ZOONOSES MONITORING

SWEDEN

The Report referred to in Article 5 of Directive 92/117/EEC

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

including information on foodborne outbreaks and antimicrobial resistance in zoonotic agents

IN 2004

INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Country: **Sweden**

Reporting Year: **2004**

Institutions and laboratories involved in monitoring:

Laboratory name	Description	Contribution

National Veterinary Institute (SVA) - SVA is an authority with expert knowledge in prevention, diagnosis and the control of infectious diseases. SVA assists other authorities organisations, veterinarians and the general public with support in decision-making, advice and help, as well as to carry out research in relevant areas. (Information and data on zoonoses in animals. Editing.)

Swedish Institute for Infectious Disease Control (SMI) - The Swedish Institute for Infectious Disease Control is a government expert authority with a mission to monitor the epidemiology of infectious disease among Swedish citizens and promote control and prevention of these diseases. (Information and data on zoonoses in humans.)

Swedish Board of Agriculture (SJV) - The Swedish Board of Agriculture is the Government's expert authority in the field of agricultural and food policy, and the authority responsible for the sectors agriculture, horticulture and reindeer husbandry. Its responsibility therefore includes monitoring, analysing and reporting to the Government on developments in these areas, and implementing policy decisions within its designated field of activities. (Information and data on zoonoses in animals and feed.)

National Food Administration (SLV) - The National Food Administration is the central supervisory authority for matters relating to food, including drinking-water and is directly responsible to the government. It has the task of protecting the interests of the consumer by working for safe food of good quality, fair practices in the food trade, and healthy eating habits. (Information and data on zoonoses in food.)

PREFACE

This report is submitted to the European Commission in accordance with Article 5 of Council Directive 92/117/EEC[1]. 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 Sweden during the year 2004. 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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1 Council Directive 92/117/ECC of 17 December 1992 concerning measures for protection against specified zoonoses and specified zoonotic agents in animals and products of animal origin in order to prevent outbreaks of foodborne infections and intoxications, OJ L 62, 15.3.1993, p. 38

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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:

Most information about numbers of animals or herds is derived from the Yearbook of Agricultural Statistics 2004, SJV. Some information about the number of slaughtered animals has been collected by the National Food Administration.

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

Data relates to 2003, except some information on numbers of slaughtered animals, which is from 2004.

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

The definitions used in EU legislation are also used in Sweden.

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

The dairy sector is playing a central role in Swedish agriculture. The number of dairy cows has, however, been decreasing over a long period of time. The number of farms with livestock has decreased the last decades whereas those remaining have increased their number of animals. In 2003, there were dairy cows in 9700 farms. There is an average of 41 cows/herd. In 2003 there were roughly 3 700 pig farms in Sweden. This is a decrease by 86% since 1980. Also, the number of pigs are falling, and the decrease was greatest during the 1980's. Around 97 % of the fattening pigs are found in herds with at least 100 animals. The number of sheep herds are decreasing, but the increasing herd sizes have resulted in a slight increase in the total number of animals. Egg production is dominated by few but large flocks. Around 90 % of the hens of laying breed are found in herds with at least 5 000 hens. The number of hens increased during the 1980's but have now reached the lowest level in many years.

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

Most farms are located in the south and central parts of Sweden and animal husbandry is the dominant line of production. Only in the central part of Sweden the cropping farms dominates. In the north of Sweden there are mostly small farms.

Table 14.1 Susceptible animal populations: number of herds and holdings rearing animals

* Only if different than current reporting year

Animal species	Category of animals	Number of herds or flocks	Year*	Number of holdings	Year*
Cattle (bovine animals)	calves (under 1 year)	24883	2003		
	dairy cows and heifers (1)	9720	2003		
	meat production animals (2)	12681	2003		
	in total	27905	2003		
Ducks	in total (3)				
Gallus gallus	laying hens (4)			5422	2001
Geese	in total (5)				
Goats	in total	518	2003		
Pigs	sows and gilts	2483	2003		
	fattening pigs	2993	2003		
	in total	3669	2003		
Sheep	animals under 1 year (lambs)	6736	2003		
	animals over 1 year	7608	2003		
	in total	7639	2003		
Solipeds	horses - in total (6)	16310	2003		
Turkeys	in total			1056	2003
Farmed reindeers	in total	932	2003		
Farmed wild boars	in total (7)				
Farmed deer	in total	609			

(1): Holdings with dairy cows
(2): Holdings with beef cows
(3): Not available
(4): Including all holdings with any type of hens
(5): Not available
(6): Including only holdings greater than 2 hectares
(7): Not available

Table 14.2 Susceptible animal populations: number of animals

* Only if different than current reporting year

Animal species	Category of animals	Livestock numbers (live animals)	Year*	Number of slaughtered animals	Year*
Cattle (bovine animals)	calves (under 1 year)	512232	2003	34070	
	dairy cows and heifers (1)	402520	2003		
	meat production animals (2)	164718	2003		
	in total	1606674	2003	490324	
Ducks	in total			44272	
Gallus gallus	parent birds - in total (3)			594252	
	broilers	5905679	2003	69627954	
	laying hens	4497678	2003	3770081	
Geese	in total			29067	
Goats	in total	5509	2003		
Pigs	sows and gilts (4)	204527	2003		
	fattening pigs (5)	1127372	2003		
	in total	1903126	2003	3337488	
Sheep	animals over 1 year	210463	2003		
	animals under 1 year (lambs)	237845	2003		
	in total	448308	2003	192347	
Solipeds	horses - in total (6)	271000	2003	5033	
Turkeys	in total	285696	2003	598695	
Ostriches	in total			869	
Farmed reindeers	in total	237481	2003	60167	2003
Farmed wild boars	in total			833	
Farmed deer	in total	20014		4960	

(1): Only dairy cows
(2): Only beef cows
(3): Broiler parents
(4): Only sows
(5): Pigs >20 kg
(6): Includes 1106 from sanitary slaughter

2. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC 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 Swedish Salmonella control programme was initiated in 1961. In 1995, the parts of the programme that covered cattle, pigs, poultry and eggs, were approved by the EU (95/50/EC) and extended surveillance was initiated. The results showed that Swedish red and white meat and eggs virtually are free from Salmonella.
Of the reported human cases, only about 15% are reported as domestic aquired salmonella infection. This figure has been stable throughout the years and is based on information reported from the physician.

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

The national situation remains very favourable. In humans, there has been a continously decreasing trend since 1999, both in the number of domestic cases and in the total number of reported cases. In food producing animals, only a few cattle and poultry farms are put under restriction following reported salmonella infection per year, and none or only a few pig farms.

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

If Salmonella is diagnosed in a food-producing animal, measures are always taken to trace and eliminate the infection. All food contaminated with Salmonella is deemed unfit for human consumption.

Recent actions taken to control the zoonoses

The Swedish Salmonella control programme has been shown to be an efficient tool to identify Salmonella early in the production chain to keep domestically produced food free from contamination.

2.1.2. Salmonellosis in humans

A. Salmonellosis in humans

Reporting system in place for the human cases

Surveillance is mainly based on passive case findings. Also, contact persons are sampled when there are cases/outbreaks of salmonellosis. In this report the total number of cases is based on reports from both the laboratories and the physicians. Information about country of origin is available only in the reports from the physicians. Investigations to trace the source of the infection are always performed.

Case definition

A case is defined as a person from whom Salmonella, of any serotype, has been isolated, including subclinical infections. Furthermore, a case is considered to be of domestic origin if the person has been infected in Sweden, thereby domestic cases will also include secondary cases to people infected abroad, as well as people infected by food items of non-domestic origin. A case is considered to be of foreign origin if the person has been abroad during the incubation period for salmonellosis.

Diagnostic/analytical methods used

Cultivation of Salmonella. Serotyping of all strains and phagetyping of S. Typhimurium and S. Enteritidis. PFGE when needed.

Notification system in place

Salmonellosis is a notifiable disease under the Communicable Disease Act (both from the laboratory and from the physician).

History of the disease and/or infection in the country

The total number of cases between 1995 and 2004 ranged from 3562 to 5141, and there has been a decreasing trend since 1999. During the same 10-year period, the number of domestic cases varied from 453 to 947, with an annual incidence of 5-10/100 000. Around 85% of all cases were infected abroad.

Results of the investigation

In 2004, the total number of cases decreased for the fifth year in a row, down to 3562. According to the clinical reports, 2709 of the cases were infected abroad and 497 were domestic (for the remaining, country of infection is not known).
Five food borne outbreaks of salmonellosis were reported in 2004:
a) S. Typhimurium 104: In June five persons got ill after having eaten roast beef at a restaurant.
b) S. Typhimurium 120: During the summer nine persons got infected at at some different places in the southern parts of the country. Sausage was the suspected source of infection.
c) S. Bardo: At the end of the summer three family members became ill after having eaten different meals containing chicken at a Chinese restaurant. S. Bardo was found in the chicken, which originated from Brazil.

d) S. Thompson: In the autumn 13 persons in different parts of Sweden contracted salmonellosis. During the same period an outbreak with the same type was reported from Norway. Epidemiological and microbiological investigations pointed out rocket salad from Italy as the common source of infection.
e) S. Mikawasima: During the autumn twelve persons, from different parts of the country, fell ill. A case-control study was carried out. Bacteria were never isolated from the food.

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

The number of domestic cases (497) was the lowest since 1998. It is a decrease by 38 % in comparison to 2003, which can be explained by an unusually low number of cases in all four outbreaks.
The decrease was evenly distributed throughout the country, during the whole year, between the sexes and different age groups.
Food and water are the most commonly citied sources of infections at the clinical reports.

Relevance as zoonotic disease

There is a very low risk of contracting domestic salmonellosis. As Swedish red and white meat basically is free from Salmonella, it may be considered that the vast majority of cases are due to consumption of imported contaminated food, contact with reptiles and turtles and some secondary cases to imported cases.

Table 3.4.1.A Salmonellosis in man - species/serotype distribution

	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc	unknown status
Salmonella	3562	37	497	4	2709	28	356
S. Enteritidis	1449	16	75	0,83	1209	13	165
S. Newport	73	0,81	9	0,10	60	0,67	4
S. Stanley	191	2,1	12	0,13	164	1,8	15
S. Typhimurium	410	4,5	193	2,1	180	2,0	37
S. Virchow	156	1,7	11	0,12	130	1,4	15
other serovars	1283	14	197	2,2	966	11	120

Footnote

The total number of cases are reported by both physicians and laboratories. The number of autochtone and imported cases are reported by the physicians.

Table 3.4.1.B Salmonellosis in man - age distribution

Age Distribution	S. Enteritidis			S. Typhimurium			Salmonella spp.		
	All	M	F	All	M	F	All	M	F
<1 year	0	0	0	3	2	1	10	5	5
1 to 4 years	3	3	0	18	10	8	35	18	17
5 to 14 years	6	3	3	14	6	8	36	18	18
15 to 24 years	8	7	1	15	6	9	48	25	23
25 to 44 years	21	11	10	59	33	26	138	73	65
45 to 64 years	27	13	14	50	27	23	136	66	70
65 years and older	10	5	5	34	21	13	94	45	49
Age unknown									
Total :	75	42	33	193	105	88	497	250	247

Footnote

Only domestic cases are included in the table.

Table 3.4.2 Salmonellosis in man - seasonal distribution

Month	S. Enteritidis	S. Typhimurium	Salmonella spp.
	Cases	Cases	Cases
January	5	57	77
February	3	7	22
March	1	8	20
April	1	5	23
May	4	5	24
June	2	18	31
July	13	12	43
August	23	23	65
September	10	19	68
October	9	26	60
November	1	5	37
December	3	6	27
not known			
Total :	75	191	497

Footnote

Only domestic cases are included.

2.1.3. Salmonella in foodstuffs

A. Salmonella spp in eggs and egg products

Monitoring system

Sampling strategy

The salmonella control of table eggs is based on control of all commercial egg laying flocks from establishments placing table eggs on the market and all commercial egg laying flocks of more than 200 hens from establishments not placing table eggs on the market.

B. Salmonella spp. in broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Swedish Salmonella control programme:
Sampling strategies are described in the Swedish Salmonella control programme that is approved by EU (95/50/EC). The programmes are supervised by the SJV and the SLV. All the sampling in the control programme is supervised by the competent authority, that is official veterinarians. They are responsible for the sampling in the herds, flocks, hatcheries, cuttingplants and in the slaughter houses.
Within the programme, neck skin samples at slaughter and crushed meat from equipment etc in cutting plants are collected.
Sampling of necks skin:
Slaughter houses are divided into two categories A and B. Category A slaughter houses annually slaughter 150 000 to 15 000 000 birds, Category B slaughter houses slaughter < 150 000 birds annually. The sampling frame is all poultry slaughtered in Sweden. Enough samples are taken to detect a prevalence of 0.1% Salmonella.
Sampling in Category A: Enough samples are collected at each slaughter house to detect a prevalence of at least 5%. A systematic sampling is performed and samples are collected daily.
Sampling in Category B: Enough samples are collected to detect a prevalence of 5% Salmonella. Samples are evenly spread over the slaughtering days.
Cutting plants:
The control programme is based on production hygiene. The sampling sheme is designed to detect a prevalence of 5% with a confidence level of 95%.

At meat processing plant

According to in-house control plans and decisions by the competent authority.

At retail

According to in-house control plans and decisions by the competent authority.

Frequency of the sampling

At slaughterhouse and cutting plant

Other: Category A: daily; Category B: spread out evenly over the year; cutting plants: once/day in plants producing >100 tons/week, once/week in plants producing >20 tons/week, once/month in plants producing >5 tons/week, twice/year in plants producing <5 tons/week.

At retail

Other: decided by the local authorities

Type of specimen taken

At slaughterhouse and cutting plant

Other: Neck skin samples at slaughter houses. Crushed meat from equipment etc or from trimmings at cutting plants.

At meat processing plant

Other: According to in-house control plans and decisions by the competent authority.

At retail

Other: According to in-house control plans and decisions by the competent authority.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: 10 neckskin samples are pooled and analyzed as 1 sample. From 10 carcasses at least 10g, approx. 3 x 3 cm of neck skin is cut off and put into a plastic bag. Each sample shall be marked with the cathegory of poultry, identity of the flock, slaughterhouse, time and date of the sampling and stored individually at 4 C until it is sent to the laboratory. At the lab; Each neckskin is divided into two equal parts. One part is pooled. The other part is separatly stored until the examination is completed. One pool may consist of neck-skin from 10-15 birds. The pooled sample is mixed well and pre-enriched in buffered peptone water and examined for salmonella according to NMKL. If salmonella is isolated from a pooled sample each individually stored neck-skin are examined.
Crushed meat: Each sample of 25 g of crushed meat from equipment etc or from trimmings is individually analysed according to NMKL.

Definition of positive finding

At slaughterhouse and cutting plant

A confirmed positive sample.

At meat processing plant

A confirmed positive sample.

At retail

A confirmed positive sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL 71, ISO 6579 or any other of the approved methods according to Comm. Decision 2003/470

At meat processing plant

Bacteriological method: NMKL 71, ISO 6579 or any other of the approved methods according to Comm. Decision 2003/470

At retail

Bacteriological method: NMKL 71, ISO 6579 or any other of the approved methods according to Comm. Decision 2003/470

Preventive measures in place

The salmonella control programme. Zero-tolerance for salmonella in processed food as well as in raw products.

Control program/mechanisms

The control program/strategies in place

National Salmonella Control Programme (Comm. Decision 95/50).

Recent actions taken to control the zoonoses

The prevalence of Salmonella in products of Swedish origin is so low that no special actions have had to be taken for many years.

Measures in case of the positive findings or single cases

All positive findings is followed by corrective actions directed against product and process.
If any serotype of salmonella is found in meat samples, the origin of contamination must be traced back to the slaughter house or holding whenever possible. Effective cleaning and disinfection of the premises and equipment must begin in the establishment immediately. This also shall be done on suspicion of salmonella contamination.
Following confirmation of the result by the National Veterinary Institute an increased level of

sampling is carried out. This involves taking at least 59 samples (each sample consists of 25 gr of meat or 10 gr neck skins) during the next five working days following the confirmation of the result.

Notification system in place

Any positive finding has to be reported to the competent authority.

Results of the investigation

Salmonella prevalence in animal products of Swedish origin is very low. The local municipalities reported 286 samples from broiler meat or products thereof. Of those, 4 (1%) were positive for salmonella.
From Cat A slaughter houses 3649 neck skins were analysed and 81 from Cat B slaughter houses. From one of the samples from Cat A salughter houses S. Typhimurium NST was isolated from a pooled sample. At re-isolation, two samples included in the pooling was positive and both originated from the same farm.
At cutting plants 1 025, samples were collected and none of these were positive.

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

Salmonella prevalence in animal products of Swedish origin is very low (see "additional information"). From 2002 to 2003, the proportion of salmonella in poultry and poultry products decreased from 10.4% to 0.6%. The proportion of positive products remained low in 2004. It remains to be seen if this is due to an improvement in products of foreign origin or a changed sampling regime at the municipalities.
The most worrying factor at present is the large number of salmonella-positive consignments from other member states that enter the country. This is true not only for meat-preparations but also for consignments covered by the salmonella guarantees.

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

As Swedish produced red and white meat, and eggs virtually are free from salmonella, the risk of contracting salmonella from domestic produced animal products is small.

Additional information

In the surveillance described in the salmonella control programme, approximately 4000 neck skin sample from the slaughter houses are analysed yearly. Between 1995 and 2004, 38 762 neck skin samples were collected and of those, 11 (0.03%) were positive.

C. Salmonella spp. in pig meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Sampling strategies are described in the Swedish Salmonella control programme

that is approved by EU (95/50/EC). The programmes are supervised by the SJV and the SLV. All the sampling in the control programme is supervised by the competent authority, that is official veterinarians. They are responsible for the sampling in the herds, flocks, hatcheries, cuttingplants and in the slaughter houses.
Within the programme, lymph nodes and carcass swabs are systematicly collected from pigs at slaughter to ensure that the samples are representative of the population of slaughtered pigs at each slaughterhouse.
Sampling at slaughter houses: Slaughter houses have been divided into two categories: Category A slaughtering 90% of all cattle and Category B slaughtering 10% of all cattle.
Category A: At each slaughterhouse a sufficient number of samples is collected to detect at least 5% salmonella infected/contaminated carcases with 95% confidence interval (CI) in the annual slaughter. Sampling is performed daily in Category A and samples consist of lymph nodes from the ileo-caecal region.
Samples are collected evenly distributed over the day and if slaughter is performed on separate lines, each will be sampled separately.
Category B: These slaughterhouses are controlled as one unit. Enough samples to detect a prevalence of 1% salmonella-infected carcases with 90% CI will be taken. These samples consist of lymph nodes from the ileo-caecal region. Sampling will be spread out over the slaughter days to avoid periodical sampling.
Furthermore, quantitative monitoring, of the slaughter hygiene at normal slaughter is also performed. The sample size will detect a prevalence of salmonella contaminated carcases of 0.1% with a 95% confidence interval. Samples consist of carcass swabs.
Cutting plants: sampling is designed to detect a prevalence of 5% salmonella (95% CI)Samples are taken from crushed meat on equipment etc. or from trimmings.

At meat processing plant

Sampling is according to each plants in-house control.

At retail

Random sampling according to the local competent authorities.

Frequency of the sampling

At slaughterhouse and cutting plant

Other: Category A: daily; Category B: spread out evenly over the year; cutting plants: once/day in plants producing >100 tons/week, once/week in plants producing >20 tons/week, once/month in plants producing >5 tons/week, twice/year in plants producing <5 tons/week.

At meat processing plant

Other: According to each in-house control plan and decisions by the competent

authority.

At retail

Other: According to in-house control plans and decisions by the competent authority.

Type of specimen taken

At slaughterhouse and cutting plant

Other: At least 5 lymphnodes from the ileo-caecal region. Carcass swabs: Approx. 1400 square cm/carcass is swabbed.

At meat processing plant

Other: Varies according to in-house control plan and decisions by the local inspector.

At retail

Other: Varies according to in-house control plan and decisions by the local inspector.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: The lymph nodes are aspetically removed and put in a plastic bag. The samples are kept refrigerated until sent to the laboratory. At the laboratory all lymph nodes from one sample is divided into two equal parts. One half is placed in a mortar and the other part is kept at +4 C .In the mortar, lymphnodes from 15 animals are pooled and homogenised.
If salmonella is isolated from a pooled sample of lymph nodes each of the individually stored samples will be analysed separately.
Carcass swabs: The carcasses are sampled before the carcass is refrigerated. The upper inner part of the hind legs including the pelvic entrance will be tested. A total of 30 cm x 20-25 cm will be swabbed. The cut surface area of the abdomen and the chest including approximately 5 cm of the skin surface will be tested. Approx. 70-80 cm x 8-10 cm will be swabbed. In total approx 1400 cm2 will be swabbed. Two sterile swabs moistured with PBS are used. The swabs from one carcass wil be place in a plastic bag in 100 ml of PBS. Samples are kept refrigerated until they are sent to the laboratory.
To each sample of two swabs 100 ml of buffered peptone water is added. The sample is incubated overnight. One drop off pre-enrichment broth from each of 10 to 15 animals is pooled in RV broth and examined according to NMKL. Each pre-enrichment broth is stored at 4o C until results are ready. In case of a positive result each broth will be analysed separately.
Crushed meat: each sample of 25 g is individually analysed according to NMKL.

At meat processing plant

According to in-house control plans and decisions by the competent authority.

At retail

According to in-house control plans and decisions by the competent authority.

Definition of positive finding

At slaughterhouse and cutting plant

A confirmed positive sample.

At meat processing plant

A confirmed positive sample.

At retail

A confirmed positive sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL 71, ISO 6579 or any other of the approved methods according to Comm. Decision 2003/470

At meat processing plant

Bacteriological method: NMKL 71, ISO 6579 or any other of the approved methods according to Comm. Decision 2003/470

At retail

Bacteriological method: NMKL 71, ISO 6579 or any other of the approved methods according to Comm. Decision 2003/470

Preventive measures in place

The salmonella control programme. Zero-tolerance for salmonella in processed food as well as in raw products.

Control program/mechanisms

The control program/strategies in place

National Salmonella Control Programme (Comm. Decision 95/50). See "Salmonella spp. in pigs".

Recent actions taken to control the zoonoses

The prevalence of Salmonella in products of Swedish origin is so low that no special actions have had to be taken for many years.

Measures in case of the positive findings or single cases

All positive findings is followed by corrective actions directed against product and process.
If salmonella is isolated from a lymph node or a carcass swab, trace- back investigation is always performed at the farm of origin. If salmonella is re-isolated at the farm, measures described in section "Salmonella spp. in pigs" are implemented.

Notification system in place

Any positive finding has to be reported to the competent authority.

Results of the investigation

Salmonella prevalence in animal products of Swedish origin is very low.
In the surveillance in the control programme, 2 782 lymph nodes were analysed. Of those, S. Typhimurium phage type 40 was isolated in 5 lymph nodes (4 fattening pigs and 1 adult pig). However, salmonella was not re-isolated at the farms from which the pigs originated and, therefor, this led to no further action and the findings do not meet the case definition in live animals. Also, 2 750 carcass swabs from pigs and 4 474 samples from both pig and cattle at cutting plants were analysed. All were negative for salmonella.

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

Salmonella prevalence in animal products of Swedish origin is very low (see "additional information").
The most worrying factor at present is the large number of salmonella-positive consignments from other MS that enter the country. This is true not only for meat-preparations but also for consignments covered by the salmonella guarantees.

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

As Swedish red and white meat, and eggs, virtually are free from Salmonella the risk of contracting salmonella from domestic produced food is very small.

Additional information

Between 1996 and 2004, 51 886 lymph nodes from fattening- and adult pigs have been sampled in total. Of those, 63 (0.1%) were positive for salmonella. Similarly, 51 919 swabs have been analysed and of those 4 (0.008%)have been positive. Furthermore, only in a few cases when salmonella were isolated from lymph nodes or swabs was salmonella re-isolated at farm level.

D. Salmonella spp in bovine meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Sampling strategies are described in the Swedish Salmonella control programme

(95/50/EC). The programmes are supervised by the SJV and the SLV. All the sampling according to the salmonella programme supervised by the competent authority, that is the official veterinarian. Official veterinarian is responsible for the sampling in the herds, flocks, hatcheries, cuttingplants and in the slaughter houses.
Within the programme, lymph nodes and carcass swabs are systematicly collected from pigs at slaughter to ensure that the samples are representative of the population of slaughtered pigs at each slaughterhouse.
Slaughter houses: Slaughter houses have been divided into two categories. Category A slaughtering 90% of all cattle and category B slaughtering 10% of all cattle.
Cat.A: At each slaughterhouse a sufficient number of samples is collected to detect at least 5% salmonella infected/contaminated carcases with 95% Confidence Interval (CI) in the annual slaughter. Sampling is performed daily in Cat.A. and samples consist of lymph nodes from the ileo-caecal region. At these slaughter hosues samples are collected evenly distributed over hte day and if slaughter is performed on separate lines, each will be sampled separately.
Cat.B: These slaughterhouses are controlled as one unit. Enough samples to detect a prevalence of 1% salmonella- infected carcases with 90% CI will be taken.
These samples consist of lymph nodes from the ileo-caecal region. Sampling is spread out over the slaughter days to avoid periodical sampling.
Furthermore quantitative monitoring of the slaughter hygiene at normal slaughter is also performed. The sample size will detect a prevalence of salmonella contaminated carcases of 0.1 % with 95% CI. Samples consist of carcass swabs.
Cutting plants: sampling is designed to detect a prevalence of 5% salmonella (95% CI). Samples are taken from crushed meat on equipment etc. or from trimmings.

At meat processing plant

Sampling is according to each plants in-house control.

At retail

Random sampling according to the local competent authorities.

Frequency of the sampling

At slaughterhouse and cutting plant

Other: Cat A: daily; cat B: spread out evenly over the year; cutting plants: once/day in plants producing >100 tons/week, once/week in plants producing >20 tons/week, once/month in plants producing >5 tons/week, twice/year in plants producing <5 tons/week.

At meat processing plant

Other: According to each in-house control plan and decisions by the competent authority.

At retail

Other: According to in-house control plans and decisions by the competent authority.

Type of specimen taken

At slaughterhouse and cutting plant

Other: At least 5 lymphnodes from the ileo-caecal region and carcass swabs.

At meat processing plant

Other: Varies according to in-house control plan and decisions by the local inspector.

At retail

Other: Varies according to in-house control plan and decisions by the local inspector.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: The lymph nodes are aspetically removed and put in a plastic bag. The samples are kept refrigerated until sent to the laboratory. At the laboratory all lymph nodes from one sample is divided into two equal parts. One half is placed in a mortar and the other part is kept at 4o C. In the mortar lymph nodes from 15 animals are pooled and homogenised.
If salmonella is isolated from a pooled sample of lymph nodes each of the individually stored samples will be analysed separately.
Carcass swabs: The carcasses are sampled before the carcass is refrigerated.
The upper inner part of the hind legs including the pelvic entrance will be tested. A total of 30x20-25 will be swabbed. The cut surface area of the abdomen and the chest including approximately 5 cm of the skin surface will be tested. Approx. 70-80 cm x 8-10 cm will be swabbed. In total approx 1400 cm2 will be swabbed. Two sterile swabs moistured with PBS are used. The swabs from one carcass will be place in a plastic bag in 100 ml of PBS. Samples are kept refrigerated until they are sent to the laboratory.
To each sample of two swabs 100 ml of buffered peptone water is added. The sample is incubated overnight. One drop off pre-enrichment broth from each of 10 to 15 animals is pooled in RV broth and examined according to NMKL. Each pre-enrichment broth is stored at 4o C until results are ready. In case of a positive result each broth will be analysed separately.
Crushed meat: each sample of 25 g is individually analysed according to NMKL.

At meat processing plant

According to in-house control plans and decisions by the competent authority.

At retail

According to in-house control plans and decisions by the competent authority.

Definition of positive finding

At slaughterhouse and cutting plant

A confirmed positive sample.

At meat processing plant

A confirmed positive sample.

At retail

A confirmed positive sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL 71, ISO 6579 or any other of the approved methods according to Comm. Decision 2003/470

At meat processing plant

Bacteriological method: NMKL 71, ISO 6579 or any other of the approved methods according to Comm. Decision 2003/470

At retail

Bacteriological method: NMKL 71, ISO 6579 or any other of the approved methods according to Comm. Decision 2003/470

Preventive measures in place

The salmonella control programme. Zero-tolerance for salmonella in processed food as well as in raw products.

Control program/mechanisms

The control program/strategies in place

National Salmonella Control Programme (Comm. Decision 95/50). See "Salmonella spp in bovine animals".

Recent actions taken to control the zoonoses

The prevalence of Salmonella in products of Swedish origin is so low that no special actions have had to be taken for many years.

Measures in case of the positive findings or single cases

All positive findings is followed by corrective actions directed against product and process.
If salmonella is isolated from a lymph node or a carcass swab, trace- back investigation is always performed at the farm of origin. If salmonella is re-isolated at the farm, measures described in section "Salmonella in bovine animals" are implemented.

Notification system in place

Any positive finding has to be reported to the competent authority.

Results of the investigation

Salmonella prevalence in animal products of Swedish origin is very low. At retail, 2 386 samples from fresh meat or meat products were reported from the local municipalities. Also, 239 samples from dairy products, including cheese, were analysed and all were negative.
In the surveillance in the control programme, 3 253 lymph nodes and 3 251 carcass swabs were analysed. Of those, all were negative except for 3 lymph nodes (1 S. Typhimurium NST, 1 S. Duesseldorf and 1 S. Subspecies I). However, as salmonella could not be re-isolated at the farms from which the positive animals originated the farms were negative.
Apart from this, 4 474 samples from both cattle and pig were collected from cutting plants, amd all were negative.

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

Salmonella prevalence in animal products of Swedish origin is very low (see "additional information"). The most worrying factor at present is the large number of salmonella-positive consignments from other MS that enter the country. This is true not only for meat-preparations but also for consignments covered by the salmonella guarantees.

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

As Swedish red and white meat, and eggs, virtually are free from Salmonella the risk if contracting salmonella from Swedish produced food is very small.

Additional information

Between 1996 and 2004, 28 842 lymph nodes from cattle have been sampled in total. Of those, 18 (<0.1%) were positive for salmonella. Furthermore, 28 872 swabs have been analysed and of those 6 (<0.1%) have been positive. Furthermore, only in a few cases when salmonella was isolated from lymph nodes or swabs the same serotype was isolated at farm level leading to restrictions on the farm.
Other food products analysed for salmonella in 2004:
The local municipalities also tested 26 other meat products for salmonella, all were negative. Furthermore, 2 (0.04%) out of 515 fishery products were positive, and 2 (0.02%) out of 1022 fruit and vegetable products.

Table 3.3.1 Salmonella sp. in meat and meat products

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium
Bovine meat								
fresh								
- at slaughter		See footnote						
- at retail (1)	SLV		sample	25 g	1262	0		
meat products								
non-ready-to-eat								
- at retail	SLV		sample	25 g	1124	0		
Pig meat								
fresh								
- at slaughter		See footnote						
Broiler meat								
fresh								
- at slaughter (2)	SLV	salmonella control program	neck skin		3730	2		2
- at processing plant (3)	SLV	salmonella control program	sample		1025	0		
- at retail	SLV		sample	25 g	197	4		
meat products								
non-ready-to-eat								
- at retail	SLV		sample	25 g	89	0		
Other meat								
fresh								
- at retail	SLV		sample	25 g	16	0		
- at cutting plant - Control programme - mandatory (Both beef and pork) (4)	SLV	salmonella control program	sample	25 g	4474	0		
Other animals or mixed meat								
meat products								
non-ready-to-eat								
- at retail	SLV		sample	25 g	10	0		

(1) : 2386 samples represent both bovine and pig meat (the reporting do not differentiate between the animal species).
(2) : Neck-skin samples taken according to the Salmonella control programme. A small portion of the samples are from layers. 2 positive samples from layers (all from the same flock) were detected, none from broilers.
(3) : Samples of crushed meat from equipments etc. taken according to the Salmonella control programme at cutting plant.
(4) : 1-5 samples pooled to 25 g

Footnote

All data, except were otherwise stated, are reported by the local authorities. There is no information of where in the food chain the samples are taken. Most samples are taken at retail, and some at production plants.
Serotypes are not reported.
For results from the salmonella control programme in cattle and pigs, see Table 3.2.4.

The following amendments were made :

Date of modification	Species	Column	Old value	New value
2005-09-19	Broiler meat - fresh - at processing plant	Remarks	salmonella control program	salmonella control program
	Other meat - at cutting plant - Control programme - mandatory (Both beef and pork)	Source of information		SLV
	Other meat - at cutting plant - Control programme - mandatory (Both beef and pork)	Remarks		salmonella control program
	Other meat - at cutting plant - Control programme - mandatory (Both beef and pork)	Epidemiological unit		sampl
	Other meat - at cutting plant - Control programme - mandatory (Both beef and pork)	Sample weight		25 g
2005-09-19	Other meat - at cutting plant - Control programme - mandatory (Both beef and pork)	Epidemiological unit	sampl	sample
	Other meat - at cutting plant - Control programme - mandatory (Both beef and pork)	Units tested		4474
	Other meat - at cutting plant - Control programme - mandatory (Both beef and pork)	Units positive		0

Table 3.3.2 Salmonella sp. in other food

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium
Dairy products								
other products	SLV		sample	25 g	169	0		
Fishery products								
fish	SLV		sample	25 g	279	1		
shellfish (1)	SLV		sample	25 g	236	1		
Fruit & Vegetables	SLV		sample	25 g	1022	2		
Ices and desserts	SLV		sample	25 g	1083	0		
Prepared food, ready to eat	SLV		sample	25 g	4454	3		
Cheeses	SLV		sample	25 g	70	0		

(1) : Including molluscs.

Footnote

Information about isolated serotype is not available.

2.1.4. Salmonella in animals

A. Salmonella spp. in Gallus gallus - breeding flocks for egg production and flocks of laying hens

Monitoring system

Sampling strategy

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

Sampling strategies are outlined in the Swedish Salmonella control programme, that is approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.
All the sampling according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for the sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official veterinarian or under his/her supervision if sampling is delegated to farmers/companies.
The control constitutes of clinical surveillance and sampling. The clinical surveillance include general surveillance and surveillance related to the control programme where an official veterinarian visits breeding establishments every 8 week, laying hens farm once a year and meatproducing poultry farm twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination.
Breeders and hatchery:
Sampling of breeding flocks is carried out according to the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.
Elite and Grand Parent: samples are taken on 5 separate occasions during rearing. Tissue samples from dead chicks and chicken box linings are taken as a supplement to the faecal sampling. During egg production faecal samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.
The parent generation is tested at 3 occasions during the rearing period through tissue sampling as well as faecal sampling. During eggproduction samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

Laying hens flocks

See "Breeding flocks"
Pullets and layers for table egg production:
Sampling of laying flocks with more than 200 layers from establishments not placing eggs on the market and of laying flocks from establishments placing their eggs on the market is carried out as faecal samples. Sampling methods are sufficient to demonstrate freedom within a flock at a confidence level of 95%, if the estimated prevalence of salmonella is 5%.

Egg laying flocks are tested as day-old chicks and once during the rearing period two weeks before moving to a laying unit. The result of this examination must be known before moving the birds. During the laying phase egg laying flocks are sampled three times: 25-30 weeks old, 50 weeks of age and 3-4 weeks before slaughter. The delay between the last sample and slaughter is made in order to be able to take appropriate measures at slaughter if salmonella is found. Today this last sample is taken not more than 10 days before slaughter due to demands from the slaughterhouse. The result of the last examination must be notified to the poultry meat inspection veterinarian before sending the flock to the slaughterhouse.

Frequency of the sampling

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

Detection of annual prevalence of flock prevalence of 5% with a confidence interval of 95% by flock prevalence of 5% with a confidence interval of 95%% confidence level and flock prevalence of 5% with a confidence interval of 95%% accuracy

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

Other: GP - as dayold, 1-2weeks, 4 weeks, 9-11weeks and 2 weeks before moving P - day-old, 4 weeks and 2 weeks before moving

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

Other: Once a month in the holding and every flock (batch) every 14 days at the hatchery

Laying hens: Day-old chicks

Every flock is sampled

Laying hens: Rearing period

2 weeks prior to moving

Laying hens: Production period

Other: at 25-30 weeks, at 50 weeks and 3-4 weeks before slaughter

Laying hens: Before slaughter at farm

3-4 weeks prior to slaughter

Laying hens: At slaughter

Other: see Salmonella in broiler meat and products thereof

Type of specimen taken

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

Other: ceacum from dead chickens, chicken box lining and meconium at the hatchery

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

Other: ceacal and faecal samples

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

Faeces

Laying hens: Day-old chicks

Other: ceacum from dead chickens, chicken box lining and meconium at the hatchery

Laying hens: Rearing period

Faeces

Laying hens: Production period

Faeces

Laying hens: Before slaughter at farm

Faeces

Laying hens: At slaughter

Other: neck skin, see Salmonella in broiler meat and products thereof

Methods of sampling (description of sampling techniques)

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

Chicken box lining:
The lining from chicken boxes are cut into smaller pieces and put into plastic bags. The lining from at most five boxes may be put into one bag as one pooled sample. The plastic bag shall be marked and sent to the laboratory the same day.
The pooled sample is cut into smaller pieces and mixed well. At least 25 g material is examined for Salmonella according to Nordic Committee on Food Analysis.
Dead birds:

Ceaca from 10 animals are taken out and pooled into one stomacher bag (one pooled sample). The stomacher bag shall be marked and sent to the laboratory the same day.
The pooled sample is homogenized in a stomacher. If the sample comes from day old chickens, at least 10g material shall be examined. If the samples comes from older birds, at least 25g material shall be examined. All samples are examined for Salmonella according to Nordic Committee on Food Analysis.
Meconium:
Meconium from 250 newly hatched chickens are collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The pooled sample is homogenized in a stomacher. At least 30g material is analyzed for Salmonella according to Nordic Committee on Food Analysis.

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

From each epidemiological unit; 60g(30gx2)fresh faecal material and, 10 ceaca pooled into 1 sample.
Dead birds:
Caeca from at most 10 animals are taken out and pooled into one stomacher bag (one pooled sample). The stomacher bag shall be marked and sent to the laboratory the same day. The pooled sample is homogenized in a stomacher. If the sample comes from day old chickens, at least 10g material shall be examined. If the samples comes from older birds, at least 25g material shall be examined. All samples are examined for Salmonella according to Nordic Committee on Food Analysis.
Faecal samples:
One pooled sample consists of droppings from 30 birds. From each individual at least 1g faeces is collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The sample is examined for Salmonella according to Nordic Committee on Food Analysis.

Breeding flocks: Production period

60g (30gx2) fresh faecal material collected in the flock and pooled meconium from 250 newly hatched chicks from each flock every 14 day at the hatchery

Laying hens: Day-old chicks

see "Breeding flocks: Day-old chicks"

Laying hens: Rearing period

Fresh droppings from 90 pullets at different locations within the unit. Each pooled sample consists of 30g.

Laying hens: Production period

90g fresh faecal material pooled into 30gx3 or in case of free range indoors or if a flock consists of <1000 hens - 30gx2 (60g)

Laying hens: Before slaughter at farm

30gx3(90g) or 30x2(60g) fresh faecal droppings

Laying hens: At slaughter

see "Salmonella in broiler meat and products thereof"

Case definition

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

If salmonella is isolated from an individual animal, the whole flock is positive. In poultry, the flock is the epidemiological unit.

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

See "Breeding flocks: Day-old chicks"

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

See "Breeding flocks: Day-old chicks"

Laying hens: Day-old chicks

See "Breeding flocks: Day-old chicks"

Laying hens: Rearing period

See "Breeding flocks: Day-old chicks"

Laying hens: Production period

See "Breeding flocks: Day-old chicks"

Laying hens: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Laying hens: At slaughter

The pooled neckskin sample is traced back to the farm of origin. The farm is put under restrictions and an official veterinarian is assigned for official sampling. If these are negative - no further measures. If positive - the farm (or only the epidemiological unit if there are more than one separate units at the holding) is considered infected.

Diagnostic/analytical methods used

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

necessary): Day-old chicks

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Laying hens: Day-old chicks

Bacteriological method: NMKL No 71:1999

Laying hens: Rearing period

Bacteriological method: NMKL No 71:1999

Laying hens: Production period

Bacteriological method: NMKL No 71:1999

Laying hens: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Laying hens: At slaughter

Bacteriological method: NMKL No 71:1999

Vaccination policy

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

Vaccination against salmonellosis is not allowed in poultry.

Laying hens flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

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

In food-producing animals salmonella control in feed- and feed production (HACCP based approach) is integrated in the salmonella control.
Strict hygiene rules are enforced through the whole production chain as preventive measures for salmonella. These rules are implemented by the Prophylactic volontary

salmonella control programme and includes: a)Rules for feed production and transport, b) hygienic rules to protect the birds from salmonella infection from the surroundings, c) salmonella free newly hatched chickens are delivered from the hatcheries, d) precaution to stop spread of salmonella from an infected flock, and e) all- in - all out principle in all categories of poultry production.

Laying hens flocks

See "Breeding flocks"

Control program/mechanisms

The control program/strategies in place

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

In food-producing animals salmonella control in feed- and feed production (HACCP based approach) is integrated in the control.
Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The control programme for live poultry covers laying hens, broilers, turkeys, ducks and gees from elite flocks to commercial stock. Other species of live poultry as defined in article 2 (1) of the Council Directive 90/539/EEC are excluded from this control programme. All serotypes of salmonella are covered.
The control consitutes of clinical surveillance and sampling. The clinical surveillance inlcude general surveillance and surveillance related to the control programme. The official veterinarian visits every poultry holding with breeders, layers and meat production establishment as required according to the control programme. All categories of poultry are sampled for bacteriological examination as described above.

Laying hens flocks

See "Breeding flocks"

Measures in case of the positive findings or single cases

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

The infected farm is put under restriction and the flock is culled and either sent for destruction (in case of invasive serotype) or heat-treated (the latter is never practised in Sweden). An investigation in order to trace the source of infection is conducted by the official veterinarian. The premises/ contaminated houses are cleaned and disinfected and manure and feeding stuffs left on the farm are destroyed or decontaminated. Restrictions are not lifted until environmental samples from within the house are taken and analyzed with negative results.

Laying hens flocks

See "Breeding flocks"
In laying hens flocks, finding of invasive salmonella serotype results in destruction of the flock and all eggs in storage.
Finding of non invasive salmonella serotypes results in destruction or sanitary slaughter of the flock. In those cases: a)The meat may be used for human consumption after heat treatment in the processing plant. b)Eggs from a flock infected with non invasive salmonella may be used for human consumption after pasteurization.

Notification system in place

All findings of salmonella is compulsory notifiable. The obligation to notify all salmonella findings has been in force since 1961.

Results of the investigation

In 2004, no breeding flock or hatchery was infected with Salmonella.
Two farms with laying hen were infected with salmonella. One with S.Typhimurium NST and the other with Phagtype 193.
Results from the surveillance in the control programme is presented under the section "Salmonella in broiler meat and products thereof".

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

Since 1996, the situation has remained stable with only 3 to 4 infected flocks per year. The favourable situation is also reflected in the yearly sampling of approximately 4000 neck skin samples at the slaughter houses. Between 1995 and 2004, 38 762 neck skin samples were collected and of those, 11 (0.03%) were positive.

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

As Swedish produced red and white meat, and eggs virtually are free from salmonella, the risk of contracting salmonella from domestic produced food of animal origin is very small.

Additional information

In poultry, the flock is the epidemiological unit. This is important concerning breeders as several flocks may be raised in seperate units in the holding at the same. Measures, in case of positive findings, are taken at each epidemiological unit since the strict hygiene rules that are implemented according to the Swedish Salmonella control programme makes it possible to define the flocks as strictly seperated units.

B. Salmonella spp. in Gallus gallus - breeding flocks for meat production and broiler flocks

Monitoring system

Sampling strategy

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

necessary)

Sampling strategies are outlined in the Swedish Salmonella control programme, that is approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.
All sampling according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for the sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official veterinarian or under his/her supervision if sampling is delegated to farmers/companies.
The control constitutes of clinical surveillance and sampling. The clinical surveillance include general surveillance and surveillance related to the control programme where an official veterinarian visits breeding establishments every 8 week and meatproducing poultry farms twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination.
Breeders and hatchery:
Sampling of breeding flocks is carried out according to the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.
There are no broiler Elite flocks in Sweden.
Grand Parent:
samples are taken on 5 separate occasions during rearing. Tissue samples from dead chicks and chicken box linings are taken as a supplement to the faecal sampling. During egg production faecal samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.
The parent generation is tested at 3 occasions during the rearing period through tissue sampling as well as faecal sampling. During eggproduction samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

Broiler flocks

All commercial meat-producing establishments has an official veterinarian assigned for salmonella control. The veterinarian is usually employed by the National Food Administration and stationed at the slaughterhouse where the flock is destined for slaughter. The veterinarian visits the farm at least twice a year for supervision and sampling.
Every flock is sampled 1-2 weeks prior to slaughter either by the veterinarian or by the farmer if sampling is delegated. The result must be notified to the veterinarian before sending the flock to the slaughterhouse.

Frequency of the sampling

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

Detection of annual prevalence of at a confidence level of 95%, if the estimated within flock prevalence of salmonella is 5% by at a confidence level of 95%, if the estimated within flock prevalence of salmonella is 5%% confidence level and

at a confidence level of 95%, if the estimated within flock prevalence of salmonella is 5%% accuracy

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

Other: GP - as day-old, 1-2 weeks, 4 weeks, 9-11 weeks and 2 weeks prior to moving, P - day-old, 4 weeks and 2 weeks prior to moving

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

Once a month

Broiler flocks: Day-old chicks

Every flock is sampled

Broiler flocks: Rearing period

1-2 weeks prior to slaughter

Broiler flocks: Before slaughter at farm

1-2 weeks prior to slaughter

Broiler flocks: At slaughter (flock based approach)

Other: see Salmonella in broiler meat and products thereof

Type of specimen taken

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

Other: ceaca from dead birds, chicken box lining and meconium

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

Other: ceacal and faecal material

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

Faeces

Broiler flocks: Day-old chicks

Other: ceaca from dead birds, chicken box lining and meconium

Broiler flocks: Before slaughter at farm

Other: faecal and organs

Broiler flocks: At slaughter (flock based approach)

Other: neck skins, see Salmonella in broiler meat and products thereof

Methods of sampling (description of sampling techniques)

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

Chicken box lining:
The lining from chicken boxes are cut into smaller pieces and put into plastic bags. The lining from at most five boxes may be put into one bag as one pooled sample. The plastic bag shall be marked and sent to the laboratory the same day.
The pooled sample is cut into smaller pieces and mixed well. At least 25 g material is examined for Salmonella according to Nordic Committee on Food Analysis.
Dead birds:
Ceaca from 10 animals are taken out and pooled into one stomacher bag (one pooled sample). The stomacher bag shall be marked and sent to the laboratory the same day.
The pooled sample is homogenized in a stomacher. If the sample comes from day old chickens, at least 10g material shall be examined. If the samples comes from older birds, at least 25g material shall be examined. All samples are examined for Salmonella according to Nordic Committee on Food Analysis.
Meconium:
Meconium from 250 newly hatched chickens are collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The pooled sample is homogenized in a stomacher. At least 30g material is analyzed for Salmonella according to Nordic Committee on Food Analysis.

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

Sampling:
From each epidemiological unit, 60g (30gx2) fresh faecal material and 10 ceaca (pooled into 1 sample) are collected.
Faecal samples:
One pooled sample consists of droppings from 30 birds. From each individual at least 1g faeces is collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The sample is examined for Salmonella according to Nordic Committee on Food Analysis.
Dead birds:
See "Breeding flocks: Day-old chicks"

Breeding flocks: Production period

60g (30gx2) fresh faecal material is collected in the flock.
Faecal samples:

See "Breeding flocks: Rearing period"

Broiler flocks: Day-old chicks

Chicken box lining, dead birds, meconium:
See "Breeding flocks: Day-old chicks"

Broiler flocks: Rearing period

no sampling between day-old and pre-slaughter

Broiler flocks: Before slaughter at farm

30g faecal material pooled into 1 sample and 30 ceaca pooled 10x3 = 4 analyses
In houses with >2 epidemiological units or <500 birds/unit; 30gx2 (60g) faecal material and 10 organs pooled to 1 sample is taken
Faecal samples:
See "Breeding flocks: Rearing period"
Ceacal sampling:
Ceaca from 10 animals are taken out and pooled into one stomacher bag (one pooled sample). The stomacher bag shall be marked and sent to the laboratory the same day. The pooled sample is homogenized in a stomacher. If the sample comes from day old chickens, at least 10g material shall be examined. If the samples comes from older birds, at least 25g material shall be examined. All samples are examined for Salmonella according to Nordic Committee on Food Analysis.

Broiler flocks: At slaughter (flock based approach)

see "Salmonella in broiler meat and products thereof"

Case definition

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

If salmonella is isolated from an individual animal, the whole flock is positive. In poultry, the flock is the epidemiological unit.

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

See "Breeding flocks: Day-old chicks"

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

See "Breeding flocks: Day-old chicks"

Broiler flocks: Day-old chicks

See "Breeding flocks: Day-old chicks"

Broiler flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Broiler flocks: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Broiler flocks: At slaughter (flock based approach)

A positive neck skin sample at slaughter initiates an investigation back at the holding of origin. The farm is put under restrictions and official sampling is conducted. If these samples are positive the holding/flock is considered infected.

Diagnostic/analytical methods used

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Broiler flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Broiler flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Broiler flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Broiler flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

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

Vaccination against salmonellosis is not allowed in poultry.

Broiler flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

Broiler flocks

In food-producing animals salmonella control in feed- and feed production (HACCP based approach) is integrated in the salmonella control.
Strict hygiene rules are enforced through the whole production chain as preventive measures for salmonella. These rules are implemented by the Prophylactic volontary salmonella control
programme and includes: a)Rules for feed production and transport, b) hygienic rules to protect the birds from salmonella infection from the surroundings, c) salmonella free newly hatched chickens are delivered from the hatcheries, d) precaution to stop spread of salmonella from an infected flock, and e) all- in - all out principle in all categories of poultry production.

Control program/mechanisms

The control program/strategies in place

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

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The control programme for live poultry covers laying hens, broilers, turkeys, ducks and gees from elite flocks to commercial stock. Other species of live poultry as defined in article 2 (1) of the Council Directive 90/539/EEC are excluded from this control programme. All serotypes of salmonella are covered. The control consitutes of clinical surveillance and sampling. The clinical surveillance inlcude general surveillance and surveillance related to the control programme. The official veterinarian visits every poultry holding with breeders, layers and meat production establishment as required according to the control programme. All categories of poultry are sampled for bacteriological examination as described above.

Broiler flocks

see "Breeding flocks"

Measures in case of the positive findings or single cases

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

The chicks would be traced, culled and sent for destruction and the premesis where the chicks were sent to and the hatchery would be cleaned and disinfected. The farm/flock of origin is traced and put under restrictions. Official sampling is conducted and if the flock is positive, it is culled and either sent for destruction (in case of invasive serotype) or

heat-treated (the latter is never practised in Sweden). An investigation in order to trace the source of infection is conducted by the official veterinarian. The premises/ contaminated houses are cleaned and disinfected and manure and feeding stuffs left on the farm are destroyed or decontaminated. Restrictions are not lifted until environmental samples from within the house are taken and analyzed with negative results.

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

The infected farm is put under restriction and the flock is culled and either sent for destruction (in case of an invasive serotype) or heat-treated (the latter is never practised in Sweden). An investigation in order to trace the source of infection and destination of hatching eggs delivered from the holding is conducted by the official veterinarian. The premises/ contaminated houses are cleaned and disinfected and manure and feeding stuffs left on the farm are destroyed or decontaminated. Restrictions are not lifted until environmental samples from within the house are taken and analyzed with negative results.

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

See "Breeding flocks: Rearing period"

Broiler flocks: Day-old chicks

See "Breeding flocks: Rearing period"

Broiler flocks: Rearing period

See "Breeding flocks: rearing period"

Broiler flocks: Before slaughter at farm

See "Breeding flocks: rearing period"

Broiler flocks: At slaughter (flock based approach)

see "Salmonella in broiler meat and products thereof"

Notification system in place

All findings of salmonella is compulsory notifiable. The obligation to notify all salmonella findings has been in force since 1961.

Results of the investigation

One holding of broilers that was infected during late 2003 were re-infected during 2004 (the next flock) with the same serotype. The re-infection was probably due to insufficient cleaning of the ventilation system since positive isolates were found there during early investigation.
The results from surveillance of neck skins are presented un der the section "Salmonella in broiler meat and products thereof".

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

Since 1996, the situation has remained stable with only 1 to 2 infected flocks per year. This is also reflected in the yearly sampling of approximately 4000 neck skin samples at the slaughter houses. Between 1995 and 2004, 38 762 neck skin samples were collected and of those 11 (0.03%) were positive.

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

As Swedish produced red and white meat, and eggs virtually are free from salmonella, the risk of contracting salmonella from domestic produced animal products is small.

Additional information

In poultry, the flock is the epidemiological unit. This is important concerning broilers as several flocks may be raised at the same time in different units within the same house/holding. When measures are taken in case of positive findings the strict hygiene rules that are implemented according to the Swedish Salmonella control programme makes it possible to define the broiler flock as the epidemiological unit.

C. 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)

Sampling strategies are outlined in the Swedish Salmonella control programme, that is approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.
All the sampling according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for the sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official veterinarian or under his/her supervision if sampling is delegated to farmers/companies.
The control constitutes of clinical surveillance and sampling. The clinical surveillance include general surveillance and surveillance related to the control programme where an official veterinarian visits breeding establishments every 8 week, laying hens farm once a year and meatproducing poultry farm twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination.
Breeders and hatchery:
Sampling of breeding flocks is carried out according to the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.
Elite and Grand Parent:
There are no turkey elite or GP breeding flocks in Sweden.
The parent generation is tested at 3 occasions during the rearing period through

tissue sampling as well as faecal sampling. During eggproduction samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

Meat production flocks

See "Breeding flocks"

Frequency of the sampling

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

Detection of annual prevalence of at a confidence level of 95%, if the estimated prevalence of salmonella is 5%. by at a confidence level of 95%, if the estimated prevalence of salmonella is 5%. % confidence level and at a confidence level of 95%, if the estimated prevalence of salmonella is 5%. % accuracy

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

Other: P - as day-old, 4 weeks and 2 weeks prior to moving

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

Once a month

Meat production flocks: Day-old chicks

Every flock is sampled

Meat production flocks: Before slaughter at farm

1-2 weeks prior to slaughter

Meat production flocks: At slaughter (flock based approach)

Other: see Salmonella in broiler meat and products thereof

Type of specimen taken

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

Other: ceaca from dead birds, chicken box lining and meconium

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

Other: ceacal and faecal samples

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

necessary): Production period

Other: ceacal and faecal samples

Meat production flocks: Day-old chicks

Meconium

Meat production flocks: Before slaughter at farm

Faeces

Meat production flocks: At slaughter (flock based approach)

Other: neck skin; see Salmonella in broiler meat and products thereof

Methods of sampling (description of sampling techniques)

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

Pooled meconium from each flock at the hatchery every 14 day, chicken box linings and dead birds at arrival
Meconium:
Meconium from 250 newly hatched turkeys are collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The pooled sample is homogenized in a stomacher. At least 30g material is analyzed for Salmonella according to Nordic Committee on Food Analysis.
Chicken box lining:
The lining from the boxes are cut into smaller pieces and put into plastic bags. The lining from at most five boxes may be put into one bag as one pooled sample. The plastic bag shall be
marked and sent to the laboratory the same day. The pooled sample is cut into smaller pieces and mixed well. At least 25 g material is examined for Salmonella according to Nordic Committee on Food Analysis.
Dead birds:
Ceaca from 10 animals are taken out and pooled into one stomacher bag (one pooled sample). The stomacher bag shall be marked and sent to the laboratory the same day. The pooled sample is homogenized in a stomacher. If the sample comes from day old turkeys, at least 10g material shall be examined. If the samples comes from older birds, at least 25g material shall be examined. All samples are examined for Salmonella according to Nordic Committee on Food Analysis.

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

Dead birds:
"See Breeding flocks: Day-old chicks"
Faecal samples:
One pooled sample consists of droppings from 30 birds. From each individual at

least 1g faeces is collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day.
The sample is examined for Salmonella according to Nordic Committee on Food Analysis.

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

See "Breeding flocks: rearing period"

Meat production flocks: Day-old chicks

Chicken box lining:
The lining from chicken boxes are cut into smaller pieces and put into plastic bags. The lining from at most five boxes may be put into one bag as one pooled sample. The plastic bag shall be marked and sent to the laboratory the same day.
The pooled sample is cut into smaller pieces and mixed well. At least 25 g material is examined for Salmonella according to Nordic Committee on Food Analysis.
Meconium:
See "Breeding flocks: Day-old chicks"
Dead birds:
See "Breeding birds: Day-old chicks"

Meat production flocks: Rearing period

no sampling between day-old and pre-slaughter

Meat production flocks: Before slaughter at farm

90g fresh faecal material pooled into 30gx3
Faecal samples:
One pooled sample consists of droppings from 30 birds. From each individual at least 1g faeces is
collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day.
The sample is examined for Salmonella according to Nordic Committee on Food Analysis.

Meat production flocks: At slaughter (flock based approach)

see Salmonella in broiler meat and products thereof

Case definition

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

If salmonella is isolated from an individual animal, the whole flock is positive. In poultry, the flock is the epidemiological unit.

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

See "Breeding flocks: Rearing period"

Meat production flocks: Day-old chicks

See "Breeding flocks: Rearing period"

Meat production flocks: Rearing period

See "Breeding flocks: Rearing period"

Meat production flocks: Before slaughter at farm

See "Breeding flocks: Rearing period"

Meat production flocks: At slaughter (flock based approach)

A positive neck skin sample at slaughter initiates an investigation back at the holding of origin. The farm is put under restrictions and official sampling is conducted. If these samples are positive the holding/flock is considered infected.

Diagnostic/analytical methods used

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Meat production flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Meat production flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Meat production flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Case definition

If salmonella is isolated from an individual animal, the whole flock is positive. In poultry, the flock is the epidemiological unit.

Vaccination policy

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

Vaccination against salmonellosis is not allowed in poultry.

Meat production flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

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

Strict hygiene rules are enforced through the whole production chain as preventive measures for salmonella. These rules are implemented by the Prophylactic volontary salmonella control
programme and includes: a)Rules for feed production and transport, b) hygienic rules to protect the birds from salmonella infection from the surroundings, c) salmonella free newly hatched chickens are delivered from the hatcheries, d) precaution to stop spread of salmonella from an infected flock, and e) all- in - all out principle in all categories of poultry production.

Meat production flocks

see "Breeding flocks"

Control program/mechanisms

The control program/strategies in place

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

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The control programme for live poultry covers laying hens, broilers, turkeys, ducks and gees from elite flocks to commercial stock. Other species of live poultry as defined in article 2 (1) of the Council Directive 90/539/EEC are excluded from this control
programme. All serotypes of salmonella are covered. The control consitutes of clinical surveillance and sampling. The clinical surveillance inlcude general surveillance and surveillance related to the control programme. The official veterinarian

visits every poultry holding with breeders, layers and meat production establishment as required according to the control programme. All categories of poultry are sampled for bacteriological examination as described above.

Meat production flocks

see "Breeding flocks"

Measures in case of the positive findings or single cases

The infected farm is put under restriction and the flock is culled and either sent for destruction (in case of invasive serotype) or heat-treated (the latter is never practised in Sweden). An investigation in order to trace the source of infection is conducted by the official veterinarian. The premises/ contaminated houses are cleaned and disinfected and manure and feeding stuffs left on the farm are destroyed or decontaminated. Restrictions are not lifted until environmental samples from within the house are taken and analyzed with negative results.

Notification system in place

All findings of salmonella is compulsory notifiable. The obligation to notify all salmonella findings has been in force since 1961.

Results of the investigation

No turkey breeders or meat producing flocks were infected with salmonella during 2004.

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

Since 1996, the situation has remained stable with none to a few infected flocks per year.

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

As Swedish produced red and white meat, and eggs virtually are free from salmonella, the risk of contracting salmonella from food products of domestic animal origin is very small.

Additional information

In poultry, the flock is the epidemiological unit. This is important also concerning turkey breeders and turkeys for slaughter as several flocks may be raised in seperate units in the house/holding at the same. Measures, in case of positive findings, are taken at each epidemiological unit since the strict hygiene rules that are implemented according to the Swedish Salmonella control programme makes it possible to define the flocks as strictly separated units.

D. Salmonella spp in geese - breeding flocks and meat production flocks

Monitoring system

Sampling strategy

Breeding flocks

Sampling strategies are outlined in the Swedish Salmonella control programme, that is approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.
All sampling according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for the sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official veterinarian or under his/her supervision if sampling is delegated to farmers/companies.
The control constitutes of clinical surveillance and sampling. The clinical surveillance include general surveillance and surveillance related to the control programme where an official veterinarian visits geese breeding establishments every 8 week and meatproducing geese farms twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination.
Breeders and hatchery:
Sampling of breeding flocks is carried out according to the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.
There are no geese Elite and Grand Parent stock in Sweden.
The Parent generation is tested at 3 occasions during the rearing period through tissue sampling as well as faecal sampling. During eggproduction samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

Type of specimen taken

Imported feed material of animal origin

see "Salmonella spp in feed"

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

Other: faecal and ceacal

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

Faeces

Meat production flocks: Before slaughter at farm

Faeces

Meat production flocks: At slaughter (flock based approach)

Other: neck skin, see Salmonella in broiler meat and products thereof

Frequency of the sampling

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

Other: as dayold, at 4 weeks and 2 weeks prior to moving

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

Once a month

Meat production flocks: Before slaughter at farm

1-2 weeks prior to slaughter

Meat production flocks: At slaughter (flock based approach)

Other: see Salmonella in broiler meat and products thereof

Methods of sampling (description of sampling techniques)

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

Fresh faecal droppings are collected from 60 geese and the material is divided in 2 samples (30gx2)
Faecal samples:
One pooled sample consists of droppings from 30 birds. From each individual at least 1g faeces is collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The sample is examined for Salmonella according to Nordic Committee on Food Analysis.

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

See "Breeding flocks"

Meat production flocks: Before slaughter at farm

60 fresh faecal droppings pooled as 30gx2

Meat production flocks: At slaughter (flock based approach)

see "Salmonella in broiler meat and products thereof"

Case definition

Breeding flocks: Day-old chicks

If salmonella is isolated from an individual animal, the whole flock is positive. In poultry, the flock is the epidemiological unit.

Breeding flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Breeding flocks: Production period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Day-old chicks

See "Breeding flocks: Day-old chicks"

Meat production flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Meat production flocks: At slaughter (flock based approach)

A positive neck skin sample at slaughter results in restriction on the holding of origin and additional official sampling at the holding. If the official samples are positive the farm is considered infected

Diagnostic/analytical methods used

Breeding flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Breeding flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Breeding flocks: Production period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Meat production flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Meat production flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Breeding flocks

Vaccination against salmonellosis is not allowed in poultry.

Meat production flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

Breeding flocks

High bio-security rules at the same level as for other breeding stocks. These flocks are raised indoors

Meat production flocks

Controlled feed, salmonella free ducklings

Control program/mechanisms

The control program/strategies in place

Breeding flocks

At some breeding establishments where geese are kept indoors the same strict hygiene rules are enforced as in the preventive volontary salmonella control programme even though geese farms
are not accepted within the programme. It includes: a)Rules for feed production and transport, b)hygienic rules to protect the birds from salmonella infection from the surroundings, c) salmonella free newly hatched geeslings are delivered from the hatcheries, d) precaution to stop spread of salmonella from an infected flock, and e) all- in - all out principle in all houses.
At some holdings no preventive measures are applied

Meat production flocks

These are raised out-doors. Following rules are applied at some establishments: a)Rules for feed production and transport, b) salmonella free newly hatched geeslings are delivered from the hatcheries, c)precaution to stop spread of salmonella from an infected flock. At some holdings no preventive measures are applied.

Measures in case of the positive findings or single cases

Breeding flocks

Restrictions to and from the farm, culling of infected animals, destruction, cleaning and disinfection and finally environmental negative samples before restrictions are lifted.

Meat Production flocks

See "Breeding flocks"

Notification system in place

All findings of salmonella is compulsory notifiable. The obligation to notify all salmonella

findings has been in force since 1961.

Results of the investigation

Salmonella Typhimurium was found in 2 holdings with geese during 2004. One holding with commercial geese for slaughter and the other holding was a hobbyflock with 30 geese for household consumption. The 2 isolates were Phagtype 9 and 195, respectively.
Results from surveillance of neck skins is presented under the section Salmonella in broiler meat and products thereof.

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

Since 1996, the situation has remained stable with no to a few infected flocks per year.

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

As Swedish produced red and white meat, and eggs virtually are free from salmonella, the risk of contracting salmonella from domestic produced animal products is small.

E. Salmonella spp in ducks - breeding flocks and meat production flocks

Monitoring system

Sampling strategy

Breeding flocks

Sampling strategies are outlined in the Swedish Salmonella control programme, that is approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.
All sampling according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for the sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official veterinarian or under his/her supervision if sampling is delegated to farmers/companies.
The control constitutes of clinical surveillance and sampling. The clinical surveillance include general surveillance and surveillance related to the control programme where an official veterinarian visits a duck breeding establishments every 8 week and meatproducing duck farms twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination.
Breeders and hatchery:
Sampling of breeding flocks is carried out according to the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.
There are no Elite and Grand Parent ducks in Sweden. The breeding stock is imported as P.
The parent generation is tested at 3 occasions during the rearing period through tissue sampling as well as faecal sampling. During eggproduction samples are taken from the breeders themselves every month as a supplement to the sampling

in the hatchery.

Meat production flocks

Mandatory sampling if >500 ducks are raised for slaughtered/year.
Every flock is sampled 1-2 weeks prior to slaughter. If thinning is practised additional sampling has to be done efter 10 days. At 2 occasions/year this sampling is done by an official veterinarian - usually the veterinarian responsible at the slaughterhouse where the ducks are admitted for slaughter.

Frequency of the sampling

Breeding flocks: Day-old chicks

Detection of annual prevalence of flock prevalence of 5% with a confidence interval of 95% by flock prevalence of 5% with a confidence interval of 95%% confidence level and flock prevalence of 5% with a confidence interval of 95%% accuracy

Breeding flocks: Production period

Once a month

Meat production flocks: Day-old chicks

1-2 weeks prior to slaughter

Meat production flocks: Before slaughter at farm

1-2 weeks prior to slaughter

Meat production flocks: At slaughter (flock based approach)

Other: see Salmonella in broiler meat and products thereof

Type of specimen taken

Breeding flocks: Rearing period

Faeces

Breeding flocks: Production period

Faeces

Meat production flocks: Before slaughter at farm

Faeces

Meat production flocks: At slaughter (flock based approach)

Other: : neck skins, see Salmonella in broiler meat and products thereof

Methods of sampling (description of sampling techniques)

Breeding flocks: Rearing period

Fresh faecal droppings are collected from 60 ducks and the material is divided in 2 samples (30gx2) and 10 ceacal samples pooled into 1 sample.
Faecal samples:
One pooled sample consists of droppings from 30 birds. From each individual at least 1g faeces is collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The sample is examined for Salmonella according to Nordic Committee on Food Analysis.

Breeding flocks: Production period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Meat production flocks: At slaughter (flock based approach)

see "Salmonella in broiler meat and products thereof"

Case definition

Breeding flocks: Day-old chicks

If salmonella is isolated from an individual animal, the whole flock is positive. In poultry, the flock is the epidemiological unit.

Breeding flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Breeding flocks: Production period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Day-old chicks

See "Breeding flocks: Day-old chicks"

Meat production flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Meat production flocks: At slaughter (flock based approach)

A positive neck skin sample at slaughter results in restriction on the holding of origin and additional official sampling at the holding. If the official samples are positive the farm is considered infected

Diagnostic/analytical methods used

Breeding flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Breeding flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Breeding flocks: Production period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Meat production flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Meat production flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Breeding flocks

Vaccination is prohibited

Meat production flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

Breeding flocks

High bio-security rules at the same level as for other breeding stocks. These flocks are raised indoors.

Meat production flocks

Controlled feed, salmonella free ducklings.

Control program/mechanisms

The control program/strategies in place

Breeding flocks

Strict hygiene rules are enforced on breeding stock which is kept indoors with the same preventive measures implemented as for other breeding poultry. The rules are in line with what is required within the Prophylactic volontary salmonella control programme even though duck farms are not accepted within the programme. It includes: a)Rules for feed production and transport, b) hygienic rules to protect the birds from salmonella infection from the surroundings, c) salmonella free newly hatched
ducklings are delivered from the hatcheries, d) precaution to stop spread of salmonella from an infected flock, and e) all- in - all out principle in all houses. At some of the breeding duck farms no preventive measures are implemented.

Meat production flocks

These are raised out-doors. Following rules may be applied at some holdings: a)Rules for feed production and transport, b) salmonella free newly hatched ducklings from the hatcheries, c)precaution to stop spread of salmonella from an infected flock

Measures in case of the positive findings or single cases

Restrictions, culling of infected animals, destruction, cleaning and disinfection and finally environmental negative samples before restrictions are lifted.

Notification system in place

All findings of salmonella is compulsory notifiable. The obligation to notify all salmonella findings has been in force since 1961.

Results of the investigation

One large holding with ducks for meat production was re-infected with S. Worthington during 2004. It was the same serotype as last year (during 2003)

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

Since 1996, the situation has remained stable with none to a few infected flocks per year.

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

As Swedish produced red and white meat are virtually free from salmonella, the risk of contracting salmonella from food products of domestic animal origin is very small.

F. Salmonella spp in pigs

Monitoring system

Sampling strategy

Breeding herds

Sampling strategies are described in the Swedish Salmonella control programme (95/50/EC). The programmes are supervised by the SJV and the SLV. All the sampling according to the salmonella programme is performed or supervised by the competent authority, that is official veterinarians. They are responsible for the sampling in the herds, flocks, hatcheries, cuttingplants and in the slaughter houses.
Within the programme, lymph nodes and carcass swabs are systematicly collected from pigs at slaughter to ensure that the samples are representative of the population of slaughtered pigs at each slaughterhouse. The salmonella control programme is presented in the section "Salmonella spp. in pig meat and products thereof".
Other programmes:
There is a voluntary additional sampling of faecal materials in a quality programme called BIS (Best In Sweden) run by the industry (Swedish meats).
Other sampling:
Sampling at farms is performed whenever there is a clinical suspicion. There is also mandatory sampling at import of animals as well as additional sampling at breeding farms.

Multiplying herds

see "breeding herds"

Fattening herds

see "breeding herds"

Frequency of the sampling

Breeding herds

Other: apart from sampling in the control programme, there is additional faecal sampling once yearly (sow pools twice yearly)

Multiplying herds

Other: apart from sampling in the control programme, there is additional faecal sampling once yearly (sow pools twice yearly)

Fattening herds at farm

Other: in outbreak investigations and voluntary control programmes (BIS)

Fattening herds at slaughterhouse (herd based approach)

Other: see Salmonella spp. in pig meat and products

Type of specimen taken

Breeding herds

Faeces

Multiplying herds

Faeces

Fattening herds at farm

Faeces

Fattening herds at slaughterhouse (herd based approach)

Other: see Salmonella spp. in pig meat and products

Methods of sampling (description of sampling techniques)

Breeding herds

Faecal sampling:
For individual sampling, at least 10 g faeces from each animal is collected. From pens with growers/finisher pigs pooled faecal samples of at least 50g (10g froam each of at least 5 animals/pen) is collected. All samples should be analysed within 24-48 h after collection.
From individual samples, 5 g faeces is examined while the remaining part is stored at +4C until examination is completed. Material from at most 15 animals are pooled. If salmonella is isolated from a pooled sample, each of the individually stored samples can be examined for salmonella separately.

Multiplying herds

See "breeding herds"

Fattening herds at farm

Monitoring is performed at the slaughter house. In case sampling is performed for example following confirmed or suspected salmonella infection at herd level, faecal samples are collected and analysed as described under "Breeding herds"

Fattening herds at slaughterhouse (herd based approach)

If salmonella is found from any lymph node or carcass swab collected in the control programme (inlcuding animals from breeding-, multiplying- and fattening herds) trace back of the infection to the farm of origin is always performed. Faecal samples are collected as described under "Breeding herds".
For information about sampling of lymph nodes and carcass swabs in the control programme, see "Salm spp. in pig meat and products".

Case definition

Breeding herds

Is salmonella is isolated from a pig, then the whole herd is positive. The herd is the

epidemiological unit.

Multiplying herds

see under "breeding herd"

Fattening herds at farm

see under "breeding herd"

Fattening herds at slaughterhouse (herd based approach)

see under "breeding herd"

Diagnostic/analytical methods used

Breeding herds

Bacteriological method: NMKL No 71:1999

Multiplying herds

Bacteriological method: NMKL No 71:1999

Fattening herds at farm

Bacteriological method: NMKL No 71:1999

Fattening herds at slaughterhouse (herd based approach)

Other: see Salmonella spp. in pig meat and products

Vaccination policy

Breeding herds

vaccination is not used in Sweden

Multiplying herds

see under "breeding herd"

Fattening herds

see under "breeding herd"

Other preventive measures than vaccination in place

Breeding herds

In cattle, pigs and other food-producing animals salmonella control in feed- and feed production (HACCP based approach) is integrated with the control programme to ensures that feed to food producing animals virtually is free from Salmonella.
Apart from this, there is also a voluntary hygiene programme since 2002 run by the

industry and supervised by the SJV. In this programme, certain rules of hygiene and standardised preventive measures have to be implemented. Affiliation to the the voluntary control programme imply a higher level of economic compensation in case salmonella infection.
There is also voluntary additional sampling in a programme called BIS (Best In Sweden or Baest i Sverige) run by the industry (Swedish meats).

Multiplying herds

see "breeding herds"

Fattening herds

see "breeding herds"

Control program/mechanisms

The control program/strategies in place

Breeding herds

The control programme is outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The programme is nation-wide, thus it covers all herds in Sweden, also those that may deliver their animals abroad. The programme covers all herds.
The salmonella control programme is officially supervised and includes: a) Compulsory notification of all findings of salmonella, regardless od serotype, b) Compulsory action if salmonells is isolated, including prohibition on placing animals on the market, c) Examination for salmonella in animals slaughtered under special conditions (e.g diseased animals or when salmonella is suspected), and d) Control programme at slaughter houses and in herds, and clinical surveillance in herds.
As breeding herds and multiplying herds constitute the top of the breeding pyramide, a complementary monitoring is performed in these herds at farm level.
Description of sampling of so called risk herds, in herds that are not covered by a slaughter house based control programme, and of animals from herds not included in a control programme, that are introduced into herds included in a control programme are described in the Swedish salmonella control programme document 95/50/EC.

Multiplying herds

see "breeding herds"

Fattening herds

see "breeding herds"

Measures in case of the positive findings or single cases

If Salmonella is isolated from cattle, pigs and other food-producing animals, indicating a herd

infection, restrictions are put on the farm/herd. Such restrictions may include a ban of transport (unless transport to sanitary slaughter), collection of bacteriological samples, and institution of a sanitation plan, i.e. involving elimination of chronically infected animals, cleaning and disinfection, treatment of manure and sludge, and decontamination of feeding stuffs. Also, the feed supplier is investigated. Restrictions are lifted when faecal samples from all animals in the epidemiological unit (usually the herd) taken at two consecutive samplings one month apart are negative.
Isolated salmonella strains have to be sent in to the SVA for typing and testing of antimicrobial resistance.
Every carcass that is contaminated by Salmonella is deemed unfit for human consumption.

Notification system in place

All findings of salmonella is compulsory notifiable. The obligation to notify all salmonella findings has been in force since 1961.

Results of the investigation

In 2004, salmonella was not detected in any pig herd.
Results from the salmonella control programme is presented in section "Salmonella spp. in pig meat and products".

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

The situation in Sweden remains favourable. From the beginning of the 80's there has, in general, been less than 5 infected herds per year. There have been even less infected farms since 2000, with the exception of 2003 when there was an outbreak of S. Cubana in feed including 30 herds.
See also "Salmonella spp. in pig meat and products".

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

As <0.01% of Swedish pigs are infected with salmonella, the risk of contracting salmonella from Swedish food produced from pigs is very small.

Additional information

Apart from sampling of animals in the voluntary and mandatory salmonella programmes at herd- and slaughter level, there is extensive sampling at feed mills to ensure production of feed virtually free from salmonella contamination.

G. Salmonella spp. in bovine animals

Monitoring system

Sampling strategy

Sampling strategies are described in the Swedish Salmonella control programme (95/50/EC). The programmes are supervised by the SJV and the SLV. All the sampling according to the salmonella programme is supervised by the competent authority, that is

official veterinarians. They are responsible for the sampling in the herds, flocks, hatcheries, cuttingplants and in the slaughter houses.
Within the programme, lympnh nodes and carcass swabs are systematicly collected from pigs at slaughter to ensure that the samples are representative of the population of slaughtered pigs at each slaughterhouse. The salmonella control programme is presented in the section "Salmonella spp. in bovine meat and products".
Sampling at farms is performed whenever there is a clinical suspicion. Animals that are bought to a farm under certain defined criteria are also sampled.

Frequency of the sampling

Animals at farm

Other: In case of clinical suspicion at autopsy or sanitary slaughter.

Animals at slaughter (herd based approach)

Other: see Salmonella spp. in bovine meat and products thereof

Type of specimen taken

Animals at farm

Faeces

Animals at slaughter (herd based approach)

Other: see Salmonella spp. in bovine meat and products thereof

Methods of sampling (description of sampling techniques)

Animals at farm

For individual sampling, at least 10 g faeces from each animal is collected. From pens with calves/young stock pooled faecal samples of at least 50g (10g froam each of at least 5 animals/pen) is collected. All samples should be analysed within 24-48 h after collection.
From individual samples, 5 g faeces is examined while the remaining part is stored at +4C until examination is completed. Material from at most 15 animals are pooled. If salmonella is isolated from a pooled sample, each of the individually stored samples can be examined for salmonella separately.

Animals at slaughter (herd based approach)

If salmonella is found from any lymph node or carcass swab collected in the control programme trace back of the infection to the farm of origin is always performed. Faecal samples are collected as described under "Animals at farm".
For information about sampling of lymph nodes, carcass swabs and cutting plants in the control programme, see "Salmonella spp. in bovine meat and products thereof".

Case definition

Animals at farm

If salmonella is isolated from a pig, then the whole herd is positive. The herd is the epidemiological unit.

Animals at slaughter (herd based approach)

see "Salmonella spp. in bovine meat and products thereof"

Diagnostic/analytical methods used

Animals at farm

Other: NMKL 71:1999 or a modified ISO 1992. For analyses of faecal samples from cattle cystein and selenite broth is sometimes used.

Animals at slaughter (herd based approach)

Other: see Salmonella spp. in bovine meat and products thereof

Vaccination policy

Vaccination is not used.

Other preventive measures than vaccination in place

In food-producing animals salmonella control in feed- and feed production (HACCP based approach)is integrated in the salmonella control.
Apart from this, there is also a voluntary hygiene programme since 2002 run by the industry and supervised by the SJV. In this programme, certain rules of hygiene and standardised preventive measures have to be implemented. Affiliation to the the voluntary control programme imply a higher level of economic compensation in case salmonella infection.

Control program/mechanisms

The control program/strategies in place

Control strategies follow the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC).
The control programme is nation-wide, thus it covers all herds in Sweden, also those that may deliver their animals abroad. The salmonella control programme is officially supervised and includes: a) Compulsory notification of all findings of salmonella, regardless od serotype, b) Compulosry action if salmonells is isolated, including prohibition on placing animals on the market, c) Examination for salmonella in animals slaughtered under special conditions (e.g diseased animals or when salmonella is suspected), and d) Control programme at slaughter houses and in herds, and clinical surveillance in herds.
Description of sampling of so called risk herds, in herds that are not covered by a slaughter house based control programme, and of animals from herds not included in a control programme, that are introduced into herds included in a control programme are described in the Swedish salmonella control programme document 95/50/EC.

Measures in case of the positive findings or single cases

If Salmonella is isolated from cattle, pigs and other food-producing animals, indicating a herd infection, restrictions are put on the farm/herd. Such restrictions may include a ban of transport (unless transport to sanitary slaughter), collection of bacteriological samples, and institution of a sanitation plan, i.e. involving elimination of chronically infected animals, cleaning and disinfection, treatment of manure and sludge, and decontamination of feeding stuffs. Also, the feed supplier is investigated. Restrictions are lifted when faecal samples from all animals in the epidemiological unit (usually the herd) taken at two consecutive samplings one month apart are negative.
For positive findings in the surveillance of lymph nodes and carcass swabs in the control programme, see "Salmonella spp. in bovine meat and products thereof".

Notification system in place

All findings of salmonella is compulsory notifiable. The obligation to notify all salmonella findings has been in force since 1961.

Results of the investigation

In 2004, 8 cattle farms were infected with salmonella. The following serotypes were isolated at the farms:
a) 1 S. Mbandaka. Salmonella was detected at sanitary slaughter.
b) 2 S. Dublin (one dairy farm and one that farm with specialised calf production). The dairy farm was detected following autopsy of a dead calf and following sampling of a calf with respiratory symptoms, and the farm with specialised calf production (neighbouring farm to the dairy farm) was detected due to a trace-back investigation decided by the authorities.
c) 1 S. Typhimurium DT 40. Salmonella was detected following sampling at autopsy of a dairy cow found dead following symptoms with diarrhoea.
d) 1 S. Subspecie.
e) 3 S. Typhimurium multiresistent DT 104. It was shown that these strains belonged to the same clone and that all were pentaresistent. The farm had experienced poor health of calves and salmonella was detected following sampling at autopsy. The two other farms were detected following sampling at trace-back investigation from the 1st infected farm, both were organic farms.
For results from sampling in the salmonella control programme, see "Salmonella spp. in bovine meat and products thereof"

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

The situation remains very favourable with few infected farms each year. During the 1980s' the number of salmonella infected cattle farms declined rapidly. Since the end of the 1990s' the number of farms infected varied from 4 to 12 per year.

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

The risk of contracting salmonella from Swedish produced food of cattle origin is very small as <0.1% of Swedish cattle is infected with salmonella.

Additional information

Apart from the cattle farms that were found infected with
S. Typhimurium DT 104 in 2004, four cattle farms have previously been were infected with this serotype. All have been penta resistant. One of the herds was depopulated whereas the others were cleaned-up.

H. Salmonella spp. in animal

Monitoring system

Sampling strategy

Described here is salmonella in other animal species (such as horses, pets and wild life) than the ones covered in the salmonella control programme.
Sampling at farms/holdings or of individual animals is performed whenever there is a clinical suspicion. Sampling may also be performed at autopsy. Wild life sent to the SVA for autopsy may be tested for salmonella.

Case definition

Animals at farm

If salmonella is isolated from an individual dog, horse or cat, then the whole kennel/holding/stable etc. is positive. However, if salmonella is isolated from other animal species, each animal is regarded positive.

Vaccination policy

Vaccination is not used in Sweden.

Measures in case of the positive findings or single cases

If Salmonella is isolated cattle, pigs and other food-producing animals (including horses), indicating a herd infection, restrictions are put on the farm/herd according to Swedish legislation. For other domestic animal species, proper actions are taken in order to elimante the infection and prevent spread of salmonella.

Notification system in place

All findings of salmonella is compulsory notifiable. The obligation to notify all salmonella findings has been in force since 1961.

Results of the investigation

Early in 2004, there was a small outbreak of S. Typhimurium in cats and 31 animals were found positive. Phagetyping were performed in 10 of these, and phagetype 40 was detected in 9 cats and NST in 1. This outbreak was similar to the one recorded in 2003 (also caused by S. Typhimurium phagetype 40, affecting 114 cats).
Furthermore, 2 dogs were salmonella positive (S. Typhimurium PT 40, S. Roodepoort), 3 horse stables (S. Typhimurium: PT 146, NST and unknown), 3 passerine birds (S. Typhimurium

NST), 2 other wild birds (S. Typhimurium NST and PT 41), 4 reptiles (1 S. Kottbus, 1 S. Subsp. II and 2 S. Subsp. IV), and 6 other animal species (3 S. Dublin, 2 S. Enteritidis PT1 and PT 9A and 1 S. Subsp. I; See table 3.2.4).

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

The situation remains stable.

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

It has been reported that findings of salmonella in reptiles kept as pets pose a risk for transmission of salmonella to humans. For other animal species, transmission to humans is regarded to be very limited.

Table 3.2.1 Salmonella sp. in Poultry breeding flocks (Gallus gallus)

	Source of information	Remarks	Epidemiological unit	Flocks tested	Flocks positive	S. Enteritidis	S. Typhimurium
Gallus gallus							
grandparent breeding flocks for egg production line	SJV		flock	1	0		
parent breeding flocks for egg production line	SJV		flock	20	0		
- during production period	SJV		flock	14	0		
- during rearing period	SJV		flock	6	0		
grandparent breeding flocks for meat production line	SJV		flock	13	0		
parent breeding flocks for meat production line	SJV		flock	86	0		
- during rearing period	SJV		flock	29	0		
- during production period	SJV		flock	57	0		

Table 3.2.2 Salmonella sp. in other commercial poultry

	Source of information	Remarks	Epidemiological unit	Flocks tested	Flocks positive	S. Enteritidis	S. Typhimurium	S. Worthington	S. Hadar
Gallus gallus									
laying hens									
- during rearing period	SJV		Flock	137	0				
- during production period	SJV		Flock	772	2		2		
broilers									
- during rearing period	SJV		Flock	3000	2				2
Ducks									
- during production period	SJV	Flocks tested not available	Flock		1			1	
Geese									
- during production period	SJV	Flocks tested not available	Flock		2		2		
Turkeys									
breeding flocks, unspecified	SJV		Flock	6	0				
- during production period	SJV		Flock	131	0				

Table 3.2.3 Salmonella sp. in non-commercial poultry and birds

	Source of information	Remarks	Epidemiological unit	Flocks tested	Flocks positive	S. Enteritidis	S. Typhimurium
Pheasants	SJV		flock	4	0		

Table 3.2.4 Salmonella sp. in animals (non poultry)

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	S. Enteritidis	S. Typhimurium	S. Rookepoort	S. Dublin	S. Mbandaka	Salmonella spp.	S. Kottbus
	SJV, SVA	b	herd		8		4		2	1	1	
Cattle (bovine animals) (1)												
- at slaughter - Control programme - mandatory - official sampling (swab) (2)	SLV	carcass swab	animal	3475	0							
- at slaughter - Control programme - mandatory - official sampling (lymphnode) (3)	SLV	lymph node	animal	3470	0							
Pigs												
breeding animals												
- at slaughter - Control programme - mandatory - official sampling (swab) (6)	SLV	carcass swab	animal	2750	0							
- at slaughter - Control programme - mandatory - official sampling (lymphnode) (7)	SLV	lymph node	animal	2782	0							
fattening pigs												
- at slaughter - Control programme - mandatory - official sampling (swab) (4)	SLV	carcass swab	animal	3190	0							

- at slaughter - Control programme - mandatory - official sampling (lymphnode) (5)	SLV	lymph node	animal	3191	0							
Solipeds	SJV, SVA	a, c	holding		3		3					
Pet animals												
dogs	SJV, SVA	a, d	animal		3		1	1			1	
cats	SJV, SVA	a, e	animal		31		31					
reptiles	SJV, SVA	a, f	animal		4						3	1
Wildlife												
wild birds	SVA	a, g	animal		5		5					
Other animals	SVA, SJV	a,h	animal		6	2			3		1	

(1) : The number of holdings not available.
(2) : 3251 swabs from major slaughter houses (sl.h.) and 224 from minor sl.h.
(3) : 3253 lymph nodes from major sl.h. and 217 from minor sl.h. Three lymph nodes were positive(S. Typhimurium, S. Duessseldorf, S. Subspecie) but salmonella was not re-isolated at any of the farms, thus, the case definition for a positive farm was not met.
(4) : 2980 samples from major sl.h. and 210 from minor sl.h.
(5) : 2981 sampls from major sl.h. and 210 from minor sl.h. Four lymph nodes were positive for S. Typhimurium phage type 40, but salmonella was not re-isolated in the herds of origin. Thus, the case definition for a positive farm was not met.
(6) : 2645 samples from major sl.h. and 105 from minor sl.h.
(7) : 2686 samples from major sl.h and 96 from minor sl.h. One lymph node was positive for S. typhimurium phage type 40, but salmonella was not re-isolated in the herd of origin, thus the case definition for a positive farm was not met.

Footnote

a) Units tested not available.
b) Phage types (PT) isolated: 1 PT 40, 3 PT 104
c) PT isolated: 1 PT 146, 1 NST
d) PT isolated: 1 PT 40
e)When investigated, 9 out of 10 isolates of S. Typhimurium were PT 40 and one isolate was of NST.
f)3 Salmonella spp. includes 1 Subsp. II and 2 Subsp. IV
g)PT isolated: 4 PT NST, 1 PT 41
h)S. Dublin (2 seals, 1 rat), S. Enteritidis (1 hedgehodge PT 9A, 1 musk-ox PT 1) and S. Subsp. IV (1 turtle)

2.1.5. Salmonella in feedstuffs

A. Salmonella spp. in feed

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

(Note from the editors: Parts of the text below does not fit the premade text form, therefore all text has been entered below "National evaluation..." and "Additional information". We include this text as Salmonella control in feed is integrated in the Swedish Salmonella control programme.)
Current situation:
All sampling follow the legislation on feeding stuffs and animal by-products and is supervised by the SJV. In addition to the compulsory testing, a large number of voluntary samples are taken. All Salmonella findings are sent to the SVA for confirmation and serotyping.
Analytical method used:
The bacteriological method used is NMKL method No 71 (5th ed., 1999). Serotyping is performed by slide agglutination. Certain serotypes are subtyped by molecular methods. The compulsory samples taken at the feed mills are analysed at the SVA. Also, samples taken by official feed inspectors and "hygiene groups", consisting of the county veterinarian and an official feed inspector, are analysed at the SVA. Other samples may be analysed at other accredited laboratories. Most analysing laboratories are accredited according to EN/150/17025.
Sampling at feed mills:
At the feed mills, samples are taken mainly according to Hazard Analysis Critical Control Point (HACCP) principles, both on the premises and along the production line. The HACCP system was initiated in 1991 and has proven to be effective for detecting and preventing Salmonella in feeding stuffs. Feed mills that produce feeding stuffs for poultry are obliged to take a minimum of five samples per week from specified critical control points. Feed mills that produce feeding stuffs for ruminants, pigs or horses, are obliged to take two samples a week. The producer often takes additional voluntary samples. Official feed inspectors sample at specified points at the feed mills, one to five times a year, depending on production volume. Also, a so-called hygiene group makes yearly inspections at feed mills that produce more than 1000 tons of feeding stuffs annually. Feed mills that produce less are visited less frequently. At these inspections, samples are taken at critical points - especially in connection with coolers, aspirators and elevators.
Sampling of feed materials:
Feed materials are classified according to the Salmonella risk they may present: feed materials of animal origin (S1), high risk feed materials of vegetable origin (S2, e.g. soy bean meal and some products deriving from rape seed), and low risk feed materials of vegetable origin (S3, e.g. rice). Production of these classified feed materials has to follow a hygiene programme, containing routines for Salmonella sampling, should be approved by the SJV.
All consignments of feed materials classified as S1, S2 and S3 that is traded into Sweden have to be sampled, either in Sweden or in the country of origin. If the consignment was sampled outside Sweden, it must be proved that the required samples have been taken.
Feed material of animal origin has to be sampled according to regulation (EC) No 1774/2002. If the production is continuous, the number of samples to be taken is decided by the SJV. In addition to this, many voluntary samples are collected.
- Text continues below "Additional information". -

Additional information

- Text continued from "National evaluation..." -
Sampling of compound feeding stuffs traded into Sweden:
All compound feeding stuffs (S1, S2 or S3) that are traded into Sweden and produced for ruminants, pigs or poultry, are tested for Salmonella following the same principles as feed raw materials.
Processing plants for animal by-products and feed material of animal origin:
Feed materials of animal origin are sampled in accordance with the EU legislation. In addition to this, many voluntary samples are taken.
Pet food:
Every company producing pet food is regularly inspected and the feed is sampled for Salmonella once a year by an official feed inspector. In addition to this, voluntary samples are taken. Every consignment of dog chews from a third country is sampled at the border inspection, even though it must be accompanied by a certificate showing that the pet food has been tested negative for Salmonella in compliance with the EU legislation. Dog chews that are found positive for Salmonella are rejected.
Pet food produced by animal by-products have to be sampled for Salmonella according to regulation (EC) No 1774/2002.
Measures in case of positive findings:
No feed materials containing, or suspected of containing, Salmonella may be used in the production of feeding stuffs. Positive Salmonella findings always give rise to further testing and decontamination.
Heat treatment:
All compound feeding stuffs for poultry have to be heat treated to >75°C. In practice, a great amount of feeding stuffs for ruminants and pigs are also heat treated. Non heat-treated feed grains for sale, aimed for poultry on farm, have to originate from a storage plant that has been approved by the SJV. All storage facilities must fulfil certain requirements regarding sampling.
Results from 2004:
In the tables, the compulsory samples, the samples taken in the official control and the voluntary samples that have been reported to the SJV are presented. There is no obligation to report negative results from voluntary samples.
- Feed mills and compound feeding stuffs:
In the HACCP control of feed mills, 8456 samples were reported and of those 21 were positive. The positive samples belonged to 14 serotypes (Table 3.1.3)
- Feed material of vegetable origin:
50 samples of feed material were positive for Salmonella from imported feed materials. The isolates came from derived material of soybean, maize and rapeseed. The most common serotypes were S. Senftenberg (n=5) and S. Mbandaka (n=11). Samples taken on rapeseed meal produced in Sweden showed 9 positive results for Salmonella. They were all enviroment samples. The serotypes were S. Cubana (n=3) and S. Mbandaka (n=5) and S. Senftenberg (n=1). In total, 2656 samples were analysed.
-Processing plants for animal by-products and feed materials of animal origin
Out of 2852 samples from feed materials of land animal origin, 18 (0.6%) were positive. Of those, 13 were from meat and bone meal, representing 8 serotypes (Table 3.1.1). 23 (3%) out of 669 samples from fish meal were positive. The positive samples were S. Agona or S. Senftenberg.
- Dog snacks:

In 2004, there were 3 positive findings belonging to three different serotypes of Salmonella in dog chews.

Table 3.1.1 Salmonella sp. in feed material of animal origin

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium	S. Agona	S. Senftenberg	S. Montevideo	S. Lille	S. Idikan	S. Braenderup	S. Westphalia	S. Give	S. Nola	S. Mbandaka
Feed material of land animal origin																		
Meat and bone meal	SJV	b,c,d,e	sample		716	13			4	1		1	1	1		1	1	3
Greaves	SJV	b,c,d,e	sample		611	3					3							
Poultry offal meal	SJV	e	sample		104	2			1						1			
Egg powder	SJV	e	sample		31	0												
Blood products	SJV	b,c,d	sample		151	0												
Protein meal	SJV	b,c,d	sample		1239	0												
Feed material of marine animal origin																		
Fish meal	SJV	b,c,d	sample		669	23			16	7								

Footnote

a)Compulsory sampling (national requirements)
b)Compulsory sampling (EU requirements)
c)Voluntary sampling
d)Production
e)Import
Negative voluntary sampling is not incuded as data about number of samples is un-known.

Table 3.1.2 Salmonella sp. in feed of vegetable origin (Part A)

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium	S. Livingstone	S. Havana	S. Kentucky	S. Cerro	S. Agona	S. Mbandaka	S. Tabligbo	S. Yoruba	S. Gloucester	S. Ohio	S. Morehead	Salmonella spp.
Feed material of cereal grain origin																				
Wheat derived	SJV	f	sample		183	0														
Maize derived	SJV	a,c,e	sample		40	6			2	2										2
other cereal grain derived	SJV	a,c,e	sample		2	0														
Feed material of oil seed or fruit origin																				
Rape seed derived	SJV	a,c,e,g	sample		2191	19		1			1			7						
Palm kernel derived	SJV	a,c,e	sample		54	0														
Soya (bean) derived	SJV	a,c,e	sample		186	34				1		2	1	9	1	1	1	1	1	3

Footnote

a)Compulsory sampling (national requirements)
b)Compulsory sampling (EU requirements)
c)Voluntary sampling
d)Production
e)Import
f)Whole grain storage on farms
g)Includes 757 enviromnental samples (9 positive) and 1328 rapeseed samples (0 positive) from domestic processing plants
Negative vountary sampling is not incuded as data about number of samples is un-known.

Table 3.1.2 Salmonella sp. in feed of vegetable origin (Part B)

	S. Llandoff	S. Gaminara	S. Panama	S. Ouakam	S. Rissen	S. Senftenberg	S. Tennessee	S. Cubana
Feed material of cereal grain origin								
Wheat derived								
Maize derived								
other cereal grain derived								
Feed material of oil seed or fruit origin								
Rape seed derived						1	6	3
Palm kernel derived								
Soya (bean) derived	1	1	1	1	3	5	1	

Footnote

a)Compulsory sampling (national requirements)
b)Compulsory sampling (EU requirements)
c)Voluntary sampling
d)Production
e)Import
f)Whole grain storage on farms
g)Includes 757 enviromnental samples (9 positive) and 1328 rapeseed samples (0 positive) from domestic processing plants
Negative vountary sampling is not incuded as data about number of samples is un-known.

Table 3.1.3 Salmonella sp. in compound feedingstuff (Part A)

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium	S. Derby	S. Havana	S. Waycross	S. Infantis	S. Rissen	S. Corvallis	S. Ohio	S. Give	S. Idikan	S. Braenderup	S. Mbandaka	S. Tennessee
Compound feedingstuffs for cattle																				
Process control	SJV	a																		
Final product	SJV	a																		
Compound feedingstuffs for pigs																				
Process control	SJV	a																		
Final product	SJV	a																		
Compound feedingstuffs for poultry (non specified)																				
Process control	SJV	a																		
Final product	SJV	a																		
Compound feedingstuffs for poultry -breeders																				
Process control	SJV	a																		
Final product	SJV	a																		
Compound feedingstuffs for poultry - laying hens																				
Process control	SJV	a																		
Final product	SJV	a																		
Compound feedingstuffs for poultry - broilers																				

Process control	SJV	a																		
Final Product	SJV	a																		
Pet food																				
Dog snacks (pig ears, chewing bones)	SJV	b	sample			3	1	1	1											
other feed material																				
- at feed mill - HACPP or own checks by industry	SJV		sample		8456	21				1	1	2	1	1	4	1	1	1	1	1
- at feed mill - official food or feed controls	SJV		sample		281	0														

Footnote

a) Both voluntary and compulsory sampling (national or EU requirements) are based on HACPP principles, and presented under "Other feed material".
b) Import

Table 3.1.3 Salmonella sp. in compound feedingstuff (Part B)

	S. Livingstone	S. Cubana	S. Orritamerin
Compound feedingstuffs for cattle			
Process control			
Final product			
Compound feedingstuffs for pigs			
Process control			
Final product			
Compound feedingstuffs for poultry (non specified)			
Process control			
Final product			
Compound feedingstuffs for poultry -breeders			
Process control			
Final product			
Compound feedingstuffs for poultry - laying hens			
Process control			
Final product			
Compund feedingstuffs for poultry - broilers			
Process control			

Final Product			
Pet food			
Dog snacks (pig ears, chewing bones)			
other feed material			
- at feed mill - HACPP or own checks by industry	2	3	1
- at feed mill - official food or feed controls			

Footnote

a) Both voluntary and compulsory sampling (national or EU requirements) are based on HACPP principles, and presented under "Other feed material".
b) Import

2.1.6. *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 3.3.3 Salmonella serovars in animals

Serovars		Cattle (bovine animals)		Pigs		Gallus gallus		Other poultry	
Sources of isolates		M(*)	C(*)	M(*)	C(*)	M(*)	C(*)	M(*)	C(*)
Number of isolates in the laboratory	N=								
Number of isolates serotyped	N=								

Footnote

(*) M : Monitor, C : Clinical
The number of farms/holdings infected with salmonella, and serotype isolated, is presented in prevalence tables and text.

Table 3.3.5 S.Enteridis phagetypes in animals

Phagetype		Cattle (bovine animals)		Pigs		Gallus gallus		Other poultry	
Sources of isolates		M(*)	C(*)	M(*)	C(*)	M(*)	C(*)	M(*)	C(*)
Number of isolates in the laboratory	N=								
Number of isolates serotyped	N=								

Footnote

(*) M : Monitor, C : Clinical
The numbers of farms/holdings infected with salmonella, serotype and phagetype isolated are presented in prevalence tables and text.

Table 3.3.7 Salmonella Typhimurium phagetypes in animals

Phagetype		Cattle (bovine animals)		Pigs		Gallus gallus		Other poultry	
Sources of isolates		M(*)	C(*)	M(*)	C(*)	M(*)	C(*)	M(*)	C(*)
Number of isolates in the laboratory	N=								
Number of isolates serotyped	N=								

Footnote

(*) M : Monitor, C : Clinical
The numbers of farms/holdings infected with salmonella, serotype and phagetype isolated are presented in prevalence tables and text.

2.1.7. Antimicrobial resistance in *Salmonella* isolates

Antimicrobial resistance is the ability of certain microorganisms to survive or grow in the presence of a given concentration of antimicrobial agent that usually would kill or inhibit the microorganism species in question. Antimicrobial resistant Salmonella strains may be transferred from animals or foodstuffs to humans.

A. Antimicrobial resistance in Salmonella in cattle

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial susceptibility of Salmonella is monitored yearly within the Swedish Veterinary Antimicrobial Resistance Monitoring programme, SVARM. Isolates included derive from both active and passive salmonella monitoring programmes and from both clinical and non-clinical cases.

Type of specimen taken

For details on sampling see "Salmonella spp. in bovine animals".

Procedures for the selection of isolates for antimicrobial testing

It is mandatory that at least one isolate from each notified incident of Salmonella is confirmed at SVA. From these isolates, the first from each food animal species from each notified incident is tested for antimicrobial susceptibility at the Department of Antibiotics, SVA. The same inclusion criteria are also used for isolates from other warm blooded animal species, unless the epidemiological situation in a particular year is judged unusual. For example, in year 2004, Salmonella was isolated from a total of 32 cats and of these isolates; the first 20 consecutive isolates were tested and thereafter every fifth isolate (total number of isolates 22).

Laboratory methodology used for identification of the microbial isolates

For details on culture see "Salmonella spp. in bovine animals".

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Antimicrobial susceptibility was tested by a dilution method in cation adjusted Mueller-Hinton broth (CAMBH). The tests were performed following the standards for microdilution of the National Committee of Clinical Laboratory Standards (NCCLS, 2002) using VetMIC panels produced at the Dept. of Antibiotics, SVA. As quality control, Escherichia coli ATCC 25922 was included.
The Dept. of Antibiotics is accredited to perform the analyses by the Swedish Board for Accreditaion and Conformity Assesment (SWEDAC) according to SS-EN ISO/IEC 17025 and regularly participates in external quality assurance.

Breakpoints used in testing

For antimicrobials tested, range of tested concentrations and cut-off values (breakpoints) for resistance see Table 6.1.6.
Cut-off values defining resistance were set according to microbiological criteria based on the MIC distributions. An isolate was regarded as resistant to a specific antimicrobial when its MIC was distinctly higher than those of inherently susceptible strains of the bacterial species in question. Where appropriate, the breakpoints suggested by NCCLS (2002) for animal pathogens were also taken into consideration.

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

Of the 13 notified incidents of Salmonella in cattle 2004, S. Typhimurium were involved in five incidents. In ten incidents, isolated Salmonella were sensitive to all antimicrobials tested (Table 3.2.5.1). In three incidents, all involving S. Typimurium, isolated Salmonella had the classical penta resistance (ampicillin/chloramphenicol/streptomycin/sulpha/tetracycline) Table 3.2.5.3. In these three incidents, S. Typhimurium DT 104 were isolated and in one incident also S. Typhimurium DT 120. The three incidents were connected through trade of calves.

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

The overall situation of antimicrobial resistance in Salmonella in cattle is favourable. There are few incidents each year and multiresistant clones are rarely involved. Furthermore there is no indication of spread of such clones among other animal species including wildlife.

B. Antimicrobial resistance in Salmonella in pigs

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial susceptibility of Salmonella is monitored yearly within the Swedish Veterinary Antimicrobial Resistance Monitoring programme, SVARM. Isolates included derive from both active and passive salmonella monitoring programmes and from both clinical and non-clinical cases.

Type of specimen taken

For details on sampling see "Salmonella spp. in pigs".

Procedures for the selection of isolates for antimicrobial testing

It is mandatory that at least one isolate from each notified incident of Salmonella is confirmed at SVA. From these isolates, the first from each food animal species from each notified incident is tested for antimicrobial susceptibility at the Department of Antibiotics, SVA. The same inclusion criteria are also used for isolates from other warm blooded animal species, unless the epidemiological situation in a particular year is judged unusual. For example, in year 2004, Salmonella was isolated from a total of 32 cats and of these isolates; the first 20 consecutive isolates were tested and thereafter every fifth isolate (total number of isolates 22).

Laboratory methodology used for identification of the microbial isolates

For details on culture see "Salmonella spp. in pigs".

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Antimicrobial susceptibility was tested using dilution methods in cation adjusted Mueller-Hinton broth (CAMBH). The tests were performed following the standards for microdilution of the National Committee of Clinical Laboratory Standards (NCCLS, 2002) using VetMIC panels produced at the Dept. of Antibiotics, SVA. As quality control, Escherichia coli ATCC 25922 was included.
The Dept. of Antibiotics is accredited to perform the analyses by the Swedish Board for Accreditaion and Conformity Assesment (SWEDAC) according to SS-EN ISO/IEC 17025 and regularly participates in external quality assurance.

Breakpoints used in testing

For antimicrobials tested, range of tested concentrations and cut-off values (breakpoints) for resistance see Table 6.1.6.
Cut-off values defining resistance were set according to microbiological criteria based on the MIC distributions. An isolate was regarded as resistant to a specific antimicrobial when its MIC was distinctly higher than those of inherently susceptible strains of the bacterial species in question. Where appropriate, the breakpoints suggested by NCCLS (2002) for animal pathogens were also taken into consideration.

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

Of the 7 notified incidents of Salmonella in pigs 2004, S. Typhimurium were involved in six incidents. Of these five incidents involved S. Typimurium DT 40 and one incident DT 41. In all seven incident incidents, isolated Salmonella were sensitive to all antimicrobials tested (Table

3.2.5.1).

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

The overall situation of antimicrobial resistance in Salmonella in pigs is favourable. Since the start of the monitoring programme SVARM year 2000, all 78 incidents except one has involved Salmonella sensitive to all antimicrobials tested. The resistant isolate, S. Typhimurium DT12, was from an incident year 2000 and was resistant to nalidixic acid only.

C. Antimicrobial resistance in Salmonella in poultry

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial susceptibility of Salmonella is monitored yearly within the Swedish Veterinary Antimicrobial Resistance Monitoring programme, SVARM. Isolates included derive from both active and passive salmonella monitoring programmes and from both clinical and non-clinical cases.

Type of specimen taken

For details on sampling see "Salmonella spp. in poultry".

Procedures for the selection of isolates for antimicrobial testing

It is mandatory that at least one isolate from each notified incident of Salmonella is confirmed at SVA. From these isolates, the first from each food animal species from each notified incident is tested for antimicrobial susceptibility at the Department of Antibiotics, SVA. The same inclusion criteria are also used for isolates from other warm blooded animal species, unless the epidemiological situation in a particular year is judged unusual. For example, in year 2004, Salmonella was isolated from a total of 32 cats and of these isolates; the first 20 consecutive isolates were tested and thereafter every fifth isolate (total number of isolates 22).

Laboratory methodology used for identification of the microbial isolates

For details on culture see "Salmonella spp. in poultry".

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Antimicrobial susceptibility was tested using dilution methods in cation adjusted Mueller-Hinton broth (CAMBH). The tests were performed following the standards for microdilution of the National Committee of Clinical Laboratory Standards (NCCLS, 2002) using VetMIC panels produced at the Dept. of Antibiotics, SVA. As quality control, Escherichia coli ATCC 25922 was included.
The Dept. of Antibiotics is accredited to perform the analyses by the Swedish Board for Accreditaion and Conformity Assesment (SWEDAC) according to SS-EN ISO/IEC 17025 and regularly participates in external quality assurance.

Breakpoints used in testing

For antimicrobials tested, range of tested concentrations and cut-off values (breakpoints) for resistance see Table 6.1.6.
Cut-off values defining resistance were set according to microbiological criteria based on the MIC distributions. An isolate was regarded as resistant to a specific antimicrobial when its MIC was distinctly higher than those of inherently susceptible strains of the bacterial species in question. Where appropriate, the breakpoints suggested by NCCLS (2002) for animal pathogens were also taken into consideration.

Preventive measures in place

See "Salmonella spp. in poultry".

Control program/mechanisms

The control program/strategies in place

See "Salmonella spp. in poultry".

Results of the investigation

Of the six notified incidents of Salmonella in poultry 2004, three involved slaughter chickens (Gallus gallus), two involved geese and one involved ducks. All isolates were sensitive to all tested antimicrobials (Table 3.2.5.1).

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

The overall situation of antimicrobial resistance in Salmonella in poultry is favourable. Of the isolates from the 43 reported incidents since the start of the monitoring programme SVARM year 2000, only two have been resistant to any of the tested antimicrobials. In 2003 an isolate of S. Typhimurium DT 15a was resistant to sulphonamides and streptomycin and in 2000, an isolate of S. spp. was resistant to sulphonamides.

Table 3.2.5.2 Antimicrobial susceptibility testing of S.Enteritidis in animals

	S. Enteritidis									
	Cattle (bovine animals)		**Pigs**		**Gallus gallus**		**Turkeys**		**Wildlife (1 hedgehog, 1 musk ox)**	
Isolates out of a monitoring program									yes	
Number of isolates available in the laboratory	0		0		0		0		2	
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**
Tetracycline									2	0%
Amphenicols										
Chloramphenicol									2	0%
Florfenicol									2	0%
Cephalosporin										
Ceftiofur									2	0%
Fluoroquinolones										
Enrofloxacin									2	0%
Quinolones										
Nalidixic acid									2	0%
Trimethoprim									2	0%
Sulfonamides										
Sulfonamide									2	0%
Aminoglycosides										
Streptomycin									2	0%
Gentamicin									2	0%
Neomycin									2	0%
Penicillins										
Ampicillin									2	0%
Number of multiresistant isolates										
fully sensitives									2	100%

Table 3.2.5.3 Antimicrobial susceptibility testing of S.Typhimurium in animals

	S. Typhimurium													
	Cattle (bovine animals)		**Pigs**		**Gallus gallus**		**Ducks**		**Geese**		**Turkeys**		**Other animals (1 dog, 22 cats, 7 horses, 3 wildlife)**	
Isolates out of a monitoring program	yes		yes		yes		yes		yes		yes		yes	
Number of isolates available in the laboratory	6		6		2		1		2		0		33	
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**
Tetracycline	6	66.6%	6	0%	2	0%	1	0%	2	0%			33	0%
Amphenicols														
Chloramphenicol	6	66.6%	6	0%	2	0%	1	0%	2	0%			33	0%
Florfenicol	6	50.0%	6	0%	2	0%	1	0%	2	0%			33	0%
Cephalosporin														
Ceftiofur	6	0%	6	0%	2	0%	1	0%	2	0%			33	0%
Fluoroquinolones														
Ciprofloxacin													33	0%
Enrofloxacin	6	0%	6	0%	2	0%	1	0%	2	0%			33	0%
Quinolones														
Nalidixic acid	6	0%	6	0%	2	0%	1	0%	2	0%			33	0%
Trimethoprim	6	0%	6	0%	2	0%	1	0%	2	0%			33	0%
Sulfonamides														
Sulfonamide	6	66.6%	6	0%	2	0%	1	0%	2	0%			33	0%
Aminoglycosides														
Streptomycin	6	66.6%	6	0%	2	0%	1	0%	2	0%			33	0%
Gentamicin	6	0%	6	0%	2	0%	1	0%	2	0%			33	0%
Neomycin	6	0%	6	0%	2	0%	1	0%	2	0%			33	0%
Penicillins														
Ampicillin	6	66.6%	6	0%	2	0%	1	0%	2	0%			33	0%
Number of multiresistant isolates														
fully sensitives	2	33.3%	6	100%	2	0%	1	100%	2	100%			33	100%
resistant to >4 antimicrobials	4	66.6%												
Number of multiresistant DT104														
with penta resistance	3	50.0%	0	0%	0	0%	0	0%	0	0%			0	0%
resistant to other antimicrobials	0	0%	0	0%	0	0%	0	0%	0	0%			0	0%

Table Antimicrobial susceptibility testing of S. Typhimurium in Pigs - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	S. Typhimurium
	Pigs
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	6

Antimicrobials:	**N**	**%R**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Tetracycline	6	0%							100.0												0.5	64
Amphenicols																						
Chloramphenicol	6	0							16.7	83.3											1	128
Florfenicol	6	0								100.0											4	32
Fluoroquinolones																						
Enrofloxacin	6	0		66.7	33.3																0.03	4
Quinolones																						
Nalidixic acid	6	0								100.0											1	128
Trimethoprim	6	0%				16.7	83.3														0.25	32
Sulfonamides																						
Sulfonamide	6	0													66.7	33.3					16	2048
Aminoglycosides																						
Streptomycin	6	0									83.3	16.7									2	256
Gentamicin	6	0					83.3	16.7													0.5	64
Neomycin	6	0							100.0												2	16
Cephalosporin																						
Ceftiofur	6	0					16.7	83.3													0.12	16
Penicillins																						
Ampicillin	6	0						66.7	33.3												0.25	32

Table Antimicrobial susceptibility testing of S. Typhimurium in Other animals (1 dog, 22 cats, 7 horses, 3 wildlife) - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	S. Typhimurium
	Other animals (1 dog, 22 cats, 7 horses, 3 wildlife)
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	33

Antimicrobials:	**N**	**%R**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Tetracycline	33	0%							100.0												0.5	64
Amphenicols																						
Chloramphenicol	33	0							18.2	81.8											1	128
Florfenicol	33	0								100.0											4	32
Fluoroquinolones																						
Enrofloxacin	33	0		39.4	45.5	15.2															0.03	4
Quinolones																						
Nalidixic acid	33	0								87.9	6.1	6.1									1	128
Trimethoprim	33	0%				18.2	78.8	3.0													0.25	32
Sulfonamides																						
Sulfonamide	33	0											3.0	18.2	39.4	39.4					16	2048
Aminoglycosides																						
Streptomycin	33	0									54.5	45.5									2	256
Gentamicin	33	0					75.8	24.2													0.5	64
Neomycin	33	0							100.0												2	16
Cephalosporin																						
Ceftiofur	33	0					15.2	84.8													0.12	16
Penicillins																						
Ampicillin	33	0						84.8	15.2												0.25	32

Table Antimicrobial susceptibility testing of S. Typhimurium in Cattle (bovine animals) - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	S. Typhimurium
	Cattle (bovine animals)
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	6

Antimicrobials:	**N**	**%R**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Tetracycline	6	67%							33					67							0.5	64
Amphenicols																						
Chloramphenicol	6	67							16.7	16.7					33.3	33.3					1	128
Florfenicol	6	50								33.3		16.7	50.0								4	32
Fluoroquinolones																						
Enrofloxacin	6	0		50.0	50.0																0.03	4
Quinolones																						
Nalidixic acid	6	0								100.0											1	128
Trimethoprim	6	0%				33.3	66.7														0.25	32
Sulfonamides																						
Sulfonamide	6	67													33.3					66.7	16	2048
Aminoglycosides																						
Streptomycin	6	67									33.3			66.7							2	256
Gentamicin	6	0					16.7	83.3													0.5	64
Neomycin	6	0							100.0												2	16
Cephalosporin																						
Ceftiofur	6	0					16.7	83.3													0.12	16
Penicillins																						
Ampicillin	6	0						33.3						66.7							0.25	32

Table Antimicrobial susceptibility testing of S. Species in Cattle (bovine animals) - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	S. Species
	Cattle (bovine animals)
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	14

Antimicrobials:	**N**	**%R**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Tetracycline	14	29%						28.6	42.9					28.6							0.5	64
Amphenicols																						
Chloramphenicol	14	29							28.6	28.6	14.3				14.3	14.3					1	128
Florfenicol	14	21								57.1	14.3	7.1	21.4								4	32
Fluoroquinolones																						
Enrofloxacin	14	0		50.0	35.7	14.3															0.03	4
Quinolones																						
Nalidixic acid	14	0								85.7	14.3										1	128
Trimethoprim	14	0%				21.4	71.4	7.1													0.25	32
Sulfonamides																						
Sulfonamide	14	29												42.9	21.4	7.1				29	16	2048
Aminoglycosides																						
Streptomycin	14	29									42.9	21.4	7.1	28.6							2	256
Gentamicin	14	0					42.9	57.1													0.5	64
Neomycin	14	0							100.0												2	16
Cephalosporin																						
Ceftiofur	14	0					35.7	57.1	7.1												0.12	16
Penicillins																						
Ampicillin	14	29					14.3	50.0	7.1					28.6							0.25	32

Table 3.2.5.1 Antimicrobial susceptibility testing of Salmonella spp. in animals

	Salmonella spp.													
	Cattle (bovine animals)		**Pigs**		**Gallus gallus**		**Ducks**		**Geese**		**Turkeys**		**Other animals (3 dogs, 22 cats, 8 horses, 8 wildlife)**	
Isolates out of a monitoring program (1)	yes		yes		yes		yes		yes		yes		yes	
Number of isolates available in the laboratory	14		7		3		1		2		0		41	
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**
Tetracycline	14	28.6%	7	0%	3	0%	1	0%	2	0%			41	0%
Amphenicols														
Chloramphenicol	14	28.6%	7	0%	3	0%	1	0%	2	0%			41	0%
Florfenicol	14	21.4%	7	0%	3	0%	1	0%	2	0%			41	0%
Cephalosporin														
Ceftiofur	14	0%	7	0%	3	0%	1	0%	2	0%			41	0%
Fluoroquinolones														
Enrofloxacin	14	0%	7	0%	3	0%	1	0%	2	0%			41	0%
Quinolones														
Nalidixic acid	14	0%	7	0%	3	0%	1	0%	2	0%			41	0%
Trimethoprim	14	0%	7	0%	3	0%	1	0%	2	0%			41	0%
Sulfonamides														
Sulfonamide	14	28.6%	7	0%	3	0%	1	0%	2	0%			41	0%
Aminoglycosides														
Streptomycin	14	28.6%	7	0%	3	0%	1	0%	2	0%			41	0%
Gentamicin	14	0%	7	0%	3	0%	1	0%	2	0%			41	0%
Neomycin	14	0%	7	0%	3	0%	1	0%	2	0%			41	0%
Penicillins														
Ampicillin	14	28.6%	7	0%	3	0%	1	0%	2	0%			41	0%
Number of multiresistant isolates														
fully sensitives	10	71.4%	7	100%	3	100%	1	100%	2	100%			41	100%
resistant to >4 antimicrobials	4	28.6%												

(1) : Isolates derive from both active and passive salmonella-monitoring programmes and from both clinical and non-clinical cases.

Table Antimicrobial susceptibility testing of Salmonella spp. in Other animals (3 dogs, 22 cats, 8 horses, 8 wildlife) - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	Salmonella spp.
	Other animals (3 dogs, 22 cats, 8 horses, 8 wildlife)
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	41

Antimicrobials:	**N**	**%R**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Tetracycline	41	0%						7.3	92.7												0.5	64
Amphenicols																						
Chloramphenicol	41	0							22.0	78.0											1	128
Florfenicol	41	0								100.0											4	32
Fluoroquinolones																						
Enrofloxacin	41	0		39.0	46.3	14.6															0.03	4
Quinolones																						
Nalidixic acid	41	0								80.5	14.6	4.9									1	128
Trimethoprim	41	0%				14.6	82.9	2.4													0.25	32
Sulfonamides																						
Sulfonamide	41	0											4.9	26.8	36.6	31.7					16	2048
Aminoglycosides																						
Streptomycin	41	0								4.9	51.2	43.9									2	256
Gentamicin	41	0					70.7	29.3													0.5	64
Neomycin	41	0							100.0												2	16
Cephalosporin																						
Ceftiofur	41	0				2.4	17.1	78.0	2.4												0.12	16
Penicillins																						
Ampicillin	41	0						85.4	14.6												0.25	32

Table Antimicrobial susceptibility testing of Salmonella spp. in Pigs - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	Salmonella spp.																					
	Pigs																					
Isolates out of a monitoring program	yes																					
Number of isolates available in the laboratory	7																					
Antimicrobials:	**N**	**%R**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Tetracycline	7	0%							100.0												0.5	64
Amphenicols																						
Chloramphenicol	7	0							14.3	85.7											1	128
Florfenicol	7	0								100.0											4	32
Fluoroquinolones																						
Enrofloxacin	7	0		71.4	28.6																0.03	4
Quinolones																						
Nalidixic acid	7	0								100.0											1	128
Trimethoprim	7	0%				14.3	85.7														0.25	32
Sulfonamides																						
Sulfonamide	7	0													71.4	28.6					16	2048
Aminoglycosides																						
Streptomycin	7	0								14.3	71.4	14.3									2	256
Gentamicin	7	0					85.7	14.3													0.5	64
Neomycin	7	0							100.0												2	16
Cephalosporin																						
Ceftiofur	7	0					14.3	85.7													0.12	16
Penicillins																						
Ampicillin	7	0						71.4	28.6												0.25	32

Table 3.2.6 Breakpoints for antibiotic resistance of Salmonella in Animals

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Salmonella	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline	Microbiol*	8		8	0.5	64				
Amphenicols										
Chloramphenicol	Microbiol*	16		16	1	128				
Florfenicol	Microbiol*	16		16	4	32				
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	Microbiol*	0.25		0.25	0.03	4				
Quinolones										
Nalidixic acid	Microbiol*	16		16	1	128				
Trimethoprim	Microbiol*	8		8	0.25	32				
Sulfonamides										
Sulfonamide	Microbiol*	256		256	16	2048				
Aminoglycosides										
Streptomycin	Microbiol*	32		32	2	256				
Gentamicin	Microbiol*	8		8	0.5	64				
Neomycin	Microbiol*	8		8	2	16				
Kanamycin										
Trimethoprim + sulfonamides										
Cephalosporin										
Ceftiofur	Microbiol*	2		2	0.12	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	Microbiol*	8		8	0.25	32				

Footnote

* Cut-off values (break-points) set according to microbiological criteria, i.e. based on MIC distribution

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

From 1991 to June 2001, a Campylobacter programme initiated by the industry was implemented. During that period the prevalence varied between 9 and 16%. In July 2001, a new and more sampling intensive Campylobacter programme was initiated that showed that the flock prevalence varied between 14 and 20%. It is likely that this increase was due changes in sampling strategy and analyses.
From 1995-2004, the number of reported domestic cases varied between 1814 and 2839. The recorded increase is a part of a European trend. Approximately 30-45% of the total number of cases are of domestic origin.

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

Campylobacteriosis is the most common zoonotic infection in Sweden presently, as in the rest of the EU. As 30-45% of the cases in Sweden are of domestic origin it is important to implement measures to reduce the incidence, an example of this is the campylobacter programme. Since 1997, there has been an increase in the total number of reported cases in Sweden. This is part of a European trend. However, in 2002 the number of reported cases decreased slightly compared with the preceding years and the last two years the decrease has continued.
Since the start of the new campylobacter programme in July 2001, the flock prevalence in broilers has varied between 14 and 20 %.
There is a marked seasonal variation both in poultry and human cases, although the peak in human campylobacteriosis precedes the peak reported in poultry. Reasons for this need to be investigated further.

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

Consumption of poultry meat is regarded as an important source of infection for human campylobacteriosis. However, case-control studies have also shown other risk factors for domestic campylobacteriosis, for example consumption of unpasteurised milk, barbeque and contact with dogs. Several waterborne outbreaks have also been reported in Sweden.

Recent actions taken to control the zoonoses

A campylobacter program financed by the EU started in 2001 and will continue throughout 2005. The objective is to reduce the prevalence in primary production and in the food chain to 0-2 % positive flocks; changes in production should be with the condition that the welfare and productivity could at least be maintained.

Suggestions to the Community for the actions to be taken

One important action is to implement a harmonised monitoring programme in poultry. The work that has started in this area should proceed. With increasing trade within the EU, campylobacter appears to be a Community problem, requiring a Community solution.

2.2.2. Campylobacteriosis in humans

A. Thermophilic Campylobacter in humans

Reporting system in place for the human cases

Surveillance is based on passive case findings.

Case definition

A positive case is defined as a person from whom Campylobacter has been isolated.

Diagnostic/analytical methods used

Cultivation from stool sample and blood.

Notification system in place

Campylobacteriosis is notifiable under the Communicable Disease Act (both from the laboratory and from the physician).

History of the disease and/or infection in the country

Infection with Campylobacter became notifiable in 1989. From 1995 to 2004, the total number of cases reported have varied between 5119 to 8578, with the highest figure in 2001. During the same time period the number of reported domestic cases varied between 1814 and 2839. The increase in number of cases is a part of a European trend. However, in 2002 the number of reported cases decreased slightly compared with the preceding years and the last two years the decrease has continued. Approximately 30-45% of the total number of cases are of domestic origin.

Results of the investigation

During 2004, a total of 6169 cases of campylobacteriosis were reported, which is quite a big decrease from the year before. Also among the domestic cases the decrease was considerable, nearly 600 cases. The decrease was evenly distributed throughout the country, during the whole year, between the sexes and different age groups.
Four smaller outbreaks of campylobacteriosis were reported during the year.

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

There is a peak of cases (both among domestic cases and cases acquired abroad) during the summer months. Reasons for this are unknown, but it can be speculated that increased outdoor activities play a role. Increased travelling also leads to increased number of cases acquired abroad.
Food and water are the most commonly cited sources of infections at the clinical reports.

Relevance as zoonotic disease

A significant part (30-45 %) of the cases of campylobacteriosis are domestic. It is unknown how many of those that are caused by consumption of poultry. It needs to be investigated how

effective it would be to implement measures in order to reduce the prevalence of Campylobacter in broilers, and which measure that would be most effective.

Table 6.3.A Campylobacteriosis in man - species/serotype distribution

	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc	unknown status
Campylobacter	6169	68	2108	23	3372	37	689
C. coli							
C. jejuni							
C. upsaliensis							
Campylobacter spp.	6169	68	2108	23	3372	37	689

Footnote

The total number of cases are reported by both physicians and laboratories. The number of autochtone and imported cases are reported by the physicians.

Table 6.3.B Campylobacteriosis in man - age distribution

Age Distribution	C. coli			C. jejuni			Campylobacter spp.		
	All	M	F	All	M	F	All	M	F
<1 year							25	19	6
1 to 4 years							177	103	74
5 to 14 years							125	72	53
15 to 24 years(1)							265	150	114
25 to 44 years							686	371	315
45 to 64 years							546	297	249
65 years and older							284	162	122
Age unknown									
Total :	0	0	0	0	0	0	2108	1174	933

(1) : One person with unknown sex.

Footnote

Domestic cases.

Table 6.3.C Campylobacteriosis in man - seasonal distribution

Month	C. coli	C. jejuni	C. upsaliensis	Campylobacter spp.
	Cases	Cases	Cases	Cases
January				69
February				61
March				57
April				44
May				151
June				316
July				338
August				457
September				220
October				166
November				153
December				75
not known				1
Total :	0	0	0	2108

Footnote

Domestic cases.

2.2.3. Campylobacter in foodstuffs

A. Thermophilic Campylobacter in Broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Industry decides. No reporting to the authorities is requested.

At meat processing plant

See above.

At retail

No special sampling strategy is used by the local authorities. Sampling is very infrequent.

Frequency of the sampling

At slaughterhouse and cutting plant

Other: Infrequent sampling.

At meat processing plant

Other: Infrequent sampling.

At retail

Other: Infrequent sampling.

Type of specimen taken

At slaughterhouse and cutting plant

Other: No information available.

At meat processing plant

Other: No information available.

At retail

Other: Varies, mostly meat products.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

No information available.

At meat processing plant

No information available.

At retail

No information available.

Definition of positive finding

At retail

Campylobacter identified in the sample.

Diagnostic/analytical methods used

At retail

Bacteriological method: NMKL 119: 1990

Control program/mechanisms

Suggestions to the Community for the actions to be taken

A food safety objective (FSO) should be established, e.g. <1000 Camp./g.

Measures in case of the positive findings or single cases

Campylobacter found in products that will be consumed without further heat-treatment is considered as unfit for consumption.

Notification system in place

None.

Results of the investigation

In 2004, C. jejuni was isolated from 15 (56%) out 27 samples of fresh poultry meat collected at retail. Campylobacter were not found when 28 samples of poultry meat products were collected at retail and analysed. (For results from sampling of poultry meat at slaughter, see "Campylobacter in animals".)

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

Poultry products are still considered to be an important source of human infection.

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

Campylobacter in poultry is relevant both to findings in poultry meat and products thereof as well as to human cases.

Additional information

Results from investigation of other food than poultry:
C. jejuni was found in 2 (1%) samples when 209 samples of fruit and vegetables were tested. However, none out of 271 samples of ready-to-eat-food was positive when analysed for the presence of Campylobacter.

Table 6.2 Thermophilic Campylobacter spp. in food

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	C. coli	C. lari	C. upsaliensis	C. jejuni	Campylobacter spp.
Poultry meat										
fresh										
- at retail	SLV		sample		27				15	
meat products										
- at retail	SLV		sample		28				0	
Fruit & Vegetables	SLV		sample		209				2	
Prepared food, ready to eat	SLV		sample		271				0	

Footnote

All data is from local authorities. They do not differentiate between sampling at production plant or retail. Most samples are taken at retail.

2.2.4. Campylobacter in animals

A. Thermophilic Campylobacter in Gallus gallus

Monitoring system

Sampling strategy

In the Campylobacter programme, every slaughter group of broilers is examined for Campylobacter at the slaughterhouse. The program is voluntary, and financed by the Swedish Poultry Meat Association (SPMA) and the SJV, with additional funding from the European Commission. The programme is run by the SPMA, SJV, SLV, SVA and SMI and will last until 2005.
During May-Dec, 2004, a study was conducted at 30 broiler farms with the aim to indetify risk factors for introducing Campylobacter into the broiler houses. The farms were sampled at least once a week during a maximum of four rotations. The samples consisted of sock samples from the ground outside, in the stables and ante rooms, and samples from insects, water feed and ventilation shaft. Both farms with high and low incidence, according to results from the campylobacter programme, were included.

Frequency of the sampling

At slaughter

Other: Every slaughter group is sampled

Type of specimen taken

At slaughter

Other: cloacal and neck skin samples

Methods of sampling (description of sampling techniques)

Rearing period

In the single survey, sock samples were collected.

Before slaughter at farm

In the single survey, sock samples were collected.

At slaughter

From each slaughter group, 40 individual cloacal samples are taken on the slaughter line after stunning but before scalding. Each individual sample contains about 0.5 g faeces, taken with a cotton swab. Ten swabs are pooled together to form one sample. The four pooled cloacal samples are pooled into two samples in the enrichment broth at the laboratory. From each slaughter group, 10 individual neck-skin samples, each measuring about 2 cm2, are taken from the carcasses before chilling, and pooled to form one sample. Thus, two pooled

cloacal samples and one pooled neck-skin sample are analysed from each slaughter group.

Case definition

Rearing period

At herd level, a case is defined as a flock that tested positive for thermophilic Campylobacter in a sock sample. The epidemiological unit is the flock.

Before slaughter at farm

See "Rearing priod"

At slaughter

At herd level, a case is defined as a slaughtered group that tested positive for thermophilic Campylobacter in a cloacal sample. The epidemiological unit is the slaughtered group

Diagnostic/analytical methods used

Rearing period

Bacteriological method: NMKL 119:1990

Before slaughter at farm

Bacteriological method: NMKL 119:1990

At slaughter

Bacteriological method: NMKL 119:1990

Vaccination policy

Other preventive measures than vaccination in place

Preventive measures that are applied at the producers are hygiene barriers, cleaning and desinfection after slaughter of each flock and leaving the stable empty for a defined period before introducing a new flock. Specific advices to each producer is also given by the Swedish Poulty Meat Association.
The majority of the slaughter companies pay extra for Campylobacter free broilers, as a bonus to encourage efforts to reduce the infection.

Control program/mechanisms

The control program/strategies in place

The current Campylobacter program, commenced on 1st July 2001, will run until 2005. The program is voluntary, and financed by the SPMA and the SJV, with additional funding from the European Commission. The objective is to estimate the baseline

prevalence both in primary production and in the food chain. All slaughter-groups will be sampled at slaughter, and if Campylobacter is found the broiler producer will receive hygienic recommendation to avoid introduction of Campylobacter in the flocks.
The purpose of the program is to increase the knowledge about the epidemiology of Campylobacter in order to plan effective measures to reduce the prevalence of Campylobacter in the food chain, starting with primary production.
The SPMA covers the entire production chain, from feed manufacturers, breeding companies, hatcheries, broiler producers, abattoirs and processing plants. Members of the SPMA produce approximately 99% of all broilers slaughtered in Sweden. The members are obliged to only use approved feed and to participate in stipulated animal health programs such as foot health, Salmonella, coccidiosis, clostridia, welfare and classification program.

Suggestions to the Community for the actions to be taken

One important action is to implement a harmonised monitoring programme. The work on increased harmonisation should proceed without delay.

Measures in case of the positive findings or single cases

If a flock is found positive, hygiene measures should be introduced in order to clean-up the barns where the broilers have been kept from infection.

Notification system in place

In poultry, Campylobacter infection is not notifiable. However, results are available from the Campylobacter programme.

Results of the investigation

From the producers affiliated to the Swedish Poultry Meat Association 429 (14 %) out of 3019 slaughter groups were positive for Campylobacter. From 41 slaughter groups, that are not affiliated to the control programme, 21 (51%) were positive.
Preliminary results from the single survey did not indicate any significant statistical difference regarding the presence of Campylobacter in the environment, between the producers that often delivereed campylobacter positive slaughter groups and those that rarely delivered positive slaughter groups. Out of the sock samples collected in the flocks, 56 (8%) out of 691 samples were positive.

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

Since the start of the voluntary control programme there has been a decreasing trend in number of Campylobacter positive flocks at slaughter. Reasons for this need to be investigated further, but it can be speculated that given recommendations about how to improve hygiene may have a positive effect. It can also be suggested that annual variation in temperature and precipitation may have an effect.

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

Consumption of poultry meat is regarded as an important source of domestic aquired

campylobacter infection in humans, even if there also are other sources of importance.

Additional information

From 1991 to June 2001, a Campylobacter monitoring programme was implemented by the industry (SPMA). During that period the prevalence varied between 9 and 16%. In July 2001 a new and more sampling intensive Campylobacter programme was initiated that will run until 2005. The new programme showed that the flock prevalence varied between 14 and 20%. It is likely that this increase was due to increased sampling, less pooling of samples (four pooled cloacal samples and one pooled neck skin sample per flock compared with one pooled cloacal sample prior to 1 July 2001) and daily laboratory analyses.

Studies within the programme have shown that the prevalence varies between farms and some seem to never be colonised. About one fourth of the farms were free from Campylobacter during the first year of the new programme, and the majority of those have been free for several years. A seasonal variation with higher prevalences of Campylobacter infection in broiler flocks during late summer and early autumn has been observed.

Another study was carried out in 2002 and it was shown that in 21% of the investigated positive flocks, one or two out of four cloacal samples were positive, and in 79% three or four samples were positive. Thus, in one fifth of the flocks the within flock prevalence is considerable lower than 100%.

In 2003, 18 % of tested flocks tested positive for Campylobacter. The same year, a study was conducted during the period with the highest prevalence (August to December). It was shown that the majority of positive flocks were infected during the last week before slaughter.

Table 6.1.1 Thermophilic Campylobacter spp. in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	C. jejuni	C. coli	C. lari	C. upsaliensis
Gallus gallus									
broilers									
- at farm	SVA	single survey including 30 producers	socksample	691	56				
- at slaughter	SVA, SPMA	Flocks associated to the SPMA.	flock	3019	429				
Other poultry	SVA	Flocks not associated to the SPMA.	flock	41	20				

Footnote

All positive findings are C. jejuni or C. Spp.
SPMA=Swedish Poultry Meat Association

2.2.5. Antimicrobial resistance in *Campylobacter* isolates

A. Antimicrobial resistance in Campylobacter jejuni and coli in poultry

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial susceptibility of Campylobacter spp. from cattle, pigs and slaughter chickens are regularly monitored in the Swedish Veterinary Antimicrobial Resistance Monitoring programme (SVARM). This year, isolates from slaughter chickens (Gallus gallus) were tested.

Type of specimen taken

Campylobacter spp. was isolated from cloacal swabs from healthy slaughter chickens sampled at slaughter as part of the Swedish Campylobacter programme.

Methods of sampling (description of sampling techniques)

For details on sampling see "Thermophilic Campylobacter in Gallus gallus".

Procedures for the selection of isolates for antimicrobial testing

From the 400 flocks positive for Campylobacter in the Swedish Campylobacter programme year 2004, 112 isolates, each representing one flock, were randomly selected for susceptibility testing. The isolates were stored in -70°C pending susceptibility testing.

Methods used for collecting data

Susceptibility testing was performed at the Department of Antibiotics, SVA. At subculture before testing, 12 isolates did not grow and consequently, 100 isolates were finally included. Of these 94 were C. jejuni and 6 hippurate-negative thermophilic Campylobacter spp. presumably C. coli.

Laboratory methodology used for identification of the microbial isolates

For details on culture of Campylobacter see "Thermophilic Campylobacter in Gallus gallus".

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Before susceptibility testing, all isolates were subcultured by a modified NMKL method (NMKL Nr 119, 1990) using Preston enrichment broth and Preston selective agar, and incubation at 42oC. Identification was based on colony morphology, microscopic appearance including motility and the following phenotypic characteristics: production of oxidase, catalase, hippurate hydrolysis reaction and indoxyl-actetate reaction (Nachamkin, 1999). With these tests, hippurate-positive C. jejuni can be identified whereas other isolates are described as hippurate-negative thermophilic Campylobacter spp.

Antimicrobial susceptibility was tested by a dilution method using VetMIC panels produced at the Dept. of Antibiotics, SVA. For Campylobacter spp. there are currently no accepted standards for broth dilution susceptibility tests. The microdilution method described by NCCLS was adapted for Campylobacter spp. Each well in the microdilution panels was inoculated with 100 µl CAMBH with an inoculum density of approximately 106 CFU/ml. The panels were incubated in 37oC for 48 hours in a microaerophilic atmosphere. Campylobacter jejuni CCUG 11284 (analogue to Campylobacter jejuni ATCC 33560) was included as quality control.
The Dept. of Antibiotics is accredited according to SS-EN ISO/IEC 17025 by the Swedish Board for Accreditation and Conformity Assessment (SWEDAC) to perform antimicrobial susceptibility tests with microdilution methods. The Dept. of Antibiotics participates in several national or international proficiency tests for antimicrobial susceptibility testing.

Breakpoints used in testing

For antimicrobials tested, range of tested concentrations and cut-off values (break-points) for resistance se Table 6.1.6.
Cut-off values were set according to microbiological criteria based on MIC distributions. An isolate was regarded as resistant to a specific antimicrobial when its MIC was distinctly higher than those of inherently susceptible strains of the bacterial species.

Results of the investigation

Results of suceptibility testing of 94 C. jejuni are presented in Table 6.1.2 and Table "Antimicrobial susceptibility testing of C. jejuni in Gallus gallus - qualitative data". The six isolates of hippurate-negative thermophilic Campylobacter spp., were all sensitive to the tested substances except one isolate resistant to nalidixic acid and enrofloxacin (data not shown).

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

Overall, levels of antimicrobial resistance among Campylobacter from slaughter chickens were low and of the same magnitude as in years 2001 and 2002.

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

A low level of resistance, as in Campylobacter spp. from broiler chickens in Sweden, is also seen in isolates from humans infected within the country. In two studies on isolates from Swedish human Campylobacter infections acquired in Sweden, the level of resistance was as low as for the Swedish chicken isolates (Osterlund et al., 2003; Ronner et al., 2004). Erythromycin resistance was neither found among the human isolates nor the chicken isolates. However, in isolates from infections acquired abroad, the occurrence of both fluoroquinolone and tetracycline resistance was very high (39-95%) and a few percent of these isolates were erythromycin resistant (Osterlund et al., 2003; Ronner et al., 2004).

Additional information

References:
Ronner, A-C., Olsson Engvall, E., Andersson, L. and Kaijser, B. Int J Food Microbiol. 2004,

96:173-179.
Osterlund, A., Hermann M., and Kahlmeter, G. Scand J Infect Dis. 2003, 35:478-81.

Table Antimicrobial susceptibility testing of C. jejuni in Gallus gallus - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	C. jejuni
	Gallus gallus
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	94

Antimicrobials:	**N**	**%R**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Tetracycline	94	0%			95.7	1.1					3.2										0.25	32
Fluoroquinolones																						
Enrofloxacin	94	5		25.5	53.2	13.8	2.1			3.2	2.1										0.03	4
Quinolones																						
Nalidixic acid	94	5							9.6	27.7	52.1	5.3			3.2	2.1					0.5	128
Aminoglycosides																						
Gentamicin	94	0				5.3	58.5	35.1	1.1												0.25	8
Macrolides																						
Erythromycin	94	0			3.2	7.4	48.9	34.4	3.2	3.2											0.12	16
Penicillins																						
Ampicillin	94	5					6.4	7.4	46.8	26.6	4.3	3.2	3.2	2.1							0.5	64

Table 6.1.2 Antimicrobial susceptibility testing of Campylobacter in animals

	Campylobacter spp.					
	Cattle (bovine animals)		**Pigs**		**Poultry**	
Isolates out of a monitoring program					yes	
Number of isolates available in the laboratory	0		0		94	
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**
Tetracycline					94	0%
Fluoroquinolones						
Enrofloxacin					94	5.3%
Quinolones						
Nalidixic acid					94	5.3%
Aminoglycosides						
Gentamicin					94	0%
Macrolides						
Erythromycin					94	0%
Penicillins						
Ampicillin					94	5.3%
Number of multiresistant isolates						
fully sensitives					84	89.4%
resistant to 1 antimicrobial					5	5.3%
resistant to 2 antimicrobials					5	5.3%

Footnote

All isolates Campylobacter jejuni

Table 6.1.6 Breakpoints used for antimicrobial susceptibility testing of Campylobacter in Animals

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline	Microbiol.*	8		8	0.25	32				
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	Microbiol.*	1		1	0.03	4				
Quinolones										
Nalidixic acid	Microbiol.*	16		16	0.5	128				
Aminoglycosides										
Gentamicin	Microbiol.*	8		8	0.25	8				
Macrolides										
Erythromycin	Microbiol.*	16		16	0.12	16				
Penicillins										
Ampicillin	Microbiol.*	16		16	0.5	64				

Footnote

* Cut-off values (break-points) set according to microbiological criteria i.e. based on MIC distributions

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

Between 25 and 67 cases are recorded annually, the majority of these are patients who are immuno-suppressed, pregnant women and elderly.
In animals, an increased number of cases was observed in the late 1990s and since then the number of reported cases vary around 35 per year. This is probably due to increased uasge of big bale silage and/or increased number of autopsies (as part of the TSE surveillance).

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

There was an increase in the number of human cases in 2000 and 2001, but since than the number of cases has decreased again and the situation is considered to be stable.
In animals the situation is stable.

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

Food borne transmission is believed to be more important than transmission from animals.

2.3.2. Listeriosis in humans

A. Listeriosis in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Case definition

A case is defined as a person from whom L. monocytogenes has been isolated from a normally sterile site. Mother and child/foetus is regarded as one case.

Diagnostic/analytical methods used

Cultivation from blood and cerebral spinal fluid.

Notification system in place

Invasive Listeria infection is notifiable under the Communicable Disease Act (both from the laboratory and from the physician).

History of the disease and/or infection in the country

Around 25-35 cases were previously reported on a yearly basis, most of them from vulnerable groups (immuno-suppressed persons, pregnant women and elderly). The number of cases increased during 2000 (n=46) and peaked in 2001 (n=67). Since then the number of cases have declined.

Results of the investigation

After the peak in number of cases in 2000 the annual number has decreased and during 2004, 44 cases were notified. The number of infected pregnant women also decreased and during 2004 two infected women gave birth to healthy children.

Relevance as zoonotic disease

Food borne transmission is believed to be more important than transmission from animals. Listeriosis has practically only been relevant in immuno-suppressed people, pregnant women and elderly.

Table 7.2.A Listeriosis in man - species/serotype distribution

Listeria	Cases	Cases Inc
	44	0
Listeria spp.	44	0,5
congenital cases	2	0,02
deaths	18	0,2

Table 7.2.B Listeriosis in man - age distribution

Age Distribution	L. monocytogenes			Listeria spp.		
	All	M	F	All	M	F
<1 year	1	0	1	1	0	1
1 to 4 years	1	1	0	1	1	0
5 to 14 years	0	0	0	0	0	0
15 to 24 years	0	0	0	0	0	0
25 to 44 years	3	2	1	3	2	1
45 to 64 years	10	7	3	10	7	3
65 years and older	29	18	11	29	18	11
Age unknown	0	0	0	0	0	0
Total :	44	28	16	44	28	16

2.3.3. Listeria in foodstuffs

A. Listeria spp. in food

Monitoring system

Sampling strategy

Sampling is performed by local authorities on a random basis. No official control progam exists. Sampling usually takes place at retail level but can also be at production units.
Sampling performed by industry is not reported to the authorities unless specifically asked for.

Frequency of the sampling

At the production plant

Other: According to in-house control at each production plant.

At retail

Other: According to the local authorities own decisions.

Definition of positive finding

At the production plant

A sample positive for L. monocytogenes

At retail

A sample positive for L. monocytogenes

Diagnostic/analytical methods used

At the production plant

Bacteriological method: NMKL 136 : 2004 is probably what is mostly used. For quantitative analysis an in-house (SLV) method is used.

At retail

Other: For diagnosis, an in-house (SLV) method is used for the quantitative analysis and NMKL 136 for qualitative analysis.

Preventive measures in place

Most production plants are focusing on preventing environmental contamination of the plant.

Control program/mechanisms

The control program/strategies in place

There is no official surveillance of L. monocytogenes in food and surveillance is done

through various projects initiated by the SLV, municipalities and other research institutions.

Measures in case of the positive findings

If Listeria is found in food that will not be further heat-treated the food is regarded as unfit for human consumption if 5 samples 3 or more are found positive or 1 or more contains >=100 L. monocytogenes/gram. At retail level, where usually only one sample is taken the food will be regarded as unfit for human consumption if >=100 L. monocytogenes /gram is found. Food for young children and sensitive populations are regarded as unfit for consumption if L. monocytogenes is found, regardless of concentration.

Results of the investigation

In 2004, 110 samples from meat products (bovine and pig meat) at retail, and 12 from cheeses at retail, all had <100 cfu/g when tested for L. monocytogenes. Two (6%) out of 34 samples from ready-to-eat food had>100 cfu/g. When fishery products were tested, 13 (20%) out of 65 samples of raw spiced ("gravad") salmon and none of 11 samples from other fish products had >100 cfu/g when tested for L. monocytogenes.

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

The situation is stable. Vacuumpacked smoked or marinated fish continues to be the major problem.

Additional information

During 2001, the SLV and the local municipalities performed a project with the aim to investigate the prevalence of L. monocytogenes in different ready-to-eat-foods. Out of 3600 samples, 63 (1.7%) were positive. It was shown that fish products had the highest percentage (6.2%) of positive samples.
The local municipalities report only 234 analyses altogether for 2004, of those 15 (6,4 %) were positive.

Table 7.1 Listeria monocytogenes in food

	Source of information	Remarks	Epidemiological unit	Sample weight	Definition used	Units tested	<100 cfu/g	>100 cfu/g	L. monocytogenes
Bovine meat									
meat products									
ready-to-eat									
- at retail (1)	SLV	Reports from local authorities	sample			110	110		
Cheeses									
- at retail	SLV	Reports from local authorities	sample			12	12		
Fishery products									
fish									
smoked									
- at retail (2)	SLV	Reports from local authorities	sample			65	52	13	
other									
- at retail	SLV	Reports from local authorities	sample			11	11		
Prepared food, ready to eat	SLV	Reports from local authorities	sample			34	32	2	

(1) : The number includes samples of pig meat products as well. Reports do not differentiate between the two species.
(2) : the number represents both smoked and raw spiced ("gravad") fish.
We do not know if the positive analyses represents any quantitative analyses or only qualitative.

Footnote

The recommendation is that 5 samples should be taken. One of these is analysed qualitatively and, if negative, no further analyses is done. If positive, all five samples are analysed quantitatively.
The local authorities do not state where the samples are taken. Most are taken at retail but for each product there may be some samples taken at the production plant.

2.3.4. Listeria in animals

A. Listeria spp. in animal - all animals

Monitoring system

Sampling strategy

There is no active surveillance system and detection of cases is based on clinical observations.

Frequency of the sampling

When there is a suspected case.

Case definition

A case may be defined with (1) positive histopathology combined with clinical signs, (2) positive bacteriology and histopathology or, (3) positive immunohistochemistry and histopathology. The animal is the epidemiological unit.

Diagnostic/analytical methods used

The diagnostic methods used include histopathology, immunohistochemistry and bacteriology.

Measures in case of the positive findings or single cases

In a verified case of listeriosis, the SJV decides from case to case to investigate the herd and clarify the source of infection.

Notification system in place

Listeriosis is notifiable in all animal species.

Results of the investigation

In 2004, there were 35 reports of Listeria infection in animals. Out of those, 29 were sheep, 1 cattle and 1 deer.

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

Before 1999, there were between 10 and 20 reported listeria infections in animals per year. However, the number of cases increased from 1999 and onward (33-51 per year). An explanation for this may be the increased use of big bale silage. Also, the number of cattle and sheep that are autopsied due to the TSE surveillance, may have increased the chance of finding listeriosis.

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

As Listeria spp are present in the environment and also to a small degree in food-producing

animals, a risk of contracting domestic listeriosis does exist. However, cases of listeriosis in animals and listeriosis in humans are often not epidemiologically linked.

2.4. VEROCYTOTOXIC ESCHERICHIA COLI

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

In 1996, VTEC O157 was isolated in Swedish cattle for the first time and human E. coli O157 infection was traced back to presence of VTEC O157 in a cattle herd. The same year, VTEC O157 in cattle became notifiable. However, since 1999, VTEC O157 findings are only notifiable when associated with human VTEC infection.
Several studies of prevalence conducted throughout the years have shown that 1% of Swedish cattle (highest prevalences in young animals) is infected with VTEC O57 and about 10% of Swedish cattle farms.
Since 1998 the number of domesetic human VTEC O157 infections has varied from 59-97, apart from 2002 when 129 cases were reported. This was due to an outbreak of VTEC O 157 infection (including 28 cases) in southern Sweden (county of Skane), caused by contaminated locally produced fermented cold-smoked sausages.

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

VTEC infection is regarded as a serious zoonotic infection and cattle, or products thereof, are seen as an important source of infection. It cannot be excluded that outbreaks caused by domestic produced foods may occur in the future. The majority of cases are reported from the western part of Sweden and in this region it seems to be a special strain of VTEC O157 circulating, more pathogenic than others. Furthermore, most of the VTEC positive farms in the country are recorded in the same area. Surveillance is needed to investigate whether this specific strain are spreading to other counties in Sweden.

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

In case of human infection, trace back is performed. If the infection is traced back to a cattle farm, special recommendations are given, for example about improved hygiene. If VTEC is found on a farm without connection to human cases, no additional recommendations are given.

Recent actions taken to control the zoonoses

The guideline that were established in 1997 by the SVA, SLV, SJV, SMI and the National Board of Health and Welfare (SoS), was revised in 2004. The guideline gives recommendations on how to handle VTEC O157 in cattle when associations have been made with human VTEC infection and the responsibility of the different authorities and organisations.
In 2004, binding directives were introduced by the SJV to prevent disease associated with animals in public settings. According to the directives, each setting should establish a written hygiene programme, inclusive of visitors instructions. A qualitative risk assessment was made as a guideline for the establishment of these compulsory preventive measures in which testing for VTEC of ruminants used for exhibition is recommended.
From 2004, all serotypes of VTEC are notifiable in humans, previously only infection with

VTEC O157 was reported. It is discussed if other serotypes than O157 in animals will be analysed to a larger extent.

2.4.2. Verocytotoxic Escherichia coli in humans

A. Verotoxigenic Escherichia coli infections in humans

Reporting system in place for the human cases

Surveillance is based on passive case findings.

Case definition

A case is defined as a person from whom EHEC (VTEC) (of any serotype) has been isolated.

Diagnostic/analytical methods used

Cultivation and nucleic acid amplification.

Notification system in place

Since 1st of July 2004 all serotypes of VTEC is notifiable under the Communicable Disease Act (both from the laboratory and the physician). Before that types other than O157 were reported on a voluntary basis. Both clinical and subclinical cases are included. However, the Haemorrhagic Uremic Syndrome (HUS) is not notifiable.

History of the disease and/or infection in the country

In late 1995 and early 1996, there was an outbreak of EHEC O157 (VTEC O157) including approximately 120 cases. The outbreak increased the awareness of EHEC O157 and after this incidence most people with haemorrhagic diarrhoea are investigated for EHEC O157. Between 1998 and 2001, the number of human cases varied between 59 and 97. In 2002, physicians reported 129 cases. This sudden increase in number of cases was caused by two outbreaks caused by water (n=11) and contaminated cold-smoked sausage (n=28), respectively. The majority of cases are reported from the southwest part of Sweden. In 2003 the number of cases were lower again (n=73).

Results of the investigation

During 2004 the Communicable Disease Act was changed to include all serotypes of EHEC (VTEC) instead of just EHEC O157. This change in the legislation, caused a great increase in reported cases to a total number of 182. Of those, 60 % (n=109) were of domestic origin.
There was one outbreak of EHEC in 2004. Fourteen persons fell ill after having been to the football tournament, Gothia Cup, in July. All the cases were infected with the same type of EHEC O157. The source of infection was probably the food they had consumed at a number of schools, where they had stayed during the tournament.

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

During the first half of the year there are usually few cases of EHEC reported and during 2004 this number was extremly low. The first case of the year was reported in April. There was a great increase of cases during the second half of the year, probably due to the change in the Communicable Disease Act.
The increase was observed in both sexes and among all age groups.

The distribution of cases throughout the country differed a bit from previous years with more cases in the counties of Stockholm and Jönköping (in Jönköping an ongoing study made the number of samples analysed higher).

Relevance as zoonotic disease

EHEC (VTEC) O157 is a serious zoonotic infection and it cannot be excluded that large outbreaks may occur in the future. Compared with other food borne infections, infection with EHEC O157 can be serious, especially in young children developing HUS. There is a lack of knowledge concerning the possibilities to determine if an efficient control strategy of VTEC O157 can be implemented in the primary production. For prophylactic reasons, it has been recommended that young children (<5 years of age) should avoid visiting cattle farms and hygiene recommendations have been issued for other visitors. There is also a lack of epidemiological knowledge in animals about serotypes other than O157, although it is known that they cause a significant part of the EHEC (VTEC) infections in humans. More research is needed to estimate the true occurrence of these serotypes in animals, food and humans as well as their zoonotic impact.

Table 11.3.A Verocytotoxic Escherichia coli infections in man - species/serotype distribution

Pathogenic Escherichia coli	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
HUS	7	0,078	7	0,078	0	0
- clinical cases	7	0,078	7	0,078	0	0
- lab. confirmed cases	5	0,055	5	0,055	0	0
- caused by O157 (VT+)	5	0,055	5	0,055	0	0
- caused by other VTEC						
E.coli infect. (except HUS)(1)	175	1,9	102	1,1	58	0,64
- laboratory confirmed	149	1,7	90	1,0	37	0,41
- caused by 0157 (VT+)						
- caused by other VTEC						

(1) : For 15 cases, country of infection is unknown.

Footnote

The total number of cases are reported by both physicians and laboratories. The number of autochtone and imported cases are reported by the physicians.

Table 11.3.B Verocytotoxic Escherichia coli infections in man - age distribution

Age Distribution	Verotoxigenic E. coli (VTEC)			VTEC O 157:H7			VTEC non-O 157		
	All	M	F	All	M	F	All	M	F
<1 year	4	2	2						
1 to 4 years	34	17	17						
5 to 14 years	16	11	5						
15 to 24 years	13	5	8						
25 to 44 years	18	8	10						
45 to 64 years	13	4	9						
65 years and older	11	5	6						
Age unknown									
Total :	109	52	57	0	0	0	0	0	0

Footnote

Only domestic cases are included in the table.

2.4.3. Pathogenic Escherichia coli in foodstuffs

Table 11.2 Verocytotoxic Escherchia coli in food

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	VTEC O 157	VTEC O 157:H7
Bovine meat								
fresh								
- at retail	SLV	a		sample	54	0		
meat products								
- at retail	SLV	a		sample	12	0		
carcasse								
- at slaughter - survey (domestic)	(SVA)	b		sample	60	0		
- at slaughter - survey (imported)	(SVA)	b		sample	40	0		
minced meat								
- survey (domestic)	(SVA)	b		sample	50	0		
- survey (imported)	(SVA)	b		sample	125	0		
fermented sausages								
- survey (imported)	(SVA)	b		sample	21	0		
Poultry meat								
fresh								
- at retail	SLV	a		sample	1	0		
Other processed food products								
prepared dishes	SLV	a		sample	23	0		
Dairy products	SLV	a		sample	4	0		
Fishery products	SLV	a		sample	63	0		
Cheeses								
soft and semi soft								
made from raw or thermised milk								
- survey (imported)	(SVA)	b		sample	109	0		
Vegetables								
- survey (imported)	(SVA)	b,c		sample	75	0		

Footnote

a) The source of information is local authorities. No detailed information is available. The numbers given for bovine meat includes pork and pork products. We have no detailed information separating the two.
b) This testing was part of a survey conducted by the City of Stockholm Environmental and Health Administration

in 2004. The objective of this project was to investigate the prevalence of E. coli O157, O111, O103, O26 and O145, in certain types of food, produced in Sweden or imported, and sold in the city of Stockholm. In total, almost 500 samples were collected at slaughter or retail.
c) Including both vegetables, herbs and spices.

2.4.4. Pathogenic Escherichia coli in animals

A. Verotoxigenic Escherichia coli in cattle (bovine animals)

Monitoring system

Sampling strategy

If a County Medical Officers in Swedish county suspects that an infection of VTEC O157 has been acquired after animal contact, the County Veterinary Officer will be informed, and immediately state a request to the Swedish Board of Agriculture for sampling of animals (cattle as well as other species) on the farm in question.

Frequency of the sampling

Animals at farm

Other: Trace back of human VTEC infection.

Animals at slaughter (herd based approach)

Other: Trace back of human VTEC infection.

Type of specimen taken

Animals at farm

Other: Faeces and/or milkfilter.

Animals at slaughter (herd based approach)

Surface of carcasses

Methods of sampling (description of sampling techniques)

Animals at farm

In general up to 100 individual faecal samples are collected per farm with the main sampling focus on young stock as they are considered to be more likely to harbour VTEC.
The samples are analysed as pooled samples whereas up to five individual samples are pooled to one faecal sample of 25 grams.
For individual faecal samples approximately 30 grams of faeces are collected.

Animals at slaughter (herd based approach)

If a cattle herd have been linked to a human EHEC case and VTEC strains with identical subtyping pattern (PFGE) as the human isolate has been isolated from cattle, the farmer is given recommendations described in the guideline. These recommendations include for example that all carcasses from the farm at slaughter should be sampled for VTEC and that the carcasses should be arrested awaiting the answer of this investigation.

Carcass swabs are collected from the inner part of the hind legs. A total of 30x20-25 cm or a total of approximately 700cm2 will be swabbed.

Case definition

Animals at farm

A case is defined as an animal from which VTEC O157 is isolated. The herd is the epidemiological unit.

Animals at slaughter (herd based approach)

A positive herd is defined as a herd from which an animal tested positive for VTEC O 157.

Diagnostic/analytical methods used

Animals at farm

Bacteriological method: NMKL No 164:1999

Animals at slaughter (herd based approach)

Bacteriological method: NMKL No 164:1999

Other preventive measures than vaccination in place

The established guidelines give recommendations to all farms, but are mainly directed to those that have visitors regularly and farms sending animals to slaughter.

Control program/mechanisms

The control program/strategies in place

Recent actions taken to control the zoonoses

The guidelines that were established in 1997 were revised and updated in 2004. These guidelines give recommendations of how to minimize spreading of the infection to other animals, neighbouring farms and to people (especially children). In 2004, binding directives were introduced by the Swedish Board of Agriculture to prevent disease associated with animals in public settings. According to the directives, each setting should establish a written hygiene programme, inclusive of visitors instructions. A qualitative risk assessment was made as a guideline for the establishment of these compulsory preventive measures in which testing for VTEC of ruminants used for exhibition is recommended.

Suggestions to the Community for the actions to be taken

In the future, it should be discussed if monitoring of VTEC prevalence in cattle can be harmonised. However, we think that it is too early to introduce any harmonisation concerning VTEC for time being.

Measures in case of the positive findings or single cases

The established guidelines mainly contain recommendations of how to handle VTEC O157 in cattle when associations have been made with human VTEC infection. The recommendations include for example that animals should be tested negative for VTEC O157 prior to transport and slaughter, and that hygiene recommendations should be instituted at the farm. Faecal samples are collected repeatedly in the epidemiological unit (usually the herd) from a representative numbers of animals of different age.

Notification system in place

VTEC O157 is notifiable in animals if there is an epidemiological link to human VTEC infection.

Results of the investigation

Six cattle farms and one sheep farm were sampled for the presence of VTEC O157 in tracing of human infection. Of those, cattle at four farms showed the same strain of VTEC O157 that was diagnosed in the human cases of VTEC infection. At the other two cattle farms and the sheep farm, VTEC was not detected.
At one farm associated to human infection, other animal species than cattle were sampled (1 dog, 3 sheep and 6 lambs). One of the sheep and three lambs were positive for VTEC O157.
The human cases (mainly children but also adults) that were associated with these four cattle farms were infected by direct contact or consumption of unpasteurised milk.

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

VTEC infection is regarded as a serious zoonotic infection and cattle, or products thereof, are regarded as an important source of infection as cattle is the major reservoir of VTEC O157. It cannot be excluded that outbreaks caused by domestic produced foods will occur in the future. The majority of cases are reported from the western part of Sweden (county of Halland) and in this region it seems to be a special strain of VTEC O157 with certain virulence factors. Furthermore, most of the VTEC positive farms in the country are recorded in the very same area. Surveillance is needed to investigate whether this specific strain spread to other counties in Sweden, and if so, which actions that should be taken.

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

Direct contact with live cattle is regarded as an important source of human infection. Another important source of infection is consumption of un-pasteurised milk, even if this is not recommended. It cannot be excluded that larger outbreaks may occur caused by inadequately processed domestic food. However, very rarely VTEC is diagnosed in food for human consumption. VTEC O157 was first identified in food of Swedish origin in 1999. One positive sample was found in imported meat in 1996, and in local produced sausage in 2003.

Additional information

In 1996, VTEC O157 was isolated in Swedish cattle for the first time and human E. coli O157 infection was traced back to presence of VTEC O157 in a cattle herd. Restrictions were laid on

the herd and surveillance was initiated. The same year, VTEC O157 in cattle became notifiable. However, since 1999, VTEC O157 findings are only notifiable when associated with human VTEC infection.

Between 1996 and 2004, one to nine cattle farms were investigated annually as being a suspected source to human infection. Of these, between one and four farms were annually confirmed to be connected to human infection (in total 28 herds). VTEC O157 was detected on all farms but one (VTEC O26). One of the herd was a goat herd.

In 1998 a survey was conducted at slaughterhouse level in other animals but cattle. The results showed that 0.8 % (4/474) lambs and 0.9 % (1/109) sheep and 0.08% (2/2446) pigs were positive for VTEC O157.

Between 1996 and 2003, the industry (Swedish meats) analysed between 334 and 968 carcass swabs at the slaughterhouses. Sporadic samples were found positive during four years, the remaining years all were negative.

Between 1997 and 2002, around 2000 faecal samples were collected annually from cattle at the slaughterhouses for bacteriological investigation of VTEC O157. The number of samples collected at each slaughterhouse was proportional to the number of slaughtered cattle. Results from theses studies showed that VTEC O157 was isolated from between 0.3% and 1.7 % of the samples. The highest prevalence was recorded in young animals. From 2000-2002, the average prevalence among barley-beef calves (7-9 months at slaughter) was 5.3%, compared with 1.6% among young bulls (12-18 months at slaughter) and 0.7% among adult cattle. As the situation has remained stable throughout the sample period it has been regarded sufficient to conduct prevalence studies every 3rd-5th year. The next study will be conducted in 2005.

Between 1997 and 2002, about 2000 faecal samples were collected annually from cattle at the slaughterhouses for bacteriological investigation of VTEC O157. About 1% of the individual samples were positive. The highest prevalence was recorded in young animals. It has also been shown that 9% % of the cattle farms in Sweden were positive for VTEC O157, of these, 28% were placed in the Western part of Sweden (the county of Halland). A study from 1998 showed that less than 1% of lambs, sheep and pigs were positive for VTEC O157.

In 2002, there was a human VTEC outbreak in southern Sweden, caused by fermented cold-smoked sausages that were contaminated with VTEC O157. At trace-back it was found that the meat in the food product originated from at least 15 farms in the area. Even if VTEC O157 was isolated from five of the 15 farms, none of the isolated strains was the same as the VTEC strain that caused the human cases, as shown by PFGE.

Table 11.1 Verocytotoxic Escherchia coli in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	VTEC O 157	VTEC O 157:H7
Cattle (bovine animals)							
meat production animals (1)	SVA, SJV	faeces, trace-back investigation	herd	2	1		1
dairy cows (2)	SVA, SJV	faeces, trace-back investigation	herd	4	3		3
Sheep	SVA	faeces, trace-back investigation	animal	9	4		4
unspecified (3)	SVA	faeces, trace-back investigation	herd	1	0		0
Pet animals							
dogs	SVA	faeces, trace-back investigation	animal	1	0		0
cats	SVA	faeces, trace-back investigation	animal	1	0		0

(1) : trace back of human infection
(2) : trace back of human infection
(3) : trace back of human infection

Footnote

All investigated herds have been sampled in trace-back investigation of human infection. The positive herds have been linked to VTEC infection in humans by typing methods. Otherwise, VTEC in cattle is not reported. All other sampled animals are part of an investigation from one of the meat producing herds.

2.5. TUBERCULOSIS

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:
Sweden was declared free from bovine tuberculosis in 1958. Since then, sporadic cases have occurred in cattle, the most recent in 1978. Compulsory tuberculin testing of all cattle was abolished in 1970 and the national bovine TB control in cattle is based on meat inspection. When Sweden joined the European Community in 1995 the status of OTF (officially tuberculosis free) was obtained. No cases have been repored in wildlife for more than 55 years.
M. bovis was diagnosed in farmed deers in 1991. Trace back investigation revealed that the infection was introduced by deers imported in 1987. In 1994, a voluntary control programme was introduced that became mandatory in 2003. In total, 13 herds have tested positive and all have been depopulated.
M. tuberculosis:
Between 2001 and 2003, M. tuberculosis was diagnosed in five elephants and one giraffe at a Zoo in eastern part of Sweden. The animals were euthanised and a thorough investigation was performed (See "M. Tuberculosis in Zoo animals"). No human infection has been associated to this outbreak.
In humans, less than 10 cases of M. bovis are notified annually in Sweden. Most of these are found in elderly people, infected in their youth before bovine TB was eradicated in Sweden, or in immigrants from areas where bovine TB is still common.

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)

As Sweden is OTF, the risk of contracting domestic TB from livestock and other animals is negligible.
The risk for animal keepers to contract infection with M. tuberculosis from elephants is small, but cannot be ruled out as elephants, and other relevant animals at Zoos, might carry subclinical infection.

2.5.2. Tuberculosis in humans

A. Tuberculosis due to Mycobacterium bovis in humans

Reporting system in place for the human cases

Surveillance is mainly based on passive case findings; however, it is recommended that refugees and asylum seekers are screened for TB.

Case definition

A case is defined as a person from whom M. bovis has been isolated

Diagnostic/analytical methods used

The diagnostic methods used are cultivation and isolation of M. bovis in clinical specimen or demonstration of the bacteria by nucleic acid amplification test.

Notification system in place

Tuberculosis is a notifiable disease under the Communicable Disease Act (both from the laboratory and from the physician).

Results of the investigation

Four cases of M. bovis infection were reported, of which 2 were older than 65 years old and born in Sweden. Most likely they became infected before Sweden was declared free from bovine TB. The remaining 2 persons were younger, immigrants and had probably acquired their infection abroad.

Relevance as zoonotic disease

Most cases of M. bovis infection in the Swedish population are acquired abroad. Apart from this, cases also occur among elderly people who got infected before M. bovis was eradicated from the Swedish cattle population. As Sweden is OTF, the risk of contracting domestic TB from animals is negligible. Also, the risk of contracting bovine TB from people in Sweden is considered extremely low as there are few cases of human TB caused by M. bovis in Sweden and person-to-person spread is rare.

Table 1.2.A Tuberculosis in man - species/serotype distribution

	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
Mycobacterium	372	4	0	0	3	0
M. bovis	4	0,044			2	0,022
M. tuberculosis	367	4,1				
M. africanum	1	0,011			1	0,011
reactivation of previous cases(1)	43	0,48				

(1) : History of previous TB

Footnote

For 93 cases species were not known.

Table 1.2.B Tuberculosis in man - age distribution

Age Distribution	M. bovis		
	All	M	F
<1 year			
1 to 4 years			
5 to 14 years			
15 to 24 years	1		1
25 to 44 years	1		1
45 to 64 years			
65 years and older	2	1	1
Age unknown			
Total :	4	1	3

2.5.3. Mycobacterium in animals

A. Mycobacterium bovis in Bovine Animals

Status as officially free of bovine tuberculosis during the reporting year

The entire country free

Sweden was declared free from bovine tuberculosis in 1958. When Sweden joined the EU in 1995, the status of Officially Tuberculosis Free (OTF) was obtained (1) (former Decision 95/63/EC). Sweden fulfils the requirements on control measures in OTF member states (2).
(1)Commission Decision 03/046/EG, as last amended by 04/230/EG.
(2)Council Directive 64/432/EEC, Annex A, as last amended by 00/20/EC.

Monitoring system

Sampling strategy

Monitoring is performed by meat inspections at slaughter of food producing animals. The inspection is performed by the National Food Administration. If TB is suspected, samples are collected and analysed at the National Veterinary Institute.
Furthermore, tuberculin tests are performed at artifical insemination stations and at export/import of animals as required according to EU-legislation.
Apart from this, sampling is also performed in case of clinical suspicion.

Frequency of the sampling

All cattle is inspected at slaughter and samples are taken in case suspected pathological changes are detected. Samples are also collected at necropsy in case of clinical suspicion or positive tuberculin test.

Type of specimen taken

Organs/ tissues: lymph nodes or other organs with pathological changes

Methods of sampling (description of sampling techniques)

If TB is suspected at autopsy, or if tuberculin test is positive, lymph nodes from five different areas (retropharyngeal, submandibular, mediastinal, mesenterial and inguinal) and organs with macroscopic changes are collected. Materials are sent for histology, direct smears and eventually for culture, if deemed necessary. Lymhp nodes are stored in a freezer for one week in case culture is to be performed. For culture, lymph nodes are pooled (including at least two lymph nodes from each region) wheras organs with pathological changes are cultured separately.
Also, skin fold tuberculin test are used for diagnosis (Statens jordbruksverks foreskrifter om tuberkulinundersökning av notkreatur, svin, far, getter och kameldjur. SJVFS 2003:33, K62). In case tuberculin test is positive, culture is always performed.

Case definition

A positive case is defined as an animal from which M. bovis. M. tuberculosis, or any other mycobacteria in the M. tuberculosis-complex has been isolated.

Diagnostic/analytical methods used

Samples from autopsy/meat inspection is investigated by histology and direct smears. The result from these test determines if culture is performed. Culture is performed according to the method M-110 (T3100). Cultures are read once/week for eight weeks and microscopy of suspected colonies is performed. If deemed necessary, re-culture is carried out at four weeks. In case mycobacteria in the M. tuberculosis-complex is isolated the strain is further subtyped.

Vaccination policy

Vaccination is not allowed.

Control program/mechanisms

The control program/strategies in place

Sweden is OTF and fulfils the requirements on control measures in OTF member states (see "The entire country free").

Suggestions to the Community for the actions to be taken

Measures in case of the positive findings or single cases

If tuberculosis would be diagnosed in a food producing animal eradication measures are implemented, including depopulation of the whole herd, in accordance with the Swedish Act of Epizootics.

Notification system in place

Infection with M. bovis, M. tuberculosis, or other mycobacteria in the M. tuberculosis-compelx, is compulsory notifiable in all animal species on the basis of clinical suspicion.

Results of the investigation

In total, 5 cattle were investigated for M. bovis in 2004, all were negative. Of those, two cattle were investigated by culture, one was a heifer that tested positive in tuberculin test before export and the other was a cow where meat inspection could not rule out TB. In both herds, all cattle more than one year old was tuberculin tested. All were negative. Of the remaining 3 animals, two were investigated following meat inspection and one following autopsy where TB could not be ruled out.

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

As Sweden is OTF, the risk of contracting domestic TB from animals is negligible.

Additional information

Animals other than cattle:
Apart from the tested cattle mentioned above, other animals were also tested for bovine TB in 2004. 59 pigs were investigated, following suspicion at meat inspection, by histology, 56 by direct smears and 43 were cultured. All were negative. Apart from this, one dog and 2 cats were tested by direct smears, all were negative. Lastly, 7 wild animals were tested by direct smears following meat inspection, all were negative.

B. Mycobacterium bovis in farmed deer

Monitoring system

Sampling strategy

In 1994, a voluntary official control programme was implemented. In June 2003, the control programme became compulsory.
In the programme, tuberculin tests are performed and herds that are found positive for bovine TB are depopulated. Furthermore, all animals are inspected at slaughter. In the voluntary programme, all animals >1 year that are found dead or euthanised are subjected to autopsy, whereas this applies to all animals in the mandatory programme.
In brief, a herd obtains Bovine TB-free status (A-status) after three consecutive whole herd tuberculin tests of all deer older than one year, with negative results. Only herds with A-status may sell live deer and to maintain the A-status all female deer have to be tested after two years and then every third year, without non-compliant test results. Bovine TB-free status can also be obtained by slaughter of the whole herd and repopulation with deer from Bovine TB-free herds. Herds where testing is discontinued are downgraded to Bovine TB-free herds with B-status, which means they cannot sell live animals.

Frequency of the sampling

Sampling is performed if TB is suspected after meat inspection of slaughtered animals, if there is a clinical suspicion, or if there is a positive tuberculin test.

Type of specimen taken

Organs/ tissues: Lymph nodes or other organs with pathological changes.

Methods of sampling (description of sampling techniques)

If TB is suspected at autopsy, or if tuberculin test is positive, lymph nodes from five different areas (retropharyngeal, submandibular, mediastinal, mesenterial and inguinal) and organs with macroscopic changes are collected. Materials are sent for histology, direct smears and eventually for culture, if deemed necessary. Lymhp nodes are stored in a freezer for one week in case culture is to be performed. For culture, lymph nodes are pooled (including at least two lymph nodes from each region) wheras organs with pathological changes are cultured separately.
Also, skin fold tuberculin test are used for diagnosis (Foreskrifter om andring i Statens jordbruksverks foreskrifter (SJVFS 1994:76) om organiserad hälsokontroll avseende tuberkulos hos kron- och dovhjortar i hägn. SJVFS 2003:35). In case tuberculin test is positive, culture is always performed.

Case definition

A positive case is defined as an animal from which M. bovis, M. tuberculosis, or other mycobacteria in the M. tuberculosis-complex, has been isolated.

Diagnostic/analytical methods used

Samples from autopsy/meat inspection is investigated by histology and direct smears. The result from these test determines if culture is performed. Culture is performed according to the method M-110 (T3100). Cultures are read once/week for eight weeks and microscopy of suspected colonies is performed. If deemed necessary, re-culture is carried out at four weeks. In case mycobacteria in the M. tuberculosis-complex is isolated the strain is further subtyped.

Vaccination policy

Vaccination is not allowed.

Control program/mechanisms

The control program/strategies in place

A voluntary official TB control programme in farmed deer, administered by the industry (the Swedish Animal Health Service; Svenska djurhalsovarden) partially financed by the authorities, was implemented in July 1994. In June 2003, when 96% of all herds were affiliated to the program, the control program was made compulsory.

Recent actions taken to control the zoonoses

The voluntary control programme became compulsory in 2003. Since the program's inception it has become evident that, on certain large extensive deer farms, it is difficult to muster all animals in the herd and virtually impossible to establish that no deer are present outside the mustering pen. An alternative control was needed in these herds. Followingly, the national legislation was amended so that owners of farms larger than 100 hectares and where there are no imported deer in the herd, may apply to SBA for the alternative control for BTB, based on slaughter and meat inspection. In these herds, at least 20% of the herd (equally distributed over sex and age classes) shall be slaughtered annually for at least 15 years and the carcasses submitted for meat inspection. Furthermore, all other deer that are killed or die due to other reasons shall be meat inspected/autopsied.

Measures in case of the positive findings or single cases

If tuberculosis would be diagnosed in farmed deer eradication measures are implemented, including depopulation of the whole herd, in accordance with the Swedish Act of Epizootics.

Notification system in place

Infection with M. bovis, M. tuberculosis, or other mycobacteria in the M. tuberculosis-complex, is notifiable in all animal species on the basis of clinical suspicion.

Results of the investigation

As the control programme is mandatory, all 609 deer herds in Sweden were affiliated in 2004. Since the beginning of the programme, 515 (85%) herds have been declared free from TB; 108 after three whole herd tuberculin tests, 345 after culling of the whole herd and subsequent meat inspection, and 62 herds were established with deer originating from TB free herds. Thus, 94 herds in the control programme are not yet not declared free from TB. Compared with the previous year, 27 additional herds were declared free during 2004.
In the control programme, tuberculin tests were performed in 1165 animals in 19 herds. All were negative.
Nine deer were investigated by histology and direct smears after suspicion at meat inspection, and 5 following autopsy. Four were cultured as TB could not be ruled out by histology and direct smears. All samples were negative.

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

As the control programme has run sucessfully throughout the years, and there only were a few farms not affiliated, the Swedish Board of Agriculture made one of the final steps by making the programme mandatory. Thus, Sweden is about to start planning the end of the programme.

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

It can be considered that the risk of contracting human TB from a farmed deer is negligble.

Additional information

C. M. tuberculosis in animal - Zoo animals

Monitoring system

Sampling strategy

Sampling is performed in case of clinical suspicion.

Type of specimen taken

Organs/ tissues: lymph nodes and organs with pathological changes

Methods of sampling (description of sampling techniques)

If TB is suspected at autopsy, or if tuberculin test is positive, lymph nodes from five different areas (retropharyngeal, submandibular, mediastinal, mesenterial and inguinal) and organs with macroscopic changes are collected. Materials are sent for histology, direct smears and eventually for culture, if deemed necessary. Lymhp nodes are stored in a freezer for one week in case culture is to be performed. For culture, lymph nodes are pooled (including at least two lymph nodes from each region) wheras organs with pathological changes are cultured separately.

Case definition

A positive case is defined as an animal from which M. bovis, M. tuberculosis, or other mycobacteria in the TB-complex has been isolated.

Diagnostic/analytical methods used

Samples collected at autopsy are investigated by histology and direct smears. The result from these test determines if culture is done. Apart from this, samples from animals that were positive in tuberculin test are always cultured. Culture is performed according to the method M-110 (T3100). Cultures are read once/week for eight weeks and microscopy of suspected colonies is performed. If deemed necessary, re-culture is carried out at four weeks. In case mycobacteria in the M. tuberculosis-complex is isolated the strain is further subtyped.

Vaccination policy

Vaccination is not allowed.

Other preventive measures than vaccination in place

Presently, trunk- or trachael lavage for detection of mycobacteria in the M. tuberculosis-complex in elephants, and other relevant zoo-animals, are performed at the two largest Zoos in Sweden, where TB has been diagnosed since 2001.

Control program/mechanisms

The control program/strategies in place

There is no specific control programme for Zoo animals.

Recent actions taken to control the zoonoses

Elephants, and other relevant zoo-animals, are regularly subjected to trunk lavage and the fluid investigated for mycobacteria in the M. tuberculosis-complex.

Suggestions to the Community for the actions to be taken

One suggestion is to make findings of mycobacteria in the M. tuberculosis-complex compulsory notifiable.

Measures in case of the positive findings or single cases

If tuberculosis would be diagnosed in a Zoo animal eradication measures are implemented, in accordance with the Swedish Act of Epizootics.

Notification system in place

Findings of M. bovis, M. tuberculosis, or other mycobacteria in the TB-complex is notifiable in all animal species on the basis of clinical suspicion.

Results of the investigation

In December 2004, a female elephant at a Zoo in the western part of Sweden was positive for M. Tuberculosis in fluid from trunk lavage. The animal had lost weight and showed mild

symptoms of coughing. The elephant was euthanised and pathology revealed gross changes in lungs, uterus and in all lymph nodes. Culture was positive in February 2005.
The elephant had a calf that was euthanised and autopsied, but found negative at culture. All other elephants at the Zoo are being investigated through regular trunk lavage sampling. The area where the elephants are kept is under restriction until investigation has been completed and thourogh cleaning and disinfection has been performed.

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

Zoo animals, especially elephants, have been shown to present a risk for transmitting tuberculosis at Swedish Zoos and this merits further attention.

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

The Zoo animals that were positive for M. tuberculosis have most likely carried the infection subclinically for long periods. It cannot be ruled out that there is a risk for animal care takers to contract TB from these animals. However, repeated follow up testing of exposed personnel at the Zoo that was put under restriction between 2001 and 2003 have not revealed any TB infection.
The risk for Zoo visitors to become infected is regarded as very small due to the sporadic contact with the animals.

Additional information

In 2001, M. tuberculosis was isolated from a diseased riding elephant at a zoo in eastern part of Sweden. The zoo was immediately put under official restrictions and tuberculin testing and/or bacteriological sampling was initiated in all contact animals and animal keepers. In total 3 elephants and one giraffe were euthanised due to positive culture. In 2003, the restrictions were lifted after cleaning and disinfection of all buildings and other housing of the infected animals. No human infection has been identified associated to these animal cases.

Table 1.1.3 Tuberculosis in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	M. bovis	M. tuberculosis
Pigs	SVA, SJV	culture n=43	animal	59	0		
Zoo animals							
elephant	SVA, SJV	culture n=8	animal	8	1		1
rhinoceros	SVA, SJV	culture n=2	animal	2	0		
antelope	SVA, SJV	culture n=1	animal	3	0		
other	SVA, SJV		animal	3	0		
Other animals	SVA, SJV	autopsy	animal	4	0		
Pet animals							
cats	SVA, SJV	autopsy	animal	1	0		
dogs	SVA, SJV	autopsy	animal	1	0		
Wildlife							
wild boars	SVA, SJV		animal	2	0		
moose	SVA, SJV		animal	3	0		
deer							
roe	SVA, SJV		animal	2	0		

Footnote

1) The sampled zoo animals were part of an outbreak investigation.
2) meat inspecction of all slaughtered animals & autopsy

1.1.1 Bovine tuberculosis

(11)			
MANDATORY	**CATTLE**		
Number of herds under official control:(10)		Number of animals under official control:	
	OTF bovine herds	**OTF bovine herds with status suspended**	**Bovine herds infected with tuberculosis**
Status of herds at year end (a):(1)		0	0
New cases notified during the year (b):		0	0
	Units tested	**Units suspected**	**Units positive**
Routine tuberculin test (c) - data concerning herds:(2)	0	0	0
Routine tuberculin test (c) - data concerning animals:(3)	0	0	0
	Animals slaughtered	**Animals suspected**	**Animals positive**
Routine post-mortem examination (d):(4)		0	0
		Herds suspected	**Herds confirmed**
Follow up of suspected cases in post-mortem examination (e):		0	0
Follow-up investigation of suspected cases: trace, contacts (f):		0	0
	Animals tested	**Animals suspected**	**Animals positive**
Other routine investigations: exports (g):(5)		1	0
Other routine investigations: tests at AI stations (h):(6)		0	0
	All animals	**Positives**	**Contacts**
Animals destroyed (i):	0	0	0
Animals slaughtered (j):	0	0	0
VOLUNTARY	**CATTLE**		
	Animals tested	**Animals suspected**	**Animals positive**
Other investigations: imports (k):		0	0
	Herds tested	**Herds suspected**	**Herds positive**
Other investigations: farms at risk (l):(8)		0	0
	Samples tested	***M. bovis*isolated**	
Bacteriological examination (m):(9)	5	0	

(1) : all herds are included
(2) : all herds OTF
(3) : all herds OTF
(4) : all slaughtered animals
(5) : No. of tested animals not available. Also, see footnote a).
(6) : No. of tested animals not available.
(7) : all imported animals
(8) : no. of animals not available
(9) : b)
(10) : all herds are included
(11) : all animals are included

Footnote

All herds and all cattle are included in the official control.
a) positive in tuberculin test, but negative in culture and histological examination
b)histology n=4, culture n=2

1.1.2 Tuberculosis in farmed deer

MANDATORY	**FARMED DEER**		
Number of herds under official control:(3)	609	Number of animals under official control:(4)	20014
	"OTF" herds	**"OTF" herds with status suspended**	**Herds infected with tuberculosis**
Status of herds at year end (a):	515	0	0
New cases notified during the year (b):	0	0	0
	Units tested	**Units suspected**	**Units positive**
Routine tuberculin test (c) - data concerning herds:	19	0	0
Routine tuberculin test (c) - data concerning animals:	1165	0	0
	Animals slaughtered	**Animals suspected**	**Animals positive**
Routine post-mortem examination (d):(1)	4960	9	0
		Herds suspected	**Herds confirmed**
Follow up of suspected cases in post-mortem examination (e):		0	0
Follow-up investigation of suspected cases: trace, contacts (f):		0	0
	Herds tested	**Herds suspected**	**Herds positive**
Other routine investigations: exports (g):	0	0	0
Other routine investigations: tests at AI stations (h):	0	0	0
	All animals	**Positives**	**Contacts**
Animals destroyed (i):	0	0	0
Animals slaughtered (j):	0	0	0

VOLUNTARY	**FARMED DEER**		
	Animals tested	**Animals suspected**	**Animals positive**
Other investigations: imports (k):	0	0	0
	Herds tested	**Herds suspected**	**Herds positive**
Other investigations: farms at risk (l):	0	0	0
	Samples tested	***M. bovis*isolated**	
Bacteriological examination (m):(2)	14	0	

(1) : All slaughtered animals, suspicion at slaughter inspection. Analyses of suspected animals are incluced under "bacteriolgocal examination".
(2) : culture n=4, histology n=14 (the 9 suspected animals at meat inspection are included)
(3) : Since 2003, the control programme is compulsory and all herds are affiliated.
(4) : 15 609 fallow deer and 4 405 red deer

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 bovine brucellosis in Sweden was reported in 1957. Brucellosis has not been diagnosed in other animal species. Sweden is declared officially brucellosis free (OBF) in cattle since 1995 and in goats and sheep (OBmF) since 1994, and fulfils the requirements on control measures in OBF and OBmF member states.
The few yearly cases in humans are all suspected to have been acquired abroad.

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

The national situation remains stable. This is shown in the early serological surveillance in cattle, pigs, sheep and goats. Since the start of the surveillance (mid 1990s), no positive sample has been identified.
Each year there are usually a few clinical suspicions of brucella infection in animals, for example abortions or genital infections, all of which have been negative in serological/bacteriological analyses.
The sitution in humans remain stable.

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

The risk of obtaining brucellosis from domestic sources is negligible, as Sweden is declared OBF and ObmF.

2.6.2. Brucellosis in humans

A. Brucellosis in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Case definition

A case is defined as a person in whom brucellosis has been verified serologically or bacteriologically.

Diagnostic/analytical methods used

Cultivation from blood and bonemarrow.

Notification system in place

Since 1st of July 2004 brucellosis is a notifiable disease under the Communicable Disease Act (both from the laboratory and from the physician).

History of the disease and/or infection in the country

During the last 10 years, up to 6 cases have been reported annually (before the 1st of July 2004 brucellosis was not a notifiable disease and the figures were based on voluntary laboratory reports). None of these were suspected to be of domestic origin.

Results of the investigation

Three cases were reported in 2004, all infected abroad.

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

The few yearly cases in humans are all suspected to have been acquired abroad.

Relevance as zoonotic disease

The risk of obtaining brucellosis from domestic sources is negligible, as Sweden is declared free from bovine, caprine and ovine brucellosis. Furthermore, brucellosis has not been recorded in animal species in Sweden.

Table 2.3.A Brucellosis in man - species/serotype distribution

Brucella	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
	3	0	0	0	3	0
B. abortus						
B. melitensis						
B. suis						
Brucella spp.	3	0,03	0	0	3	0,03
occupational cases						

Table 2.3.B Brucellosis in man - age distribution

Age Distribution	B. abortus			B. melitensis			Brucella spp.		
	All	M	F	All	M	F	All	M	F
<1 year							0	0	0
1 to 4 years							0	0	0
5 to 14 years							0	0	0
15 to 24 years							0	0	0
25 to 44 years							2	1	1
45 to 64 years							1	1	0
65 years and older							0	0	0
Age unknown							0	0	0
Total :	0	0	0	0	0	0	3	2	1

Footnote

Infected abroad.

2.6.3. Brucella in foodstuffs

Table 2.2 Brucella sp. in food

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	B. melitensis	B. abortus	B. suis
cow milk								
raw				0				
milk for manufacture				0				
heat-treated				0				
Dairy products				0				

Footnote

No official control of Brucella spp. is performed in Sweden on a regular basis. Sampling will only take place when information indicates problems to exist.

2.6.4. Brucella in animals

A. Brucella abortus in Bovine Animals

Status as officially free of bovine brucellosis during the reporting year

The entire country free

Sweden is declared officially brucellosis free (OBF) in cattle since 1995 (former Decision 95/74/EC), since 1994 (former amendment 94/972/EC), and fulfils the requirements on control measures in OBF member states.

Monitoring system

Sampling strategy

All clinically suspected cases have to be confirmed serologically and bacteriologically. Also, on a national initiative, serological surveys are regularly performed in cattle, either in bulk milk or individal serum samples. Cattle are investigated serologically at breeding stations and before import or export.

Frequency of the sampling

Annual testing of a random sample of herds. Herds are also sampled when there is a suspicion of brucellosis.

Type of specimen taken

Other: blood or milk

Methods of sampling (description of sampling techniques)

Milk samples, and more rarely, sera, are collected from dairy herds. The milk samples are pooled (5-50 individuals) before analysis. In beef herds, individual sera are collected from cattle >2 years old.

Case definition

A positive case is defined as an animal from which Brucella spp. has been isolated, or an animal giving a significant antibody titre.

Diagnostic/analytical methods used

The diagnostic test used is an indirect ELISA. For confirmation the complement fixation test, and sometimes the tube agglutination test, are used.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

If brucellosis were diagnosed eradication and control measures would be implemented in accordance with the Swedish Act of Epizootics.

Notification system in place

Infection with Brucella spp. is notifiable in all animal species on the basis of clinical suspicion.

Results of the investigation

In the yearly screening programme, serum samples from 1 000 cattle, milk samples from 85 cows and bulk milk samples from 1 915 dairy herds were analysed by use of an indirect ELISA. One of the individual milk samples initially tested positive, however, after confirmatory tests the sample was negative. That is, all samples were negative for B. abortus.
In 2004, there were two clinical suspicions on cattle farms with history of abortions where brucella infection could not be ruled out. However, at laboratory investigation brucella serology and culture were negative.

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

The last case of bovine brucellosis was reported in 1957. Brucellosis has not been diagnosed in other animal species.

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

As Sweden has been free from bovine brucellosis for many decades, the risk of contracting domestic brucella infection from cattle is considered negligible.

Additional information

Brucella abortus has been regularly tested for in cattle since 1988. From 1997 and forward, about 3 000 samples (bulk milk and/or serum samples) have been tested yearly. Out of all these samples, none have been confirmed positive.

B. Brucella melitensis in Sheep

Status as officially free of ovine brucellosis during the reporting year

The entire country free

Sweden is declared officially brucellosis free and in goats and sheep (OBmF) since 1994 (former amendment 94/972/EC), and fulfils the requirements on control measures in OBmF member states

Monitoring system

Sampling strategy

In sheep and goats, surveillance is based on serological surveys according to EU-legislation. The samples from the sheep are collected within the voluntary control programme for Maedi-Visna. In addition to this, all clinically suspected cases have to be examined serologically and bacteriologically.

Frequency of the sampling

Annual testing of a sample of sheep. Herds are also sampled when there is a suspicion of brucellosis.

Type of specimen taken

Blood

Case definition

A positive case is defined as an animal from which Brucella spp. has been isolated, or an animal giving a significant antibody titre. The herd is the epidemiological unit

Diagnostic/analytical methods used

The Rose Bengal plate test (RBT) or complement fixation test is used.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

If brucellosis were diagnosed eradication measures would be implemented in accordance with the Swedish Act of Epizootics.

Notification system in place

Infection with Brucella spp. is notifiable in all animal species on the basis of clinical suspicion.

Results of the investigation

In total, 9 900 individual serum samples from sheep, at 403 herds, were analysed for antibodies against B. melitensis. Of the investigated samples, 11 were positive. However, after confirmatory tests with SAT, CFT and ELISA they were found negative. Thus, all samples tested negative.

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

Brucellosis has never been diagnosed in other animals than bovines (last case in 1957).

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

As Sweden has been free from ovine brucellosis for many decades, the risk of contracting domestic brucella infection from sheep is considered negligible.

Additional information

Brucella melitensis has been screened for in 5% (approximately 10.000 animals/year) of the sheep population, and in a number of goats, yearly since 1995. Out of all these samples, none have been confirmed positive.

C. Brucella melitensis in Goat

Status as officially free of caprine brucellosis during the reporting year

The entire country free

Sweden is declared officially brucellosis free in goats and sheep (OBmF) since 1994 (former amendment 94/972/EC), and fulfils the requirements on control measures in OBmF member states

Monitoring system

Sampling strategy

In sheep and goats, surveillance is based on serological surveys according to EU-legislation. The samples from goats are collected within the CAE programme. Furthermore, all clinically suspected cases have to be examined serologically and bacteriologically.

Frequency of the sampling

Annual testing of a sample of goats. Herds are also sampled when there is a suspicion of brucellosis.

Type of specimen taken

Blood

Case definition

A positive case is defined as an animal from which Brucella spp. has been isolated, or an animal giving a significant antibody titre.

Diagnostic/analytical methods used

The Rose Bengal plate test (RBT) or complement fixation test is used.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

If brucellosis were diagnosed eradication measures would be implemented in accordance with the Swedish Act of Epizootics.

Notification system in place

Infection with Brucella spp. is notifiable in all animal species on the basis of clinical suspicion.

Results of the investigation

In total, 272 individual sera from goats were analysed for antibodies against B. melitensis. All

were negative.

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

Brucellosis has never been diagnosed in other animals than bovines (last case in 1957).

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

As Sweden has been free from caprine brucellosis for many decades, the risk of contracting domestic brucella infection from goats is considered negligible.

Additional information

Brucella melitensis has been screened for in 5% (approximately 10.000 animals/year) of the sheep population, and in a number of goats, yearly since 1995. Out of all these samples, none have been confirmed positive. The herd is considered the epidemiological unit.

D. Brucella spp. in animal - Pigs

Monitoring system

Sampling strategy

The declaration of freedom from brucellosis in Swedish pigs is based on annual testing of a random sample of the pig population.

Frequency of the sampling

Annual testing of a random sample of pigs. Herds are also sampled when there is a suspicion of brucellosis.

Type of specimen taken

Blood

Case definition

A positive case is defined as an animal from which Brucella spp. has been isolated, or an animal giving a significant antibody titre. The herd is the epidemiological unit.

Diagnostic/analytical methods used

The Rose Bengal plate test (RBT) or complement fixation test is used.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

If brucellosis were diagnosed eradication measures would be implemented in accordance with the Swedish Act of Epizootics.

Notification system in place

Infection with Brucella spp. is notifiable in all animal species on the basis of clinical suspicion.

Results of the investigation

In total, 3030 individual serum samples from pigs were analysed for antibodies against Brucella suis. All of the investigated samples tested negative.

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

Brucellosis has never been diagnosed in other animals than bovines (last case in 1957).
Since 1995, Brucella has been screened for in approximately 3000 samples from pigs every year. Out of all these samples, none have been confirmed positive.

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

As Sweden has been free from porcine brucellosis for many decades, the risk of contracting domestic brucella infection from pigs is considered negligible.

Additional information

Table 2.1.3 Brucellosis in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	B. melitensis	B. abortus	B. suis
Pigs	SVA		animal	156	0			
- surveillance	SVA		animal	3030	0			
Pet animals								
dogs	SVA		animal	123	0			
Camel	SVA		animal	36	0			
Alpacas	SVA		animal	30	0			
Farmed reindeers	SVA		animal	31	0			
Other animals (1)	SVA		animal	10	0			
Wildlife								
wild boars	SVA		animal	76	0			

(1) : 1 Lama, 2 European elks, 2 antelopes and 5 mountain goats

2.1.1 Bovine brucellosis

MANDATORY	CATTLE		
Number of herds under official control:(6)	27905	Number of animals under official control:(7)	1606674
	OBF bovine herds	**OBF bovine herds with status suspended**	**Bovine herds infected with brucellosis**
Status of herds at year end (a):(5)	27905	0	0
New cases notified during the year (b):	0	0	0
	Animals tested	**Animals suspected**	**Animals positive**
Notification of clinical cases, including abortions (c):	0	0	0
	Units tested	**Units suspected**	**Units positive**
Routine testing (d1) - data concerning herds:(1)	1915	0	0
Routine testing (d2) - number of animals tested:(2)	1085	0	0
Routine testing (d3) - number of animals tested individually:	0	0	0
		Herds suspected	**Herds confirmed**
Follow-up investigation of suspected cases: trace, contacts (e):		0	0
	Animals tested	**Animals suspected**	**Animals positive**
Other routine investigations: exports (f):	0	0	0
Other routine investigations: tests at AI stations (g):(3)	813	0	0
	All animals	**Positives**	**Contacts**
Animals destroyed (h):	0	0	0
Animals slaughtered (i):	0	0	0

VOLUNTARY	CATTLE		
	Animals tested	**Animals suspected**	**Animals positive**
Other investigations: imports (k):	0	0	0
	Herds tested	**Herds suspected**	**Herds positive**
Other investigations: farms at risk (l):(4)	2	2	0
	Samples tested	**Brucella isolated**	
Bacteriological examination (m):	0	0	

(1) : Bulk tank milk
(2) : 1000 sera and 85 milk samples
(3) : 809 sera and 4 semen samples
(4) : These were herds where abortion investigations were performed and brucellosis was included as a less likely differential diagnosis.
(5) : All herds are included
(6) : All herds are included
(7) : All animals are included

2.1.2 Ovine and caprine brucellosis

MANDATORY	SHEEP AND GOATS		
Number of holdings under official control:(5)	7639	Number of animals under official control:(4)	448308
	OBF ovine and caprine holdings	**OBF ovine and caprine holdings with status suspended**	**OBF ovine and caprine holdings infected with brucellosis**
Status of herds at year end (a):(3)	7639	0	0
New cases notified during the year (b):	0	0	0
	Animals tested	**Animals suspected**	**Animals positive**
Notification of clinical cases, including abortions (c):	0	0	0
	Units tested	**Units suspected**	**Units positive**
Routine testing (d) - data concerning holdings:(1)		0	0
Routine testing (d) - data concerning animals:(2)	10045	0	0
		Holdings suspected	**Holdings confirmed**
Follow-up investigation of suspected cases: trace, contacts (e):		0	0
	Animals tested	**Animals suspected**	**Animals positive**
Other routine investigations: exports (f):	0	0	0
	All animals	**Positives**	**Contacts**
Animals destroyed (g):	0	0	0
Animals slaughtered (h):	0	0	0
VOLUNTARY	**SHEEP AND GOATS**		
	Animals tested	**Animals suspected**	**Animals positive**
Other investigations: imports (i):	56	0	0
	Holdings tested	**Holdings suspected**	**Holdings positive**
Other investigations: farms at risk (j):	0	0	0
	Samples tested	**Brucella isolated**	
Bacteriological examination (k):	0	0	

(1) : n.a.
(2) : 9900 sheep and 145 goats
(3) : All holdings are included
(4) : All animals are included
(5) : All holdings are included

2.7. YERSINIOSIS

2.7.1. General evaluation of the national situation

A. Yersinia entercolitica general evaluation

History of the disease and/or infection in the country

Yersinia infection is not notifiable in animals, therefore there is little epidemiological data on the occurence of the disease in animals.
In the beginning of the 1990s there were about 1000 annual human cases. Since then, there has been a decrease in the number of cases, which might be attributed to improved hygiene at slaughter and/or decreased sampling in patients.

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

The majority (approx 70%) of human yersinia infections are of domestic origin. Of those, children below the age of 6 predominate. Reasons for this are unknown, but need to be investigated further.
In general, it is expected that meat from pigs are a common source of infection in humans.

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

As pigs are common asymptomatic carriers of yersinia it can be expected that meat from pigs is one of the sources of human infection.

Recent actions taken to control the zoonoses

2.7.2. Yersiniosis in humans

A. Yersinosis in humans

Reporting system in place for the human cases

Surveillance is based on passive case findings.

Case definition

A case is defined as a person from whom pathogenic Yersinia spp. has been isolated.

Diagnostic/analytical methods used

Cultivation, serotyping and serology (antibody detection).

Notification system in place

Yersiniosis is a notifiable disease under the Communicable Disease Act since 1996 (both from the laboratory and from the physician).

History of the disease and/or infection in the country

Prior to 1996, yersiniosis was only reported from laboratories. In the beginning of the 1990's, more than 1000 cases were reported. Until the turn of the century there was a steady decrease that probably was due to improved hygienic technique during slaughter of swine and/or less sampling for Yersinia spp. in patients. However, from 2002 there has been an increase in the number of cases.

Results of the investigation

During 2004, a total of 804 cases were reported, which is a great increase (mostly cases from abroad) from the year before (n=554). The increase was above all localised to the middle part of Sweden. Reasons for this increase is unknown.

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

According to the reports from the physicians, two thirds of the cases suspected food or water being the source of infection.In 2004 the proportion of women infected was a bit smaller than during previous years.

Relevance as zoonotic disease

A significant part (approximately 70 %) of the human infections are of domestic origin. Yersinosis has its greatest potential as a zoonosis in young children. Reasons for this need to be further investigated. To be able to decrease the number of cases, more detailed epidemiological knowledge is needed.

Additional information

In 2004, a yersinosis case-control study among childer below 6 years of age was performed. Results will be presented in the autumn 2005.

Table 8.3.A Yersiniosis in man - species/serotype distribution

Yersinia	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
	804	8	554	6	102	1
Y. enterocolitica	804	8,9	554	6,1	102	1,1
Y. enterocolitica O:3						
Y. enterocolitica O:9						

Footnote

The total number of cases are reported by both physicians and laboratories. The number of autochtone and imported cases are reported by the physicians.

Table 8.3.B Yersiniosis in man - age distribution

Age Distribution	Y. enterocolitica			Yersinia spp.		
	All	M	F	All	M	F
<1 year	19	9	10			
1 to 4 years	158	77	81			
5 to 14 years	55	36	19			
15 to 24 years	59	35	24			
25 to 44 years	147	86	61			
45 to 64 years	70	40	30			
65 years and older	46	28	18			
Age unknown						
Total :	554	311	243	0	0	0

Footnote

Only autochtone cases are included in the table.

Table 8.3.C Yersiniosis in man - seasonal distribution

Month	Y. enterocolitica	Yersinia spp.
	Cases	Cases
January	27	
February	26	
March	21	
April	33	
May	39	
June	53	
July	65	
August	75	
September	67	
October	45	
November	53	
December	47	
not known	3	
Total :	554	0

Footnote

Only autochtone cases are included in the table.

2.7.3. Yersinia in foodstuffs

A. Yersinia spp. in food

Monitoring system

Sampling strategy

There is no official surveillance system for Yersinia spp. in food. From time to time, municipalities, the SLV and other research institutions initiate projects concerning the baseline prevalence.

Diagnostic/analytical methods used

For diagnosis, bacteriological examination according to NMKL 117, 3rd ed, 1996 is used. In addition to this, a PCR, NMKL 163:1998, may also be used.

Measures in case of the positive findings or single cases

When products that will not be further heat treatment are positive for pathogenic serotypes of Y. enterocolitica, they will be classified as non-fit for human consumption and destroyed.

Results of the investigation

In 2004, 97 (10%) out of 933 samples collected from fresh pig meat at retail, and 31 (6%) out of 522 samples from pig meat products at retail, were positive for Y. enterocolitica.

Table 8.2 Yersinia enterocolitica in food

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	Y. enterocolitica	Y. enterocolitica O:3	Y. enterocolitica O:9
Pig meat									
fresh									
- at retail	SLV		sample	10 g	933	97	97		
meat products									
- at retail	SLV		sample	10 g	522	35	35		

Footnote

A national project on Y. enterocolitica in pork meat and pork meat products was performed in 2004. The results are given in this table. The method used was PCR. The pork meat products includes both fermented and heat-treated products

2.7.4. Yersinia in animals

A. Yersinia entercolitica in pigs

Control program/mechanisms

The control program/strategies in place

There is no surveillance of Yersinia spp. in animals.

Notification system in place

Findings of Yersinia are not notifiable in animals.

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 domestic pigs, trichinosis has not been reported since 1994. However, sporadic cases (<3 per year) have been reported in free living or farmed wild boars, and other wild life.
The last case of human thrichinosis was diagnosed in 2004 and, before that, in 1991.

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

Trichinosis in farmed animals is, and has been, extremely rare for many years. The prevalence of Trichinella spp in wildlife is very low.

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

The risk of obtaining domestic trichinosis is negligible as all slaughtered animals are subjected to meat inspection.

Additional information

2.8.2. Trichinellosis in humans

A. Trichinellosis in humans

Reporting system in place for the human cases

Confirmed cases are reported.

Case definition

A case is defined as a person from whom trichinosis has been verified by laboratory investigations.

Diagnostic/analytical methods used

Antibody detection in serum with ELISA and IFL.

Notification system in place

Trichinosis is a notifiable disease under the Communicable Disease Act (both from the laboratory and from the physician).

History of the disease and/or infection in the country

Before 2004 there has been no reported case of human trichinosis since 1991.

Results of the investigation

One case of imported human trichinosis was reported in 2004. The case was infected after having consumed cold smoked pork.

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

Trichinosis in humans is extremely rare and the prevalence of Trichinella spp in Swedish farmed animals or wildlife remains very low.

Relevance as zoonotic disease

The risk of obtaining domestic trichinosis is negligible.

Table 4.2.A Trichinellosis in man - species/serotype distribution

Trichinella	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
	1	0	0	0	1	0
Trichinella spp.	1	0,01	0	0	1	0,01

Table 4.2.B Trichinellosis in man - age distribution

Age Distribution	Trichinella spp.		
	All	M	F
<1 year	0	0	0
1 to 4 years	0	0	0
5 to 14 years	0	0	0
15 to 24 years	0	0	0
25 to 44 years	0	0	0
45 to 64 years	1	1	0
65 years and older	0	0	0
Age unknown	0	0	0
Total :	1	1	0

Footnote

Infected abroad

2.8.3. Trichinella in animals

A. Trichinella in pigs

Monitoring system

Sampling strategy

All domestic pigs are controlled for Trichinella at slaughter according to Council Directive 64/433/EEC.

Frequency of the sampling

Every slaughtered animal is sampled

Type of specimen taken

Diaphragm muscle

Methods of sampling (description of sampling techniques)

Methods used are in accordance to Council Directive 77/96/EEC.

Case definition

A case is defined as an animal in which Trichinella spp. is found. The epidemiological unit is the individual animal.

Diagnostic/analytical methods used

Artificial digestion method of collective samples

Measures in case of the positive findings or single cases

If an animal is found infected with Trichinella, the carcass will be destroyed. The competent authority will also investigate the source and possible spread of infection.

Notification system in place

Trichinosis is compulsory notifiable in animals.

Results of the investigation

In 2004, all slaughtered pigs were negative for Trichinella spp.

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

Trichinosis in Swedish farmed pigs is extremely rare. The last case was found in 1994 and the Trichinella situation in Swedish pigs thus remains favourable.

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

The risk of obtaining domestic trichinosis from farmed fattening pigs is negligible.

Additional information

B. Trichinella in horses

Monitoring system

Sampling strategy

All horses are controlled for Trichinella at slaughter according to Council Directive 64/433/EEC.

Frequency of the sampling

Every slaughtered animal is sampled

Type of specimen taken

Other: Samples from musculus masseter or the tongue is analysed.

Methods of sampling (description of sampling techniques)

Methods used are in accordance to Council Directive 77/96/EEC.

Case definition

A case is defined as an animal in which Trichinella spp. is found and the epidemiological unit is the individual animal.

Diagnostic/analytical methods used

Artificial digestion method of collective samples

Measures in case of the positive findings or single cases

If an animal is found infected with Trichinella, the carcass will be destroyed.

Notification system in place

Trichinosis is compulsory notifiable.

Results of the investigation

In 2004, all slaughtered horses were negative for Trichinella spp.

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

Trichinosis in horses sent for slaughter in Sweden has not been reported.

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

The risk of obtaining domestic trichinosis from horses is negligible.

C. Trichinella spp. in animal - Wildlife

Monitoring system

Sampling strategy

Wild boars and bears must be controlled for Trichinella at slaughter. Foxes and other species of wildlife are occasionally sampled.

Frequency of the sampling

All slaughtered wild boars and bears, except animals slaughtered for on-the-farm consumption.

Type of specimen taken

Other: Diaphragm muscle

Methods of sampling (description of sampling techniques)

In wild boars and bears, at least 50 grams of diaphragm muscle are collected.

Case definition

A case is defined as an animal in which Trichinella spp. is found. The epidemiological unit is the individual animal.

Diagnostic/analytical methods used

Artficial digestion method of collective samples.

Measures in case of the positive findings or single cases

If an animal is found infected with Trichinella, the carcass will be destroyed.

Notification system in place

Trichinosis is compulsory notifiable in animals.

Results of the investigation

In 2004, one out of 6191 wild boars tested positive for Trichinella spp. In other wild life species, 11 out of 125 animals tested positive. Thrichinella spp were also found in 8 out of 257 foxes.

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

The main domestic reservoir of Trichinella spp. is the red fox (Vulpes vulpes) and it is estimated that approximately 5% of the Swedish fox population is infected with T. spiralis, T. pseudospiralis, T. nativa or T. britovi.
The past 8 years, sporadic cases (<3 per year) have been reported in free living or farmed wild boars.

In 2003, 7 (3%) out of 215 tested foxes were positive, 1 (25%) of 4 wolves, 1 (4%) out of 24 brown bears and 3 (5%) out of 57 tested lynx.
The prevalence of Thrichinella spp in Swedish wildlife seems to remain low.

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

The risk of obtaining domestic trichinosis from wild boars or bears is negligible. There is a risk of trichinosis after consumption of uncontrolled meat.

Table 4.1 Trichinella in animals

	Source of information	Remarks	Epidemiological unit	Animals tested	Animals positive
Pigs	SVA	All slaughtered animals	animal		0
Solipeds	SVA	All slaughtered animals	animal		0
Wildlife					
wild boars	SVA		animal	6191	1
foxes (1)	SVA		animal	257	8
other (2)	SVA		animal	125	11

(1) : Most of these samples were probably collected in 2003, but all were analysed in 2004.
(2) : 84 brown bear, 32 lynx, 9 wolf

Footnote

The number of slaughtered pigs and solipeds in 2004 were 3337488 and 5033, respectively.

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

The last diagnosed cases of E. granulosus was in 1997 (one reindeer) and 2000 (one elk). E. multilocularis has not been diagnosed in the country.

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

The situation in Sweden remains stable, but as E. multilocularis spreads within Europe a high awareness is important. There is also concern about possible introduction of E. multilocularis through increasing number of dogs that is brought into the country illegally.

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

As E. multilocularis never has been diagnosed in Sweden, the risk of contracting E. multilocularis infection in the country is negligible. Also, the risk of contracting domestic E. granulosus infection is negligible.

Recent actions taken to control the zoonoses

Since 1994 all dogs that are brought in from countries other than Finland and Norway must be treated with praziquantel as a preventive measure.

2.9.2. Echinococcosis in humans

A. Echinococcus spp in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Case definition

A case is defined as a person in whom echinococcosis has been diagnosed.

Diagnostic/analytical methods used

Histopathology or serology.

Notification system in place

Since 1st of July 2004 echinococcosis is a notifiable disease under the Communicable Disease Act (both from the laboratory and from the physician).

History of the disease and/or infection in the country

Notification of echinococcosis (based on voluntary reports by laboratories) was initiated in 1994 and since then 3-14 cases have been reported annually, all are assumed to have been infected abroad.

Results of the investigation

In 2004, nine cases infected with E. granulosus were reported. For these cases cuntry of infection is not reported, but it is assumed that they were infected abroad.

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

Echinococcosis is not spread in the country, but sometimes persons, originating from places where the disease exists, are found being infected.

Relevance as zoonotic disease

Currently none of the Echinococcus species represents any threat to humans in Sweden. However, due to the spread of the tapeworm (E. multilocularis) in other European countries, including findings of the parasite in Denmark, the situation might change and an increased awareness is necessary. However, it can not be excluded that echinococcosis can be introduced through the increased illegal movement of dogs into Sweden that has been seen during the last years.

Table 9.2.A Echinococcosis in man - species/serotype distribution

	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
Echinococcus	9	0	0	0	4	0
E. granulosus	9	0,10	0	0	4	0,044
E. multilocularis	0	0	0	0	0	0
Echinococcus spp.						

Footnote

Mandatory to report from 20040701. Before that no information on country of infection is available.

Table 9.2.B Echinococcosis in man - age distribution

Age Distribution	E. granulosus			E. multilocularis			Echinococcus spp.		
	All	M	F	All	M	F	All	M	F
<1 year	0	0	0						
1 to 4 years	0	0	0						
5 to 14 years	0	0	0						
15 to 24 years	5	3	2						
25 to 44 years	1	0	1						
45 to 64 years	2	0	2						
65 years and older	1	1	0						
Age unknown	0	0	0						
Total :	9	4	5	0	0	0	0	0	0

2.9.3. Echinococcus in animals

A. E. granulosus in animal

Monitoring system

Sampling strategy

All food producing animals are macroscopically examined at slaughter. Samples from foxes are collected as part of annual investigations of 300-400 foxes.

Type of specimen taken

Other: Feces and gut tissue from foxes and cyst material from intermediate hosts.

Methods of sampling (description of sampling techniques)

Samples of feces and parts of the gut are collected from foxes at autopsy. In case of suspicion, cyst material are collected from food producing animals at slaughter.

Case definition

In foxes, a case is defined as an animal with a positive fecal sample. In food producing animals a case is an animal in which the parasite has been found.

Diagnostic/analytical methods used

Other: In food producing animals surveillance is based on slaughter inspections, whereas sedimentation is used in foxes.

Measures in case of the positive findings or single cases

If an animal is found infected with Echinococcus spp. the offal will be destroyed.

Notification system in place

Echinococcosis is a notifiable disease in all animals.

Results of the investigation

In 2004, E. granulosus has not been found in slaughtered animals. Due to priorities made at the laboratory, the results from an investigation of 400 foxes will not be available until next year.

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

Sporadic cases of E. granulosus infection have occurred in imported horses that most probably were infected abroad. In reindeer, E. granulosus infection was prevalent in northern Sweden during the 1970s when around 2% of the reindeer were found infected at slaughter. Based on these findings, the routines at meat inspection of reindeer were revised and organs not approved for consumption were destroyed. During 1986-96 there was no case diagnosed in reindeer, followed by 3 cases in 1996-97. From elks, there have been two positive findings of E. granulosus, one in the early 1980s in the southern part of Sweden and one in 2000 in the central

part of the country.
Since 2001 there has been an annual investigation of 300-400 foxes in order to detect E. multilocularis and E. granulosus. None of the investigated animals tested positive.

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

The risk of obtaining domestic echinococcosis is negligible.

Additional information

In order to prevent the introduction of E. multilocularis, dogs that are brought in from countries other than Finland and Norway must be treated with praziquantel. This treatment also prevents additional introduction of E. granulosus.

B. E. multilocularis in animal

Monitoring system

Sampling strategy

All food producing animals are macroscopically examined at slaughter. Samples from foxes are collected as part of annual investigations of 300-400 foxes.

Type of specimen taken

Other: Feces and gut tissue from foxes and cyst material from intermediate hosts.

Methods of sampling (description of sampling techniques)

Samples of feces and parts of the gut are collected from foxes at autopsy. In case of suspicion, cyst material are collected from food producing animals at slaughter.

Case definition

In foxes, a case is defined as an animal with a positive fecal sample. In food producing animals a case is an animal in which the parasite has been found.

Diagnostic/analytical methods used

Other: In food producing animals surveillance is based on slaughter inspections, whereas the Copro-Elisa-test and sedimentation is used in foxes.

Control program/mechanisms

The control program/strategies in place

In order to prevent the introduction of E. multilocularis, dogs that are brought in from countries other than Finland and Norway must be treated with praziquantel.

Measures in case of the positive findings or single cases

If an animal is found infected with Echinococcus spp. the offal will be destroyed. If E.

multilocularis is found in Swedish animals, there would be a need of increased public awareness on this matter and an education campaign on the risk of exposure from wildlife would be started.

Notification system in place

Echinococcosis is a notifiable disease in all animals.

Results of the investigation

In 2004, E. multilocularis has not been found in slaughtered animals. Due to priorities made at the laboratory, the results from an investigation of 400 foxes will not be available until next year.

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

E. multilocularis has never been reported in Sweden. Since 2001 there has been an annual investigation of 300-400 foxes in order to detect E. multilocularis and E. granulosus. None of the investigated animals tested positive.
However, there is a concern about the possible introduction of E. multilocularis into the country through the increasing number of dogs that is brought into the country illegally.

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

The risk of obtaining domestic echinococcosis is negligible.

Table 9.1 Echinococcus sp. in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Echinococcus spp.	E. multilocularis	E. granulosus
Wildlife							
foxes (1)	SVA		animal	400			
other (2)	SVA		animal	1	0		

(1) : Results will be obtained later in 2005.
(2) : 1 wolf

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

Toxoplasmosis is not notifiable in animals. However, serological studies in the 1990s showed that a large proportion of Swedish cats, dogs, foxes and sheep were seropositive.
Less than 20 human cases are reported on a yearly basis, mainly in immuno-suppressed persons and in pregnant women).

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

The situation remains stable with few annual human cases.

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

There is little information about the most common sources of infection, however undercooked or raw meat is considered important.

2.10.2. Toxoplasmosis in humans

A. Toxoplasmosis in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding. Since the first of July 2004, toxoplasmosis is no longer a notifiable disease under the Communicable Disease Act.

Case definition

A case is defined as a person in whom toxoplasmosis has been verified.

Diagnostic/analytical methods used

Antibody detection in serum and cerebro-spinal fluid by direct agglutination, IFL and immunosorbent agglutination assay.
Nucleic acid amplification test.

Notification system in place

Since the first of July 2004 toxoplasmosis is not a notifiable disease under the Communicable Disease Act.

History of the disease and/or infection in the country

During the last 10 years between 4 and 18 cases have been reported annually. In 2003, 17 cases were reported. Of these, 8 were known to be of domestic origin.

Results of the investigation

In 2004, 5 cases were reported. From the first of July in 2004 there is no mandatory reporting of toxoplasmosis.

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

The situation regarding toxoplasmosis in humans remains stable.

Relevance as zoonotic disease

Clinical toxoplasmosis is most important in immuno-suppressed persons and in pregnant women. The infection can be transmitted from the mother to the foetus and cause serious and fatal injury. There is little information about the most common sources of infection, however undercooked or raw meat is considered important.
As a preventive measure for pregnant women it is recommended that they refrain from cleaning up faeces from cats.

2.10.3. Toxoplasma in animals

A. T. gondii in animal

Monitoring system

Sampling strategy

There is no official surveillance for Toxoplasma spp in animals. Sampling of sheep, goats, cats or dogs is performed in case of clinical suspicion of toxoplasmosis. Other species of animals are also occasionally sampled.

Frequency of the sampling

In case of clinical suspicion.

Type of specimen taken

Other: Usually blood or fetal fluid

Case definition

A case is defined as an animal being test positive. The animal is the epidemiological unit.

Diagnostic/analytical methods used

The diagnostic method used is a direct agglutination test and more rarely immunohistochemistry or isolation of the agent in mice or cell culture.

Notification system in place

Toxoplasmosis is not notifiable in animals.

Results of the investigation

In 2004, 11 (37%) of 30 investigated cats , 4 (20%) of 20 dogs, 37 (59%) of 63 sheep and 1 (50%) of 2 cattle tested positive for T. gondii. None of 3 investigated horses and 7 other animals were positive.

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

The last decade, the situation regarding toxoplasmosis in animals has been relatively stable.

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

A risk of contracting domestic Toxoplasma spp infection does exist. However, the relevance of clinical toxoplasmosis is most important in immunosuppressed persons and in pregnant women.

Additional information

Results from a study in 1987 showed that around 40% of the sampled cats, 23% of the dogs, 20% of the sheep and 1% of the horses were seropositive for T. gondii. In 1999, a study showed

that 3.3% of sampled fattening pigs (n=695) and 17.3% of adult pigs (n=110) were seropositive. Another study performed between 1991-99 showed that 84 (38 %) of 221 red foxes were T. gondii seropositive.

Table 10.1 Toxoplasma gondii in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive
Cattle (bovine animals)	SVA		animal	2	1
Sheep	SVA		animal	63	37
Solipeds	SVA		animal	3	0
Pet animals					
dogs	SVA		animal	20	4
cats	SVA		animal	30	11
Other animals	SVA		animal	7	0

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

The Swedish animal population has been free from rabies since 1886.

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

The national situation is stable. However, there are concerns about the risk of introducing rabies through the increased number of dogs that are brought into the country illegally.

Recent actions taken to control the zoonoses

No recent actions have been taken and it is considered that the current regulation of movement of dogs and cats from EU and EFTA into Sweden is sufficient.

2.11.2. Rabies in humans

A. Rabies in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Case definition

A case is a person with positive rabies diagnostic.

Diagnostic/analytical methods used

Serology, antigen detection and isolation of the virus.

Notification system in place

Rabies is a notifiable disease under the Communicable Disease Act (both from the laboratory and from the physician).

History of the disease and/or infection in the country

Two persons, one in 1974 and one in 2000, contracted rabies after having had contact with dogs in India and Thailand, respectively. Apart from that, there have been no human cases reported in modern times.

Results of the investigation

No human case of rabies was reported.

Relevance as zoonotic disease

As Sweden is free from rabies in animals since 1886 and import of animals is strictly regulated, the risk of contracting rabies in Sweden is negligible. However, it can not be excluded that rabies can be introduced through the increased illegal movement of dogs into Sweden, that has been seen during the last years.

2.11.3. Lyssavirus (rabies) in animals

A. Rabies in dogs

Monitoring system

Sampling strategy

The surveillance of rabies in Sweden is passive. Animals that are brought into the country illegally are tested for rabies, if they are euthanised. Also, there is a passive surveillance of bats and other wildlife, that are sent in to the National Veterinary Institute.

Frequency of the sampling

Sampling is performed when there is a suspicion of rabies.

Type of specimen taken

Organs/ tissues: imprints from brain tissue

Methods of sampling (description of sampling techniques)

Specimens from brain tissue are analysed as soon as possible after collection.

Case definition

A case is defined as an animal from which rabies virus has been detected.

Diagnostic/analytical methods used

Other: fluorescent antibody test (FAT) performed on smears from hippocampus or medulla oblongata, and mouse inoculation test as a complementary test

Vaccination policy

Vaccination of animals is only allowed in dogs and cats that are to be brought out of Sweden. Dogs and cats that are brought into the country has to be tested for levels of protective antibodies following vaccination.

Control program/mechanisms

The control program/strategies in place

Recent actions taken to control the zoonoses

Since the number of dogs that ar brought into the country, both legally and illegally, has increased an assessment of the risks involved is needed. The Swedish Board of Agriculture has commissioned such an assessment to be completed during summer 2005.

Suggestions to the Community for the actions to be taken

One suggestion is to have import restrictions on dogs from areas where rabies virus

strains are adapted to dogs.

Measures in case of the positive findings or single cases

If rabies were diagnosed, measures to eradicate the disease would be taken in accordance with the Swedish Act of Epizootics.

Notification system in place

Rabies is notifiable on clinical suspicion

Results of the investigation

Twenty five dogs were investigated, none of them tested positive.

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

Rabies has not occurred in Sweden since 1886. Dogs and cats from EU, EFTA countries and countries regarded as having a low risk of rabies (EU998/2003)can be brought into Sweden after rabies vaccination and antibody titre control, whereas dogs and cats from other countries have to be kept in quarantine for four months.
Presently there is a great concern about increased number of illegally imported dogs into Sweden.

Additional information

Other animal species that were tested in 2004 were: 59 bats, 15 squirrels, 3 lynx, 13 cats and 1 zoo animal. All were negative.
Veterinarians and the public are advised to send bats that are found dead to the SVA for rabies investigation, and hunters are encouraged to notify SVA about wildlife that behave in a way that rabies might be suspected.
In 1987-89 and 1999, surveys were performed where sick (n=75) or dead bats (n=200) were investigated for rabies, all were negative. From 2000 to 2003, between 11 and 54 bats have been investigated annually. All have been negative.

Table 5.1 Rabies in animals

	Source of information	Remarks	Animals tested	Animals positive
Wildlife				
bats	SVA		59	0
other (1)	SVA		1	0
squirrel	SVA		15	0
lynx	SVA		3	0
Pet animals				
dogs	SVA		25	0
cats	SVA		13	0

(1) : racoon

3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE

3.1. E. COLI INDICATORS

3.1.1. General evaluation of the national situation

3.1.2. Antimicrobial resistance in *Escherichia coli* isolates

A. Antimicrobial resistance of E.coli in animal - Gallus gallus - at slaughter - monitoring programme

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial susceptibility of Escherichia coli from healthy animals (pigs, slaughter chickens and cattle) is monitored regularly within the Swedish Veterinary Antimicrobial Resistance Monitoring programme, SVARM. This year, isolates from slaughter chickens (Gallus gallus) were tested.

Type of specimen taken

Escherichia coli were isolated from intestinal content (caecum) of healthy broiler chickens sampled at slaughter.

Methods of sampling (description of sampling techniques)

Five abattoirs for chickens participated in the collection of samples. These abattoirs are geographically separated and accounted for 92% of the total slaughter volume in Sweden during 2002. The number of samples collected at each abattoir was proportional to the respective annual slaughter volume.
Sampling was performed weekly, with exceptions for holidays and summer vacations, by meat inspection staff or abattoir personnel. Each sample collected from chickens represents a unique flock, but not necessarily a unique production site. By these measures, bacterial isolates included are from randomly selected healthy individuals of Swedish flocks.

Procedures for the selection of isolates for antimicrobial testing

One isolate of E. coli from each sample was tested for antimicrobial susceptibility.

Methods used for collecting data

Culture and susceptibility testing were performed at the Department of Antibiotics, National Veterinary Institute (SVA).

Laboratory methodology used for identification of the microbial isolates

Approximately 0.5 g of ceacal content was diluted in 4.5 mL phosphate buffered saline (PBS, pH 7.2). After thorough mixing, 0.1 mL of this suspension was spread on MacConkey agar. After incubation overnight at 37°C, one lactose positive colony with morphology typical for E. coli was sub-cultured on horse-blood agar (5% v/v), after which the isolate was tested for

production of tryptofanase (indole) and b-glucuronidase (p-nitrophenyl-b-D-glucopyranosiduronic acid, PGUA). Only lactose-positive isolates with typical morphology and positive reactions in both tests were selected for susceptibility tests.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Antimicrobial susceptibility was tested using dilution methods in cation adjusted Mueller-Hinton broth (CAMBH). The tests were performed following the standards for microdilution of the National Committee of Clinical Laboratory Standards (NCCLS, 2002) using VetMIC panels produced at the Dept. of Antibiotics, SVA. As quality control, Escherichia coli ATCC 25922 was included.
The Dept. of Antibiotics is accredited to perform the analyses by the Swedish Board for Accreditaion and Conformity Assesment (SWEDAC) according to SS-EN ISO/IEC 17025 and regularly particpates in external quality assurance.

Breakpoints used in testing

For antimicrobials tested, range of tested concentrations and cut-off values (breakpoints) for resistance see Table 6.1.6.
Cut-off values were set according to microbiological criteria based on the MIC distributions. An isolate was regarded as resistant to a specific antimicrobial when its MIC was distinctly higher than those of inherently susceptible strains of the bacterial species in question. Where appropriate, the breakpoints suggested by NCCLS (2002) for animal pathogens were also taken into consideration.

Results of the investigation

Results of the investigation are presented in Table 13.1 and Table "Antimicrobial susceptibility of E. coli in Gallus gallus".
Overall, frequencies of resistance are low and have been stable over the four years studied since the SVARM programme was started year 2000. Nor is there any statistically significant increase in the occurrence of multiresistant isolates. Sulphonamide resistance was the most common trait, which could be a consequence of the occasional use of this substance to treat coccidiosis in broiler chickens. A direct selection pressure cannot explain resistance to the other substances as they are used in small amounts only (tetracyclines and fluoroquinolones) or not at all (aminoglycosides and ampicillin). The observed association between sulphonamide resistance and other resistance traits, however, implies that use of sulphonamides might co-select for resistance to other substances.

Table 13.1 Antimicrobial susceptibility testing of E.coli in animals

	E.coli							
	Cattle (bovine animals)		**Pigs**		**Gallus gallus**		**Turkeys**	
Isolates out of a monitoring program					yes			
Number of isolates available in the laboratory					300			
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**
Tetracycline					300	6.0%		
Amphenicols								
Chloramphenicol					300	0%		
Florfenicol					300	0%		
Cephalosporin								
Ceftiofur					300	0%		
Fluoroquinolones								
Enrofloxacin					300	2.3%		
Quinolones								
Nalidixic acid					300	5.0%		
Trimethoprim					300	0.3%		
Sulfonamides								
Sulfonamide					300	9.0%		
Aminoglycosides								
Streptomycin					300	4.9%		
Gentamicin					300	0%		
Neomycin					300	3.3%		
Penicillins								
Ampicillin					300	4.0%		
Number of multiresistant isolates								
fully sensitives					256	85.3%		
resistant to 1 antimicrobial					20	6.7%		
resistant to 2 antimicrobials					8	2.7%		
resistant to 3 antimicrobials					5	1.7%		
resistant to 4 antimicrobials					4	1.3%		
resistant to >4 antimicrobials					7	2.3%		

Table Antimicrobial susceptibility testing of E.coli in Gallus gallus - at slaughter - monitoring programme - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	E.coli
	Gallus gallus - at slaughter - monitoring programme
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	300

Antimicrobials:	**N**	**%R**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Tetracycline	300	6.0%					1.7	41.0	50.3	1.0					6.0						0.5	64
Amphenicols																						
Chloramphenicol	300	0							8.7	72.0	19.3										1	128
Florfenicol	300	0								53.0	46.7	0.3									4	32
Fluoroquinolones																						
Enrofloxacin	300	2.3	19.3	62.3	13.3	2.7	1.7	0.3	0.3												0.03	4
Quinolones																						
Nalidixic acid	300	5.0						1.0	24.3	67.0	2.7			3.0	0.7	1.3					1	128
Trimethoprim	300	0.3%				20.7	50.3	26.0	2.3	0.3			0.3								0.25	32
Sulfonamides																						
Sulfonamide	300	9.0										54.0	25.3	8.7	3.0				0.7	8.3	16	2048
Aminoglycosides																						
Streptomycin	300	4.9							0.3	29.3	57.3	7.3	0.7	1.3	2.0	1.3	0.3				2	256
Gentamicin	300	0					17.3	70.0	12.0	0.3	0.3										0.5	64
Neomycin	300	3.3							88.0	7.0	1.7		3.3								2	16
Cephalosporin																						
Ceftiofur	300	0			1.0	15.0	69.0	15.0													0.12	16
Penicillins																						
Ampicillin	300	4.0					0.3	5.7	55.0	35.7	1.0		0.3	3.7							0.25	32

Table 13.7 Breakpoints used for antibiotic resistance testing of E.coli in Animals

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Escherichia coli	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline	Microbiol*	8		8	0.5	64				
Amphenicols										
Chloramphenicol	Microbiol*	16		16	1	128				
Florfenicol	Microbiol*	16		16	4	32				
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	Microbiol*	0.25		0.25	0.03	4				
Quinolones										
Nalidixic acid	Microbiol*	16		16	1	128				
Trimethoprim	Microbiol*	8		8	0.25	32				
Sulfonamides										
Sulfonamide	Microbiol*	256		256	16	2048				
Aminoglycosides										
Streptomycin	Microbiol*	32		32	2	256				
Gentamicin	Microbiol*	8		8	0.5	64				
Neomycin	Microbiol*	8		8	2	16				
Kanamycin										
Trimethoprim + sulfonamides										
Cephalosporin										
Ceftiofur	Microbiol*	2		2	0.12	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	Microbiol*	8		8	0.25	32				

Footnote

* Cut-off values (break-points) set according to microbiological criteria, i.e. based on MIC distribution

4. FOODBORNE OUTBREAKS

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, epidemological investigations and reporting of foodborne outbreaks

The municipal environmental/public health authorities are responsible for detecting and preventing diseases related to food and water. Ill persons and the overall epidemiological investigation are the responsibilities of the regional infectious disease authority and the general practitioner. The municipal environmental/public health authorities are encouraged to report foodborne diseases to the Swedish National Food Administration (SLV)over the Internet. However, this is not mandatory. Based on the reports received, SLV and the Swedish Institute for Infectious Disease Control (SMI), prepare a yearly report which is also sent to the WHO Surveillance program for control of foodborne infections and intoxications in Europe.

Description of the types of outbreaks covered by the reporting:

The reporting covers both sporadic cases and outbreaks (i.e. two or more cases with similar symptoms associated with a food or a meal in common). In general, no distinction between family or general outbreaks is made.

Table 12. Foodborne outbreaks in humans

Causative agent	General outbreak	Family outbreak	Total Number in persons			Source			Type of evidence	Location of exposure	Contributing factors
			ill	died	in hospital		Suspected	Confirmed			
1	2	3	4	5	6	7			8	9	10
Histamine	2		4			Fishery products, fish, cooked	X		Symptoms, type of food	Restaurant	Deficiencies in handling food
unknown	1		3			Mixed meat, fermented sausage	X			In the home	
unknown	3		20			Other meat, minced meat	X		Epidemiology	Restaurants	
unknown	2		5			Vegetables, other	X		Epidemiology	Restaurant, home	
unknown	2		6			Fishery products, processed	X		Epidemiology	Restaurants	
unknown	1		2			Other processed, foods, sandwich, non-meat	X		Appearance of food	Restaurant	Deficiencies in food handling
unknown	3		50			Other processed foods, sandwich with meat	X		Epidemiology	In the home	Deficiences in handling food
unknown	1		2			Other processed foods, sandwich with meat	X		High levels of indicator bacteria	Store	Inadequate storage temperatures
unknown	1		20			Other processed foods, sandwich with meat	X		Epidemiology	Institution	
unknown	1		55			Other processed foods, prepared dishes	X		Epidemiology	Restaurant, temporary	Deficiencies
unknown	2		8			Other processed foods, prepared dishes	X		Epidemiology	In the home	
unknown	3		27			Other prepared foods, prepared dishes	X		Epidemiology	Restaurant	Lack of hygiene, Inadequate cold storage
unknown	2		9			Other food, buffet	X		Epidemiology	In the home	Lack of hygiene, inadequate cooling
unknown	1		2			Other food, only meal identified	X		Results of inspection	Restaurant	Lack of hygiene

unknown	1		2			Other food, only meal identified	X		Results of inspection	Restaurant	Lack of hygiene
unknown	1		2			Other food, only meal identified	X		Epidemiology	Restaurant	Inadequate storage of food
unknown	1		2			Other food, only meal identified	X		Epidemiology	Restaurant	Lack of hygiene, inadequate storage temperature
unknown	1		2			Other food, only meal identified	X		Epidemiology	Restaurant	Lack of hygiene, inadequate storage temperature
unknown	1		3			Other food, only meal identified	X		Epidemiology	Restaurant	
unknown	1		4	0	0	Other food, only meal identified	X		Epidemiology	Restaurant	
unknown	1		7	0	0	Other food, only meal identified	X		Epidemiology	Restaurant	
unknown	1		8			Other food, only meal identified	X		Epidemiology	Restaurant	
unknown	1		15			Other food, only meal identified	X		Epidemiology	Restaurant	
unknown	20		71			Unknown					
Marine biotoxins	1		12			Fishery products, shellfish, cooked	X		Epidemiology, type of food	Restaurant	Contaminated food
Bacillus - B. cereus	1	-	2	0	-	Other processed food, prepared dishes		X	Laboratory confimed in leftovers	Restaurant	Deficiences in food handling
Food borne viruses - calicivirus (including norovirus)	3		54			Other food, only meal identified	X		Lab. confirmed in feces	Restaurants	Lack of hygien, Ill person handling food
Food borne viruses - calicivirus (including norovirus)	1		18			Bakery products, cakes	X		Lab. confirmed in feces	In the home	Lack of hygiene
Campylobacter - C. jejuni	1		2		1	Broiler meat, meat preparation	X		Lab. confirmed in feces	In the home	Contaminated food
Campylobacter - C. jejuni	1		2			Poultry meat, meat preparation	X		Lab. confirmed in feces	Restaurant	Contaminated food
Campylobacter - Campylobacter spp.	1		10			Poultry meat, meat preparation	X		Lab. confirmed in feces	Restaurant	Inadequate heat treatment
Campylobacter - Campylobacter spp.	1		2			Unknown			Lab. confirmed in feces		
Clostridium - C. perfringens	1		19	0	0	Bovine meat, meat preparation	X		Epidemiology	Restaurant	Lack of hygiene, inadequate equipment for cooling
Food borne viruses - rotavirus	1		13			Other food, buffet	X		Lab. confirmed in feces	Restaurant	Ill person handling food

Salmonella - Salmonella spp.	1		3			Poultry meat, meat preparation	X		Laboratory conf in food	In the home	
Salmonella - S. Mikawasima	1		12			Unknown			Lab. confirmed in feces		
Salmonella - S. Thompson	1		14			Vegetables, salads, non-precut		X	Laboratory conf in feces and food	In the home	Contaminated food
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		130			Vegetables, other		X	Lab. confirmed in feces	Restaurant	Lack of hygiene knowlege, contaminated food
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	2		41			Other processed foods, sandwich with meat	X		Lab. confirmed in feces	Restaurants	-
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		74			Vegetables, other		X	Lab. confirmed in feces	Restaurant	Ill person handling food
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	2		38			Other food, buffet	X		Lab. confirmed in feces	Restaurant, in the home	-
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		14			Other processed food, prepared dish	X		Lab. confirmed in feces	in the home	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		33			Fruits, berries		X	Lab. confirmed in feces	In the home	Contaminated food
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		200			Bakery products, cakes		X	Lab. confirmed in feces	In the home	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		20			Live bivalve molluscs, oysters		X	Lab. confirmed in feces	Restaurant	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	4		245			Unknown			Lab. confirmed in feces		
Pathogenic Escherichia coli - Verotoxigenic E. coli (VTEC) - VTEC O 157	1		17	0	0	Unknown			Lab. confirmed in feces		
Salmonella - S. Typhimurium - DT 104	1		5			Bovine meat, meat preparation	X		Lab. confirmed in feces	Restaurant	Contaminated food
Salmonella - S. Typhimurium - DT 120	1		9			Mixed meat, meat products		X	Laboratory conf in feces and food	In the home	Contaminated food