ZOONOSES MONITORING

SWEDEN

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

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 2005

INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Country: **Sweden**

Reporting Year: **2005**

Institutions and laboratories involved in reporting and monitoring:

Laboratory name	Description	Contribution
Institute for Infectious Disease Control (SMI; Smittskyddsinstitutet)	SMI 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.	food borne outbreaks, human data
National Veterinary Institute (SVA; Statens Veterinärmedicinska anstalt)	SVA is a Swedish national authority that strives for good animal and human health, a good environment and sustainable food production.\r\n	compiling of the report, animal data
National Food Administration (SLV; Statens livsmedelsverk)	SLV is the central supervisory authority for matters relating to food, including drinking-water.	food data, food borne outbreaks
Board of Agriculture (SJV; Statens jordbruksverk)	SJV 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.	animal data, feed data

PREFACE

This report is submitted to the European Commission in accordance with Article 9 of Council Directive 2003/99/EC[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 2005. 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] Directive 2003/99/EC of the European Parliament and of the Council of 12 December 2003 on the monitoring of zoonoses and zoonotic agents, amending Decision 90/424/EEC and repealing Council Directive 92/117/EEC, OJ L 325, 17.11.2003, p. 31

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1. ANIMAL POPULATIONS

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

A. Information on susceptible animal population

Sources of information:

Most information about numbers of animals or herds is derived from the Yearbook of Agricultural Statistics 2005, Swedish Board of Agriculture. 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:

Most data relates to 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 plays 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 2004, there were dairy cows in around 9150 farms. There is an average of 44 cows/herd. In 2004 there were roughly 3200 pig farms in Sweden. This is a decrease by around 85% 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 Susceptible animal populations

* Only if different than current reporting year

Animal species	Category of animals	Livestock numbers (live animals)	Year*	Number of slaughtered animals	Year*	Number of herds or flocks	Year*	Number of holdings	Year*
Cattle (bovine animals)	dairy cows and heifers (1)	403702	2004					9147	2004
	meat production animals (2)	171730	2004					13013	2004
	calves (under 1 year)	513607	2004	31203				24116	2004
	in total	1628464	2004	469749				27626	2004
Deer	farmed - in total (3)	20180	2005	5980				617	
Ducks	in total			87466					
Gallus gallus (fowl)	parent breeding flocks, unspecified - in total			699521					
	laying hens			3406114					
	broilers	6085387	2004	73457981					
Geese	in total			33946					
Goats	in total	5509	2004					518	2004
Ostriches	farmed			735					
Pigs	breeding animals	195054	2004						
	fattening pigs	1094537	2004					2699	2004
	in total	1818037	2004	3174978				3194	2004
Reindeers	farmed - in total	266000		52409				953	
Sheep	animals under 1 year (lambs)	245533	2004					7050	2004
	animals over 1 year	220028	2004					8237	2004
	in total	465561	2004	223603				8239	2004
Solipeds, domestic	horses - in total	283100	2004	3463				56000	2004
Turkeys	in total	285696	2003	564721				1056	2004
Wild boars	farmed - in total			401					

(1): Only dairy cows
(2): Only beef cows
(3): Hjortåret 2004/2005

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. The last four years the number of reported human cases has been very stable with an annual incidence of about 40/100 000, including domestic and imported cases, and 6-9/100 000 for the domestic 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. 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.
There is no control programme for packing centers or for eggs at retail.

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 approved by teh EU (95/50/EC). The programmes are supervised by the SJV and the SLV. All 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 SVA 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 196 samples from broiler meat or products thereof. Of those, 8(4%) were positive for salmonella. Since all samples taken in the national control programme was negative it must be assumed that the positve samples represent products from other MS.
From Cat A slaughter houses 3369 neck skins were analysed and 137 from Cat B slaughter houses. At cutting plants 1 014, samples were collected. All samples 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"). 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 but in 2005 4%of the samples were postive. 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.
It should be mentioned that at present 40 % of poultry meat preparations are of foreign origin and for these products there are no 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 2005, 42268 neck skin samples were collected and of those, 11 (0.02%) were positive.

C. Salmonella spp. in turkey meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Turkey production is included in the Swedish Salmonella control programme and the same applies for turkeys as for broilers.

However the turkey production in Sweden is very small and the reports from the salmonella control do not distinguish between turkeys and broilers. The turkeys are thus included in the figures reported for broilers. They represent a very small part of the numbers reported.
Even so no Salmonella was found in turkey neck-skins or at cutting plants.

D. 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 approved by EU (95/50/EC). The programmes are supervised by the SJV and the SLV. All 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 of lymph nodes is described under "Salmonella in pigs".
Slaughter houses have been divided into two categories: Category A slaughtering 90% of all pigs and Category B slaughtering 10% of all pigs.
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. 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. Sampling wil be spread out over the slaughter days to avoid periodical sampling.
Carcass swabs are sampled as a quantitative monitoring of the slaughter hygiene at normal slaughter. The sample size will detect a prevalence of salmonella contaminated carcases of 0.1% with a 95% confidence interval.
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: Carcass swabs: representative sampling 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: Carcass swabs: Approx. 1400 square cm/carcass is swabbed. Cuttingplants: crushed meat

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

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, 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. Results from sampling of fresh meat or meat products from cattle and pig are reported under "Salmonella spp in bovine meat and produvts thereof".
Also, 5764 carcass swabs from pigs (2680 from breeding pigs and 3084 from fattening pigs) were analysed. Three of these were positive (all from fattening pigs, S. typhimurium NST, S.Enteritidis PT 4 and S. Senftenberg).
From cutting plants, 4 119 samples from both cattle and pigs were collected, 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 of contracting salmonella from domestically produced food is very small.

Additional information

Between 1996 and 2004, 57 633 lymph nodes from fattening- and adult pigs have been sampled in total. Of those, 70 (0.1%) were positive for salmonella. Similarly, 57 682 swabs have been analysed and of those 7 (0.01%)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.

E. 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 and All sampling is supervised by the competent authority, that is the official veterinarian. Official veterinarians 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 cattle at slaughter to ensure that the samples are representative of the population of slaughtered cattle at each slaughterhouse. Description of sampling of lymph nodes is presented under "Salmonella spp. in bovines".
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. At these slaughter hosues samples are collected evenly distributed over the 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. Sampling is spread out over the slaughter days to avoid periodical sampling.
Carcass swabs are collected as a quantitative monitoring of the slaughter hygiene at normal slaughter. 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: Carcass swabs: representative sampling 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: carcass swabs: aprrox.1400 square cm/carcass, cuttingplants: crushed meat

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

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 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, 1820 samples from fresh meat or meat products (including pork and pork products) were reported from the local municipalities, 5 of these were positive. the origin of the positive samples is not specified. Also, 659 samples from dairy products, including 58 cheese samples, were analysed. Of those, 3 cheese samples were positive.
In the surveillance in the control programme 3297 carcass swabs were analysed. Of those, 1 was positive (S. Livingstone).
From cutting plants, 4119 samples from both cattle and pigs were analysed, 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 negligbel.

Additional information

Between 1996 and 2005, 32139lymph nodes from cattle have been sampled in total. Of those, 20 (0.06%) were positive for salmonella. Furthermore, 32169 swabs have been analysed and of those 7 (002%) 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 2005:
The local municipalities reported 4008 samples of ready-to-eat foods , all negative. In herbs and spices,4 out of 55 reported samples were positive. Three out of 654 fruits and vegetables were positive. Finally, 34 samples from table eggs at retail, 151 fishery products and 228 crustaceans were negative for salmonella.

Table Salmonella in poultry meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Meat from broilers (Gallus gallus)								
fresh (1)	local health authority	single	25 g	196	8			
- at cutting plant - domestic production - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling	SLV	single	25 g	1014	0			
carcass								
- at slaughterhouse - animal sample - neck skin - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling	SLV	single	10 g	3506	0			

(1) : broiler meat or products thereof

Footnote

Samples are neckskin samples taken at the slaughterhouses and meat trimmings from cutting plants. Turkeys are included in the figures but represent only a very small portion.

Table Salmonella spp. in milk and dairy products

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Milk, cows'								
raw								
intended for direct human consumption	local health authorities	single	25g	5	0			
Cheeses made from cows' milk	local health authorities	single	25	58	3			
Dairy products (excluding cheeses)								
ice-cream	local health authorities	single	25g	596	0			

Footnote

The local authorities do not report serotype , nor do they distinguish different type of cheeses.
157 samples of unspecified other milk non-cheese products were also reported, positive samples 0

Table Salmonella in red meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Meat from pig								
fresh (1)	se red meat	single	25g	1052	3			
meat preparation								
intended to be eaten cooked	local health authorities	single	25g	768	2			
Meat from bovine animals								
meat preparation								
intended to be eaten cooked	see above							
Meat from sheep								
fresh (3)	see above							
Meat from bovine animals and pig								
- at cutting plant - domestic production - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling	SLV	single	25 g	4119	0			
Meat, red meat (meat from bovines, pigs, goats, sheep, horses, donkeys, bison and water buffalos) (4)	local health authorities	single	25 g	1052	3			

(1) : includes meat from cattle, pig and sheep
(3) : see "meat from pig - fresh"
(4) : includes meat from cattle, pig and sheep

Footnote

The local authorities report all red meat together so the figure represent both pigs and cattle and sheep. no distinction between meat and minced meat is made in the reports.

Table Salmonella spp. in other food

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Eggs								
table eggs								
- at retail	local health authorities	single	25g	34	0			
Fishery products	local health authorities	single	25g	151	0			
Crustaceans	localhealth authorities	single	25g	228	0			
Fruits and vegetables								
precut	local health authorities	single	25g	564	3			
Spices and herbs	local health authority	single	25 g	55	4			
Other processed food products and prepared dishes								
unspecified								
ready-to-eat foods	local health authority	single	25 g	4008	0			

Footnote

The local health authorities do not distinguish between shellfish and molluscs, and not between precut and ready to eat fruit and vegetables. The reported figures are thus inclusive. They do not report serotypes.

2.1.3. 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, approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.
All sampling performed according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for 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 hen farms once a year and meat producing 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 considered infected with salmonella. 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. However,this is not practised in Sweden.

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 farm was infected with S. enteritidis phage type 1b. This farm was infected by the same serotype in 2003, but was declared free after throrough investigation, cleaning and desinfection. This time salmonella was isolated from the feed plant at the farm, indicating that salmonella had remained at the farm since 2003.
No breeding flock or hatchery was infected with Salmonella.
Results from sampling of neck skins and crushed meat 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 2005, 42268 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, approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.
All sampling performed according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible 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 meat producing 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 considered salmonella infected. 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

All flocks and holdings were negative in 2005.
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 2005, 42 268 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, 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 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 meat producing 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 considered salmonella infected. 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 considered salmonella infected. 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 2005.

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, 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 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 meat producing 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 considered salmonella infected. 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 was not isolated from any holding in 2005.
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, 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 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 meat producing 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 Parents.
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 considered salmonella infected. 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

Salmonella was not isolated at any holding in 2005.

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 fattening and adult pigs at slaughter to ensure that the samples are representative of the population of slaughtered pigs at each slaughterhouse. Sampling of lymph nodes in the programme is described here, wheras sampling of carcass swabs and at cutting plants are described under "Salmonella spp. in pig meat and products thereof".
CONTROL PROGRAMME
Sampling of lymph nodes at slaughter houses:
Slaughter houses have been divided into two categories: Category A slaughtering 90% of all pigs and Category B slaughtering 10% of all pigs.
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 consit of lymph nodes from the ileo-caecal region. Sampling wil be spread out over the slaughter days to avoid periodical sampling.
VOLUNTARY PROGRAMME
There is a voluntary additional sampling of faecal materials at herd level in a quality programme called BIS (Best In Sweden) run by the industry (Swedish meats). In this programme, integrated- , fattening-, piglet producing-, and satellite herds are includuded. Sampling is performed by the veterinarian.
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: 1) lymph nodes at Category A: daily, Catergory B: spread out evenly over

the year , 2) sampling at suspicion/outbreak, 3) faecal samples once a year

Multiplying herds

Other: 1) lymph nodes at Category A: daily, Catergory B: spread out evenly over the year , 2) sampling at suspicion/outbreak, 3) faecal samples once a year

Fattening herds at farm

Other: 1) lymph nodes at Category A: daily, Catergory B: spread out evenly over the year , 2) sampling at suspicion/outbreak, 3) faecal samples once a year

Fattening herds at slaughterhouse (herd based approach)

Other: see "fattening herds at farm"

Type of specimen taken

Breeding herds

Other: feaces and lymph nodes

Multiplying herds

Other: feaces and lymph nodes

Fattening herds at farm

Other: feaces and lymph nodes

Fattening herds at slaughterhouse (herd based approach)

Other: see "fattening herds at farm"

Methods of sampling (description of sampling techniques)

Breeding herds

CONTROL PROGRAMME
1)Faecal sampling
Sampling procedure:
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 from each of at least 5 animals/pen) is collected. All samples should be analysed within 24-48 h after collection.
Bacteriological examination:
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.
For sampling at suspicion or in outbreaks investigations feacal samples are only pooled for fattening pigs and not for adult pigs.

2)Lymph nodes at slaughter:
At least 5 lymph nodes from the ileo-caecal region are aseptically 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.

Multiplying herds

See "breeding herds"

Fattening herds at farm

1) For sampling of lymph nodes and feacal sampling at suspicion or at outbreak investigation, see "Breeding herds".
2) Faecal sampling in the voluntary programme (BIS).
Samples are taken every second year in all farms affiliated to the programme, including integrated-, fattening-, piglet producing- and satellite herds. Two pooled faecal samples from 5 pens, respectively, are collected.

Fattening herds at slaughterhouse (herd based approach)

For sampling of lymph nodes, see "breeding herds".

Case definition

Breeding herds

Is salmonella is isolated from a pig, then the whole herd is considered infected with salmonella. 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:

Vaccination policy

Breeding herds

vaccination is not allowed 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 in herds 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 health 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, as well as suspicion of salmonella, regardless of 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.

Multiplying herds

see "breeding herds"

Fattening herds

see "breeding herds"

Measures in case of the positive findings or single cases

1)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 of the whole herd, and institution of a sanitation plan, i.e. involving elimination of chronically infected animals, cleaning and disinfection, treatment of manure and sludge, and destruction of feeding stuffs. Trace-back and trace-forward investigations are also performed. 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.
2)If salmonella is found from any lymph node 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.
3) If salmonella is isolated from other animals, humans or feed and connections can be made to pigs, investigation is always performed.
4)Every carcass that is contaminated by Salmonella is deemed unfit for human consumption.

Notification system in place

All findings of salmonella, irrespective of serotype, is compulsory notifiable. The obligation to notify all salmonella findings has been in force since 1961. Suspicions of salmonella are also notifiable.

Results of the investigation

1)In 2005, two pig herds were found infected with S. typhimurium DT 40, respectively.
2)In the control programme, 5747 lymph nodes were analysed (2674 adult swine, 3073 fattening

pigs). Of these, 8 were positive. Three adult pigs were positive for S. Typhimurium phage type 40, 1 adult pig, respectively, was positive for S. Typhimurium DT 104, S. Dublin and S. Chester. Two fattening pig, respectively, were positive for
S.Typhimurium NST and S. Typhimurium DT 41.
Salmonella was re-isolated at the farm at one occasion(S. Typhimurium DT40).
3)In the voluntary control run by the industry (Swedish Meats) 850 pooled faecal samples from 1271 herds were analysed. All were negative.

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 negligble.

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 at critical control points to ensure production of feed virtually free from salmonella contamination.
Between 1996 and 2004, 57 633 lymph nodes from fattening- and adult pigs have been sampled in total. Of those, 70 (0.1%) were positive for salmonella. Similarly, 57 682 swabs have been analysed and of those 7 (0.01%)have been positive.

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 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, 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 of lymph nodes in the programme is described here, wheras sampling of carcass swabs and at cutting plants are described under " Salmonella spp. in bovine meat and products thereof".
CONTROL PROGRAMME
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 the 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.
OTHER SAMPLING
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: 1) lymph nodes at Category A: daily, category B: spread out evenly over the year, 29 sampling at suspicion /outbreak/sanitary slaughter

Animals at slaughter (herd based approach)

Other: see lymph nodes at "Animals at farms"

Type of specimen taken

Animals at farm

Other: faeces and lymph nodes

Animals at slaughter (herd based approach)

Other: see Animals at farms

Methods of sampling (description of sampling techniques)

Animals at farm

FAECAL SAMPLING:
Sampling procedure:
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.
Bacteriological examination:
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.
LYMPH NODES AT SLAUGHTER:
The lymph nodes are aseptically 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.

Animals at slaughter (herd based approach)

For information about lymph nodes, see "Animals at farm". For information about carcass swabs and cutting plants, see "Salmonella spp. in bovine meat and products thereof".

Case definition

Animals at farm

If salmonella is isolated from a cattle, then the whole herd is considered infected with salmonella. The herd is the epidemiological unit.

Animals at slaughter (herd based approach)

see "Animals at farm"

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 or Animals at farm

Vaccination policy

Vaccination is not allowed.

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 and suspicions of salmonella, regardless of 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.

Measures in case of the positive findings or single cases

1)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 of the whole herd, and institution of a sanitation plan, i.e. involving elimination of chronically infected animals, cleaning and disinfection, treatment of manure and sludge, and destruction of feeding stuffs. Trace-back and trace-forward investigations are also performed. 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.
2)If salmonella is found from any lymph node collected in the control programme trace back of the infection to the farm of origin is always performed.
3) If salmonella is isolated from other animals, humans or feed and connections can be made to pigs, investigation is always performed.
Contaminated carcasses are 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. Suspicions of salmonella infection is also notifiable.

Results of the investigation

In 2005, 13 cattle farms were infected with salmonella. The following serotypes were isolated at the farms:
1) 9 S. Dublin. Seven of these herds can be traced back to one herd that was split up after a fire at the farm.
2) 3 S. Typhimurium. From this farm, salmonella was also isolated from pigs and sheep.
3) 1 S. Livingstone.
In the surveillance in the control programme, 3 297 lymph nodes were analysed. Of those, 2 were positive for S. Typhimurium NST. Salmonella was not re-isolated at the farm of origin.
For results from sampling of carcass swabs and at cutting plants 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 negligble as <0.1% of Swedish cattle is infected with salmonella.

Additional information

In 2004, 3 cattle farms were infected with S. Typhimurium DT 104. Previoulsy, four cattle farms have 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 2005, there was an outbreak of S. Typhimurium in cats and 139 cases were reported. None of these were phage typed, but it can be suspected that they belong to phage type 40, as seen during previous years. Apart from that, S. Java was also reported from a household with two diseased cats. It is suspected that the cats get infected by wild birds. In total, 15 positive wild birds were reported (11 S. Typhimurium (unknown phage type), 1 S. Typhimurium DT 40 and DT 41, respectively.
Faeces from one hedgehog at a childern day-care center was sampled after a child had been infected with S. Typhimurium phage type 1. The hedge hog was positive for the same salmonella serotype and phage type.
Furthermore, 7 dogs were reported positive, 8 reptiles, 1 zoo animal, and 15 wild birds. The various serotypes are shown in the table "Salmonella in other animals".

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.

Additional information

In 2003, 20004 and also in 2005, there have been yearly outbreaks of Salmonella Typhimurium in cats during late winter/early spring. In 2003, 114 cats were reported, followed by 31 in 2004. Phage type 40 has been the dominating type among the samples that were phagetyped. In 2005, 138 cats with S. typhimurium was reported.

Table Salmonella in breeding flocks of Gallus gallus

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Gallus gallus (fowl)							
elite breeding flocks for egg production line	SJV		0	0			
grandparent breeding flocks for egg production line	SJV	flock	3	0			
parent breeding flocks for egg production line	SJV	flock	38	0			
day-old chicks	SJV	flock	38	0			
during rearing period	SJV	flock	16	0			
during production period	SJV	flock	22	0			
elite breeding flocks for meat production line	SJV		0	0			
grandparent breeding flocks for meat production line	SJV	flock	8	0			
parent breeding flocks for meat production line	SJV	flock	138	0			
day-old chicks	SJV	flock	138	0			
during rearing period	SJV	flock	74	0			
during production period	SJV	flock	64	0			

Footnote

There are no elite flock in Sweden

Table Salmonella in other poultry

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Gallus gallus (fowl)							
laying hens							
during rearing period	SJV	flock	250	0			
during production period	SJV	flock	859	1	1		
broilers							
during rearing period	SJV	flock	2368	0			
Ducks							
breeding flocks	SJV	flock	1	0			
meat production flocks	SJV	flock	26	0			
Geese							
meat production flocks	SJV	flock	42	0			
Turkeys							
breeding flocks	SJV	flock	12	0			
meat production flocks	SJV	flock	108	0			

Footnote

Rearing and laying hen flocks included if >200 birds

Table Salmonella in other birds

		Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Ostriches		SJV	flock	41	0			

Table Salmonella in other animals (Part A)

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. IIIa 41:z4,z23:-	S. Uzaramo	S. Nima	S. IIIb61:r:z	S. Agona	S. Chester	S. Paratyphi B var. Java	S. Ealing	S. Livingstone	S. enterica subsp. diarizonae	S. Dublin	S. Montevideo	S. Kisarawe
Cattle (bovine animals) (1)	SJV	herd		13												1		9		
- at slaughterhouse - animal sample - carcass swabs - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (4)	SLV	animal	3297	1												1				
- at slaughterhouse - animal sample - lymph nodes - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (5)	SLV	animal	3297	2																
Sheep (2)	SJV	herd		2													1			
Pigs (3)	SJV	herd		2																
breeding animals																				

- at slaughterhouse - animal sample - carcass swabs - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (6)	SLV	animal	2680																	
- at slaughterhouse - animal sample - lymph nodes - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (7)	SLV	animal	2674	6									1					1		
fattening pigs																				
- at slaughterhouse - animal sample - carcass swabs - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (8)	SLV	animal	3084	3																
- at slaughterhouse - animal sample - lymph nodes - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (9)	SLV	animal	3073	2																
raised under controlled housing conditions in integrated production system																				

- at farm - animal sample - faeces - Monitoring - sampling by industry - census sampling (11)	Swedish Meats	herd	1271	0																
Solipeds, domestic	SJV	animal		1																
Cats	SVA	animal		139		138								1						
Dogs	SVA	animal		7		1						1								
Reptiles																				
pet animals	SVA	animal		3				1												1
zoo animal	SVA	animal		5			1		1	1	1				1					
Hedgehogs	SVA	animal		1		1														
Zoo animals, all																				
- at zoo (10)	SVA	animal		1															1	
Birds	SVA	animal		15		11														

(1) : 7 herds (S.Dublin) have the same herd of origin. In one herd (S.Typhimurium, phage type (PT)40) salmonella was also isolated in pigs and sheep. In one herd both S.Thompson and S.Typhimurium (PT not typable(NT)) were isolated.
(2) : In one herd (S. Typhimurium) salmonella was also isolated in pigs and cattle.
(3) : In one of the herds S.Typhimurium PT 40 was re-isolated from a positive lymfnode.
(4) : 3.128 swabs from major slaughter houses(sl.h) and 169 from minor sl.h. Salmonella was not re-isolated in the herd of origin.
(5) : 3.132 lymph nodes from major sl.h. and 165 from minor sl.h. Salmonella was not re-isolated in the herds of origin.
(6) : 2.631 swabs from major sl.h. and 49 from minor sl.h. Salmonella was not re-isolated from the herd of origin.
(7) : 2.624 lymph nodes from major sl.h. and 50 from minor sl.h. Salmonella was not re-isolated in five of the six herds of origin. In the re-isolated herd (S.Typhimurium, PT 40) positive sheep och cattle were found.
(8) : 2.918 swabs from major sl.h. and 166 from minor sl.h. Salmonella was not re-isolated in the herd of origin.
(9) : 2.906 lymph nodes from major sl.h. and 167 from minor sl.h. Salmonella was not re-isolated in the herd of origin.
(10) : Pig
(11) : 850 pooled samples from 1271 herds in the voluntary programme BIS run by the industry

Table Salmonella in other animals (Part B)

	S. Senftenberg	S. IIIb 38:k:z	S. Thompson	S. Enteritidis - 4	S. Typhimurium - Not typable	S. Typhimurium - DT 104	S. Typhimurium - DT 40	S. Typhimurium - DT 41	S. Typhimurium - DT 10
Cattle (bovine animals) (1)					1		1		1
- at slaughterhouse - animal sample - carcass swabs - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (4)					2				
- at slaughterhouse - animal sample - lymph nodes - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (5)							1		
Sheep (2)							2		
Pigs (3)									
breeding animals									

- at slaughterhouse - animal sample - carcass swabs - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (6)					1	3			
- at slaughterhouse - animal sample - lymph nodes - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (7)									
fattening pigs									
- at slaughterhouse - animal sample - carcass swabs - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (8)	1		1	1			1		
- at slaughterhouse - animal sample - lymph nodes - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (9)							1	1	
raised under controlled housing conditions in integrated production system									

- at farm - animal sample - faeces - Monitoring - sampling by industry - census sampling (11)									
Solipeds, domestic								1	
Cats									
Dogs					5				
Reptiles									
pet animals		1							
zoo animal									
Hedgehogs									
Zoo animals, all									
- at zoo (10)									
Birds							1	3	

(1) : 7 herds (S.Dublin) have the same herd of origin. In one herd (S.Typhimurium, phage type (PT)40) salmonella was also isolated in pigs and sheep. In one herd both S.Thompson and S.Typhimurium (PT not typable(NT)) were isolated.
(2) : In one herd (S. Typhimurium) salmonella was also isolated in pigs and cattle.
(3) : In one of the herds S.Typhimurium PT 40 was re-isolated from a positive lymfnode.
(4) : 3.128 swabs from major slaughter houses(sl.h) and 169 from minor sl.h. Salmonella was not re-isolated in the herd of origin.
(5) : 3.132 lymph nodes from major sl.h. and 165 from minor sl.h. Salmonella was not re-isolated in the herds of origin.
(6) : 2.631 swabs from major sl.h. and 49 from minor sl.h. Salmonella was not re-isolated from the herd of origin.
(7) : 2.624 lymph nodes from major sl.h. and 50 from minor sl.h. Salmonella was not re-isolated in five of the six herds of origin. In the re-isolated herd (S.Typhimurium, PT 40) positive sheep och cattle were found.
(8) : 2.918 swabs from major sl.h. and 166 from minor sl.h. Salmonella was not re-isolated in the herd of origin.
(9) : 2.906 lymph nodes from major sl.h. and 167 from minor sl.h. Salmonella was not re-isolated in the herd of origin.
(10) : Pig
(11) : 850 pooled samples from 1271 herds in the voluntary programme BIS run by the industry

2.1.4. Salmonella in feedingstuffs

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 2005
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 COMPUND FEEDING STUFFS:
In the HACCP control of feed mills, 8409 samples were reported and of those 25 were positive. The positive samples belonged to 15 serotypes (Table Salmonella in compound feeding stuffs)
- FEED MATERIAL OF VEGETABLE ORIGIN
In total, 3048 samples from derived material of soybean, maize, palm kernel and rape seed were analysed. Of those, 67 were positive. No sample from maize derive was positive. The most common serotype was S. Tennessee (n=14).
-PROCESSING PLANTS FOR ANIMAL BY-PRODUCTS AND FEED MATERIALS OF ANIMAL ORIGIN
Out of 1819 samples from feed materials of land animal origin, only one was positive. (Table Salmonella in feed material of animal origin). None out of 120 samples from fish meal was positive.
-DOG SNACK
There were 6 positive findings belonging to three different serotypes of Salmonella in dog chews.

Table Salmonella in feed material of animal origin

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Livingstone
Feed material of land animal origin									
dairy products	SJV			n.a.					
meat meal	SJV			n.a.					
meat and bone meal	SJV			76	1				1
bone meal	SJV			n.a.					
greaves	SJV			n.a.					
poultry offal meal	SJV			616	0				
feather meal	SJV			n.a.					
blood meal	SJV			n.a.					
animal fat	SJV			n.a.					
egg powder	SJV			60	0				
protein meal	SJV			1067	0				
Feed material of marine animal origin									
fish meal	SJV			120	0				
fish oil	SJV			n.a.					
fish silage	SJV			n.a.					
other fish products	SJV			n.a.					

Footnote

Compulsory (national or EU requirements) and voluntary sampling. Negative voluntary sampling is not included as data about number of samples is unknown.
Sampling unit unknown.

Table Salmonella in other feed matter (Part A)

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Typhimurium	S. Enteritidis	Salmonella spp., unspecified	S. Infantis	S. Lexington	S. Agona	S. Rissen	S. Muenster	S. Cerro	S. Mbandaka	S. Adelaide	S. Anatum	S. Bere	S. Tennessee	S. Cubana
Feed material of cereal grain origin																				
barley derived	SJV			n.a.																
wheat derived	SJV			n.a.																
maize derived																				
	SJV	batch		144	0															
other cereal grain derived	SJV			n.a.																
Feed material of oil seed or fruit origin																				
groundnut derived	SJV			n.a.																
rape seed derived	SJV	batch		1012	33			9	6						1				12	
palm kernel derived	SJV	batch		584	4			2									2			
soya (bean) derived	SJV	batch		1308	30			4		1	2	4	1	1	4	1	1		2	4
cotton seed derived	SJV			n.a.																
sunflower seed derived	SJV			n.a.																
linseed derived	SJV			n.a.																

other oil seeds derived	SJV			n.a.																
Other feed material																				
legume seeds and similar products	SJV			n.a.																
tubers, roots and similar products	SJV			n.a.																
other seeds and fruits	SJV			n.a.																
forages and roughages	SJV			n.a.																
other plants	SJV	batch		4	0															

Footnote

Compulsory (national or EU requirements) and voluntary sampling. Negative voluntary sampling is not included as data about number of samples is unknown.

Table Salmonella in other feed matter (Part B)

	S. Livingstone	S. Senftenberg
Feed material of cereal grain origin		
barley derived		
wheat derived		
maize derived		
other cereal grain derived		
Feed material of oil seed or fruit origin		
groundnut derived		
rape seed derived	5	
palm kernel derived		
soya (bean) derived		5
cotton seed derived		
sunflower seed derived		
linseed derived		
other oil seeds derived		
Other feed material		
legume seeds and similar products		
tubers, roots and similar products		

other seeds and fruits			
forages and roughages			
other plants			

Footnote

Compulsory (national or EU requirements) and voluntary sampling. Negative voluntary sampling is not included as data about number of samples is unknown.

Table Salmonella in compound feedingstuffs (Part A)

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Typhimurium	S. Enteritidis	Salmonella spp., unspecified	S. Mbandaka	S. Livingstone	S. Agona	S. Anatum	S. Ouakam	S. Schwarzengrund	S. Ohio	S. Rissen	S. Cubana	S. Adelaide	S. Emek	S. Senftenberg
Compound feedingstuffs for cattle																				
final product	SJV			n.a																
Compound feedingstuffs for pigs																				
final product	SJV			n.a																
Compound feedingstuffs for poultry (non specified)																				
final product	SJV			n.a																
Compound feedingstuffs for poultry -breeders																				
final product	SJV			n.a																
Compound feedingstuffs for poultry - laying hens																				
final product	SJV			n.a																
Compund feedingstuffs for poultry - broilers																				
final product	SJV			n.a																
Pet food																				

dog snacks (pig ears, chewing bones)	SJV	single		10	6				1	2	3									
Other feed material																				
- at feed mill - environmental sample - Surveillance - official controls (other than control and eradication programmes) - official sampling	SJV	single		361	0															
- at feed mill - environmental sample - Surveillance - HACCP or own checks by industry - sampling by industry	SJV	single		8409	25	4		1	2			1	1	2	1	2	3	1	1	1

Footnote

The voluntary and compulsory sampling (national or EU requirements) are based on HACCP principles and presented under "Other feed material".

Table Salmonella in compound feedingstuffs (Part B)

	S. Infantis	S. Tennessee	S. Llandoff
Compound feedingstuffs for cattle			
final product			
Compound feedingstuffs for pigs			
final product			
Compound feedingstuffs for poultry (non specified)			
final product			
Compound feedingstuffs for poultry -breeders			
final product			
Compound feedingstuffs for poultry - laying hens			
final product			
Compund feedingstuffs for poultry - broilers			
final product			
Pet food			
dog snacks (pig ears, chewing bones)			
Other feed material			

- at feed mill - environmental sample - Surveillance - official controls (other than control and eradication programmes) - official sampling		2	1
- at feed mill - environmental sample - Surveillance - HACCP or own checks by industry - sampling by industry	2		

Footnote

The voluntary and compulsory sampling (national or EU requirements) are based on HACCP principles and presented under "Other feed material".

2.1.5. Salmonella serovars and phagetype distribution

Table Salmonella serovars in animals

Serovars		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		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 : Monitoring, C : Clinical
See Tables of Salmonella prevalences in animals.

Table S. Enteritidis phagetypes in animals

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

Footnote

(*) M : Monitoring, C : Clinical
See Table Salmonella in breeding flocks of Gallus gallus

Table Salmonella Typhimurium phagetypes in animals

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

Footnote

(*) M : Monitoring, C : Clinical
See Table Salmonella in other animals

2.1.6. Antimicrobial resistance in Salmonella isolates

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.

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 warm-blooded 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 2005, Salmonella was isolated from a total of 138 cats and of these isolates; the first 20 consecutive isolates were tested and thereafter every fifth isolate (total number of isolates 44).

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

For antimicrobials and range of tested see Table "Breakpoints for antibiotic resistance testing of Salmonella in Animals".
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 cut-off values (breakpoints) for resistance see Table "Breakpoints for antibiotic resistance testing of Salmonella in Animals".
For classification of zoonotic bacteria (Salmonella and Campylobacter) microbiological cut-off values recommended by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) were used (http://www.escmid.org). When the range of concentrations tested was inappropriate for the recommended value, a cut-off value was defined on basis of the actual MIC distributions obtained in the SVARM programme. The same approach was used when recommended cut-off values would have cut through distributions of MIC in a manner not in agreement with the concept of wild-type distributions, causing an erroneously high frequency of resistance in single a year(s). This applies to gentamicin, streptomycin and sulphamethoxazole in Salmonella.

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 19 notified incidents of Salmonella in cattle 2005, S. Typhimurium were involved in seven incidents. In 15 incidents, isolated Salmonella were sensitive to all antimicrobials tested (Table "Antimicrobial susceptibility testing of Salmonella in animals"). In two incidents, all involving S. Typimurium, isolated Salmonella had the classical penta resistance (ampicillin/chloramphenicol/streptomycin/sulpha/tetracycline). In these two incidents, S. Typhimurium DT 104 were isolated and in one incident also S. Typhimurium DT 120. The two 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

See "Antimicrobial resistance in Salmonella in cattle" for details.

Type of specimen taken

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

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

See "Antimicrobial resistance in Salmonella in cattle" for details.

Breakpoints used in testing

See "Antimicrobial resistance in Salmonella in cattle" for details.

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 12 notified incidents of Salmonella in pigs 2005, S. Typhimurium were involved in 8 incidents. Of these, 1 incident involved S. Typhimurium DT 104, 4 DT 40,1 DT 41 and 2 incidents where isolates were not phagetyped. In all 12 incident except one, isolated Salmonellae were sensitive to all tesiet antimicrobials. In one incident involving S. Typhimurium DT104 the isolate had the typical pentaresistance (ampicillin/chloramphenicol/streptomycin/sulpha/tetracycline) (Table "Antimicrobial susceptibility testing of Salmonella in animals")

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 90 incidents except two has involved Salmonella sensitive to all antimicrobials tested. Of the resistant isolates, one was from 2000 (S. Typhimurium DT12, resistant to nalidixic acid) and one from 2005 (S. Typhimurium DT 104 resistant to ampicillin/chloramphenicol/streptomycin/tetracycline/sulpha.

C. Antimicrobial resistance in Salmonella in poultry

Sampling strategy used in monitoring

Frequency of the sampling

See "Antimicrobial resistance in Salmonella in cattle" for details.

Type of specimen taken

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

Methods of sampling (description of sampling techniques)

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

Procedures for the selection of isolates for antimicrobial testing

See "Antimicrobial resistance in Salmonella in cattle" for details.

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

See "Antimicrobial resistance in Salmonella in cattle" for details.

Breakpoints used in testing

See "Antimicrobial resistance in Salmonella in cattle" for details.

Preventive measures in place

See "Salmonella spp. in poultry".

Control program/mechanisms

The control program/strategies in place

See "Salmonella spp. in poultry".

Recent actions taken to control the zoonoses

See "Salmonella spp. in poultry".

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 44 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 Antimicrobial susceptibility testing of S.Enteritidis in animals

n = Number of resistant isolates

	S. Enteritidis							
	Cattle (bovine animals)		**Pigs**		**Gallus gallus (fowl)**		**Turkeys**	
Isolates out of a monitoring programme	yes		yes		yes		yes	
Number of isolates available in the laboratory	0		1		1		0	
Antimicrobials:	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**
Tetracyclines	0		1	0	1	0	0	
Amphenicols								
Chloramphenicol	0		1	0	1	0	0	
Florfenicol	0		1	0	1	0	0	
Cephalosporins								
Cefotaxim	0		1	0	1	0	0	
Ceftiofur	0		1	0	1	0	0	
Fluoroquinolones								
Enrofloxacin	0		1	0	1	0	00	
Quinolones								
Nalidixic acid	0		1	0	1	0	0	
Trimethoprim	0		1	0	1	0	0	
Sulfonamides								
Sulfonamide	0		1	0	1	0	0	
Aminoglycosides								
Streptomycin	0		1	0	1	0	0	
Gentamicin	0		1	0	1	0	0	
Neomycin	0		1	0	1	0	0	
Penicillins								
Ampicillin	0		1	0	1	0	0	
Fully sensitive			1	1	1	1		

Table Antimicrobial susceptibility testing of S. Typhimurium in Other animals - Monitoring (5 dogs, 43 cats, 1 horse, 20 wildlife) - quantitative data [Dilution method]

Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	S. Typhimurium
	Other animals - Monitoring (5 dogs, 43 cats, 1 horse, 20 wildlife)
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	163

Antimicrobials:	**N**	**n**	**<=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**
Tetracyclines	69	4							54	11				1	3						0.5	32
Amphenicols																						
Chloramphenicol	69	2							3	62	2					2					1	128
Florfenicol	69	1								66	2		1								4	32
Cephalosporins																						
Cefotaxim	69	0		1	42	25	1														0.06	2
Ceftiofur	69	0				1	9	58	1												0.12	16
Fluoroquinolones																						
Enrofloxacin	69	1		10	58		1														0.03	4
Quinolones																						
Nalidixic acid	69	1								53	15					1					1	128
Trimethoprim	69	1				4	58	6						1							0.25	32
Sulfonamides																						
Sulfonamide	69	4												12	47	6				4	16	2048
Aminoglycosides																						
Streptomycin	69	3									4	52	10	1	1	1					2	256
Gentamicin	69	0					16	52	1												0.5	64
Neomycin	69	0							67	2											2	16
Penicillins																						
Ampicillin	69	4						57	8					4							0.25	32

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

Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	S. Typhimurium
	Pigs - Monitoring
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	8

Antimicrobials:	**N**	**n**	**<=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**
Tetracyclines	8	1							5	2					1						0.5	32
Amphenicols																						
Chloramphenicol	8	1								7						1					1	128
Florfenicol	8	1								7				1							4	32
Cephalosporins																						
Cefotaxim	8	0			6	2															0.06	2
Ceftiofur	8	0					2	6													0.12	16
Fluoroquinolones																						
Enrofloxacin	8	0		2	6																0.03	4
Quinolones																						
Nalidixic acid	8	0								7	1										1	128
Trimethoprim	8	0				2	6														0.25	32
Sulfonamides																						
Sulfonamide	8	1												2	4	1				1	16	2048
Aminoglycosides																						
Streptomycin	8	1								1	1	5			1						2	256
Gentamicin	8	0					3	5													0.5	64
Neomycin	8	0							8												2	16
Penicillins																						
Ampicillin	8	1						7						1							0.25	32

Table Antimicrobial susceptibility testing of S.Typhimurium in animals

n = Number of resistant isolates

	S. Typhimurium													
	Cattle (bovine animals)		**Pigs**		**Gallus gallus (fowl)**		**Turkeys**		**Sheep - mixed herds**		**All animals - wild**		**All animals - pet animals (dog, cat, horse)**	
Isolates out of a monitoring programme	yes		yes		yes		yes		yes		yes		yes	
Number of isolates available in the laboratory	7		8		0		0		1		20		49	
Antimicrobials:	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**
Tetracyclines	7	3	8	1	0	0	0		1	0	20	0	49	4
Amphenicols														
Chloramphenicol	7	3	8	1	0		0		1	0	20	0	49	2
Florfenicol	7	3	8	1	0		0		1	0	20	0	49	1
Cephalosporins														
Cefotaxim	7	0	8	0	0		0		1	0	20	0	49	0
Ceftiofur	7	0	8	0	0		0		1	0	20	0	49	0
Fluoroquinolones														
Enrofloxacin	7	0	8	0	0		0		1	0	20	0	49	1
Quinolones														
Nalidixic acid	7	0	8	0	0		0		1	0	20	0	49	1
Trimethoprim	7	0	8	0	0		0		1	0	20	0	49	1
Sulfonamides														
Sulfonamide	7	3	8	1	0		0		1	0	20	0	49	4
Aminoglycosides														
Streptomycin	7	3	8	1	0		0		1	0	20	0	49	3
Gentamicin	7	0	8	0	0		0		1	0	20	0	49	0
Neomycin	7	0	8	0	0		0		1	0	20	0	49	0
Penicillins														
Ampicillin	7	3	8	1	0		0		1	0	20	0	49	4
Fully sensitive	7	4	8	7	0		0		1	1	20	20	49	45
Resistant to 4 antimicrobials													49	1
Resistant to >4 antimicrobials	7	3	8	1									49	3
Number of multiresistant S. Typhimurium DT104														
with penta resistance	2	2	1	1										

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

Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	S. Typhimurium
	Cattle (bovine animals) - Monitoring
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	7

Antimicrobials:	**N**	**n**	**<=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**
Tetracyclines	7	3							4						3						0.5	32
Amphenicols																						
Chloramphenicol	7	3								4						3					1	128
Florfenicol	7	3								4			2	1							4	32
Cephalosporins																						
Cefotaxim	7	0			5	2															0.06	2
Ceftiofur	7	0					3	4													0.12	16
Fluoroquinolones																						
Enrofloxacin	7	0		2	5																0.03	4
Quinolones																						
Nalidixic acid	7	0								6	1										1	128
Trimethoprim	7	0					7														0.25	32
Sulfonamides																						
Sulfonamide	7	3												3	1					3	16	2048
Aminoglycosides																						
Streptomycin	7	3										4		1	2						2	256
Gentamicin	7	0						6	1												0.5	64
Neomycin	7	0							7												2	16
Penicillins																						
Ampicillin	7	3						2	2					3							0.25	32

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

Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	Salmonella spp.
	Pigs - Monitoring
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	12

Antimicrobials:	**N**	**n**	**<=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**
Tetracyclines	12	1						1	8	2					1						0.5	32
Amphenicols																						
Chloramphenicol	12	1								9	2					1					1	128
Florfenicol	12	1								10	1			1							4	32
Cephalosporins																						
Cefotaxim	12	0		1	9	2																
Ceftiofur	12	0				1	2	9														
Fluoroquinolones																						
Enrofloxacin	12	0		3	9																0.03	4
Quinolones																						
Nalidixic acid	12	0								9	3										1	128
Trimethoprim	12	0				2	9	1													0.25	32
Sulfonamides																						
Sulfonamide	12	1												4	6	1				1	16	2048
Aminoglycosides																						
Streptomycin	12	1								1	2	7	1		1						2	256
Gentamicin	12	0					3	8	1												0.5	64
Neomycin	12	0							12												2	16
Penicillins																						
Ampicillin	12	1					1	8	2					1							0.25	32

Table Antimicrobial susceptibility testing of Salmonella spp. in Cattle (bovine animals) - Monitoring - quantitative data [Dilution method]

Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	Salmonella spp.
	Cattle (bovine animals) - Monitoring
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	19

Antimicrobials:	**N**	**n**	**<=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**
Tetracyclines	19	3							16						3						0.5	64
Amphenicols																						
Chloramphenicol	19	3								16						3					1	128
Florfenicol	19	3								14	2		2	1							4	32
Cephalosporins																						
Cefotaxim	19	0		5	10	4															0.06	2
Ceftiofur	19	0				2	8	9													0.12	16
Fluoroquinolones																						
Enrofloxacin	19	0		12	7																0.03	4
Quinolones																						
Nalidixic acid	19	0								8	10	1									1	128
Trimethoprim	19	0				1	8														0.25	32
Sulfonamides																						
Sulfonamide	19	3											1	8	6	1					16	2048
Aminoglycosides																						
Streptomycin	19	4									2	7	6	2	2						2	256
Gentamicin	19	0					3	14	2												0.5	64
Neomycin	19	0							18	1											2	16
Penicillins																						
Ampicillin	19	3					1	11	4					3							0.25	32

Table Antimicrobial susceptibility testing of Salmonella in animals

n = Number of resistant isolates

	Salmonella spp.													
	Cattle (bovine animals)		**Pigs**		**Gallus gallus (fowl)**		**Turkeys**		**Sheep - mixed herds**		**All animals - wild**		**All animals - pet animals (dogs, cat,horse)**	
Isolates out of a monitoring programme	yes		yes		yes		yes		yes		yes		yes	
Number of isolates available in the laboratory	19		12		1		0		2		20		145	
Antimicrobials:	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**
Tetracyclines	19	3	12	1	1	0	0		2	0	20	0	51	4
Amphenicols														
Chloramphenicol	19	3	12	1	1	0	0		2	0	20	0	51	2
Florfenicol	19	3	12	1	1	0	0		2	0	20	0	51	1
Cephalosporins														
Cefotaxim	19	0	12	0	1	0	0		2	0	20	0	51	0
Ceftiofur	19	0	12	0	1	0	0		2	0	20	0	51	0
Fluoroquinolones														
Enrofloxacin	19	0	12	0	1	0	0		2	0	20	0	51	1
Quinolones														
Nalidixic acid	19	0	12	0	1	0	0		2	0	20	0	51	1
Trimethoprim	19	0	12	0	1	0	0		2	0	20	0	51	1
Sulfonamides														
Sulfonamide	19	3	12	1	1	0	0		2	0	20	0	51	4
Aminoglycosides														
Streptomycin	19	4	12	1	1	0	0		2	0	20	0	51	3
Gentamicin	19	0	12	0	1	0	0		2	0	20	0	51	0
Neomycin	19	0	12	0	1	0	0		2	0	20	0	51	0
Penicillins														
Ampicillin	19	3	12	1	1	0	0		2	0	20	0	51	4
Fully sensitive	19	15	12	11	1	1			2	2	20	20	51	47
Resistant to 1 antimicrobial	19	1												
Resistant to 4 antimicrobials													51	1
Resistant to >4 antimicrobials	19	3	12	1									51	3

Table Antimicrobial susceptibility testing of Salmonella spp. in Other animals - Monitoring (6 dogs, 44 cats, 1 horse, 20 wildlife) - quantitative data [Dilution method]

Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	Salmonella spp.
	Other animals - Monitoring (6 dogs, 44 cats, 1 horse, 20 wildlife)
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	165

Antimicrobials:	**N**	**n**	**<=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**
Tetracyclines	71	4							56	11				1	3						0.5	32
Amphenicols																						
Chloramphenicol	71	2							3	63	3					2					1	128
Florfenicol	71	1																			4	32
Cephalosporins																						
Cefotaxim	71	0		1	43	26	1														0.06	2
Ceftiofur	71	0				1	9	60	1												0.12	16
Fluoroquinolones																						
Enrofloxacin	71	1			11	59		1													0.03	4
Quinolones																						
Nalidixic acid	71	1								54	16					1					1	128
Trimethoprim	71	1				4	60	6						1							0.25	32
Sulfonamides																						
Sulfonamide	71	4												13	47	7				4	16	2048
Aminoglycosides																						
Streptomycin	71	3									4	53	11	1	1	1					2	256
Gentamicin	71	0					16	54	1												0.5	64
Neomycin	71	0							69	2											2	16
Penicillins																						
Ampicillin	71	4						59	8					4							0.25	32

Table Breakpoints for antibiotic resistance testing of Salmonella in Animals

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS

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 <=
Tetracyclines	EUCAST	8		8	0.5	32				
Amphenicols										
Chloramphenicol	EUCAST	16		16	1	128				
Florfenicol	EUCAST	16		16	4	32				
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	EUCAST	0,25		0,25	0.03	4				
Quinolones										
Nalidixic acid	EUCAST	16		16	1	128				
Trimethoprim	EUCAST	2		2	0.25	32				
Sulfonamides										
Sulfonamide	CLSI	256		256	16	2048				
Aminoglycosides										
Streptomycin	CLSI	32		32	2	256				
Gentamicin	CLSI	4		4	0.5	64				
Neomycin		4		4	2	16				
Kanamycin										
Trimethoprim + sulfonamides										
Cephalosporins										
Cefotaxim	EUCAST	0,5		0,5	0.06	2				
Ceftiofur	EUCAST	2		2	0.12	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	EUCAST	4		4	0.25	32				

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 1995-2005, 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 and the last three years the annual figures have been stable.
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. Campylobacter, thermophilic 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 2005, C. jejuni was isolated from 1 (3%) out 32 samples of fresh poultry meat taken by local health authorities at retail. Campylobacter were not found when 25 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 Campylobacter in poultry meat

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for thermophilic Campylobacter spp.	C. coli	C. lari	C. jejuni	C. upsaliensis	thermophilic Campylobacter spp., unspecified
Meat from broilers (Gallus gallus)										
fresh	local health authorities	single	10g	32	1					
meat products										
raw but intended to be eaten cooked	local health authorities	single	10g	25	0					

Table Campylobacter in other food

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for thermophilic Campylobacter spp.	C. jejuni	C. coli	C. upsaliensis	C. lari	thermophilic Campylobacter spp., unspecified
Fruits and vegetables	local health authority	single	10g	209	2	2				
Other processed food products and prepared dishes										
unspecified										
ready-to-eat foods	local health authority	single	10g	271	0					

2.2.3. Campylobacter, thermophilic 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; Svensk fågel) and SJV, with additional funding from the European Commission. The programme was run by the SPMA, SJV, SLV, SVA and SMI between July 1, 2001 and December 31, 2005.
During 2005 sampling for qualitative analyses were done both at farm level (feacal droppings and sock samples) and at slaughter (cloacal, caecum and neck skin samples). Furthermore, a quantitative study was carried out on neck skin and whole carcass rinse samples. The study was carried out during the high prevalence season (May to October) at all slaughterhouses. The purpose of the quantification study was to investigate the correlation between the results at farm level and at slaughter with the Campylobacter load after processing and whether the qantification of the neck skin samples gave the same results as the carcass rinse samples.

Frequency of the sampling

Rearing period

Other:

Before slaughter at farm

Other: single study: sock smples within 8 h before transport to slaughter, faecal droppings May-December, within 8 h before transport to slaughter

At slaughter

Other: Every slaughter group is sampled

Type of specimen taken

Rearing period

Other: single survey: sock samples

Before slaughter at farm

Other: single survey: sock samples and faecal droppings

At slaughter

Other: cloacal and neck skin samples

Methods of sampling (description of sampling techniques)

Before slaughter at farm

Sock samples inside the stable were taken by walking at least four times on the longest distance from wall to wall, preferably when the ordinary work was being done in the stable. Sampling by sock samples was done in the broiler houses just before loading. One sock sample consisted of one pair (two socks) of tubular retention bandage (Danafast).
During the high prevalence season, producers took 30 faecal droppings at three different locations in the house. These samples indicated the spread of Campylobacter in the stable.

At slaughter

FROM EACH SLAUGHTER GROUP:
1) one pooled cloacal sample:
20 individual cloacal samples were taken on the slaughter line after stunning but before scalding. Each sample contained about 0.5 g faeces, taken with a cotton swab. All 20 swabs were pooled together to form one sample in a sterile plastic jag containing 10 ml Cary Blair transport medium.
2) one pooled neck skin sample:
From each slaughter group, 10 individual neck-skin samples, each measuring about 2 square cm, were taken from the carcasses before
chilling, and pooled to form one sample in a sterile plastic jag containing 10 ml Cary Blair transport medium.
3) one pooled caecum sample:
From April-December, 10 caecum samples from 10 broilers were collected during processing. The samples were pooled into one sample.
QUANTITATIVE STUDY
This study was carried out during the high prevalence season (May to October) at all slaughterhouses.
Neck skin and whole carcass rinse samples were collected. From each slaughter group, two carcasses were randomly selected and sampled, one before and one directly after chilling, on 4 days a week (not Fridays due to logistics). The carcasses were rinsed in 400 ml buffered peptone water, and the rinse fluid was put in a sterile plastic jar and sent overnight in a coolbox to SVA. The neck skin samples were analysed by taking 1 ml of the 10 ml Cary-Blair from the plastic jar with 10 neck skin samples with a size of about 2 square cm. Both carcass and neck skin analyses were performed by direct plating (1ml) of serially diluted rinse fluid on mCCDA

Case definition

Rearing period

At farm 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 farm 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 at primary production are hygiene barriers, cleaning and disinfection 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 Poultry 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 was running from July 1st, 2001 to Dec 31, 2005. The program was voluntary, and financed by the SPMA and the SJV, with additional funding from the European Commission. The objective was to estimate the baseline prevalence both in the primary production and in the food chain. All slaughter-groups was sampled at slaughter, and if Campylobacter was found the broiler producer was given hygienic recommendation to avoid introduction of Campylobacter in the flocks.
The purpose of the program was 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

In the monitoring programme for Campylobacter in EU, caecum samples are to be sampled. One conclusion from the study carried out in Sweden indicate that caecum is the sample at slaughter that is most in accordance with the results at farm level.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

From the producers affiliated to the SPMA 394 (13 %) out of 2974 slaughter groups were positive for Campylobacter. From 94 slaughter groups not affiliated to the control programme 37 (39%) were positive.
STUDIES CONDUCTED IN 2005
1) Comparison between sock samples, and sampling of fresh droppings at farm level.
Campylobacter was found both in faecal droppings and in sock samples in 58/377 (15%) of the flocks. In 3 (1%) of the flocks, Campylobacter was isolated only from the socks. Reasons for this could be a recent introduction of Campylobacter or insufficient sampling of faecal droppings.
2)Comparative studies between sock samples at farm level and cloacal-, caecum-and neck skin samples at slaughter level.
a) Out of 2051 samples at farm- and slaughter level, 218 (11%)sock-and 270 (14 %)cloacal samples were positive.
b) Out of 1490 sampled slaughter groups, 202 (13 %) of the caecum samples and in 181 (12%) of the sock samples, repectively, were positive.
c) Out of 2050 sampled slaughter groups, 357 (17%) neck skin samples and 218 (11%) sock samples at farm level were positive.
3) A quantitative study of neck skin samples and whole carcass samples.
The purpose was to investigate the correlation with the results at farm level and slaughter with the Campylobacter load after processing and if quantification of neck skin samples will give the same result as carcass rinse samples, as the former is cheaper and easier to handle.
a) The results indicated that no correlation could be found between analyses of the neck skins and the whole carcass rinse samples, respectively.
b) The slaughter groups that were positive in sock samples and/or faecal droppings at farm level had a significant higher Campylobacter load, compared with the slaughter groups positive only at slaughter.
c) If caecum samples were positive it was significantly higher levels of Campylobacter on the neck skin samples and carcasses (before as well as after the chiller), compared with carcasses that were positive only in the cloacal and/or neck skin samples.

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

From 2001 to 2005, the number of Campylobacter positive slaughter groups decreased

(including cloacal- and neck skin samples). In the first Campylobacter programme before 2001, a variation in the Campylobacter prevalence was seen between the years.
A decreasing trend in the annual prevalence of positive flocks was seen 2001-05. One reason for this could be increased knowledge of the importance of hygienic barriers at the primary production.

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. This programme ended Dec 31, 2005. The new programme showed a higher flock prevalence. It is likely that the higher prevalence 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. About one fourth of the farms were free from Campylobacter during the first year of the new programme, and the majority of those were free for several years. A seasonal variation with higher prevalence of Campylobacter infection in broiler flocks during late summer and early autumn has been observed.
In 2002 it was shown that in 21% of 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, 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.
In 2004, it was shown that no difference in findings of Campylobacter in the environment outside the stables between producers that often and rarely, respectively, deliver Campylobacter positive slaughter groups.
It appears that hygiene barriers are of importance for preventing Campylobacter in the environment to be transferred into the broiler houses.

Table Campylobacter in animals

	Source of information	Sampling unit	Units tested	Total units positive for Campylobacter, thermophilic	C. jejuni	C. coli	C. lari	C. upsaliensis	thermophilic Campylobacter spp., unspecified
Cattle (bovine animals)	SVA	animal	18	4	1				3
Gallus gallus (fowl)									
broilers									
- at farm (1)	SVA	flock	8221	1025	953				72
- at slaughterhouse (2)	SVA, SPMA	slaughter batch	3067	376	350				26
Dogs	SVA	animal	57	15	1				14
Cats	SVA	animal	10	1					1

(1) : Up to 1 sock sample and 3 faecal droppings per flock. There are often several flocks per farm.
(2) : Flocks associated to the Swedish Poultry Meat Association (SPMA): 394/2974 (13%) pos slaughter groups.
Flocks not associated to the SPMA: 37/94 (39%) pos slaughter groups.

2.2.4. Antimicrobial resistance in Campylobacter, thermophilic isolates

A. Antimicrobial resistance in Campylobacter jejuni and coli in pigs

Sampling strategy used in monitoring

Frequency of the sampling

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

Type of specimen taken

Campylobacter were isolated from colon content of healthy pigs.

Methods of sampling (description of sampling techniques)

Samples (n=131) were collected from healthy slaughter pigs at eight abattoirs. Samples were distributed between abattoirs according to annual slaughter volume and evenly distributed over four sampling periods.

Laboratory methodology used for identification of the microbial isolates

Campylobacter spp. were isolated and identified at SVA according to standard procedures. Samples were cultured for thermophilic Campylobacter spp. by a modified NMKL method (NMKL Nr 119, 1990) using Preston selective agar and incubation at 42°C. 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.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Susceptibility tests were performed at Dept. of Antibiotics, SVA, with accredited methodology, using microdilution methods in cation adjusted Mueller-Hinton broth (CAMBH). Tests were performed following the standards for microdilution of the Clinical and Laboratory Standards Institute (CLSI, formerly NCCLS). The microdilution panels used, VetMIC, are produced at the Dept. of Antibiotics, SVA.

Results of the investigation

Campylobacter were isolated from 76% of the cultured samples. The majority of isolates (n=97) were classified as hippurate-negative thermophilic Campylobacter spp. and only three were C. jejuni.
A large proportion, 24%, of hippurate-negative thermophilic Campylobacter spp. was resistant to quinolones (enrofloxacin and nalidixic acid) but resistance to other substances was uncommon. Of the three C jejuni tested, one isolate was resistant to nalidixic acid and

enrofloxacin.

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

The results from this years survey agree with the results from years 1999 and 2003. Resistance to most substances is rare but the prevalence of quinolone resistance in Campylobacter spp from pigs is high. This is surprising since quinolones are not authorised for group treatment of pigs in Sweden. Injectables, i.e. enrofloxacin and danofloxacin, are authorised for individual treatment and probably mainly used to treat diarrhea or respiratory disease in younger pigs and possibly the mastitis-metritis-agalactia syndrome in sows. Since consumption statistics is not available per animal species, the extent of usage in the pig population is not known but injectables are unlikely to constitute a selection pressure in the period close to slaughter. If usage in piglets and sows select for resistant Campylobacter remaining until slaughter deserve further study.
Only six of the 70 quinolone resistant Campylobacter spp. obtained in the surveys made in SVARM were resistant to any other of the substance tested. All six were resistant to tetracyclines. It is therefore unlikely that quinolone resistance is an effect of co-selection by other substances used for group treatment of pigs in Sweden, i.e. tetracyclines and macrolides.

Table Antimicrobial susceptibility testing of C. coli in Pigs - at slaughterhouse - Monitoring - quantitative data [Dilution method]

Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	C. coli
	Pigs - at slaughterhouse - Monitoring
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	97

Antimicrobials:	**N**	**n**	**<=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**
Tetracyclines	97	4				59	20	9	5	2	1			1							0.25	32
Fluoroquinolones																						
Enrofloxacin	97	23		17	42	13	2		1	14	8										0.03	4
Quinolones																						
Nalidixic acid	97	23								7	43	21	3	2	17	4					1	128
Aminoglycosides																						
Gentamicin	97	0					4	51	42												0.25	8
Macrolides																						
Erythromycin	97	0				1	5	24	40	24	2	1									0.12	16
Penicillins																						
Ampicillin	97	5					1	16	20	45	10		4		1						0.5	64

Table Antimicrobial susceptibility testing of Campylobacter in animals

n = Number of resistant isolates

	Campylobacter spp.					
	Cattle (bovine animals)		**Pigs**		**Gallus gallus (fowl)**	
Isolates out of a monitoring programme			yes			
Number of isolates available in the laboratory			97			
Antimicrobials:	**N**	**n**	**N**	**n**	**N**	**n**
Tetracyclines			97	4		
Fluoroquinolones						
Enrofloxacin			97	23		
Quinolones						
Nalidixic acid			97	23		
Aminoglycosides						
Gentamicin			97	0		
Macrolides						
Erythromycin			97	0		
Penicillins						
Ampicillin			97	5		
Fully sensitive			97	60		
Resistant to 1 antimicrobial			97	28		
Resistant to 2 antimicrobials			97	2		

Footnote

In evaluating multiresistance, nalidixic acid and enrofloxacin is considered one substance

Table 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

Campylobacter, thermophilic	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 <=
Tetracyclines	EUCAST	2		2	0.25	32				
Amphenicols										
Chloramphenicol										
Florfenicol										
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	EUCAST	0.5		0.5	0.03	4				
Quinolones										
Nalidixic acid	EUCAST	32		32	1	128				
Trimethoprim										
Sulfonamides										
Sulfonamide										
Aminoglycosides										
Streptomycin										
Gentamicin	EUCAST	2		2	0.25	8				
Neomycin										
Kanamycin										
Macrolides										
Erythromycin	EUCAST	16		16	0.12	16				
Trimethoprim + sulfonamides										
Cephalosporins										
3rd generation cephalosporins										
Penicillins										
Ampicillin	EUCAST	16		16	0.5	64				

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 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

After a peak in the number of reported human cases in 2000 the annual number has decreased and the situation is now more stable. During 2005, 40 cases were notified. There was no change in the number of reported infected pregnant women. During 2005 two women with listeriosis had miscarriages .
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. 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 National food administration (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 3 out of 5 samples 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 2005, 4 samples from meat products (bovine and pig meat) at retail, and 14 from cheeses at retail, all had <100 cfu/g when tested for L. monocytogenes. 8 samples ofready-to-eat food all had <100 cfu/g. When fishery products were tested, 4 (11%) out of 37 samples and none of 12 samples from shellfish 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 National Food Administration (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 75 analyses altogether for 2005, of those 4 (5 %) were positive - all 4 were fish products.

Table Listeria monocytogenes in milk and dairy products

	Source of information	Sampling unit	Sample weight	Definition used	Units tested	=<100 cfu/g	>100 cfu/g	Total units positive for L.monocytogenes	Listeria monocytogenes presence in x g
Cheeses made from cows' milk									
soft and semi-soft									
made from raw or low heat-treated milk	local health authorities	single	25 g		14	0		0	

Footnote

the local health authorities do not distinguish between different kind of cheeses nor between what species of milk the cheese was made of.
The figures thus represent all kinds of cheeses.

Table Listeria monocytogenes in other foods

	Source of information	Sampling unit	Sample weight	Definition used	Units tested	=<100 cfu/g	>100 cfu/g	Total units positive for L.monocytogenes	Listeria monocytogenes presence in x g
Fish									
smoked	local health authorities	single	25G		37	-	-	4	
Crustaceans									
unspecified									
cooked	local health authority	single	25G		12	0	0	0	
Other processed food products and prepared dishes	local health authority	single	25 g		8	0	0	0	
Meat from bovine animals and pig	local health authority	single	25 g		4	0	0	0	

2.3.3. 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 2005, 5 cattle and 25 sheep tested positive for Listeria. The number of tested animals is unknown.

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.

Table Listeria spp. in animals

	Source of information	Sampling unit	Units tested	Total units positive for Listeria	L. monocytogenes	Listeria spp., unspecified
Cattle (bovine animals)	SVA	animal		5		
Sheep	SVA	animal		25		

Footnote

Unknown number of tested animals.

2.4. E. COLI INFECTIONS

2.4.1. General evaluation of the national situation

A. Verotoxigenic Escherichia coli infections general evaluation

History of the disease and/or infection in the country

In 1996, VTEC O157 was isolated in Swedish cattle for the first time and human E. coli O157 infection was traced back to 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 EHEC.
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.
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.

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

VTEC infection is a serious zoonotic infection and cattle, or products there of, are important sources of infection. The majority of human cases are reported from the western part of Sweden and in this region it seems to be a special strain of VTEC O157 circulating, perhaps more pathogenic than others. Furthermore, most of the VTEC positive farms are located in the same area. Surveillance is needed to investigate whether this specific strain is spreading to other counties in Sweden. Domestically produced food has been the source of infection at two larger outbreaks, in 2003 from fermented sausage and in 2005 from sallad. It cannot be excluded that outbreaks caused by domestic produced foods may occur in the future.
In 2005 there was an explosive increase of human cases with EHEC. One explanation to this is the change in the legislation, to include all the serotypes. Another cause is the salad outbreak mentioned above.

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 guidelines that were established in 1997 by the SVA, SLV, SJV, SMI and the National Board of Health and Welfare (SoS), were revised in 2004. These guidelines give recommendations on how to handle VTEC O157 in cattle when associations have been made

with human EHEC 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 in the future.

2.4.2. Escherichia coli, pathogenic in foodstuffs

Table VT E.coli in food

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Escherichia coli, pathogenic	E. coli spp., unspecified	Verotoxigenic E. coli (VTEC) - VTEC O157	Verotoxigenic E. coli (VTEC) - VTEC O157:H7
Meat from bovine animals	local health authorities	single	10g	53	2			
Vegetables	local health authorities	single	10g	19	0			

Footnote

The local authorities do not distinguish between pig , sheep and cattle meat.

2.4.3. Escherichia coli, pathogenic in animals

A. Verotoxigenic Escherichia coli in cattle (bovine animals)

Monitoring system

Sampling strategy

TRACE BACK OF HUMAN INFECTION
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.
PREVALENCE SURVEYS
Prevalence studies will be conducted every 3rd year. Presently there is an on-going study 2005-06. In these surveys, 2000 faecal samples are collected randomly throughout the year from cattle at the slaughterhouses for bacteriological investigation of VTEC O157.

Frequency of the sampling

Animals at farm

Other: Trace back of human VTEC infection.

Animals at slaughter (herd based approach)

Sampling distributed evenly throughout the year

Type of specimen taken

Animals at farm

Other: Faeces and/or milkfilter.

Animals at slaughter (herd based approach)

Other: faeces, carcass swabs

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 has 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

Other: NMKL No 164:2005 2nd ed

Animals at slaughter (herd based approach)

Bacteriological method: ISO 10273:2003

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 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.

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 within the EU. However, we think that it is too early to introduce any harmonisation concerning VTEC for the 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

Ten cattle farms were sampled for VTEC when tracing human infection. From 4 farms, identical VTEC O157 strains were isolated as from the patients, and from one farm an identical VTEC O8 strain.
Eight cattle farms were sampled in trace back of human infections in the outbreak caused by contaminated sallad. Four farms were positive for VTEC O157. However, only from one farm was the isolated strain identical to the outbreak strain, and a similar strain was isolated from another farm.
A VTEC O157 prevalence study started in the autumn 2005 and will continue to the autumn 2006. In total, 2000 feacal samples collected at slaughter will be analysed. So far, 24 out of 568 (4.2%) samples have been positive. Reasons for a higher prevalence than expected (i.e. earlier studies around 1%) may be due to: a) the samples are collected during the high season for VTEC, b) slightly modified bacteriological culture method, or c) a true increased prevalence. In parallell with feacal sampling, 500 ears collected at the slaughter house will be analysed. During 2005, 23 out of 157 (14.6%) have been positive. Reasons for the higher prevalence in ear samples compared with feacal samples will be further investiagated in 2006 together with the results from the whole study period.

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 important sources of human infection as cattle is the major reservoir of VTEC O157. The majority of human 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, perhaps more pathogenic than others. 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 has spread to other counties in Sweden, and if so, which actions should be taken.
It cannot be excluded that outbreaks caused by domestic produced foods
will occur in the future.

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 an important source of human infection. Another important source is consumption of un-pasteurised milk, even if this is un-recommended. VTEC O157 was first identified in food of Swedish origin in 1999. One positive sample was found in imported meat in 1996. Two outbreaks caused by domestic food has been recorded, one caused by locally produced sausage (2003) and the other by locally produced salad (2005). It cannot be excluded that larger outbreaks may occur caused by domestic food.

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 2005, one to ten farms (all but one being cattle farms) were investigated annually as being a suspected source to human infection. Of these, between one and four farms per year were confirmed connected to human infection (in total 29 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. In 2005 a new prevalence study started that will be finalised in the end of 2006.

It has also been shown that 9% of the dairy herds in Sweden were positive for VTEC O157, of these, 23% are situated 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 VT E.coli in animals

	Source of information	Sampling unit	Units tested	Total units positive for Escherichia coli, pathogenic	E. coli spp., unspecified	Verotoxigenic E. coli (VTEC) - VTEC O157	Verotoxigenic E. coli (VTEC) - VTEC O157:H7	Verotoxigenic E. coli (VTEC) - VTEC O8
Cattle (bovine animals) (1)	SJV	herd	18	7			6	1
- at slaughterhouse - animal sample - Surveillance - surveillance survey - objective sampling (2)	SVA	animal	157	23			23	
- at slaughterhouse - animal sample - faeces - Surveillance - surveillance survey - objective sampling (3)	SVA	animal	568	24			24	

(1) : *Two VTEC O157 herds (out of 8 sampled) were part of the outbreak investigation of the human outbreak caused by contaminated sallad. One strain was identical to the outbreak strain and the other very similar. *Four VTEC O157 and one VTEC O8 herd, respectively, out of 10 sampled, were part of trace back of human infection.
(2) : Results on a on-going prevalence study autumn 2005-2006. Samples consisted of ears collected at slaughter. 157 out of 500 ears were analysed in 2005.
(3) : Results on a on-going prevalence study autumn 2005-2006. 568 out of 2000 samples were analysed in 2005.

2.5. TUBERCULOSIS, MYCOBACTERIAL DISEASES

2.5.1. General evaluation of the national situation

A. Tuberculosis General evaluation

History of the disease and/or infection in the country

M. bovis:
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 deer in 1991. Trace back investigation revealed that the infection was introduced by imported deer 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.
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.
M. tuberculosis:
Between 2001 and 2004, M. tuberculosis was diagnosed in five elephants and one giraffe at a Zoo in eastern part of Sweden, and in one elephant at a Zoo in the wester part. 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.

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. 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 SLV. If TB is suspected, samples are collected and analysed at the SVA. Furthermore, tuberculin tests are performed at artifical insemination stations and at export/import of animals as required according to EU-legislation. 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: Samples from organs/tissues with suspected lesions and adjacent lymph nodes. Both fresh and formalin fixed samples.

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive tuberculine test, several lymph nodes are collected for histopathology, acid fast staining of direct smears and mycobacterial culture. Any organ with gross lesions is also sampled. Lymph nodes always collected for culture include retropharyngeal, submandibular, parotideal, medistinal, tracheobronchial, mesenterial, iliacal and inguinal lymph nodes. Lymphnodes are pooled for culture, 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 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 BKT/MKB/M-110. Cultures are read once/week for eight weeks and microscopy of suspected colonies is performed. If acid-fast rods are seen, a molecular probe for the M. tuberculosis complex is applied to colony material. 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

Apply rules for TB control on all domestic animal species and not just cattle.

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 suspicion (for ex clinical- or post mortem suspicion).

Results of the investigation

In total, 3 cattle were investigated for M. bovis in 2005, all were negative. Of those, 2 cattle were investigated by culture as they had tested positive in the tuberculin test at export. The remaining animal was detected 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 2005. 49 pigs were investigated, following suspicion at meat inspection, by histology, by direct smears and 42 were cultured. All were negative. Apart from this, 2 sheep, 1 horse, 2 dogs, 1

hamster and 5 wild animals were tested by direct smears, all were negative. One of the sheep was also cultured but found 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 regulary 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 animals of all ages 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 reactors. 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: Samples from organs/tissues with suspected lesions and adjacent lymph nodes. Both fresh and formalin fixed samples.

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive tuberculin test, several lymph nodes are collected for histopathology, acid fast staining of direct smears and mycobacterial culture. Any organ with gross lesions is also sampled. Lymph nodes always collected for culture include retropharyngeal, submandibular, parotideal, medistinal, tracheobronchial, mesenterial, iliacal and inguinal lymph nodes. Lymphnodes are pooled for culture, 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 M. tuberculosis-complex, have been isolated.

Diagnostic/analytical methods used

Samples from autopsy/meat inspection are investigated by histology and direct smears. The result from these tests determines if culture is performed. Culture is performed

according to the method BKT/MKB/M-110. Cultures are read once/week for eight weeks and microscopy of suspected colonies is performed. If acid-fast rods are seen, a molecular probe for the M. tuberculosis complex is used on colony materials. 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, including all herds in the country.

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 or any epidemiological links to imports, 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 suspicion (for ex clinical- or post mortem suspicion).

Results of the investigation

As the control programme is mandatory, all 617 deer herds in Sweden were affiliated in 2005. Since the beginning of the programme, 537 (87%) herds have been declared free from TB; 108 after three whole herd tuberculin tests, 353 after culling of the whole herd and subsequent meat inspection, and 76 herds were established with deer originating from TB free herds. Thus, 80

herds in the control programme are not yet not declared free from TB. Compared with the previous year, 22 additional herds were declared free during 2005.
In the control programme, tuberculin tests were performed on 1054 animals from 15 19 herds. From two herds, 4 and 2 animals, respectivly, were reagents. The animals were slaughtered, and autopsies. Cultures were performed as TB could not be ruled out by histology and direct smears. All animals were TB negative on culture (2 in 2005 and 4 in 2006).
6 deer were investigated by histology and direct smears after suspicion at meat inspection. 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 SJV 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, or if suspected lesions are detected at autopsy.

Type of specimen taken

Organs/ tissues: Samples from organs/tissues with suspected lesions and adjacent lymph nodes. Both fresh and formalin fixed samples. Tracheal or trunk samples are taken in case of low suspicions.

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive tuberculine test, several lymph nodes are collected for histopathology, acid fast staining of direct smears and mycobacterial culture. Any organ with gross lesions is also sampled. Lymph nodes always collected for culture include retropharyngeal, submandibular, parotideal, medistinal, tracheobronchial, mesenterial, iliacal and inguinal lymph nodes. Lymph nodes are pooled for culture, wheras organs with pathological changes are cultured separately.
In some cases of low suspicion, where killing of the animal is not immediately necessaer, trachal or trunk (for elephants) samples are taken.

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 necropsy 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 the tuberculin test are always cultured. Culture is performed according to the method BKT/MKB/M-110. 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. If growth of acid-fast rods is seen, a molecular probe for the M. tuberculosis complex is used on colony material. In case mycobacteria in the M. tuberculosis-complex are 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 on a few occasions 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 2005, one giraffe in a Zoo in the eastern part of Sweden was positive for M. tuberculosis in

culture. From the same Zoo, one lion was suspected of having TB following autopsy, but the animal was culture negative. This lion had mistakely fed on the euthanised giraffe that later was found culture positive.

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 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 the 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 5 elephants, including the index case, 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.
In Dec 2004, a female elephant at a Zoo in the western part of Sweden was positive for M. Tuberculosis in fluid from trunk lavage. The elephant was euthanised and pathology revealed gross changes in lungs, uterus and in all lymph nodes. Culture was positive in February 2005. A calf of the elephant was euthanised and autopsied, but found negative at culture. All other elephants at the Zoo were investigated through regular trunk lavage sampling. The area where the elephants are kept was put under restriction while investigation, cleaning and disinfection was performed.
An epidemiological link was foudn between the two Zoos, and subtyping of the bacterial isoaltes confirmed this link.

Table Tuberculosis in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Mycobacterium	M. bovis	M. tuberculosis	Mycobacterium spp., unspecified
Sheep (1)	SVA, SJV	animal	2	0			
Pigs (2)	SVA, SJV	animal	49	0			
Zoo animals, all (3)	SVA, SJV	animal	3	0			
Solipeds, domestic							
horses	SVA, SJV	animal	1	0			
Dogs							
pet animals	SVA, SJV	animal	2	0			
Cats							
pet animals	SVA, SJV	animal	3	0			
Moose	SVA, SJV	animal	2	0			
Alpacas							
farmed	SVA, SJV	animal	2	0			
Hamsters							
pet animals	SVA, SJV	animal	1	0			
Other animals (4)	SVA, SJV	animal	1	0			
Elephants							
zoo animals	SVA, SJV	animal	6	0			
Rhinoceros							
zoo animal	SVA, SJv	animal	1	0			
Giraffes							
zoo animal	SVA, SJV	animal	3	1		1	
Antelopes							
zoo animal	SVA, SJV	animal	3	0			
Other carnivores							
zoo animals (5)	SVA, SJV	animal	2	0			

(1) : culture n=1
(2) : culture n=42
(3) : The remaining zoo animals not listed among the others (1 gnu, 1 dolphin, 1 tamarin).
(4) : frog
(5) : lion

Footnote

All units tested from zoo animals were cultured.

Table Bovine tuberculosis in countries and regions that do not receive Community co-financing for eradication programme

Region	Total number of existing bovine		Officially free herds		Infected herds		Routine tuberculin testing		Number of tuberculin tests carried out before the introduction into the herds (Annex A(I)(2)(c) third indent (1) of Directive 64/432/EEC)	Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological examinations	Number of animals detected positive in bacteriological examination
	Herds	Animals	Number of herds	%	Number of herds	%	Interval between routine tuberculin tests	Number of animals tested			
SVERIGE	27626	1628464	27626	100	0	0				2	0
Total	27626	1628464	27626	100	0	0	0	0	0	2	0

Footnote

As Sweden is OFT, no routine tuberculin testing is performed. Tuberculin tests are done at artificial insemination stations and at import/export according to EU legislation. The number of tested animals is unknown.

Table Tuberculosis in farmed deer

Region	Total number of existing farmed deer		Free herds		Infected herds		Routine tuberculin testing		Number of tuberculin tests carried out before the introduction into the herds	Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological examinations	Number of animals detected positive in bacteriological examination
	Herds	Animals	Number of herds	%	Number of herds	%	Interval between routine tuberculin tests	Number of animals tested			
SVERIGE	617	20180	537	87				1054		6	0
Total	617	20180	537	87	0	0	0	1054	0	6	0

Footnote

Comments to the table: *537 herds are free, but the remaining 80 is not classified as infected. If a herd would be infected, all animals are euthanised. *Tuberculin testing: There is a stepwise procedure for a herd to be declared free. For detailed information, see text "Mycobacterium bovis in farmed deer". *In 2005, reagents were found in two herds (2 and 4 animals, respectively). The animals were euthanised.

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 yearly 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 remains 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. Brucella in foodstuffs

2.6.3. 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 screening programme, serum samples from 1 000 cattle and bulk milk samples from 2000 dairy herds were analysed by use of an indirect ELISA. One bulk milk sample initially tested positive in the i-ELISA test. A thorough investigation of the herd did not show any signs of ongoing Brucella infection. The interpretation of the positive analyse is being a false positiv ereaction, most likely due to cross reaction.
Additionally, 798 breeding animals, or animals for export, were tested and all 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.
Several other animals were tested at import/export - all were negative (for example 158 dogs, 14 camels, 17 alpaca, 41 reindeer).

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, 9938 individual serum samples from sheep from 745 herds, were analysed for antibodies against B. melitensis. All samples were negative. The samples were collected within the voluntary Maedi-Visna programme.
Twelve animals for import/export 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, 62 individual sera from goats originating from 12 farms were analysed for antibodies against B. melitensis. All were negative. The samples were collected within the CAE-programme. Six more goats tested negative at export/import.

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, 3096 individual serum samples from pigs were analysed for antibodies against Brucella suis. All samples were negative.
Apart from this, 1824 breeding animals or animals aimed for export/import 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 Brucellosis in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Brucella	B. melitensis	B. abortus	B. suis	Brucella spp., unspecified
Pigs (1)	SVA	animal	1824	0				
- at farm - animal sample - blood - Surveillance - official controls (other than control and eradication programmes) - official sampling - objective sampling	SVA	animal	3096	0				
Cattle (bovine animals) (2)	SVA	animal	798	0				
Sheep (3)	SVA	animal	12	0				
Reindeers (4)	SVA	animal	41	0				
Dogs								
pet animals (5)	SVA	animal	158	0				
Alpacas (6)	SVA	animal	17	0				
Camels (7)	SVA	animal	14	0				
Goats (8)	SVA	animal	6	0				
Moose (9)	SVA	animal	8	0				
Lamas (10)	SVA	animal	5	0				
Other animals (11)	SVA	animal	11	0				

(1) : breeding animals and export/import
(2) : breeding animals, export
(3) : import/export
(4) : export
(5) : Five clinical suspicions, all negative in culture.
(6) : import
(7) : export/import
(8) : export/import
(9) : export/import
(10) : import
(11) : 2 deer, 4 European bison, 1 snowgoat, 3 markhor, 1 musk-ox; export/import

Table Bovine brucellosis in countries and regions that do not receive Community co-financing for eradication programme

Region	Total number of existing bovine		Officially free herds		Infected herds		Surveillance						Investigations of suspect cases								
							Serological tests			Examination of bulk milk samples			Information about abortions			Epidemiological investigation					
	Herds	Animals	Number of herds	%	Number of herds	%	Number of bovine herds tested	Number of animals tested	Number of infected herds tested	Number of bovine herds tested	Number of animals or pools tested	Number of infected herds	Number of notified abortions whatever cause	Number of isolations of Brucella infection	Number of abortions due to Brucella abortus	Number of animals tested with serological blood tests	Number of suspended herds	Number of positive animals		Number of animals examined microbio logically	Number of animals positive microbio logically
																		Serologically	BST		
SVERIGE	27626	1628464	27626	100	0	0		1000		2000											
Total	27626	1628464	27626	100	0	0	0	1000	0	2000	0	0	0	0	0	0	0	0	0	0	0

Footnote

One bulk milk sample initially tested positive in the serological screening (i-ELISA). A thorough investigation of the herd did not show any signs of ongoing Brucella infection. The interpretation of the positive analyse is being a false positive reaction, most likely due to cross-reaction.

Ovine or Caprine Brucellosis in countries and regions that do not receive Community co-financing for eradication programme

Region	Total number of existing ovine / caprine		Officially free herds		Infected herds		Surveillance			Investigations of suspect cases				
	Herds	Animals	Number of herds	%	Number of animals	%	Number of herds tested	Number of animals tested	Number of infected herds	Number of animals tested with serological blood tests	Number of animals positive serologically	Number of animals examined microbio logically	Number of animals positive microbio logically	Number of suspended herds
SVERIGE	8575	471070	8575	100	0	0		10000	0					
Total	8575	471070	8575	100	0	0	0	10000	0	0	0	0	0	0

Footnote

Includes goats and sheep, altogether.

2.7. YERSINIOSIS

2.7.1. General evaluation of the national situation

A. Yersinia enterocolitica general evaluation

History of the disease and/or infection in the country

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. During the last five years, around 600-800 cases per year have been reported.

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 years predominate. Reasons for this are unknown, but need to be investigated further.
In 2005, for the first time in many years, less cases were reported than during the year before. This is true for both domestically acquired cases and for those infected abroad. The decrease was mainly observed during the last months of the year. The majority of the cases were as usual in the age group under ten years and a small majority was men.
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. 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 2005, only 16 samples from fresh meat or meat products from pigs were analysed. One was positive.

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

Fresh pig meat as well as pig meat products are considered to be the main source of Yersinia infection in humans.

Additional information

In 2004 the SLV performed a survey to investigate the presence of Yersinia in food. Out of 933 samples collected from fresh pig meat at retail 97 (10%) were positve, and 31 (6%) out of 522 samples from pig meat products at retail, were positive for Y. enterocolitica when analysed with PCR. Only one of the samples was positive after conventional culturing.

Table Yersinia spp. in food

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Yersinia	Y. enterocolitica	Yersinia unspecified	Y. enterocolitica - Y. enterocolitica O:3	Y. enterocolitica - Y. enterocolitica O:9
Meat from pig									
fresh	local health authorities	single	10g	13	0				
meat products	local health authorities	single	10g	3	1	1			

2.7.3. Yersinia in animals

A. Yersinia enterocolitica 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 trichinosis 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 that might be eaten (wild boars) is low to very low, while it is higher in carnivorous wildlife such as foxes, lynxes, wolves and bears.

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 pigs and horses are subject to meat inspection. However, for meat originating from wildlife, that might be infected with Trichinella, risk mitigation measures other than meat inspection are necessary such as freezing.

2.8.2. Trichinella in animals

A. Trichinella in pigs

Number of officially recognised Trichinella-free holdings

Sweden has not implemented a system of trichinella free holdings during 2005.

Monitoring system

Sampling strategy

General

Sweden did not implement a system of trichinella free holdings, or regions with negligble Trichinella risk, during 2005.
All domestic pigs are controlled for Trichinella at slaughter accordign to Council Directive 64/433/EEC.

Frequency of the sampling

General

Every slaughtered pig is sampled.

Type of specimen taken

General

Diaphragm muscle

For Trichinella free holdings

Diaphragm muscle

Methods of sampling (description of sampling techniques)

General

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

Case definition

General

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

Diagnostic/analytical methods used

General

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

Thrichinosis is compulsory notifiable in animals.

Results of the investigation including description of the positive cases and the verification of the Trichinella species

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 found was found in 1994 and the Trichinella situation in Swedish pigs 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 pigs is negligble.

B. Trichinella in horses

Monitoring system

Sampling strategy

All horses are controlled for Trichinella at slaughter according to Regulation 2075/2005/EU (new regulation).

Frequency of the sampling

Every slaughtered horse (soliped) is sampled.

Type of specimen taken

Other samples for 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 (new regulation).

Case definition

A case is defined as a horse (soliped) in which Trichinella spp. is found and the epidemiological unit is the individual horse.

Diagnostic/analytical methods used

Artificial digestion method of collective samples.

Results of the investigation including the origin of the positive animals

All samples were negative for Trichinella spp.

Measures in case of the positive findings or single cases

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

Notification system in place

Trichinosis is compulsory notifiable.

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 trichinosis from horses slaughtered in Sweden is negligble.

Table Trichinella in animals

	Source of information	Sampling unit	Units tested	Total animals positive for Trichinella	T. spiralis	Trichinella spp., unspecified
Pigs (1)	SVA	animal	3174872	0		
Solipeds, domestic						
horses (2)	SVA	animal	2581	0		
Wild boars						
wild	SVA	animal	6962	0		
Foxes	SVA	animal	121	2		
Bears	SVA	animal	68	0		
Wolves						
wild	SVA	animal	4	1		
Lynx						
wild	SVA	animal	54	6		

(1) : All slaughtered animals
(2) : All slaughtered animals

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 moose). E. multilocularis has not been diagnosed in the country.
Notification of echinococcosis in humans was initiated in 1994 and since then 3-14 cases have been reported annually, all assumed to have been infected abroad.

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 and risk mitigating measures are important. In 2006, a risk assessment of introducing E. multilocularis into Sweden from EU and the effect of anithelmintics will be performed (see text "E. multilocularis"). The risk assessment indicated that a very high compliance to the strategy of antihelmintic (praxiquantel) treatment was required for the risk of EM entering Sweden to remain low.

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

E. multilocularis never has been diagnosed in Sweden and the risk of domestic infection is at present negligible. However, a risk assessment that is being performed in 2006 shows that there is a medium to high risk of introducing the parasite into Sweden from dogs and cats entering the country from EU. If introduced, it is likely that the parasite will establish itself within Sweden in wildlife reservoirs with serious consequences unless a strategy of antihelmintic is implemented and complied with.

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.

Suggestions to the Community for the actions to be taken

Continuous treatment of dogs and cats prior to entering countires free from E. multilocularis from countries with the infection.

2.9.2. 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 around 300 foxes. Single necropsied wild wolves may also be examined.

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 faeces and parts of the gut are collected from foxes at necropsy. In case of suspicion, cyst materials are collected from food producing animals at slaughter.

Case definition

A case is defined as an animal in which the parasite has been found.

Diagnostic/analytical methods used

Other: In food producing animals surveillance is based on slaughter inspections. From foxes the contents of the intestine of 100 foxes are examined by parasitological technique. PCR may also be used.

Measures in case of the positive findings or single cases

If an animal is found infected with Echinococcus spp. the offal adn carcass will be destroyed.

Notification system in place

Echinococcosis is a notifiable disease in all animals.

Results of the investigation

In 2005, neither E. granulosus or >E. multilocularis was found at inspection of all slaughtered animals. 200 foxes sampled during 2005 and 400 from 2004, respectively, were analysed. All were negative. Three dogs and wolves, respectively, tested negative.

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 around 200-400 foxes.
In addition, E. multilocularis will be look for when wild wolves that are examined post mortem.

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 faeces and parts of the gut are collected from foxes at necropsy. In case of suspicion, cyst materials are collected from food producing animals at slaughter.

Case definition

A case is defined as 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.

Suggestions to the Community for the actions to be taken

Keeping the policy of treating dogs and cats entering the country with antihelmintics.

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 2005, neither E. granulosus or >E. multilocularis was found at inspection of all slaughtered animals. 200 foxes sampled during 2005 and 400 from 2004, respectively, were analysed. All were negative. Three dogs and wolves, respectively, tested negative.

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. All have been negative.
The EU Regulation 998/2003 gives a five year transition period for Sweden after which a new Community policy will be devised based on national reports including a risk assessment to the EC. Results from the assessment conducted 2006 shows that: 1)there is high risk for serious consequences if E. multilocularis is introduced into Sweden, 2) the number of infected dogs and cats introduced could be between 10-40 per year. However, the risk can be reduced to low or very low if a high compliance (>99%) to a policy of that all dogs or cats that could have been exposed to infected intermediate hosts are treated with antihelmintics before entering Sweden.

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 Echinococcus spp. in animals

	Source of information	Sampling unit	Units tested	Total units positive for Echinococcus spp.	E. granulosus	E. multilocularis	Echinococcus spp., unspecified
Cattle (bovine animals) (1)	SVA, SJV	animal	469749	0			
Sheep (2)	SVA,SJV	animal	223603	0			
Goats (3)	SVA, SJV	animal		0			
Pigs (4)	SVA, SJV	animal	3174978	0			
Solipeds, domestic (5)	SVA, SJV	animal	3463	0			
Reindeers (6)	SVA, SJV	animal	52409	0			
Dogs	SVA	animal	3	0			
Foxes (7)	SVA	animal	600	0			
Wolves	SVA	animal	3	0			

(1) : macroscopic investigation of all slaughtered animals
(2) : macroscopic investigation of all slaughtered animals
(3) : macroscopic investigation of all slaughtered animals
(4) : macroscopic investigation of all slaughtered animals
(5) : macroscopic investigation of all slaughtered animals
(6) : macroscopic investigation of all slaughtered animals
(7) : 400 of these foxes are from 2004, but the results were not available at that time.

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, sheep and a smaller number of pigs were seropositive.
Since the first of July 2004 toxoplasmosis is not a notifiable disease under the Communicable Disease Act. During the last 10 years before that between 4 and 18 human cases were reported annually, 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. 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 fluids/organs

Case definition

A case is defined as an animal being test positive. The animal is the epidemiological unit.

Diagnostic/analytical methods used

The diagnostic methods used for serology are direct agglutination test, IF or ELISA and more rarely immunohistochemistry or isolation of the agent in mice or cell culture. PCR is used for identification of oocysts of Toxoplasma from cat faeces.

Notification system in place

Toxoplasmosis is not notifiable in animals.

Results of the investigation

In 2005, 16 out of 49 (33%) investigated cats and 1 out of 7 sheep. None of 14 dogs, 8 rabbits, 1 moose and 1 horse 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 Toxoplasma in animals

	Source of information	Sampling unit	Units tested	Total units positive for Toxoplasma
Sheep	SVA	animal	7	1
Solipeds, domestic	SVA	animal	1	0
Dogs	SVA	animal	14	0
Cats	SVA	animal	49	16
Rabbits (1)	SVA	animal	8	0
Moose	SVA	animal	1	0

(1) : research

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. For information about conducted risk assessment, see "Rabies in dogs".

2.11.2. 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 SVA.

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 are brought into the country, both legally and illegally, has increased an assessment of the risks involved is needed. A risk assessment regarding the risk of introducing rabies with illegally imported dogs was performed 2005. The risk was assessed as low and dependent on the origin of the dogs and number of dogs imported. A risk assessment regarding legally imported dogs and cats is to be completed during summer 2006.

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

Nine dogs were investigated and all were negative.

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 2005 were: 41 bats, 4 cats, and 1 wolf, fox and hedgehog, respectively. 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. Between 1998 and 2004, 281 bats were investigated and all were negative.

Table Rabies in animals

	Source of information	Sampling unit	Units tested	Total units positive for Lyssavirus (rabies)	unspecified lyssavirus
Dogs	SVA	animal	9	0	
Cats	SVA	animal	4	0	
Bats					
wild	SVA	animal	41	0	
Foxes					
wild	SVA	animal	1	0	
Wolves					
wild	SVA	animal	1	0	
Hedgehogs					
wild	SVA	animal	1	0	

3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE

3.1. ESCHERICHIA COLI, NON-PATHOGENIC

3.1.1. General evaluation of the national situation

3.1.2. Antimicrobial resistance in Escherichia coli, non-pathogenic isolates

A. Antimicrobial resistance of E. coli in animal - Pigs - fattening pigs - at slaughterhouse - Monitoring

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 fattening pigs were tested.

Type of specimen taken

Escherichia coli were isolated from intestinal content (caecum) of healthy fattening pigs sampled at slaughter.

Methods of sampling (description of sampling techniques)

Eight abattoirs participated in the collection of samples. These abattoirs are geographically separated and accounted for 80% of the total slaughter volume of fattening pigs in Sweden during 2002. The number of samples collected at each abattoir was proportional to the respective annual slaughter volume. Each sample represents a uniqie herd.
Sampling at each abbaotir was performed during four periods in year 2005 by meat inspection staff or abattoir personnel.

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.
For antimicrobials tested and range of tested concentrations see Table "Breakpoints used for antimicrobial susceptibility testing of E. coli in Animals".

Breakpoints used in testing

Microbiological cut-off values recommended by the European Committee on Antimicrobial Susceptibility Testing (EUCAST, http://www.escmid.org) or breakpoints recommended by National Committee of Clinical Laboratory Standards (NCCLS, 2002) were used. See Table "Breakpoints used for antimicrobial susceptibility testing of E. coli in Animals".

Results of the investigation

Overall, frequencies of resistance are low in an international perspective. Resistance mostly occurs to substances currently or previously used in Swedish pig production (sulphonamides, tetracycline, ampicillin, trimethoprim, streptomycin). Resistance to chloramphenicol occurs at a low level although this substance has not been used since the early 70s. Since this resistance trait seldom occurs alone but in combination with resistance to sulphonamides, ampicillin or trimethoprim, remaining resistance is likely due to co-selection. Quinolone resistance occurs in occasional isolates only.
Occurrence of resistance appears to be stable and without statistically significant trends over the years studied. Frequency of ampicillin resistance year 2005 is however higher than in previous years.

Table Antimicrobial susceptibility testing of E. coli in Pigs - fattening pigs - at slaughterhouse - Monitoring - quantitative data [Dilution method]

Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	E. coli
	Pigs - fattening pigs - at slaughterhouse - Monitoring
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	390

Antimicrobials:	**N**	**n**	**<=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**
Tetracyclines	390	34						125	208	23		1	4	2	27						0.5	64
Amphenicols																						
Chloramphenicol	390	13						1	30	285	59	2	10	1	1	1					1	128
Florfenicol	390	0								211	175	4									4	32
Cephalosporins																						
Cefotaxim	390	0		236	151	3															0.06	2
Ceftiofur	390	0			17	265	2														0.12	16
Fluoroquinolones																						
Enrofloxacin	390	1	83	278	28		1														0.03	4
Quinolones																						
Nalidixic acid	390	1						5	129	240	15					1					1	128
Trimethoprim	390	25				110	208	43	4	3				22							0.25	32
Sulfonamides																						
Sulfonamide	390	41										212	102	31	4				2		16	2048
Aminoglycosides																						
Streptomycin	390	41							3	101	202	28	15	13	19	4	5				2	256
Gentamicin	390	0					128	205	50	7											0.5	64
Neomycin	390	4							357	26	3	2	2								2	16
Penicillins																						
Ampicillin	390	25					3	71	219	72				25							0.25	32

Table Antimicrobial susceptibility testing of E. coli in animals

n = Number of resistant isolates

	E. coli							
	Cattle (bovine animals)		**Pigs**		**Gallus gallus (fowl)**		**Turkeys**	
Isolates out of a monitoring programme			yes					
Number of isolates available in the laboratory			390					
Antimicrobials:	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**
Tetracyclines			390	34				
Amphenicols								
Chloramphenicol			390	13				
Florfenicol			390	0				
Cephalosporins								
Cefotaxim			390	0				
Ceftiofur			390	0				
Fluoroquinolones								
Enrofloxacin			390	1				
Quinolones								
Nalidixic acid			390	1				
Trimethoprim			390	25				
Sulfonamides								
Sulfonamide			390	41				
Aminoglycosides								
Streptomycin			390	41				
Gentamicin			390	0				
Neomycin			390	4				
Penicillins								
Ampicillin			390	25				

Table Breakpoints used for antimicrobial susceptibility testing of E. coli in Animals

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS

Escherichia coli, non-pathogenic	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 <=
Tetracyclines	EUCAST	8		8	0.5	64				
Amphenicols										
Chloramphenicol	EUCAST	16		16	1	128				
Florfenicol	EUCAST	16		16	4	32				
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	EUCAST	0.12		0.12	0.03	4				
Quinolones										
Nalidixic acid	EUCAST	16		16	1	128				
Trimethoprim	EUCAST	2		2	0.25	32				
Sulfonamides										
Sulfonamide	CLSI	256		256	16	2048				
Aminoglycosides										
Streptomycin	CLSI	32		32	2	256				
Gentamicin	CLSI	4		4	0.5	64				
Neomycin	EUCAST	8		8	2	16				
Kanamycin										
Trimethoprim + sulfonamides										
Cephalosporins										
Cefotaxim	EUCAST	0.25		0.25	0.06	2				
Ceftiofur	EUCAST	1		1	0.06	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	EUCAST	8		8	0.25	32				

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 required to report the results of outbreak investigations to the Swedish National Food Administration (SLV)over the Internet. 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
Campylobacter, thermophilic	2		7			Other processed foods: prepared dishes	x		Epidemiology, Lab confirmed in patients	Restaurant	Deficiences in food handling
Campylobacter, thermophilic	1		8			Unknown			Lab confirmed in patients		
Unknown	2		6			nuts	x		Epidemiology	industry; home	Pathogen in food
Unknown	1		4			other processed foods, prepared dishes	x		Epidemiology	household	
Unknown	1		2			mixed meat product	x		Epidemiology; sensory remarks	Restaurant	Deficiences in food preparation, too low cooking temp
Unknown	1		8			fish, gravad	x		Epidemiology	household	Deficiences in food handling: sick persons handled food
Unknown	1		15		1	bakery products, pastry	x		Epidemiology	Restaurant	Deficiences in food handling: too high storage temp
Unknown	1		65			bakery products, pastry	x		Epidemiology	Restaurant	
Unknown	3		22			other processed foods, sandwich with meat	x		Epidemiology	Restaurant	Deficiences in food handling
Unknown	1		28			other processed foods, sandwiches	x		Epidemiology	Institution	
Unknown	2		14			other processed foods, sandwiches	x		Epidemiology	catering; home	
Unknown	1		3			other processed foods, sandwiches	x		Epidemiology	Restaurant	Deficiences in food handling
Salmonella(1)	1		15			Mixed meat: Fermented sausages		x	Lab confirmed in patients and food	Household	Pathogen in food

Histamine	1	2		other processed foods, pasta with tuna	x		Symtoms and type of food	Restaurant	Pathogen in food
Unknown	1	29		other processed foods, prepared dishes	x		Epidemiology	Restaurant	
Unknown	5	12		mixed meat, meat products	x		Epidemiology	Restaurant	Deficiences in food handling
Unknown	2	18		other processed foods, prepared dishes	x		Epidemiology	Restaurant	Deficiences in food handling; too slow cooling
Unknown	1	2		fishery products, fresh	x		Epidemiology, sensory remarks on food	Restaurant	Deficiences in food handling; too long storage at room temp
Unknown	1	2		other processed foods, prepared dishes	x		Epidemiology	household	
Unknown	1	4		other processed foods, prepared dishes	x		Epidemiology	Institution	Deficiences in food handling, wrong temperature
Unknown	1	17		other processed foods, prepared dishes	x		Epidemiology	Institution: school	Lack of hygiene knowledge
Unknown	1	22		other processed foods, prepared dishes: buffe	x		Epidemiology	catering; home	
Unknown	32	151	3	other processed foods, prepared dishes	x		Epidemiology; remarks on food or restaurant or other	Restaurant	
Unknown	31	105		unknown					
Campylobacter, thermophilic	1	2		Other processed foods: Prepared dishes	x		Epidemiology, Lab. confirmed in patient, sensory remarks	Restaurant	Deficiences in food handling
Campylobacter, thermophilic	1	6	1	Unknown			Lab confirmed in patient		
Salmonella - S. Enteritidis	1	8		Poultry meat	x		Epidemiology: Lab confirmed in patients	Household	
Campylobacter, thermophilic - C. jejuni	4	15		Poultry meat: meat preparation	x		Epidemiology, Lab confirmed in patients	Household	Deficiences in food preparation
Escherichia coli, pathogenic - Verotoxigenic E. coli (VTEC)	1	4		Unknown			Lab confirmed in feces		
Bacillus - B. cereus	1	4		Other processed food products: mashed potatoes		x	Laboratory confirmed in food	Restaurant	Deficiences in food handling, inadequate cooloing

Clostridium - C. perfringens	2	4		Other processed foods: Prepared dishes		x	Lab confirmed in food	Restaurant	Deficiences in food handling
Clostridium - C. perfringens	2	5		Other processed foods: Prepared dishes	x		Epidemiology, Lag confirmed in food from separate day	Restaurant	Deficiences food handling
Clostridium - C. perfringens	1	200		Mixed meat preparation		x	Lab confirmed in patients and food	Institution: School	Deficiences in food handling
Staphylococcus - S. aureus	1	3		Mixed meat preparation		x	Symptoms: Lab confirmed in food	Restaurant	Deficiences in food handling
Staphylococcus - S. aureus(2)	1	9		Bakery Products Cream Cake		x	Epidemiology, Lab confirmed in food	Restraunt, Household	Lack of hygiene Knowledge
Staphylococcus - S. aureus	1	3		Other foods: Picnic	x		Epidemiology, Lab confirmed in sausage leftovers	Household	
Staphylococcus - S. aureus	1	3		Other foods: Buffe	x		Epidemiology: Inspection report	Restaurant	Deficiences in food handling
Shigella - S. sonnei	1	6		Unknown			Lab confirmed in patients		
Shigella - S. sonnei	1	9		Other processed foods: Sandwiches	x		Epidemiology, Lab confirmed in patients	Restaurants	
Food borne viruses - calicivirus (including norovirus)	1	30		other processed foods, prepared dishes	x		Epidemiology; lab.confirmed in patients	shop, household	Deficiencis in hygiene
Food borne viruses - calicivirus (including norovirus)	1	8	1	unknown			Lab.confirmed in patients		
Food borne viruses - calicivirus (including norovirus)	1	10		unknown			Lab.confirmed in patients		
Food borne viruses - calicivirus (including norovirus)	1	4		unknown			Lab.confirmed in one patient		
Food borne viruses - calicivirus (including norovirus)	1	10		bakery products, pastry	x		Epidemiology	household	Deficiencis in hygiene
Food borne viruses - calicivirus (including norovirus)	1	9		Other processed foods: Sandwich with meat	x		Epidemiology	Restaurant; home	Deficiencis in hygiene
Salmonella - S. Stourbridge	1	6		Cheeses: Goat cheese from raw milk		x	Lab confirmed in patients and food	Household	Pathogen in food
Salmonella - S. Virchow	1	2	2	Other processed foods: Prepared dishes	x		Epidemiology: Lab confirmed in patients	Market	Pathogen in food, deficiences in handling
Food borne viruses - hepatitis A virus	1	4		other foods: buffe with shellfish	x		Epidemiology; lab.confirmed in patients	catering; home	

Escherichia coli, pathogenic - Verotoxigenic E. coli (VTEC) - VTEC O177	1		2			Mixed meat: Fermented sausages		x	Lab confirmed in food and patients	Household	Pathogen in food
Escherichia coli, pathogenic - Verotoxigenic E. coli (VTEC) - VTEC O157	1		8			Cow milk: Raw		X	Epidem, Lab confirmed in patients and cows	Household	Pathogen in food
Escherichia coli, pathogenic - Verotoxigenic E. coli (VTEC) - VTEC O157	1		135			Vegetables: salad		x	Epidemiology: Lab confirmed in patients	Restaurants: Households	Pathogen in food
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		9			other processed foods, sandwiches	x		Epidemiology; lab.confirmed in patients	Institution	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		3			other processed foods, prepared dishes	x		Epidemiology; lab.confirmed in patients	household	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		78			other processed foods, prepared dishes	x		Epidemiology; lab.confirmed in patients	Institution: school	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		20			unknown					
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		43			other foods: buffe	x		Epidemiology	Restaurant	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		20			other processed foods, sandwiches	x		Epidemiology; lab.confirmed in patients	catering; home	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	1		7			other processed foods, sandwiches	x		Epidemiology; lab.confirmed in patients	Restaurant; home	
Salmonella - S. Typhimurium - Not typable	1		5			Mixed meat: Fermented sausages		x	Lab confirmed in patients and food	Household	Pathogen in food
Salmonella - S. Typhimurium - U 302	1		6		2	Other processed foods: Prepared dishes	x		Epidemiology, Lab confirmed in patients	Restaurant	Deficiences in food handling
Salmonella - S. Typhimurium - DT 120	1		5			Mixed meat product	x		Epidemiology, lab confirmed in patients	Restaurant	Deficiences in food handling
Salmonella - S. Typhimurium - DT 104	1		23		4	Pig meat: Meat preparation	x		Epidemiology, Lab confirmed in patients and food handler	Restaurant	Deficiences in food preparation, too low cooking temperature
Salmonella - S. Typhimurium - DT 104	1		25			Other foods; Buffe	x		Epidemiology, Lab confirmed in patients	Restaurant	Deficiences in food handling

(1) : Two serotypes: S. Typhimurium NST and S. Infantis
(2) : Bacillus cereus also implicated in outbreak