported that all seven had had a possibility to consume the suspected meat jelly product at the care facility. The sliced meat jelly was produced in 500 kg batches on a biweekly basis and delivered to customers across the country through a distribution company. Internal quality control samples had yielded negative results for listeria at the production plant in March - May except for one finding of <i>L. monocytogenes</i> different from the outbreak strain. During an inspection by the local food safety authority in the beginning of August, a pooled sample taken from a floor drain and a wagon wheel in the food processing environment was found positive for the outbreak strain of <i>L. monocytogenes</i>.</p>
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Table Foodborne Outbreaks: detailed data for Parasites

Please use CTRL for multiple selection fields

## Cryptosporidium - Cryptosporidium spp., unspecified

Value

FBO Code	crypto
Number of outbreaks	1
Number of human cases	264
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Vegetables and juices and other products thereof
More food vehicle information	salad
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Farm (primary production)
Origin of food vehicle	Intra EU trade
Contributory factors	Unprocessed contaminated ingredient
Mixed Outbreaks (Other Agent)	
Additional information	Salad produced in the EU was suspected of having caused a large cryptosporidium outbreak in 5 different restaurants in 4 towns. Salad samples (frozen) were sent to the EURL in Italy, but all results were negative. Some patient samples were positive for Cryptosporidium sp. Trace back investigations found the salad to be the common food source in all of the restaurants.

Table Foodborne Outbreaks: detailed data for Salmonella

Please use CTRL for multiple selection fields

## S. Agona

Value

FBO Code	220
Number of outbreaks	1
Number of human cases	97
Number of hospitalisations	2
Number of deaths	0
Food vehicle	Buffet meals
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Other setting
Place of origin of problem	Restaurant/Café/Pub/Bar/Hotel/Catering service
Origin of food vehicle	Unknown
Contributory factors	Unknown
Mixed Outbreaks (Other Agent)	
Additional information	

Table Foodborne Outbreaks: detailed data for Staphylococcal enterotoxins

Please use CTRL for multiple selection fields

null

Value

FBO Code	205
Number of outbreaks	1
Number of human cases	2
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Cheese
More food vehicle information	Goat milk cheese
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food vehicle or its component - Symptoms and onset of illness pathognomonic to causative agent
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Restaurant/Café/Pub/Bar/Hotel/Catering service
Origin of food vehicle	Intra EU trade
Contributory factors	Other contributory factor;Storage time/temperature abuse
Mixed Outbreaks (Other Agent)	
Additional information	

Table Foodborne Outbreaks: detailed data for Unknown agent

Please use CTRL for multiple selection fields

## Unknown

Value

FBO Code	243
Number of outbreaks	1
Number of human cases	20
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Tap water, including well water
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Household / domestic kitchen
Place of origin of problem	Water distribution system
Origin of food vehicle	Domestic
Contributory factors	Unknown
Mixed Outbreaks (Other Agent)	
Additional information	

Table Foodborne Outbreaks: detailed data for Viruses

Please use CTRL for multiple selection fields

## Calicivirus - sapovirus (Sapporo-like virus)

Value

FBO Code	
Number of outbreaks	1
Number of human cases	unknown
Number of hospitalisations	unknown
Number of deaths	unknown
Food vehicle	
More food vehicle information	
Nature of evidence	
Outbreak type	Unknown
Setting	Unknown
Place of origin of problem	Unknown
Origin of food vehicle	Unknown
Contributory factors	Unknown
Mixed Outbreaks (Other Agent)	
Additional information	

## Calicivirus - norovirus (Norwalk-like virus)

Value

FBO Code	255
Number of outbreaks	1
Number of human cases	82
Number of hospitalisations	1
Number of deaths	0
Food vehicle	Vegetables and juices and other products thereof
More food vehicle information	coleslaw
Nature of evidence	Analytical epidemiological evidence;Descriptive epidemiological evidence
Outbreak type	General
Setting	Canteen or workplace catering
Place of origin of problem	Canteen or workplace catering
Origin of food vehicle	Domestic
Contributory factors	Infected food handler
Mixed Outbreaks (Other Agent)	
Additional information	



## Calicivirus - norovirus (Norwalk-like virus)

Value

FBO Code	225
Number of outbreaks	1
Number of human cases	23
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Other foods
More food vehicle information	Unknown
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Restaurant/Café/Pub/Bar/Hotel/Catering service
Origin of food vehicle	Unknown
Contributory factors	Infected food handler
Mixed Outbreaks (Other Agent)	
Additional information	

## Calicivirus - norovirus (Norwalk-like virus)

Value

FBO Code	214
Number of outbreaks	1
Number of human cases	50
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Buffet meals
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	School, kindergarten
Place of origin of problem	School, kindergarten
Origin of food vehicle	Unknown
Contributory factors	Infected food handler
Mixed Outbreaks (Other Agent)	
Additional information	

## Calicivirus - norovirus (Norwalk-like virus)

Value

FBO Code	202
Number of outbreaks	1
Number of human cases	14
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Buffet meals
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Other setting
Place of origin of problem	Restaurant/Café/Pub/Bar/Hotel/Catering service
Origin of food vehicle	Unknown
Contributory factors	Infected food handler
Mixed Outbreaks (Other Agent)	
Additional information	

## Calicivirus - norovirus (Norwalk-like virus)

Value

FBO Code	201
Number of outbreaks	1
Number of human cases	31
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Buffet meals
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	Canteen or workplace catering
Place of origin of problem	Canteen or workplace catering
Origin of food vehicle	Unknown
Contributory factors	Infected food handler
Mixed Outbreaks (Other Agent)	
Additional information	

## Calicivirus - norovirus (Norwalk-like virus)

Value

FBO Code	192
Number of outbreaks	1
Number of human cases	114
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Buffet meals
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food chain or its environment - Detection of indistinguishable causative agent in humans
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Restaurant/Café/Pub/Bar/Hotel/Catering service
Origin of food vehicle	Unknown
Contributory factors	Infected food handler
Mixed Outbreaks (Other Agent)	
Additional information	

## Calicivirus - norovirus (Norwalk-like virus)

Value

FBO Code	190
Number of outbreaks	1
Number of human cases	38
Number of hospitalisations	1
Number of deaths	0
Food vehicle	Buffet meals
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food chain or its environment - Detection of indistinguishable causative agent in humans
Outbreak type	General
Setting	School, kindergarten
Place of origin of problem	School, kindergarten
Origin of food vehicle	Unknown
Contributory factors	Infected food handler
Mixed Outbreaks (Other Agent)	
Additional information	

## Calicivirus - norovirus (Norwalk-like virus)

Value

FBO Code	189
Number of outbreaks	1
Number of human cases	52
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Buffet meals
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence;Detection of causative agent in food chain or its environment - Detection of indistinguishable causative agent in humans
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Restaurant/Café/Pub/Bar/Hotel/Catering service
Origin of food vehicle	Unknown
Contributory factors	Infected food handler
Mixed Outbreaks (Other Agent)	
Additional information	

## unspecified

Value

FBO Code	152
Number of outbreaks	1
Number of human cases	6
Number of hospitalisations	0
Number of deaths	0
Food vehicle	Drinks, including bottled water
More food vehicle information	
Nature of evidence	Descriptive epidemiological evidence
Outbreak type	General
Setting	School, kindergarten
Place of origin of problem	School, kindergarten
Origin of food vehicle	Domestic
Contributory factors	Other contributory factor
Mixed Outbreaks (Other Agent)	
Additional information	Juice unduly heated in water heater caused vomiting in kindergarten children. Copper was suspected agent.