European Food Safety Authority

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, antimicrobial resistance in zoonotic agents and some pathogenic microbiological agents.

IN 2008

INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Country: **Sweden**

Reporting Year:

PREFACE

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

The report contains information on trends and sources of zoonoses and zoonotic agents in Sweden during the year 2008 .

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

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

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

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

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

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1. ANIMAL POPULATIONS

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

A. Information on susceptible animal population

Sources of information:

Most information about numbers of animals or herds is derived from the Yearbook of Agricultural Statistics 2008, Swedish Board of Agriculture, including data from 2007. 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 2007.

Definitions used for different types of animals, herds, flocks and holdings as well as

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

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

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 is decreasing whereas those that remain increase their number of animals. In 2007, there were dairy cows in around 7100 farms. This is a decrease with 12 % compared with 2006. On the same time, herd size increased from 48 cows/herd to 52 cows/herd.

In 2007 there were roughly 2300 pig farms in Sweden. This is a decrease by around 91% since 1980. Also, the number of pigs are falling, and the decrease was greatest during the 1980's. Around 60 % of the fattening pigs are found in herds with at least 100 animals.

The number of sheep herds are decreasing. Despite an increasing of average herd size the total number of animals have decreased with 12%. Egg production is dominated by few but large flocks. Around 94 % of the hens of laying breed are found in herds with at least 5 000 hens. The number of hens increased with 18% in 2007 compared with 2006.

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. In the north of Sweden there are mostly small farms.

Table Susceptible animal populations

		Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
Animal species	**Category of animals**		**Year**		**Year**		**Year**		**Year**
Cattle (bovine animals)	**calves (under 1 year)**			27977	2008	488625	2007	20878	2007
	dairy cows and heifers [1]					369646	2007	7096	2007
	in total			420267	2008	1559725	2007	23878	2007
	meat production animals					185717	2007	12494	2007
	mixed herds [2]						2008		
Deer	**farmed - in total** [3]			5205		19927		632	
Ducks	**in total**			1056	2008				
Gallus gallus (fowl)	**broilers**	3385	2008	76108463	2008	6653298	2007		
	laying hens			3211658	2008				
	parent breeding flocks, unspecified - in total			543973	2008				
Geese	**in total**			23796	2008				
Goats	**in total**			719	2008	5509	2003		
Ostriches	**farmed**	41	2008						
Pigs	**breeding animals**					181444	2007	2483	2007

Table Susceptible animal populations

		Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
Animal species	**Category of animals**		**Year**		**Year**		**Year**		**Year**
Pigs	**breeding animals - unspecified - sows and gilts**					181444	2007	1443	2007
	fattening pigs					1494883	2007	1937	2007
	in total			3015835	2008	1676327	2007	2277	2007
Reindeers	**farmed - in total** [4)]			65160		256925	2008		
Sheep	**animals over 1 year**					241686	2007	7984	2007
	animals under 1 year (lambs)					267235	2007	6918	2007
	in total			225954	2008	508921	2007	8014	2008
Solipeds, domestic	**horses - in total**			3414	2008	283100	2004		
Turkeys	**in total**			469669	2008	100743	2007		
	meat production flocks	251	2008						
	parent breeding flocks	10	2008						
Wild boars	**farmed - in total** [5)]			285	2008				

Comments:

[1)] Only beef cows

[2)] Only dairy cows

Table Susceptible animal populations

[3] 2007/2008
[4] Renaret 2007/2008
[5] Slaughtered at slaughterhouse

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 20% are reported as domestic acquired salmonella infection. This figure has been stable throughout the years and is based on information reported from the physicians.

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

The national situation has been very favourable. The last four years the annual incidence of Salmonella in humans has been approximately 40/100 000, including domestic and imported cases, and about 9/100 000 for the domestic cases. However, there seems to be an increase in domestic cases. In food producing animals, only a few cattle, farms are put under restriction following reported salmonella infection per year but the number of Salmonella infected pig and poultry farms has increased.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases

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

Recent actions taken to control the zoonoses

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

2.1.2 Salmonellosis in humans

A. Salmonellosis in humans

Reporting system in place for the human cases

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

Case definition

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

Diagnostic/analytical methods used

Cultivation of Salmonella. Since 2005 serotyping of strains is undertaken at the national reference laboratory only as routine procedure in cases suspected to be infected in Sweden. Phagetyping of S. Typhimurium and S. Enteritidis. PFGE when needed.

Notification system in place

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

History of the disease and/or infection in the country

The total number of cases between 1995 and 2007 ranged from 3562 to 3933. During the same period, the number of domestic cases varied from 453 to 937. Around 80% of all reported cases were infected abroad.

Results of the investigation

During 2007 the number of reported cases of Salmonella was 3933. That is a little less than the previous year (4056). The number of domestic cases was 937 which is almost as high as last year. 2006 had the highest number of domestic cases (1013 cases) reported since 1999 (947 cases) but not as high as seen in 1991 (1215 cases). The increase seems to be continueing and can be partly explained by several outbreaks reported in both 2006 and 2007 and more complete information on country of infection.

Eleven outbreaks of Salmonellosis were reported in 2007 involving about 330 reported cases in total. The largest outbreak was during the summer and it also continued more sporadically until december. It finally involved at least 179 persons in Sweden and many others in other European countries. The serotype was S. Java and the suspected vehicle of infection in this outbreak was fresh baby-spinach. The source could however never be confirmed.

That summer there was another outbreak involving 51 cases. The serotype was S. Stanley and the suspected source was sprouts. That could not be confirmed either.

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

The number of domestic cases in 2007 (937) was almost as high as last year (1013). 2006 had the highest number of domestic cases reported since 1999 (947 cases). The increase seems to be continueing and can be partly explained by several outbreaks reported in both 2006 and 2007 and more complete information on country of infection.

Mainly food but also water are the most commonly cited sources of infections at the clinical reports.

Relevance as zoonotic disease

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

2.1.3 Salmonella in foodstuffs

A. Salmonella spp. in eggs and egg products

Monitoring system

Sampling strategy

The salmonella control of table eggs is based on control of all commercial egg laying flocks from establishments placing table eggs on the market and all commercial egg laying flocks of more than 200 hens from establishments not placing table eggs on the market.
There is no official control programme for packing centers or for eggs at retail.
Egg packing centers have in-house control programmes that sometimes includes sampling for Salmonella.
Eggproduct producing businesses also sometimes include salmonella in their in-house sampling plan.

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 programme is supervised by the SJV and the SLV, and sampling in the programme 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. Samples from neck skin and crushed meat include all poultry, not only broilers.

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 meat processing plant

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

authority.____

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: From each carcass 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 category 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 separately stored until the examination is completed. One pool may consist of neckskin from up to 10 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 low although there seems to be an increase in Salmonella infections in poultry flocks.

Measures in case of the positive findings or single cases

All positive findings are 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 low. The local municipalities reported 38 samples from broiler meat or products thereof. All of these were negative for salmonella.

From Cat A slaughter houses 4640 neck skins were analysed and 46 from Cat B slaughter houses. These figures include also other poultry. Salmonella was not isolated from any of the samples. At cutting plants 1 441 samples were collected. All these samples were negative.

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

Salmonella prevalence in animal products of Swedish origin is low (see "additional information"). Regarding poultry meat and products thereof, reports from the local authorities vary greatly between years. The number of samples as well as the number and percentage of positive samples differ to a large extent from year to year. These variations are explained by factors such as varying degree of reporting, special projects that are reported for a special year, special focus on imported products etc. The reports from the local authorities must therefore not be taken too seriously and they are not statistically representative for the country.

The most worrying factor at present is 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 on the market 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 the prevalence of Salmonella in Swedish produced red and white meat, and eggs is very low, 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 2008, 54201 neck skin samples were collected and of those, 17 (0.03%) 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. The turkeys are thus included in the figures reported for broilers. They represent a very small part of the numbers reported.

Results of the investigation

No positive samples were found in 2008.

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, cutting plants and in the slaughter houses.
Within the programme, lymph nodes and carcass swabs are systematically 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 carcasses 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

Carcass swabs: Approx. 1400 square cm/carcass is swabbed. Cutting plants: 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 will be placed in a plastic bag in 100 ml of PBS. Samples are kept refrigerated until they are sent to the laboratory.
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 low. No special actions have been taken.

Measures in case of the positive findings or single cases

All positive findings are followed by corrective actions directed against product and process.

If salmonella is isolated from a carcass, trace-back investigation is sometimes 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 low. Results from sampling of fresh meat or meat products from cattle and pig are reported under "Salmonella spp in bovine meat and products thereof".

Also, 5833 carcass swabs from pigs (2624 from breeding pigs and 3209 from fattening pigs) were analysed. Salmonella was detected from one carcass swab from adult swine (S. Dublin)
From cutting plants, 3512 samples from both cattle and pigs were collected, all were negative. In the total number reported from cutting plants species are not differentiated.

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

Salmonella prevalence in animal products of Swedish origin is low (see "additional information"). The number of contaminated carcasses was in 2008 back to "normal" The most worrying factor at present is still 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 the prevalence of Salmonella in Swedish red and white meat, and eggs is low, the risk of contracting salmonella from domestically produced food is very small.

Additional information

Between 1996 and 2008, 75104 lymph nodes from fattening- and adult pigs have been sampled in total. Of those, 116 (0.15%) were positive for salmonella. Similarly, 75145 swabs have been analysed and of those 11 (0.01%) have been positive.

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 houses 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: See above for general sampling and below under results for details on number of samples for details.____

At meat processing plant

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

At retail

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 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 will be placed 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 of 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 domestic 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 are 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, 1613 samples from fresh meat or meat products (including pork and pork products; domestic or imported not specified) were reported from the local municipalities, one of these was positive.
In the surveillance in the control programme 3280 carcass swabs were analysed. All were negative for Salmonella.
From cutting plants, 3512 samples from both cattle and pigs were analysed, all samples were negative for Salmonella. Animal species are not distinguished in the reports from the cutting plants.

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

Additional information

Between 1996 and 2008, 42152 lymph nodes from cattle have been sampled at category A slaughterhouses. Of those, 32 (0.08%) were positive for salmonella. Furthermore, 42161 swabs have been analysed and of those 10 (0,02%) 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 2008 and reported by local competent authorities:
The local municipalities reported 568 samples of ready-to-eat foods, all but one negative. In herbs and spices, 21 reported samples were all negative. One out of 403 fruits and vegetables was positive. Two out of 20 samples of crustaceans were Salmonella positive. 32 fishery products were negative for Salmonella.Of 27 dairy products one (cheese)was positive. 91 samples of ice-cream and deserts were all negative.
It should be observed that the reporting from the local authorities is far from complete.

Table Salmonella in poultry meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Meat from broilers (Gallus gallus) - fresh - at processing plant - Surveillance - official controls (meat scrapings at cutting plants)	NFA	single	25 gram	1441	0			
Meat from broilers (Gallus gallus) - fresh - at retail - Surveillance - official controls - objective sampling (various products, specific inform. not available,)	Local	single	25 gram	38	0			
Meat from broilers (Gallus gallus) - fresh - at slaughterhouse - Surveillance - official controls (neck skins)	National Food	batch	10 gram	4686	0			

Footnote:

Information from retail is very limited. Official control is carried out by local authorities and their reports are very incomplete.

Table Salmonella in milk and dairy products

Footnote:

No detailed information is available. Local authorities report 27 samples from dairy products, 16 from cheeses and 11 from other dairy products. One sample from cheese was positive. Local authorities also report 90 samples of ice-cream all negative. Whether sampled at retail or in processing plant is unknown.

Table Salmonella in red meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Meat from bovine animals - fresh - at retail - Surveillance - official controls - objective sampling (see footnote below)		single	25 grams	1612	1			1

Footnote:

The reports from the local authorities do not separate red meat by species . So the figure represent beef, pigs, lamb and horses. Of these beef and pork represent the great majority of samples. 97 of the samples are meat products, the rest are fresh meat.
For results from the Swedish Salmonella control Program in cattle and pigs see text forms.

Table Salmonella in other food

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Crustaceans - at retail - Surveillance - official controls - objective sampling (includes molluscs, may be cooked)	local	single	25 grams	20	2			2
Egg products - at retail - Surveillance - official controls - objective sampling [1)]	local	single	25gram	8	0			
Fishery products, unspecified - at retail - Surveillance - official controls - objective sampling	local	single	25 grams	32	0			
Fruits and vegetables - precut - ready-to-eat - at retail - Surveillance - official controls - objective sampling (may also involve ssamples taken at wholesales and packing centers)	local	single	25 grams	403	1			1
Seeds, sprouted - ready-to-eat [2)]								

Comments:

[1)] may also include egg products

[2)] samples from sprouts are included in fruit and vegetables

2.1.4 Salmonella in animals

A. 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), in the Zoonosis Directive (2003/99/EG) and in the Swedish regulation on control of Salmonella in poultry (SJVFS 2007:19). 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 and at hatcheries. 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 includes general surveillance and surveillance related to the control programme where an official veterinarian visits turkey farms once a year. The official veterinarian takes samples for salmonella once a year and three times during the production period, the other samples are taken by the food business operator. The aim is to detect a prevalence of salmonella of at least 5% with a confidence interval of 95% on flock level each time sampling is done.

Breeders and hatchery:
Sampling of breeding flocks is carried out according to Regulation SJVFS 2007:19. Sampling is manadatory at holdings with more than 250 breeding turkeys.

There are no elite and grand parent turkeys in Sweden. The breeding stock is imported as Parents.

Meat production flocks

Mandatory sampling if >500 turkeys are raised for slaughter per year.

Every flock is sampled 2 weeks prior to slaughter. If thinning is practised an additional sampling has to be done 10 days before slaughter. Once a year this sampling is done by an official veterinarian.

Frequency of the sampling

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

Every flock is sampled

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

Other: at 4 weeks and 2 weeks prior to moving

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

Every second weeks

Meat production flocks: Day-old chicks

Every flock is sampled

Meat production flocks: Before slaughter at farm

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

Meconium

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

Socks/ boot swabs

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

Socks/ boot swabs

Meat production flocks: Before slaughter at farm

Other: socks or 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

Meconium from 250 newly hatched turkeys from each breeder group at the hatchery is pooled into one sample.

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

Two paired sock samples are taken and pooled into one sample. Samples are taken at the age of 4 weeks and 2 weeks before moving or hatching.

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

Five sock samples are taken every second week and pooled into two samples. Official veterinarian takes samples three times during the production period, the other samples are taken by the food business operator.

Meat production flocks: Day-old chicks

Meat production flocks are not sampled as day-old chicks.

Meat production flocks: Rearing period

Meat production flocks are only sampled 2 weeks before slaughter.

Meat production flocks: Before slaughter at farm

Two paired sock samples are taken and pooled into one sample two weeks before slaughter. Instead of sock samples it is also possible to take 2 faecal samples of 75 g and pool them into one sample. Official veterinarian takes samples once a year, the other samples are taken by the food business operator.

Meat production flocks: At slaughter (flock based approach)

see Salmonella in broiler meat and products thereof

Case definition

If salmonella is isolated from a sample, the whole flock is considered salmonella infected.

Monitoring system

Case definition

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

If salmonella is isolated from a sample, the whole flock is considered salmonella infected.

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

If salmonella is isolated from a sample, the whole flock is considered salmonella infected.

Meat production flocks: Day-old chicks

If salmonella is isolated from a sample, the whole flock is considered salmonella infected.

Meat production flocks: Rearing period

If salmonella is isolated from a sample, the whole flock is considered salmonella infected.

Meat production flocks: Before slaughter at farm

If salmonella is isolated from a sample, the whole flock is considered salmonella infected.

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: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

Meat production flocks: Before slaughter at farm

Bacteriological method: ISO 6579:2002

Meat production 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 is not allowed.

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 voluntary 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

Strict hygiene rules are enforced through the whole production chain as preventive measures for salmonella. These rules are implemented by the Prophylactic voluntary 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. Not all meat production flocks are affiliated to the voluntary control programme.

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). All serotypes of salmonella are covered. The official veterinarian
visits every poultry holding with breeders and meat production establishment as

required according to the control programme.

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 sent for destruction. 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

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

See the text in notification system in Salmonella in broiler flocks.

Results of the investigation

Salmonella was not detected in the breeding turkey flocks.
Salmonella Reading was isolated from a meat producing turkey flock and S. Typhimurium RDNC from another meat producing flock.

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 the prevalence of Salmonella in Swedish produced red and white meat, and eggs is low, the risk of contracting salmonella from food products of domestic animal origin is small.

However, in 2007 and 2008 Salmonella isolated from turkey flocks has been associated with infections in humans.

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 separate units in the house/holding at the same. Measures, in case of positive findings, are taken at each epidemiological unit of the holding.

B. 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), in the Zoonosis Directive (2003/99/EG) and in the Swedish regulation on control of Salmonella in poultry (SJVFS 2007:19). The salmonella control programme is supervised by the SJV and the SLV.

Official veterinarians are responsible for sampling in holdings and at hatcheries. Samples are either taken by the official veterinarian or delegated to farmers/companies.

The control constitutes of clinical surveillance and sampling. The clinical surveillance includes general surveillance and surveillance related to the control programme where an official veterinarian visits breeding farms three times during egg production and otherwise once a year. The aim is to detect a prevalence of salmonella of at least 5% with a confidence interval of 95% on flock level each time sampling is done.

Breeders and hatchery:
Sampling of breeding flocks is carried out according to Regulation SJVFS 2007:19. Sampling is mandatory at holdings with more than 250 breeding geese.

There are no elite and grand parent geese in Sweden. The parent stock is imported as day -old chicks.

Type of specimen taken

Imported feed material of animal origin

see "Salmonella spp in feed"

Frequency of the sampling

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

Every flock is sampled

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

Other: at 4 weeks and 2 weeks prior to moving

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

Every 2nd weeks

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

Meconium

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

Socks/ boot swabs

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

Socks/ boot swabs

Meat production flocks: Day-old chicks

Meconium

Meat production flocks: Before slaughter at farm

Other: socks or 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

Meconium from 250 chicken from each breeder group at the hatchery is pooled into one sample.

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

Two paired sock samples are taken and pooled into one sample. Samples are taken at the age of 4 weeks and 2 weeks before any movement or before hatching.

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

Five sock samples are taken every second week and pooled into two samples. Official veterinarian takes samples three times during production period, the other samples are taken by the food business operator.

Meat production flocks: Day-old chicks

See "Breeding flocks: Day-old chicks

Meat production flocks: Rearing period

Meat producing flocks are sampled once during the rearing period, two weeks before slaughter.

Meat production flocks: Before slaughter at farm

Sampling is mandatory at holdings with >500 geese slaughtered yearly.

Two paired sock samples are taken and pooled into one sample two weeks before slaughter. Instead of sock samples it is also possible to take 2 faecal samples of 75 g and pool them into one sample. An official veterinarian takes samples once a year, the other samples are taken by the food business

operator.

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 a sample, the whole flock is considered salmonella infected. In poultry, the flock is the epidemiological unit.

Breeding flocks: Rearing period

If Salmonella is isolated from a sample the flock is considered infected with Salmonella.

Breeding flocks: Production period

If Salmonella is isolated from a sample the flock is considered infected with Salmonella.

Meat production flocks: Day-old chicks

If Salmonella is isolated from a sample the flock is considered infected with Salmonella.

Meat production flocks: Rearing period

If Salmonella is isolated from a sample the flock is considered infected with Salmonella.

Meat production flocks: Before slaughter at farm

If Salmonella is isolated from a sample the flock is considered infected with Salmonella.

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: ISO 6579:2002

Breeding flocks: Rearing period

Bacteriological method: ISO 6579:2002

Breeding flocks: Production period

Bacteriological method: ISO 6579:2002

Meat production flocks: Before slaughter at farm

Bacteriological method: ISO 6579:2002

Meat production flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Breeding flocks

Vaccination against salmonellosis is not allowed.

Meat production flocks

Vaccination against salmonellosis is not allowed.

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 chicks.

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 voluntary 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 outdoors. 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

Any finding 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 geese flocks in 2008.

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. The Swedish geese meat production in very small but the few holdings struggle with Salmonella.

Relevance of the findings in animals to findings in foodstuffs and to human cases

As the prevalence of Salmonella in Swedish produced red and white meat, and eggs is low and the existence of the Salmonella control program, the risk of contracting salmonella from domestic produced animal products is small.

C. 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), in the Zoonosis Directive (2003/99/EG) and in the Swedish regulation on control of Salmonella in poultry (SJVFS 2007:19). The salmonella control programme is supervised by the SJV and the SLV.

Official veterinarians are responsible for sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official veterinarian or sampling is delegated to farmers/companies.

The control constitutes of clinical surveillance and sampling. The clinical surveillance includes general surveillance and surveillance related to the control programme. Veterinarian takes samples once a year during rearing and three times a year under production. The other samples are taken by the food business operator. The aim is to detect a prevalence of salmonella of at least 5% with a confidence interval of 95% on flock level each time sampling is done.

Breeders and hatchery:
Sampling of breeding flocks is carried out according to Regulation SJVFS 2007:19. Sampling is mandatory at holdings with more than 250 breeding ducks.

There are no Elite and Grand Parent ducks in Sweden. The breeding stock is imported as parents.

Meat production flocks

Mandatory sampling if >500 ducks are raised for slaughter per year.

Every flock is sampled 2 weeks prior to slaughter. If thinning is practised an additional sampling has to be done 10 days before slaughter. Once a 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

Every flock is sampled

Breeding flocks: Rearing period

Other: at the age of 4 weeks and 2 weeks before moving

Breeding flocks: Production period

Every every second week weeks

Meat production flocks: Before slaughter at farm

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: Day-old chicks

Meconium

Breeding flocks: Rearing period

Socks/ boot swabs

Breeding flocks: Production period

Socks/ boot swabs

Meat production flocks: Day-old chicks

Meconium

Meat production flocks: Before slaughter at farm

Other: socks or 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: Day-old chicks

Meconium from 250 newly hatched ducklings from each breeder group at the hatchery is pooled into one sample.

Breeding flocks: Rearing period

Two paired sock samples are taken and pooled into one sample. Samples are taken at the age of 4 weeks and 2 weeks before moving or before hatching.

Breeding flocks: Production period

Five sock samples are taken every second week and pooled into two samples.

Meat production flocks: Day-old chicks

See Breeding ducks: day-old chicks

Meat production flocks: Before slaughter at farm

Two paired sock samples are taken and pooled into one sample two weeks before slaughter. Instead of sock samples it is also possible to take 2 faecal samples of 75 g and pool them into one sample. Official veterinarian takes samples once a year, the other samples are taken by the food business operator.

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: ISO 6579:2002

Breeding flocks: Rearing period

Bacteriological method: ISO 6579:2002

Breeding flocks: Production period

Bacteriological method: ISO 6579:2002

Meat production flocks: Before slaughter at farm

Bacteriological method: ISO 6579:2002

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 outdoors. 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 desinfection and finally environmental negative samples before restrictions are lifted.

Notification system in place

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

Results of the investigation

S. Paratyphi Java was isolated from one meat production flock and S. Reading from another meat production flock. S. Worthington was detected at one breeding holding.

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

Although the Swedish duck meat production is very small the few holdings struggle with Salmonella.

D. 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 sampling according to the salmonella programme is performed or supervised by the competent authority, that is official veterinarians.
Sampling is divided into routine sampling and targeted sampling. Routine sampling consists of faecal samples from herds, lymph nodes and carcass swabs at slaughter. Targeted sampling consists of faecal, environmental and feed samples from herds.

ROUTINE SAMPLING

Within the programme, lymph nodes from the ileo-caecal region are systematically 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, whereas sampling of carcass swabs is described under "Salmonella spp. in pig meat and products thereof".

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 carcasses 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.

Breeding herds are sampled once a year and multiplying herds twice a year.

All imported animals are sampled.

TARGETED SAMPLING
Sampling at farms and abattoirs is performed whenever there is a clinical

suspicion.

Multiplying herds

see "breeding herds"

Fattening herds

see "breeding herds"

Frequency of the sampling

Breeding herds

Other: 1) lymph nodes at Category A: daily, Category B: spread out evenly over the year, 2) sampling at suspicion/outbreak, 3) faecal samples once a year, 4) all imported animals

Multiplying herds

Other: 1) lymph nodes at Category A: daily, Category B: spread out evenly over the year , 2) sampling at suspicion/outbreak, 3) sow pools twice a year, 4) all imported animals

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

Fattening herds at slaughterhouse (herd based approach)

Other: The sampling unit is the pig, not the herd

Type of specimen taken

Breeding herds

Other: Lymph nodes and feaces

Multiplying herds

Other: Lymph nodes and feaces

Fattening herds at farm

Other: Lymph nodes and feaces

Fattening herds at slaughterhouse (herd based approach)

Other:

Methods of sampling (description of sampling techniques)

Breeding herds

1)Faecal sampling

1.1 Sampling procedure in clinical suspicion:

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. For sampling at suspicion or in outbreak investigations feacal samples are only pooled for fattening pigs and not

for adult pigs.

1.2 Sampling procedure in routine sampling:

50 faecal samples are taken from each breeding and multiplying herds and pooled to 10 samples.

1.3 Bacteriological examination:

All samples should be analysed within 24-48 h after collection.
From individual samples, 5 g faeces is examined while the remaining part is stored at +4C until examination is completed. Material from at most 15 animals is pooled. If salmonella is isolated from a pooled sample, each of the individually stored samples can be examined for salmonella separately.

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 are divided into two equal parts. One half is placed in a mortar and the other part is kept at +4 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.

Multiplying herds

See "breeding herds"

Fattening herds at farm

For sampling of lymph nodes and feacal sampling at suspicion or at outbreak investigation, see "Breeding herds".

Fattening herds at slaughterhouse (herd based approach)

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

Case definition

Breeding herds

If 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

Other: ISO 6579:2002 or NMKL No 71:1999

Multiplying herds

Other: ISO 6579:2002 or NMKL No 71:1999

Fattening herds at farm

Other: ISO 6579:2002 or NMKL No 71:1999

Fattening herds at slaughterhouse (herd based approach)

Bacteriological method: NMKL No 71:1999

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 pigs and other food-producing animals salmonella control in feed- and feed production (HACCP based approach) is integrated with the control programme to ensure that feed to food producing animals 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 implies a higher level of economic compensation in case salmonella infection.

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 salmonella control programme is officially supervised and includes:
a) Compulsory notification of all findings of salmonella in all animals, food, feed (including environmental sampling) and humans, as well as suspicion of Salmonella, regardless of serotype
b) Compulsory action if Salmonella is isolated see "Measures in case of positive findings"
c) Examination for Salmonella in animals slaughtered under special conditions (e.g diseased animals or when salmonella is suspected)
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) Isolated salmonella strains have to be sent in to the SVA for typing and testing of antimicrobial resistance.

2) If Salmonella is isolated from pigs and other food-producing animals, indicating a herd infection, restrictions are put on the farm/herd. Such restrictions 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 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.

3)If salmonella is found from any lymph node collected in the control programme the farm of origin is always performed except for cases when Salmonella is only isolated from the pooled sample but not from the individual pig.

4) If salmonella is isolated from other animals, humans, food or feed and connections can be made to pigs, investigation of the farm/farms is always performed.

Notification system in place

Any finding of salmonella in animals, feed (and environmenatl samples), food and humans, irrespective of serotype, is compulsory notifiable. Notification of salmonella findings has been in force since 1961. Suspicion of salmonella is also notifiable.

Results of the investigation

1) In the control programme, 5783 lymph nodes were analysed from category A slaughterhouses (2612 adult swine, 3171 fattening pigs) and 29 lymph nodes at category B abattoirs (13 adult swine, 16 slaughter pigs). Of these, 15 were positive.

Salmonella was isolated from seven samples taken from adult swine: S. Typhimurium U277 (n=2), S. Newport (n=2), S. Goldcoast (n=1), S. Thompson (n=1), S. subspecies I (n=1). All except one U277 could be isolated from individual pigs.

Salmonella was isolated from eight fattening pigs, all S. Typhimurium. Phagetypes: DT 40 (n=5), DT104 (n=1), U277 (n=1) and one RDNC. In one case, S. Typhimurium RDNC could only be isolated from the pooled sample but not from the individual pig.

S. Dublin was detected in one carcass swab of an adult swine.

2) Salmonella was detected in animals of 8 new farms in 2008.

2.1) Salmonella was detected on three farms after an isolation in the Salmonella control program in 2008: S. Newport on one farm and S. Typhimurium U277 and

DT40 on the second farm. Three different serotypes were isolated on the third farm, namely S. Typhimurium DT 40, S. Dublin and an untypable isolate. However, another serotype, S. Goldcoast was isolated from the lymph node sample of the sow sent for slaughter. The regional laboratory that performed these analyses could not find any contamination or other laboratory failures.

2.2 Salmonella was detected in lymph nodes of two swine late in 2007. These farms were sampled in January 2008. Hence, the two farms were not included in the number of new farms in 2007. S. Typhimurium NT was detected on the first and RDNC on the second farm.

2.3) Two farms were detected in the baseline study of breeding pigs. S. Cubana was isolated from one of the 120 samples taken at the farm S. Typhimurium U277 was detected on another farm. Both farms were negative in the later samplings.

2.4) S. Typhimurium U277 was detected on one farm by trace-back.

3. Five additional farms were under restrictive measures after an isolation in 2007. These farms were infected with S. Infantis (n=2), S. Typhimurium PT 104 (n=1), 120 (n=1) and RDNC. One farm with S. Infantis was declared free in 2008.

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

The situation in Sweden has been favorable. From the beginning of the 80's there were, in general, less than 5 infected herds per year. However, there seems to be an increase in the incidence of Salmonella. Control of feed and infected herds is extremely important in order to prevent Salmonella infections. The growing herd sizes and the structural changes pose a great challenge for biosecurity and sanitation.

See also "Salmonella spp. in pig meat and products".

Relevance of the findings in animals to findings in foodstuffs and to human cases

Since 1996 the percentage of Swedish pigs infected with salmonella has varied from 0,04 (2004) to 0,38 (2007). There seems to be an increase in the incidence. However, the number of Swedish pigs infected with Salmonella is still low.

Additional information

Apart from sampling of animals in the mandatory salmonella programme 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.

Swine herds can affiliate to a voluntary control programme which gives a higher biosecurity.

E. 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. Sampling can be divided into routine sampling and targeted sampling.

Routine sampling

Within the programme lymph nodes are systematically collected from cattle at slaughter to ensure that the samples are representative of the population of slaughtered cattle at each slaughterhouse. Sampling of lymph nodes in the programme is described here, wheras sampling of carcass swabs is described under "Salmonella spp. in bovine meat and products thereof".

Cat.A: At each slaughterhouse a sufficient number of samples is collected to detect at least 5% salmonella infected/contaminated carcasses 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 abattoirs 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 carcasses 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.

Animals that are bought to a farm under certain defined criteria are also sampled.

Targeted sampling

Sampling at farms is performed whenever there is a clinical suspicion. Calves up to six months are sampled at necropsy, other animals when considered necessary.

Frequency of the sampling

Animals at farm

Other: 1) lymph nodes at Category A: daily, category B: spread out evenly over the year, 2) 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

Animals at slaughter (herd based approach)

Other: lymph nodes

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 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.

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 are 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 bovine animal, 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 No 71:1999 or ISO 6579:2002

Animals at slaughter (herd based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Vaccination is not allowed.

Other preventive measures than vaccination in place

In food-producing animals salmonella control in feed and in 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 in all animals, food, feed (environmental sampling included) and humans as well as suspicions of salmonella, regardless of serotype
b) Compulsory action if salmonella is isolated, see "Measures in case of positive findings"
c) Examination for salmonella in animals slaughtered under special conditions (e.g diseased animals or when salmonella is suspected)
d) Control programme at slaughter houses and clinical surveillance in herds.

Measures in case of the positive findings or single cases

1) Isolated salmonella strains have to be sent in to the SVA for typing and testing of antimicrobial resistance.

2)If Salmonella is isolated from cattle 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 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.

3)If salmonella is found from any lymph node collected in the control programme the farm of origin is always performed except for cases when Salmonella is only isolated from the pooled sample but cannot be traced to an individual animal.

4) If salmonella is isolated from other animals, humans or feed and connections can be made to cattle, investigation is always performed.

Notification system in place

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

Results of the investigation

1) A total of 3320 lymph nodes were analysed in the Salmonella control programme: 3215 at category A slaughterhouses and 105 at category B. Salmonella was isolated from four lymph nodes at category A slaughterhouses: one S. Dublin and 2 S. Typhimurium DT 126 and one S. Typhimurium RDNC. The individual animal could be identified for all except for the case of S. Typhimurium RDNC. The farms of origin of these three cases were sampled.

2) In 2008, Salmonella was isolated from 21 new farms. The following serotypes were isolated:

2.1 Nine farms with S. Dublin. These farms were sampled because of trace-back (n=6), after a necropsy (n=1), because of clinical symptoms (n=1) and after detection of a positive lymph node (n=1). Five of these farms had dairy cattle and four had meat producing animals. On two of these farms with meat producing animals an additional serotype was also detected (S. Typhimurium RDNC).

2.2 Seven farms with S. Typhimurium.
2.2.1 Three farms were sampled because of trace-back. Phagetype DT 104 was detected in one meat and one dairy herd. Phagetype U277 was detected in one meat herd.
2.2.2 Three farms were sampled after a necropsy. Phagetype 151 was detected

in herd with beef cattle, untypable phagetype in one dairy herd and PT1 in another dairy herd. Additional serotypes were detected on two farms. S. Duesseldorf on the farm with PT 151 and PT41 on the farm with the untypable isolate.
2.2.3 One dairy farm was sampled after a detection of salmonella in a lymph node sample (phagetype 126).

2.3 Three farms with S. Reading situated close to each other. One beef farm was sampled after a necropsy. A closely situated dairy herd was sampled due to clinical symptoms and the third farm with beef cattle after trace-back.

2.4 Two farms with S. Enteritidis PT1. One herd with meat producing animals was sampled after a necropsy. The dairy herd transmitting calves to the meat herd was also found positive.

5) Eight additional farms were under restrictive measures in 2008 after an infection of Salmonella in 2006 and 2007. Six of these farms were dairy herds and two had both dairy and meat producing animals. Four of these farms were infected with S. Dublin, two with S. Typhimurium DT 104, one with S. Agona and one with S. Reading. Additional serotypes were isolated on two of these farms: on the farm with S. Agona also S. Typhimurium and S. Dublin and on one of the farms with S. Dublin also S. Enteritidis, S. Reading, S. Typhimurium and S. enterica sp. diarizonae. Investigations were performed to rule out a possible laboratory contamination. S. Reading and S. Typhimurium might have been laboratory contaminations. By the end of 2008, only two of these farms (S. Reading and S. Dublin) were under restrictive measures. The farm with S. Reading had also swine but the swine were Salmonella negative in 2008.

2) Salmonella was not detected on four farms sampled by an official veterinarian. S. Typhimurium RDNC was also isolated from three animals at necropsy. These animals originated from different farms. One farm was sampled because of bought of cattle from a farm infected with Salmonella. S. Dublin was isolated from sewage but not from the animals.

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

The situation remains has been favourable with few infected farms each year. During the 1980s' the number of salmonella infected cattle farms declined rapidly. Since the end of the 1990's the number of farms with new infections varied from 4 to 13 per year. In 2008, the number of infected farms has increased which is worrying. Only two of these 21 farms were detected in the

control programme at slaughterhouses. An outbreak caused by S. Reading has been continuing since 2007. This serotype has affected multiple animal species (duck, turkey, swine, sheep, horse, wild birds) and humans.

Relevance of the findings in animals to findings in foodstuffs and to human cases

The risk of contracting salmonella from Swedish produced food of cattle origin has been negligible as the number of Swedish cattle infected with salmonella has been low.

However, salmonella in cattle seems to be increasing. Salmonella on farms contaminates the environment which causes a risk to humans and other animal species.

Additional information

Prevalence of Salmonella in cattle seems to be increasing or has previously been underestimated. As Salmonella often causes clinical symptoms in cattle a control programme based on testing of clinically healthy cattle at slaughter reveals only some infected herds. The use of serology in dairy herds is now being investigated.

F. 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 by the salmonella control programme.
Sampling at farms/holdings or of individual animals is performed whenever there is a clinical suspicion or for trace-back. 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 sheep, goat, dog, horse or cat, the whole farm/kennel/holding/stable etc. is considered 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 from 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 eliminate the infection and prevent spread of salmonella.

Notification system in place

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

Results of the investigation

Early in 2008, 51 cases were reported in cats. Of these isolates, 23 were serotyped to Typhimurium, 1 and one S. enterica sp. diarizonae. It is suspected that the cats acquire the infection by wild birds.

Furthermore, Salmonella was isolated from 6 dogs, 4 horses, 5 sheep, 5 reptile pets, 8 wild birds (one sample a pool of five birds), 5 hedgehogs, one ferret and 5 zoo animals. 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

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

Since 2003, 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 were reported. In 2006, 77 cats with S. Typhimurium were reported. In 2007, 151 cats with S. Typhimurium was reported. In 2008 , the number of cats reported was significantly lower (51 cats). It is not yet known if this reflects a true decrease.

G. Salmonella spp. in Gallus Gallus - breeding flocks

Monitoring system

Sampling strategy

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

Sampling strategies are described in the Swedish control programme, approved by the Commission in 1995 (95/50/EU), in the Commission regulation (1003/2005) and in the national regulations on control of Salmonella (SJVFS 2004:2 and SJVFS 2007:19). The Salmonella control programme is supervised by Swedish Board of Agriculture (SJV) and National Food Administration (SLV).

All holdings having more than 250 breeders are sampled. Sampling of breeders is supervised by the competent authority. An official veterinarian visits all breeding holdings with rearing birds once a year and breeding holdings with production animals three times a year. During the visit the official veterinarian takes samples and controls sampling performed by the food business operator (FBO) and that all results are documented. Other samples are taken by the FBO.

The aim of the sampling is to detect a prevalence of Salmonella of at least 5% (CI 95%).

There are no elite breeding holdings in Sweden.

Frequency of the sampling

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

Every flock is sampled

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

Every flock is sampled

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

2nd weeks

Type of specimen taken

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

Meconium

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

Socks/ boot swabs

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

Socks/ boot swabs

Methods of sampling (description of sampling techniques)

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

Breeding flocks are sampled at hatcheries by taking meconium from day-old birds. Approximately 250 birds compose one sample.

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

Breeding flocks are sampled three times during the rearing period: as day-old chicks, at 4 weeks and 2 weeks prior to removal.

Except for day-old chicks two pairs of bootswabs are taken from the area where birds are reared. Two pairs are pooled to one sample.

Breeding flocks: Production period

Breeding flocks are sampled every second week during the production period. Five pairs of sock samples are taken from the area where birds are residing and pooled to two samples. An official veterinarian takes samples three times area, all the other samples are taken by the FBO.

Case definition

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

If Salmonella is isolated from the sample the flock is considered infected with Salmonella.

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

If Salmonella is isolated from the sample the flock is considered infected with Salmonella.

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

If Salmonella is isolated from a sample the flock is considered infected with Salmonella.

Diagnostic/analytical methods used

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

Bacteriological method: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

Vaccination policy

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

Vaccination is not in use in Sweden.

Other preventive measures than vaccination in place

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

All breeding flocks of Gallus gallus are affiliated to a voluntary Salmonella control program. The aim of the voluntary program is to reduce the risk of acquiring Salmonella. The bird stables must contain a hygienic barrier between the clean and the unclean part. The holding must apply hygienic measures to reduce the risk of transferring the organism. The stables must be cleaned and disinfected before introduction of a new flock. Only heat treated feed is allowed. The

purchase of animals is only allowed from breeding holding affiliated to the voluntary program. An official veterinarian controls the holding once a year by taking samples and inspecting the stables and the hygienic measures. The affiliated holdings get a higher compensation in case of Salmonella.

All in - all out principle is applied to breeding flocks.

Results of the investigation

In 2008, Salmonella was not detected in breeding flocks of Gallus gallus.

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

See Salmonella in Gallus gallus broiler flocks

Relevance of the findings in animals to findings in foodstuffs and to human cases

See Salmonella in Gallus gallus broiler flocks

H. Salmonella spp. in Gallus Gallus - flocks of laying hens

Monitoring system

Sampling strategy

Laying hens flocks

Sampling strategies are described in the Swedish control programme, approved by the Commission in 1995 (95/50/EU), in the Commission regulation (1003/2005) and in the national regulations on control of Salmonella (SJVFS 2004:2 and SJVFS 2007:19). The Salmonella control programme is supervised by Swedish Board of Agriculture (SJV) and National Food Administration (SLV).

All holdings selling eggs for consumption are sampled. Sampling is supervised by the competent authority. An official veterinarian visits every holding once a year. During the visit the official veterinarian takes samples and controls sampling performed by the food business operator (FBO) and that all results are documented. Other samples are taken by the FBO.

The aim of the sampling is to detect a prevalence of Salmonella of at least 5% (CI 95%).

Frequency of the sampling

Laying hens: Rearing period

2 weeks prior to moving

Laying hens: Production period

every 15 weeks with start of the age of 22-26 weeks

Laying hens: Before slaughter at farm

2 weeks prior to slaughter

Laying hens: At slaughter

Every flock is sampled

Type of specimen taken

Laying hens: Day-old chicks

Meconium

Laying hens: Rearing period

Socks/ boot swabs

Laying hens: Production period

Socks/ boot swabs

Laying hens: Before slaughter at farm

Socks/ boot swabs

Laying hens: At slaughter

Neck skin

Methods of sampling (description of sampling techniques)

Laying hens: Day-old chicks

Day-old chicks are not routinely sampled. If they are sampled one sample of meconium is taken from 250 chickens per each parent group.

Laying hens: Rearing period

Holdings with more than 200 hens are sampled.

Free-ranging birds

Two pairs of sock samples are taken from the area where the birds are rearing. This sample is pooled to form one sample.

Cage birds

Two faecal samples of 75 g are collected from the flock and pooled into one sample.

Laying hens: Production period

All holdings selling eggs for consumtpion are sampled.

Free-ranging birds

Two pairs of sock samples are taken from the area where the birds are rearing. This sample is pooled to form one sample.

Cage birds

Two faecal samples of 75 g are collected from the flock and pooled into one sample.

Laying hens: Before slaughter at farm

All flocks are sampled two weeks before slaughter.

Two alternatives for sampling:

1) Two pairs of sock samples are taken from the area where the birds are rearing. This sample is pooled to form one sample.

2)Two faecal samples of 75 g are collected from the flock and pooled into one sample.

Laying hens: At slaughter

Neck skin samples are taken as described in the chapter of Salmonella in broiler meat.

Eggs at packing centre (flock based approach)

No routine samples are taken at egg packing centres.

Case definition

Laying hens: Day-old chicks

If Salmonella is isolated from a sample the whole flock is considered infected with Salmonella.

Laying hens: Rearing period

If Salmonella is isolated from a sample the whole flock is considered infected with Salmonella.

Laying hens: Production period

If Salmonella is isolated from a sample the whole flock is considered infected with Salmonella.

Laying hens: Before slaughter at farm

If Salmonella is isolated from a sample the whole flock is considered infected with Salmonella.

Laying hens: At slaughter

See the chapter of Salmonella in broiler meat.

Diagnostic/analytical methods used

Laying hens: Day-old chicks

Bacteriological method: ISO 6579:2002

Laying hens: Rearing period

Bacteriological method: ISO 6579:2002

Laying hens: Production period

Bacteriological method: ISO 6579:2002

Laying hens: Before slaughter at farm

Bacteriological method: ISO 6579:2002

Laying hens: At slaughter

Bacteriological method: NMKL No 71:1999

Vaccination policy

Laying hens flocks

Laying hens are not vaccinated against Salmonella in Sweden.

Other preventive measures than vaccination in place

Laying hens flocks

Holdings can apply to be accepted in the voluntary Salmonella control program. The aim of the voluntary program is to reduce the risk of acquiring Salmonella. The bird stables must contain a hygienic barrier between the clean and the unclean part. The holding must apply hygienic measures to reduce the risk of transferring the organism. The stables must be cleaned and disinfected before introduction of a new flock. Only heat treated feed is allowed. The purchase of animals is only allowed from breeding holding affiliated to the voluntary program. An official veterinarian controls the holding once a year by taking samples and inspecting the stables and the hygienic measures. The affiliated holdings get a higher compensation in case of Salmonella.

A HACCP-based Salmonella control programme in feed production.

Control program/mechanisms

The control program/strategies in place

Laying hens flocks

A HACCP-based Salmonella control in feed and in feed production is integrated in the control programme. All serotypes of Salmonella are covered in the whole control programme.

Sampling is performed as described earlier. Additional samplings can be undertaken when there is a suspicion such as trace-back of an infected flock or human cases.

Suggestions to the Community for the actions to be taken

All serotypes of Salmonella should be notifiable.
A HACCP-based control of feed and feed production.

Notification system in place

When Salmonella is isolated at the laboratory the analytical laboratory has to notify the Swedish Board of Agriculture (SJV) and the regional administration (of the holding) irrespective of the serotype. The regional administration informs meat inspection veterinarian and others who need the information at this stage. The isolate is sent to the National Veterinary Institute (SVA) for confirmation, typing and resistance testing. SVA reports the results of the analyses to the sending laboratory, SJV, the food business operator and regional administration.

In addition, the laboratory must report the regional administration on the results of all poultry holdings that are situated in their region. This reporting is performed on on a quarterly basis. The regional administration summarizes the results of the holdings each year. This summary is sent to the SJV.

Results of the investigation

In 2008, Salmonella was detected in 5 flocks of laying hens: S. Typhimurium RDNC in three flocks, S. Livingstone in one and S. enterica sp. diarizonae in one. One of these flocks was sampled extra because of clinical salmonellosis in the owner family. The human and the flock isolate were of same subtype. Salmonella had not been detected in previous samplings of that flock.

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

Prevalence of Salmonella in Swedish food-producing animals is low although there seems to be a slight increase in prevalence.

I. Salmonella spp. in Gallus Gallus - broiler flocks

Monitoring system

Sampling strategy

Broiler flocks

Sampling strategies are described in the Swedish control programme, approved by the Commission in 1995 (95/50/EU), in the Commission regulation (1003/2005) and in the national regulations on control of Salmonella (SJVFS 2004:2 and SJVFS 2007:19). The Salmonella control programme is supervised by Swedish Board of Agriculture (SJV) and National Food Administration (SLV).

All holdings having more than 500 birds are sampled. Sampling is supervised by the competent authority. An official veterinarian visits all broiler holdings. During the visit the official veterinarian takes samples and controls sampling performed by the food business operator (FBO) and that all results are documented. Other samples are taken by the FBO.

The aim of the sampling is to detect a prevalence of Salmonella of at least 5% (CI 95%).

Frequency of the sampling

Broiler flocks: Before slaughter at farm

2 weeks prior to slaughter

Type of specimen taken

Broiler flocks: Before slaughter at farm

Socks/ boot swabs

Methods of sampling (description of sampling techniques)

Broiler flocks: Day-old chicks

Day-old chicks of broilers are not sampled.

Broiler flocks: Before slaughter at farm

Two pairs of sock samples are taken from the whole area where birds are reared two weeks before slaughter. The sock samples are pooled into one sample and sent to the laboratory. Once a year this sampling is performed by the official veterinarian, the other samplings are taken by the food business operator.

An extra sampling can be performed if there is a suspicion of Salmonella.

Broiler flocks: At slaughter (flock based approach)

See: Salmonella in broiler meat

Case definition

Broiler flocks: Day-old chicks

If Salmonella is isolated from a sample the flock is considered positive for Salmonella.

Broiler flocks: Rearing period

If Salmonella is isolated from a sample the flock is considered positive for Salmonella.

Broiler flocks: Before slaughter at farm

If Salmonella is isolated from a sample the flock is considered positive for Salmonella.

Broiler flocks: At slaughter (flock based approach)

See Salmonella in broiler meat.

Diagnostic/analytical methods used

Broiler flocks: Before slaughter at farm

Bacteriological method: ISO 6579:2002

Vaccination policy

Broiler flocks

Vaccination is not in use in Sweden.

Other preventive measures than vaccination in place

Broiler flocks

All holdings that are members of the Swedish Poultry Association are affiliated to a voluntary Salmonella control program. The aim of the voluntary program is to reduce the risk of acquiring Salmonella. The bird stables must contain a hygienic barrier between the clean and the unclean part. The holding must apply hygienic measures to reduce the risk of transferring the organism. The stables must be cleaned and disinfected before introduction of a new flock. Only heat treated feed is allowed. The purchase of animals is only allowed from breeding holding affiliated to the voluntary program. An official veterinarian controls the holding once a year by taking samples and inspecting the stables and the hygienic measures. The affiliated holdings get a higher compensation in case of Salmonella.

Control program/mechanisms

The control program/strategies in place

Broiler flocks

Approximately 98-99% of the slaughtered broilers originate from holdings affiliated to a voluntary Salmonella control program. All broiler flocks are sampled 2 weeks before slaughter.

Suggestions to the Community for the actions to be taken

A HACCP-based control of feed should be integrated in the Salmonella control programmes.

Measures in case of the positive findings or single cases

Broiler flocks: Day-old chicks

Day-old chicks are not routinely sampled. If they are sampled and Salmonella is detected all the birds are euthanized and destroyed irrespective of the serotype. The holding is cleaned and disinfected and put under restrictive measures. A new flock can be introduced into the holding after no Salmonella can be detected in the broiler house.

Broiler flocks: Rearing period

Broilers are not routinely sampled during the rearing period. If they are sampled and Salmonella is detected all the birds are euthanized and destroyed irrespective of the serotype. The holding is cleaned and disinfected and put under restrictive measures. A new flock can be introduced into the holding after no Salmonella can be detected in the broiler house.

Broiler flocks: Before slaughter at farm

If Salmonella is detected all the birds are euthanized and destroyed irrespective of the serotype. The holding is cleaned and disinfected and put under restrictive measures. A new flock can be introduced into the holding after no Salmonella can be detected in the broiler house.

Broiler flocks: At slaughter (flock based approach)

See Salmonella in broiler meat.

Notification system in place

When Salmonella is isolated at the laboratory the analytical laboratory has to notify the Swedish Board of Agriculture (SJV) and the regional administration (of the holding) irrespective of the serotype. The regional administration informs meat inspection veterinarian and others who need the information at this stage. The isolate is sent to the National Veterinary Institute (SVA) for confirmation, typing and resistance testing. SVA reports the results of the analyses to the sending laboratory, SJV, the food business operator and regional administration.

In addition, the laboratory must report the regional administration on the results of all poultry holdings that are situated in their region. This reporting is performed on on a quarterly basis. The regional administration summarizes the results of the holdings each year. This summary is sent to the SJV.

Results of the investigation

In 2008, Salmonella was detected in seven flocks. S. Typhimurium was detected in four flocks: phagetypes 15a (1 flock), same subtype of RDNC in two flocks and another subtype of RDNC in one flock. One of these flocks was sampled because of clinical salmonellosis in the owner family (RDNC). Same subtype was isolated in both humans and the birds. One holding had S. Agona in three consecutive flocks although the holding was cleaned and disinfected before the introduction of a new flock.

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

Between 1996-2005 the Salmonella situation was stable with 1-4 infected flocks per year. Since 2006, the number of infected flocks has slightly increased. In 2008, three poultry flocks were directly associated with human cases (one broiler flock, one flock of layer hens and one turkey flock). Although there seems to be an increase in the infection the incidence of Salmonella is still low (<0,5%).

Relevance of the findings in animals to findings in foodstuffs and to human cases

In 2008, three poultry flocks were directly associated with human cases (one broiler flock, one flock of layer hens and one turkey flock). Still, the risk of getting Salmonella from domestic broiler products is low.

Table Salmonella in breeding flocks of Gallus gallus

	Number of existing flocks	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Hadar	S. Infantis	S. Typhimurium	S. Virchow	Salmonella spp., unspecified
Gallus gallus (fowl) - grandparent breeding flocks for meat production line - during production period - at farm - environmental sample - boot swabs - Control and eradication programmes	13	Swedish	flock	13	0						
Gallus gallus (fowl) - grandparent breeding flocks for meat production line - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes	11	Swedish	flock	11	0						
Gallus gallus (fowl) - parent breeding flocks for egg production line - during production period - at farm - environmental sample - boot swabs - Control and eradication programmes	19	Swedish	flock	19	0						
Gallus gallus (fowl) - parent breeding flocks for egg production line - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes	13	Swedish	flock	13	0						
Gallus gallus (fowl) - parent breeding flocks for meat production line - during production period - at farm - environmental sample - boot swabs - Control and eradication programmes	116	Swedish	flock	116	0						
Gallus gallus (fowl) - parent breeding flocks for meat production line - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes	104	Swedish	flock	104	0						

Table Salmonella in other poultry

	Number of existing flocks	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Agona	S. Enteritidis	S. Livingstone	S. Reading	S. Typhimurium	S. enterica subsp. diarizonae
Ducks - meat production flocks - at farm - environmental sample - boot swabs - Control and eradication programmes	7	SVA	flock	7	0						
Gallus gallus (fowl) - broilers - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes	3385	SVA	flock	3385	11	6				5	
Gallus gallus (fowl) - laying hens - during production period - at farm - Control and eradication programmes - industry sampling - census sampling	757	SVA & SJV	flock	724	3			1		1	1
Gallus gallus (fowl) - laying hens - during production period - at farm - Control and eradication programmes - official and industry sampling	757	SVA &SJV	flock	724	5			1		3	1
Gallus gallus (fowl) - laying hens - during production period - at farm - Control and eradication programmes - official sampling - objective sampling	757	SVA &SJV	flock	291	1					1	
Gallus gallus (fowl) - laying hens - during production period - at farm - Control and eradication programmes - official sampling - suspect sampling (Sampling performed due to Salmonella Typhimurium in the owner family)	757	SVA &SJV	flock	1	1					1	
Gallus gallus (fowl) - laying hens - during rearing period - at farm - Control and eradication programmes - official and industry sampling	114	SVA&SJV	flock	114	0						
Geese - meat production flocks	21	SVA	flock	21	0						
Turkeys - meat production flocks	251	SVA	flock	251	2				1	1	
Turkeys - parent breeding flocks - during production period - at farm - environmental sample - boot swabs - Control and eradication programmes	5	SVA	flock	5	0						

Table Salmonella in other poultry

	Number of existing flocks	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Agona	S. Enteritidis	S. Livingstone	S. Reading	S. Typhimurium	S. enterica subsp. diarizonae
Turkeys - parent breeding flocks - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes	5	SVA	flock	5	0						

	Salmonella spp., unspecified
Ducks - meat production flocks - at farm - environmental sample - boot swabs - Control and eradication programmes	
Gallus gallus (fowl) - broilers - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes	
Gallus gallus (fowl) - laying hens - during production period - at farm - Control and eradication programmes - industry sampling - census sampling	
Gallus gallus (fowl) - laying hens - during production period - at farm - Control and eradication programmes - official and industry sampling	
Gallus gallus (fowl) - laying hens - during production period - at farm - Control and eradication programmes - official sampling - objective sampling	
Gallus gallus (fowl) - laying hens - during production period - at farm - Control and eradication programmes - official sampling - suspect sampling (Sampling performed due to Salmonella Typhimurium in the owner family)	
Gallus gallus (fowl) - laying hens - during rearing period - at farm - Control and eradication programmes - official and industry sampling	

Table Salmonella in other poultry

	Salmonella spp., unspecified
Geese - meat production flocks	
Turkeys - meat production flocks	
Turkeys - parent breeding flocks - during production period - at farm - environmental sample - boot swabs - Control and eradication programmes	
Turkeys - parent breeding flocks - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes	

Table Salmonella in other birds

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Hessarek	S. Typhimurium	Salmonella spp., unspecified	S. Peregrinus
Birds - wild - Monitoring [1)]	SVA	animal	304	8		1	3	1	3
Ostriches - at farm - animal sample - Control and eradication programmes (sock or faecal samples)	Swedish	flock	41	0					
Pheasants	SVA	animal	2	0					
Pigeons	SVA	animal	12	0					

Comments:

[1)] 49 samples were in pools of 5-6 animals

Table Salmonella in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Agona	S. Cubana	S. Dublin	S. Duesseldorf	S. Enteritidis	S. Goldcoast	S. Infantis
Alpacas - farmed - at farm - animal sample	SVA	animal	10	0							
Cats - Clinical investigations	SVA	animal	293	51				1			
Cattle (bovine animals) - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)	NFA/SVA	animal	3185	0							
Cattle (bovine animals) - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)	NFA/SVA	animal	95	0							
Cattle (bovine animals) - - faeces (Incidence in 2008)	SJV/SVA	herd	26	21			9		2		
Cattle (bovine animals) - - faeces (Prevalence in 2008)	SJV/SVA	herd	34	29	1		13		2		
Cattle (bovine animals) - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)	NFA/SVA	animal	3215	4			1				
Cattle (bovine animals) - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)	NFA/SVA	animal	105	0							
Cattle (bovine animals) - at farm - Clinical investigations [1)]	SJV/SVA	animal		11			2		1		
Dogs - Clinical investigations	SVA	animal	244	6					1		
Goats - at farm	SVA	animal	5	0							
Hedgehogs - wild - Monitoring	SVA	animal	17	5					1		
Pigs [2)]	SJV & SVA	herd	17	8		1					
Pigs - - faeces - Control and eradication programmes - official sampling - suspect sampling [3)]	SJV/SVA	herd	24	13		1					2

Table Salmonella in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Agona	S. Cubana	S. Dublin	S. Duesseldorf	S. Enteritidis	S. Goldcoast	S. Infantis
Pigs - breeding animals - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)	NFA/SVA	animal	2622	1			1				
Pigs - breeding animals - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)	NFA/SVA	animal	2	0							
Pigs - breeding animals - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)	NFA/SVA	animal	2612	7						1	
Pigs - breeding animals - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)	NFA/SVA	animal	13	0							
Pigs - fattening pigs - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)	NFA/SVA	animal	3193	0							
Pigs - fattening pigs - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)	NFA/SVA	animal	16	0							
Pigs - fattening pigs - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)	NFA/SVA	animal	3171	8							
Pigs - fattening pigs - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)	NFA/SVA	animal	16	0							
Pigs - unspecified - at farm - animal sample - Control and eradication programmes - official and industry sampling - suspect sampling [4)]	SJV/SVA	herd	17	8		1					
Reindeers - semi-domesticated	SVA	animal	7	0							
Reptiles - pet animals	SVA	animal	13	5							1

Table Salmonella in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Agona	S. Cubana	S. Dublin	S. Duesseldorf	S. Enteritidis	S. Goldcoast	S. Infantis
Sheep - at farm - animal sample - Clinical investigations [5)]	SJV/SVA	herd		5							
Solipeds, domestic	SVA	animal	396	4			1				
Wild animals - Monitoring	SVA	animal	273	1							
Zoo animals, all - at zoo	SVA	animal	47	5							

	S. Kottbus	S. Montevideo	S. Muenchen	S. Newport	S. Reading	S. Remete	S. Tennessee	S. Thompson	S. Typhimurium	S. enterica subsp. arizonae	S. enterica subsp. diarizonae
Alpacas - farmed - at farm - animal sample											
Cats - Clinical investigations									23		1
Cattle (bovine animals) - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)											
Cattle (bovine animals) - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)											
Cattle (bovine animals) - - faeces (Incidence in 2008)					3				7		
Cattle (bovine animals) - - faeces (Prevalence in 2008)					4				9		
Cattle (bovine animals) - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)									3		
Cattle (bovine animals) - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)											

Table Salmonella in other animals

	S. Kottbus	S. Montevideo	S. Muenchen	S. Newport	S. Reading	S. Remete	S. Tennessee	S. Thompson	S. Typhimurium	S. enterica subsp. arizonae	S. enterica subsp. diarizonae
Cattle (bovine animals) - at farm - Clinical investigations [1)]					2				6		
Dogs - Clinical investigations		1			1		1		2		
Goats - at farm											
Hedgehogs - wild - Monitoring									4		
Pigs [2)]				1					6		
Pigs - - faeces - Control and eradication programmes - official sampling - suspect sampling [3)]				1					9		
Pigs - breeding animals - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)											
Pigs - breeding animals - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)											
Pigs - breeding animals - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)				2				1	2		
Pigs - breeding animals - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)											
Pigs - fattening pigs - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)											
Pigs - fattening pigs - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)											

Table Salmonella in other animals

	S. Kottbus	S. Montevideo	S. Muenchen	S. Newport	S. Reading	S. Remete	S. Tennessee	S. Thompson	S. Typhimurium	S. enterica subsp. arizonae	S. enterica subsp. diarizonae
Pigs - fattening pigs - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)									8		
Pigs - fattening pigs - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)											
Pigs - unspecified - at farm - animal sample - Control and eradication programmes - official and industry sampling - suspect sampling [4)]				1					6		
Reindeers - semi-domesticated											
Reptiles - pet animals			2							1	
Sheep - at farm - animal sample - Clinical investigations [5)]					1				2		2
Solipeds, domestic					3						
Wild animals - Monitoring	1										
Zoo animals, all - at zoo						1	1				2

	Salmonella spp., unspecified	S.IIIb 48:k:1,5
Alpacas - farmed - at farm - animal sample		
Cats - Clinical investigations	26	
Cattle (bovine animals) - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)		

Table Salmonella in other animals

	Salmonella spp., unspecified	S.IIIb 48:k:1,5
Cattle (bovine animals) - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)		
Cattle (bovine animals) - - faeces (Incidence in 2008)		
Cattle (bovine animals) - - faeces (Prevalence in 2008)		
Cattle (bovine animals) - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)		
Cattle (bovine animals) - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)		
Cattle (bovine animals) - at farm - Clinical investigations [1)]		
Dogs - Clinical investigations		
Goats - at farm		
Hedgehogs - wild - Monitoring		
Pigs [2)]		
Pigs - - faeces - Control and eradication programmes - official sampling - suspect sampling [3)]		
Pigs - breeding animals - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)		
Pigs - breeding animals - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)		

Table Salmonella in other animals

	Salmonella spp., unspecified	S.IIIb 48:k:1,5
Pigs - breeding animals - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)	1	
Pigs - breeding animals - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)		
Pigs - fattening pigs - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)		
Pigs - fattening pigs - - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)		
Pigs - fattening pigs - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (High capacity abattoirs)		
Pigs - fattening pigs - - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)		
Pigs - unspecified - at farm - animal sample - Control and eradication programmes - official and industry sampling - suspect sampling [4)]		
Reindeers - semi-domesticated		
Reptiles - pet animals	1	
Sheep - at farm - animal sample - Clinical investigations [5)]		
Solipeds, domestic		
Wild animals - Monitoring		
Zoo animals, all - at zoo		1

Table Salmonella in other animals

Comments:

[1)] Necropsies, clinical suspicions. The number of tested animals is not available.
[2)] Incidence in 2008
[3)] Prevalence in 2008
[4)] Incidence in 2008
[5)] Trace-back

Footnote:

Only one serotype per herd recorded in this table
S. Kottbus was isolated from one ferret.

2.1.5 Salmonella in feedingstuffs

A. Salmonella spp. in feed

History of the disease and/or infection in the country

About fifteen major feed mills produce approximately 95% of all feed consumed from the feed industry production of feed. About 70% of the mills are farmers´ cooperatives.

The purpose of the official Salmonella programme for feed is to produce animal feed which does not give rise to Salmonella infections in animals and consequently secure human health. All serotypes and categories of feed are covered by the scope of the programme. According to the national statutory provisions (SJVFS 2006:81, latest consolidated version SJVFS 2009:20) animal feed must be produced according to certain requirements and are not allowed to be Salmonella positive.

All sampling follow the legislation on feeding stuffs and animal by-products and is supervised by the Swedish Board of Agriculture (SJV). In addition to the compulsory testing, a large number of voluntary samples are taken. All Salmonella findings are sent to the National Veterinary Institute (SVA) for confirmation and serotyping.

Analytical method
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, 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 analytical laboratories are accredited according to EN/150/17025.

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

Description of the sampling procedures

Sampling at feed mills
At the feed mills, samples are taken mainly according to Hazard Analysis Critical Control Point (HACCP) principles. The HACCP system was initiated in the feed production 1991 and has proven to be effective for detecting and preventing Salmonella in feeding stuffs. For the production process and equipment used, a safety management system including the HACCP principle shall be applied i.e. the main hazards have to be identified in the processing line followed by

Salmonella sampling to supervise the critical control points. Adequate measures shall be performed in case of positive Salmonella findings. Further on, the management system covers a number of specific GMP (Good Manufacturing Practice) requirements, according to the regulation SJVFS 2006:81, latest consolidated version SJVFS 2009:20.

On a weekly basis, minimum five samples from feed mills manufacturing compound feeding stuff for poultry and minimum two samples from feed mills manufacturing compound feeding stuff for other food-producing animals must be collected at specified places based on the HACCP principles and analyzed for Salmonella. The purpose of the weekly sampling is to make sure that Salmonella bacteria are not present in the production lines of the feed mill. All samples from the weekly monitoring of feed mills have to be analyzed at the SVA. SVA will report all positive samples from the processing control to the SJV.

Sampling of feed materials
The most important risk factor in feed production is the feed materials. According to the previous experience of Salmonella prevalence, feed materials of animal origin as well as feed materials of certain vegetable origin are considered hazardous. However, due to restrictions on the use of feed materials of animal origin in the legislation, certain feed materials of vegetable origin are presently a more important risk factor.

Feed materials are classified according to the Salmonella risk they may present: feed materials of animal origin (S1) and feed materials of vegetable origin (S2, e.g. soy bean meal and some products deriving from rape seed and S3, e.g. rice). Production of these classified feed materials has to follow a hygiene programme containing routines for Salmonella sampling.

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. 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 SBA. In addition to this, many voluntary samples are collected. The sampling protocol for feed materials is designed to detect Salmonella with 99% probability.

Every company producing pet food is regularly inspected and the feed is sampled for Salmonella by an official feed inspector. In addition to this, voluntary samples are taken. Every consignment of dog chews from a third country is controlled at the border inspection.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases

Feed is considered the most important source of Salmonella for animals. Feed-borne outbreaks have occurred in Sweden, the largest caused by S. Cubana that affected more than 30 swine farms in 2003. An outbreak caused by multiple serotypes (S. Agona, S. Infantis, S. Livingstone, S. Typhimurium) affected swine farms in 2006. A smaller outbreak caused by S. Putten occurred in 2007.

However, an epidemiological link between findings in feed and animals and humans cannot always be verified as in an outbreak caused by S. Reading in 2007-2009.

The most important risk factor in feed production is the feed materials. According to the previous experience of Salmonella prevalence, feed materials of animal origin as well as feed materials of vegetable origin are considered hazardous. However, due to restrictions on the use of feed materials of animal origin in the legislation, certain feed materials of vegetable origin are presently a more important risk factor.

Recent actions taken to control the zoonoses

Relevant measures shall always be undertaken, when positive samples are detected. Defined measures are regulated in an Annex of the feed regulations (SJVFS 2006:81, latest consolidated version SJVFS 2009:20) i.e. actions as result of positive samples. Some measures of certain importance:

- Salmonella positive feed materials have to be heat-treated (if possible) or using organic acids and retested with negative result for Salmonella before incorporation into a compound feed or before they are sold,
- feed has to be withdrawn in applicable cases from the market, reheat treated or disposed of,
- an infected production plant has to be thoroughly cleaned, disinfected followed by environmental sampling, with negative results, before the production may be continued. Dry cleaning, followed by disinfection, is commonly practiced in the sanitation programme.

It is mandatory to notify the SJV, when Salmonella has been isolated. Positive Salmonella findings in feed materials from other countries and compound feeds are reported by SJV within the RASFF- system (rapid alert system for food and feed) established in the EU.

SJV is responsible for unannounced inspections and the sampling programme, which is drawn up yearly and carried out by certain control bodies. When necessary, SVA leads and assists the company as regards actions due to positive Salmonella findings. The official control is focused on audits i. e. “system control” of the safety management system (GMP- programme).

Suggestions to the Community for the actions to be taken

A risk-based Salmonella control programme covering all steps of the primary production from feed to food should be established.

Additional information

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 other food-producing animals 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 registered by the SJV. All storage facilities must fulfill certain requirements regarding sampling.

Results from 2008
In the tables, compulsory samples, samples taken in the official control and voluntary samples that have been reported to the SJV are presented. There is no obligation to report negative results from voluntary samples.

Feed mills and compound feeding stuff
In the HACCP control of feed mills, 8870 samples were taken by the industry and 509 by the authorities. Of these 36 were positive. The positive samples belonged to 13 serotypes (four samples couldn´t be serotyped) (Table Salmonella in compound feeding stuffs). The most commonly isolated serotypes (n=13) was S. Typhimurium.

Feed material of vegetable origin
In total, 2197 samples from derived material of vegetable origin were analyzed. Of those, 17 were positive. The most common serotype was S. Livingstone (n=4). Furthermore, 894 environmental samples from domestic rapeseed processing plants were analysed. Of those, 6 were positive and 4 were of the serotype S. Senftenberg. (Table Salmonella in other feed materials)

Processing plants for animal by-products and feed materials of animal origin
Out of 2571 samples from feed materials of animal origin and environmental samples from the processing plants, 7 were positive. (Table Salmonella in feed material of animal origin).

Table Salmonella in feed material of animal origin

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Ealing	S. Enteritidis	S. Give	S. Montevideo	S. Senftenberg	S. Typhimurium
Feed material of land animal origin - blood meal - at feed mill - domestic production - Control and eradication programmes - official and industry sampling - objective sampling (Blood products+environmental)	SJV	batch		70	0						
Feed material of land animal origin - bone meal - at feed mill - domestic production - Control and eradication programmes - official and industry sampling - objective sampling (Products+enviromental)	SJV	batch		584	2					2	
Feed material of land animal origin - dairy products - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		4	0						
Feed material of land animal origin - egg powder - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		52	0						
Feed material of land animal origin - greaves - at feed mill - domestic production - Control and eradication programmes - official and industry sampling - objective sampling (Products+environmental)	SJV	batch		1607	2			2			
Feed material of land animal origin - meat and bone meal - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		65	0						
Feed material of land animal origin - meat meal - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		19	0						
Feed material of land animal origin - poultry offal meal - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		124	2	1			1		

Table Salmonella in feed material of animal origin

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Ealing	S. Enteritidis	S. Give	S. Montevideo	S. Senftenberg	S. Typhimurium
Feed material of marine animal origin - fish meal - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		44	1						
Feed material of marine animal origin - other fish products - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		2	0						

	Salmonella spp., unspecified
Feed material of land animal origin - blood meal - at feed mill - domestic production - Control and eradication programmes - official and industry sampling - objective sampling (Blood products+environmental)	
Feed material of land animal origin - bone meal - at feed mill - domestic production - Control and eradication programmes - official and industry sampling - objective sampling (Products+enviromental)	
Feed material of land animal origin - dairy products - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	
Feed material of land animal origin - egg powder - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	

Table Salmonella in feed material of animal origin

	Salmonella spp., unspecified
Feed material of land animal origin - greaves - at feed mill - domestic production - Control and eradication programmes - official and industry sampling - objective sampling (Products+environmental)	
Feed material of land animal origin - meat and bone meal - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	
Feed material of land animal origin - meat meal - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	
Feed material of land animal origin - poultry offal meal - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	
Feed material of marine animal origin - fish meal - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	1
Feed material of marine animal origin - other fish products - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	

Table Salmonella in other feed matter

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Agona	S. Corvallis	S. Cubana	S. Enteritidis	S. Lexington	S. Livingstone
Feed material of cereal grain origin - barley derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		1	0						
Feed material of cereal grain origin - maize - derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		57	2	1					1
Feed material of cereal grain origin - other cereal grain derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		17	0						
Feed material of cereal grain origin - wheat derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		5	0						
Feed material of oil seed or fruit origin - groundnut derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		8	0						
Feed material of oil seed or fruit origin - palm kernel derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		22	0						
Feed material of oil seed or fruit origin - rape seed derived - at feed mill - imported - Control and eradication programmes - official and industry sampling	SJV	batch		138	4						3
Feed material of oil seed or fruit origin - rape seed derived - at processing plant - domestic production - Control and eradication programmes - industry sampling - objective sampling	SJV	single		1728	0						

Table Salmonella in other feed matter

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Agona	S. Corvallis	S. Cubana	S. Enteritidis	S. Lexington	S. Livingstone
Feed material of oil seed or fruit origin - rape seed derived - at processing plant - environmental sample - Control and eradication programmes - industry sampling - objective sampling (domestic)	SJV	single		894	6						1
Feed material of oil seed or fruit origin - soya (bean) derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		171	9			2		2	
Feed material of oil seed or fruit origin - sunflower seed derived - at feed mill - imported - Control and eradication programmes - official sampling - objective sampling	SJV	batch		45	2		1				
Other feed material - other plants - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		4	0						
Other feed material - other seeds and fruits - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	SJV	batch		1	0						

	S. Mbandaka	S. Rissen	S. Senftenberg	S. Typhimurium	Salmonella spp., unspecified
Feed material of cereal grain origin - barley derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling					
Feed material of cereal grain origin - maize - derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling					

Table Salmonella in other feed matter

	S. Mbandaka	S. Rissen	S. Senftenberg	S. Typhimurium	Salmonella spp., unspecified
Feed material of cereal grain origin - other cereal grain derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling					
Feed material of cereal grain origin - wheat derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling					
Feed material of oil seed or fruit origin - groundnut derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling					
Feed material of oil seed or fruit origin - palm kernel derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling					
Feed material of oil seed or fruit origin - rape seed derived - at feed mill - imported - Control and eradication programmes - official and industry sampling	1				
Feed material of oil seed or fruit origin - rape seed derived - at processing plant - domestic production - Control and eradication programmes - industry sampling - objective sampling					
Feed material of oil seed or fruit origin - rape seed derived - at processing plant - environmental sample - Control and eradication programmes - industry sampling - objective sampling (domestic)	2		3		
Feed material of oil seed or fruit origin - soya (bean) derived - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling	1	1	2		1

Table Salmonella in other feed matter

	S. Mbandaka	S. Rissen	S. Senftenberg	S. Typhimurium	Salmonella spp., unspecified
Feed material of oil seed or fruit origin - sunflower seed derived - at feed mill - imported - Control and eradication programmes - official sampling - objective sampling			1		
Other feed material - other plants - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling					
Other feed material - other seeds and fruits - at feed mill - imported - Control and eradication programmes - official and industry sampling - objective sampling					

Table Salmonella in compound feedingstuffs

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Aarhus	S. Adelaide	S. Agona	S. Cubana	S. Eastbourne	S. Enteritidis
Compound feedingstuffs, not specified - at feed mill - environmental sample - Surveillance - HACCP and own checks (compulsory weekly sampling)	SJV	single	not available	8870	36	1	1	1	6	1	
Compound feedingstuffs, not specified - final product - at feed mill - imported - Surveillance - official controls - objective sampling	SJV	single	not available	24	1						
Compound feedingstuffs, not specified - process control - at feed mill - environmental sample - Surveillance - official controls - objective sampling	SJV	single	not available	485	0						
Pet food - dog snacks (pig ears, chewing bones) - at feed mill - imported - Control and eradication programmes - official sampling - objective sampling (Cattle lung)	SJV										

	S. Infantis	S. Livingstone	S. Mbandaka	S. Muenster	S. Oranienburg	S. Reading	S. Senftenberg	S. Tennessee	S. Typhimurium	Salmonella spp., unspecified
Compound feedingstuffs, not specified - at feed mill - environmental sample - Surveillance - HACCP and own checks (compulsory weekly sampling)	2	1	2		1	1	1	1	13	4
Compound feedingstuffs, not specified - final product - at feed mill - imported - Surveillance - official controls - objective sampling				1						
Compound feedingstuffs, not specified - process control - at feed mill - environmental sample - Surveillance - official controls - objective sampling										

Table Salmonella in compound feedingstuffs

	S. Infantis	S. Livingstone	S. Mbandaka	S. Muenster	S. Oranienburg	S. Reading	S. Senftenberg	S. Tennessee	S. Typhimurium	Salmonella spp., unspecified
Pet food - dog snacks (pig ears, chewing bones) - at feed mill - imported - Control and eradication programmes - official sampling - objective sampling (Cattle lung)										

2.1.6 Salmonella serovars and phagetype distribution

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

Table Salmonella serovars in animals

Serovars	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry		Dogs - Clinical investigations		Solipeds, domestic - horses		Wild animals
Sources of isolates	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**
Number of isolates in the laboratory	**4**	**44**		**15**	**12**		**2**					**4**	**6**
Number of isolates serotyped	**4**	**44**	**16**	**15**	**12**	**0**	**2**	**0**	**0**	**6**	**0**	**4**	**6**
Number of isolates per serovar													
S. Agona		1			3								
S. Cubana				1									
S. Dublin	1	15	1	1								1	
S. Duesseldorf		1											
S. Enteritidis		3								1			1
S. Goldcoast			1										
S. Hessarek													

Table Salmonella serovars in animals

Serovars	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry		Dogs - Clinical investigations		Solipeds, domestic - horses		Wild animals
Sources of isolates	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**
Number of isolates in the laboratory	**4**	**44**		**15**	**12**		**2**					**4**	**6**
Number of isolates serotyped	**4**	**44**	**16**	**15**	**12**	**0**	**2**	**0**	**0**	**6**	**0**	**4**	**6**
Number of isolates per serovar													
S. Infantis				2									
S. Kottbus													1
S. Livingstone					1								
S. Montevideo										1			
S. Newport			2	1									
S. Reading		5					1			1		3	
S. Tennessee										1			
S. Thompson			1										
S. Typhimurium	3	18	10	10	7		1			2			4
Salmonella spp.			1										
S. enterica subsp. diarizonae		1			1								
S. Peregrinus													

Table Salmonella serovars in animals

Serovars	Wild animals	Cats		Birds - wild		Sheep	
Sources of isolates	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**
Number of isolates in the laboratory			**51**	**8**			
Number of isolates serotyped	**0**	**0**	**25**	**8**	**0**	**0**	**5**
Number of isolates per serovar							
S. Agona							
S. Cubana							
S. Dublin							
S. Duesseldorf			1				
S. Enteritidis							
S. Goldcoast							
S. Hessarek				1			
S. Infantis							
S. Kottbus							
S. Livingstone							
S. Montevideo							
S. Newport							

Table Salmonella serovars in animals

Serovars	Wild animals	Cats		Birds - wild		Sheep	
Sources of isolates	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**
Number of isolates in the laboratory			**51**	**8**			
Number of isolates serotyped	**0**	**0**	**25**	**8**	**0**	**0**	**5**
Number of isolates per serovar							
S. Reading							1
S. Tennessee							
S. Thompson							
S. Typhimurium			23	3			2
Salmonella spp.				1			
S. enterica subsp. diarizonae			1				2
S. Peregrinus				3			

Footnote:

Only one serotype per herd/flock is counted.
Isolates detected in the control programme performed at slaughterhouses are categorized as monitoring.

Table Salmonella serovars in feed

Serovars	Compound feedingstuffs, not specified - process control		Feed material of marine animal origin		Feed material of land animal origin		Feed material of cereal grain origin		Feed material of oil seed or fruit origin	
Sources of isolates	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**
Number of isolates in the laboratory										
Number of isolates serotyped	**36**	**0**	**1**	**0**	**6**	**0**	**2**	**0**	**21**	**0**
Number of isolates per serovar										
S. Aarhus	1									
S. Adelaide	1									
S. Agona	1						1			
S. Corvallis									1	
S. Cubana	6								2	
S. Ealing					1					
S. Eastbourne	1									
S. Give					2					
S. Infantis	2									
S. Lexington									2	
S. Livingstone	1						1		4	

Table Salmonella serovars in feed

Serovars	Compound feedingstuffs, not specified - process control		Feed material of marine animal origin		Feed material of land animal origin		Feed material of cereal grain origin		Feed material of oil seed or fruit origin	
Sources of isolates	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**
Number of isolates in the laboratory										
Number of isolates serotyped	**36**	**0**	**1**	**0**	**6**	**0**	**2**	**0**	**21**	**0**
Number of isolates per serovar										
S. Mbandaka	2								4	
S. Montevideo					1					
S. Oranienburg	1									
S. Reading	1									
S. Rissen									1	
S. Senftenberg	1				2				6	
S. Tennessee	1									
S. Typhimurium	13									
Salmonella spp.	3									
Salmonella spp., unspecified	1		1						1	

Footnote:

Typhimurium PT 120(n=9),NST(n=3),99 (n=1)

Table Salmonella Enteritidis phagetypes in animals

Phagetype	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry	
Sources of isolates	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**
Number of isolates in the laboratory		**3**						
Number of isolates phagetyped	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
Number of isolates per type								
1		2						

Table Salmonella Typhimurium phagetypes in animals

Phagetype	Sheep		Cats		Birds - wild		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry
Sources of isolates	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**	**Clinical**	**Monitoring**
Number of isolates in the laboratory	**0**	**2**	**0**	**23**			**3**	**18**	**10**	**10**	**7**	**0**	**1**
Number of isolates phagetyped	**0**	**2**	**0**	**10**	**3**	**0**	**3**	**15**	**10**	**10**	**7**	**0**	**1**
Number of isolates per type													
DT 104		1						4	1	1			
DT 120										1			
Not typeable								1		1			
DT 40				7	1				5	2			
DT 41					1			1					
DT 15a											1		
U 277				1				1	3	4			
1		1						1					
DT 151								1					
RDNC				2	1		1	5	1	1	6		1
DT 126							2	1					

Table Salmonella Typhimurium phagetypes in animals

Phagetype	Other poultry	Dogs	
Sources of isolates	**Clinical**	**Monitoring**	**Clinical**
Number of isolates in the laboratory	**0**	**0**	**1**
Number of isolates phagetyped	**0**	**0**	**1**
Number of isolates per type			
DT 104			
DT 120			
Not typeable			
DT 40			
DT 41			
DT 15a			
U 277			
1			
DT 151			
RDNC			1
DT 126			

2.1.7 Antimicrobial resistance in Salmonella isolates

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

Salmonellosis in animals is a notifiable disease in Sweden and one isolate from each notified incident must be confirmed at SVA. Data on antimicrobial resistance presented in the Zoonosis report include one isolate of each serovar, and when appropriate phage-type, from cattle, pigs and poultry in incidents notified 2008 and in incidents previously notified and still under restrictions 2008. Also included are isolates obtained 2008 in the salmonella surveillance programme from samples collected at slaughter (carcass swabs, neck skins and lymph nodes).

Methods used for collecting data

All susceptibility tests are performed at SVA and the results are stored in an appropriate database.

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 ranges 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 SVA. As quality control, Escherichia coli ATCC 25922 was included.

The Dept. of Animal Health and Antimicrobial Strategies at SVA 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

Microbiological cut-off values for resistance recommended by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) and EFSA were used (http://www.escmid.org).

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 30 incidents of Salmonella in cattle 2008, seven incidents involved strains resistant to one or more antimicrobials.
Four incidents involved multiresistant S.Typhimurium.

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 25 incidents of Salmonella in pigs 2008 one incident involved resistant strains. The isolate, S. Typhimurium DT 104, was resistant to ampicillin, chloramphenicol, florfenicol, streptomycin, sulphonamide and tetracycline. In addition the isolate was resistant to fluoroquinolones with MIC to ciprofloxacin and nalidixic acid of 0.5 mg/L and 256 mg/L, respectively. This is the first isolate of S. Typhimurium from Swedish food-producing animals with confirmed resistance to fluoroquinolones. The finding was made on routine abattoir screening for salmonella of lymph nodes from carcasses but salmonella was not re-isolated from live animals on the farm.

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, there have been 157 incidents in pigs, of which 84 involved S. Typhimurium. Of the latter incidents, only seven involved resistant strains and of these, four involved strains resistant to four or more antimicrobials.

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 86 reported incidents since the start of the monitoring programme SVARM year 2000, 45 have involved S. Typhimurium. Of these incidents only two have involved strains resistant to four or more antimicrobials.

Table Antimicrobial susceptibility testing of S. Dublin in Cattle (bovine animals) - in total - Control and eradication programmes - quantitative data [Dilution method]

S. Dublin		Cattle (bovine animals) - in total - Control and eradication programmes																								
Isolates out of a monitoring program (yes/no)		yes																								
Number of isolates available in the laboratory		11																								
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	11	0							4	7													0.25	32
	Kanamycin	16	11	0									6	5											0.5	16
	Streptomycin	32	11	2												6	3	2							2	256
Amphenicols	Chloramphenicol	16	11	0									2	9											2	256
	Florfenicol	16	8	0										8											2	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.5	11	0				8	1	2															0.06	8
Fluoroquinolones	Ciprofloxacin	0.06	11	0			8	3																	0.008	8
	Enrofloxacin		0	0																						
Penicillins	Ampicillin	4	11	0							5	5	1												0.5	64
Quinolones	Nalidixic acid	16	11	0										7	4										2	256
Sulfonamides	Sulfonamide	256	11	0													4	6	1						8	1024
Tetracyclines	Tetracyclin	8	11	0								7	4												0.5	64
Trimethoprim	Trimethoprim	2	11	0							9	2													0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Antimicrobial susceptibility testing of S. Dublin - qualitative data

S. Dublin		Cattle (bovine animals) - in total - Control and eradication programmes	
Isolates out of a monitoring program (yes/no)		yes	
Number of isolates available in the laboratory		11	
Antimicrobials:		N	n
Aminoglycosides	Gentamicin	11	0
	Kanamycin	11	0
	Streptomycin	11	2
Amphenicols	Chloramphenicol	11	0
	Florfenicol	11	0
Cephalosporins	Cefotaxim	11	0
Fluoroquinolones	Ciprofloxacin	11	0
Penicillins	Ampicillin	11	0
Quinolones	Nalidixic acid	11	0
Sulfonamides	Sulfonamide	11	0
Tetracyclines	Tetracyclin	11	0
Trimethoprim	Trimethoprim	11	0

Table Antimicrobial susceptibility testing of S.Enteritidis in animals

S. Enteritidis		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Turkeys		Gallus gallus (fowl) - laying hens		Gallus gallus (fowl) - broilers	
Isolates out of a monitoring program (yes/no)		yes											
Number of isolates available in the laboratory		3											
Antimicrobials:		N	n	N	n	N	n	N	n	N	n	N	n
Aminoglycosides	Gentamicin	3	0										
	Kanamycin	3	0										
	Streptomycin	3	0										
Amphenicols	Chloramphenicol	3	0										
	Florfenicol	3	0										
Cephalosporins	Cefotaxim	3	0										
Fluoroquinolones	Ciprofloxacin	3	1										
Fully sensitive	Fully sensitive	3	2										
Penicillins	Ampicillin	3	0										
Quinolones	Nalidixic acid	3	0										
Resistant to 1 antimicrobial	Resistant to 1 antimicrobial	3	1										
Sulfonamides	Sulfonamide	3	0										
Tetracyclines	Tetracyclin	3	0										
Trimethoprim	Trimethoprim	3	0										

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

S. Typhimurium		Cattle (bovine animals) - in total - Control and eradication programmes																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		18																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	18	0							2	16													0.25	32
	Kanamycin	16	18	0									6	12											0.5	16
	Streptomycin	32	18	4											3	7	4	1	2		1				2	256
Amphenicols	Chloramphenicol	16	18	3									1	14						3					2	256
	Florfenicol	16	18	3									2	13			2	1							2	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.5	18	0				7	11																0.06	8
Fluoroquinolones	Ciprofloxacin	0.06	18	0			13	5																	0.008	8
	Enrofloxacin		0	0																						
Penicillins	Ampicillin	4	18	4								13	1						4						0.5	64
Quinolones	Nalidixic acid	16	18	0										16	2										2	256
Sulfonamides	Sulfonamide	256	18	4														11	3				4		8	1024
Tetracyclines	Tetracyclin	8	18	4								8	6			1	1	1	1						0.5	64
Trimethoprim	Trimethoprim	2	18	0						7	11														0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Antimicrobial susceptibility testing of S. Typhimurium in Gallus gallus (fowl) - in total - Control and eradication programmes - quantitative data [Dilution method]

S. Typhimurium		Gallus gallus (fowl) - in total - Control and eradication programmes																								
Isolates out of a monitoring program (yes/no)		yes																								
Number of isolates available in the laboratory		7																								
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	7	0								7													0.25	32
	Kanamycin	16	7	0										5	1	1									0.5	16
	Streptomycin	32	7	1											1	4	1			1					2	256
Amphenicols	Chloramphenicol	16	7	0										7											2	256
	Florfenicol	16	7	0										7											2	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.5	7	0				1	6																0.06	8
Fluoroquinolones	Ciprofloxacin	0.06	7	0			3	4																	0.008	8
	Enrofloxacin		0	0																						
Penicillins	Ampicillin	4	7	1								6							1						0.5	64
Quinolones	Nalidixic acid	16	7	0										7											2	256
Sulfonamides	Sulfonamide	256	7	1														3	3				1		8	1024
Tetracyclines	Tetracyclin	8	7	0								5	2												0.5	64
Trimethoprim	Trimethoprim	2	7	0						3	4														0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Antimicrobial susceptibility testing of S. Typhimurium in Pigs - in total - Control and eradication programmes - quantitative data [Dilution method]

S. Typhimurium		Pigs - in total - Control and eradication programmes																								
Isolates out of a monitoring program (yes/no)		yes																								
Number of isolates available in the laboratory		16																								
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	16	0							6	10													0.25	32
	Kanamycin	16	16	0									7	9											0.5	16
	Streptomycin	32	15	0										13	2										2	256
Amphenicols	Chloramphenicol	16	16	1									1	14						1					2	256
	Florfenicol	16	16	1										15				1							2	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.5	16	0				1	15																0.06	8
Fluoroquinolones	Ciprofloxacin	0.06	16	1			3	12			1														0.008	8
	Enrofloxacin		0	0																						
Penicillins	Ampicillin	4	16	1								15							1						0.5	64
Quinolones	Nalidixic acid	16	16	1										13	2					1					2	256
Sulfonamides	Sulfonamide	256	16	1														4	10	1			1		8	1024
Tetracyclines	Tetracyclin	8	16	1								4	11			1									0.5	64
Trimethoprim	Trimethoprim	2	16	0						2	14														0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Antimicrobial susceptibility testing of S.Typhimurium in animals

S. Typhimurium		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Turkeys		Gallus gallus (fowl) - laying hens		Gallus gallus (fowl) - broilers	
Isolates out of a monitoring program (yes/no)		yes		yes		yes							
Number of isolates available in the laboratory		18		16		7							
Antimicrobials:		N	n	N	n	N	n	N	n	N	n	N	n
Aminoglycosides	Gentamicin	18	0	16	0	7	0						
	Kanamycin	18	0	16	0	7	0						
	Streptomycin	18	4	16	1	7	1						
Amphenicols	Chloramphenicol	18	3	16	1	1	0						
	Florfenicol	18	3	16	1	7	0						
Cephalosporins	Cefotaxim	18	0	16	0	7	0						
Fluoroquinolones	Ciprofloxacin	18	0	16	1	7	0						
Fully sensitive	Fully sensitive	18	14	16	1	7	5						
Number of multiresistant S. Typhimurium	with penta resistance	18	3	16	1	7	0						
Penicillins	Ampicillin	18	4	16	1	7	1						
Quinolones	Nalidixic acid	18	0	16	1	7	0						
Resistant to 1 antimicrobial	Resistant to 1 antimicrobial	16	0	16	0	7	1						
Resistant to 2 antimicrobials	Resistant to 2 antimicrobials	18	0	16	0	7	1						
Resistant to 3 antimicrobials	Resistant to 3 antimicrobials	18	0	16	0	7	0						
Resistant to 4 antimicrobials	Resistant to 4 antimicrobials	18	1	16	0	7	0						
Resistant to >4 antimicrobials	Resistant to >4 antimicrobials	18	3	16	1	7	0						
Sulfonamides	Sulfonamide	18	4	16	1	7	1						
Tetracyclines	Tetracyclin	18	4	16	1	7	1						
Trimethoprim	Trimethoprim	18	0	16	0	7	1						

Table Antimicrobial susceptibility testing of Salmonella spp. in Gallus gallus (fowl) - in total - Control and eradication programmes - quantitative data [Dilution method]

Salmonella spp.		Gallus gallus (fowl) - in total - Control and eradication programmes																								
Isolates out of a monitoring program (yes/no)		yes																								
Number of isolates available in the laboratory		7																								
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	7	0							2	4	1												0.25	32
	Kanamycin	16	7	0								1	3	3											0.5	16
	Streptomycin	32	7	0												5	2								2	256
Amphenicols	Chloramphenicol	16	7	0									1	3	1	2									2	256
	Florfenicol	16	7	0										3	1	3									2	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.5	7	0					4	3															0.06	8
Fluoroquinolones	Ciprofloxacin	0.06	7	0			3	4																	0.008	8
	Enrofloxacin		0	0																						
Penicillins	Ampicillin	4	7	0							1	4	2												0.5	64
Quinolones	Nalidixic acid	16	7	0										4	3										2	256
Sulfonamides	Sulfonamide	256	7	0													1	4	2						8	1024
Tetracyclines	Tetracyclin	8	7	0								3	4												0.5	64
Trimethoprim	Trimethoprim	2	7	0						2	5														0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Antimicrobial susceptibility testing of Salmonella spp. in Cattle (bovine animals) - in total - Control and eradication programmes - quantitative data [Dilution method]

Salmonella spp.		Cattle (bovine animals) - in total - Control and eradication programmes																								
Isolates out of a monitoring program (yes/no)		yes																								
Number of isolates available in the laboratory		10																								
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	10	0							2	7	1												0.25	32
	Kanamycin	16	10	0									2	8											0.5	16
	Streptomycin	32	10	0										2	1	5	2								2	256
Amphenicols	Chloramphenicol	16	10	0										9	1										2	256
	Florfenicol	16	10	0										9	1										2	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.5	10	0				3	6	1															0.06	8
Fluoroquinolones	Ciprofloxacin	0.06	10	1			4	5	1																0.008	8
	Enrofloxacin		0	0																						
Penicillins	Ampicillin	4	10	0								10													0.5	64
Quinolones	Nalidixic acid	16	10	0									1	9											2	256
Sulfonamides	Sulfonamide	256	10	0														4	6						8	1024
Tetracyclines	Tetracyclin	8	10	0								5	5												0.5	64
Trimethoprim	Trimethoprim	2	10	0						4	6														0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Antimicrobial susceptibility testing of Salmonella in animals

Salmonella spp.		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Turkeys		Gallus gallus (fowl) - laying hens		Gallus gallus (fowl) - broilers	
Isolates out of a monitoring program (yes/no)		yes		yes		yes							
Number of isolates available in the laboratory		10		7		7							
Antimicrobials:		N	n	N	n	N	n	N	n	N	n	N	n
Aminoglycosides	Gentamicin	10	0	7	0	7	0						
	Kanamycin	10	0	7	0	7	0						
	Streptomycin	10	0	7	0	7	0						
Amphenicols	Chloramphenicol	10	0	7	0	7	0						
	Florfenicol	10	0	7	0	7	0						
Cephalosporins	Cefotaxim	10	0	7	0	7	0						
Fluoroquinolones	Ciprofloxacin	10	0	7	0	7	0						
Fully sensitive	Fully sensitive	10	10	7	7	7	7						
Penicillins	Ampicillin	10	0	7	0	7	0						
Quinolones	Nalidixic acid	10	0	7	0	7	0						
Sulfonamides	Sulfonamide	10	0	7	0	7	0						
Tetracyclines	Tetracyclin	10	0	7	0	7	0						
Trimethoprim	Trimethoprim	10	0	7	0	7	0						

Table Antimicrobial susceptibility testing of Salmonella spp. in Pigs - in total - Control and eradication programmes - quantitative data [Dilution method]

Salmonella spp.		Pigs - in total - Control and eradication programmes																								
Isolates out of a monitoring program (yes/no)		yes																								
Number of isolates available in the laboratory		7																								
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	7	0							2	5													0.25	32
	Kanamycin	16	7	0									1	6											0.5	16
	Streptomycin	32	7	0										1	2	3	1								2	256
Amphenicols	Chloramphenicol	16	7	0									1	6											2	256
	Florfenicol	16	7	0									1	6											2	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.5	7	0				2	5																0.06	8
Fluoroquinolones	Ciprofloxacin	0.06	7	0			5	2																	0.008	8
	Enrofloxacin		0	0																						
Penicillins	Ampicillin	4	7	0							1	5	1												0.5	64
Quinolones	Nalidixic acid	16	7	0										7											2	256
Sulfonamides	Sulfonamide	256	7	0										1	2	3	1								8	1024
Tetracyclines	Tetracyclin	8	7	0								4	3												0.5	64
Trimethoprim	Trimethoprim	2	7	0						4	3														0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Breakpoints for antibiotic resistance testing

Test Method Used	
Disc diffusion	○
Agar dilution	○
Broth dilution	◉
E-test	○

Standards used for testing
NCCLS

			Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		Disk content	Breakpoint Zone diameter (mm)		
		Standard for breakpoint	Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Aminoglycosides	**Gentamicin**	EUCAST	2		2	0.25	32				
	Kanamycin	SVARM	16		16	0.5	16				
	Streptomycin	SVARM	32		32	2	256				
Amphenicols	**Chloramphenicol**	EUCAST	16		16	2	256				
	Florfenicol	EUCAST	16		16	2	32				
Cephalosporins	**Cefotaxim**	EUCAST	0.5		0.5	0.06	8				
Fluoroquinolones	**Ciprofloxacin**	EUCAST	0.06		0.06	0.008	8				
Penicillins	**Ampicillin**	EUCAST	4		4	0.5	64				
Quinolones	**Nalidixic acid**	EUCAST	16		16	2	256				
Sulfonamides	**Sulfonamide**	SVARM	256		256	8	1024				
Tetracyclines	**Tetracyclin**	EUCAST	8		8	0.5	64				
Trimethoprim	**Trimethoprim**	EUCAST	2		2	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 voluntary Campylobacter programme was run. During this period the prevalence varied between 9 and 16%. Between July 2001 and Dec 2005, a new and more sampling intensive programme was implemented. In this programme the flock prevalence increased up to 20%.
It is likely that the increase was due changes in sampling strategy and bacteriological analyses. Since 2001 there has been a decreasing trend of positive slaughter groups from 20 to 12%.

From 1995 to 2008, the number of reported domestic cases varied between 1781 and 2839, with the lowest number reported in 2006. Approximately 30 to 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 commonly reported zoonotic infection in Sweden, as in the rest of the EU. As 30 to 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.

During the campylobacter programme 2001-2008, there has been a decreasing trend in number of positive slaughter groups.

There is a marked seasonal variation both in broilers and human cases, although the peak in human campylobacteriosis precedes the peak reported in broilers.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases

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.

Suggestions to the Community for the actions to be taken

One important action is to implement a harmonized monitoring programme in

poultry. The work that has started in this area should proceed. With an increasing trade within the EU, Campylobacter appears to be a Community problem, requiring a Community solution.

2.2.2 Campylobacteriosis in humans

A. Thermophilic Campylobacter in humans

Reporting system in place for the human cases

Surveillance is based on passive case findings.

Case definition

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

Diagnostic/analytical methods used

Cultivation from stool sample and blood.

Notification system in place

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

History of the disease and/or infection in the country

Infection with Campylobacter became notifiable in 1989. From 1995 to 2008, the total number of cases reported have varied between 5119 to 8578, with the highest figure in 2001. During the same time period the number of reported domestic cases varied between 1781 and 2839. Approximately 30-45% of the total number of cases are of domestic origin.

Results of the investigation

In 2008, a total of 7692 cases of campylobacteriosis were reported, which was an increase from 2007.

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

There is a peak of cases (both among domestic cases and cases acquired abroad) during the summer months. Reasons for this are unknown, but it can be speculated that increased outdoor activities play a role. Increased travel also leads to increased number of cases acquired abroad.

Food and water are the most commonly cited sources of infections at the clinical reports.

Relevance as zoonotic disease

A significant part (30-45 %) of the cases of campylobacteriosis are domestic. It is unknown how many of those that are caused by consumption of poultry. It needs to be investigated how effective it would be to implement measures in order to reduce the prevalence of Campylobacter in broilers, and which measure that would be most effective.

2.2.3 Campylobacter in foodstuffs

A. Thermophilic Campylobacter in Broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Industry decides. No reporting to the authorities is requested.

At meat processing plant

See above.

At retail

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

Frequency of the sampling

At slaughterhouse and cutting plant

Other: Infrequent sampling.

At meat processing plant

Other: Infrequent sampling.

At retail

Other: Infrequent sampling.

Type of specimen taken

At slaughterhouse and cutting plant

Other: No information available.

At meat processing plant

Other: No information available.

At retail

Other: Varies, mostly meat products.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

No information available.

At meat processing plant

No information available.

At retail

No information available.

Definition of positive finding

At retail

Campylobacter identified in the sample.

Diagnostic/analytical methods used

At retail

NMKL 119: 2007

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 2008, local health authorities reported 9 samples of fresh poultry meat and poultry meat products taken at retail.
However, no results were reported (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

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

Additional information

19 local authorities have reported altogether 142 Campylobacter samples taken in official control during 2008. Of these 17 were samples of ready-to -eat food (not specified) 93 of vegetables, 9 of poultry meat and products, 9 of red meat and products thereof, 1 of eggs and eggsproducts, 3 of fish and fish products. The remaining samples are not specified. No results are available.

Table Campylobacter in poultry meat

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for thermophilic Campylobacter spp.	C. coli	C. jejuni	C. lari	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Meat from broilers (Gallus gallus) - at retail - Monitoring - official sampling - objective sampling (includes fresh meat and products) [1)]	local	single	25 grams	9						

Comments:

[1)] no results are reported

Table Campylobacter in other food

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for thermophilic Campylobacter spp.	C. coli	C. jejuni	C. lari	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Meat from bovine animals - fresh - at retail - Monitoring - official sampling - objective sampling (includes samples from pork and meat products and minced meat) [1)]	local	single	25grams	9						

Comments:

[1)] results not reported

Footnote:

For information on Campylobacter in other food see text forms Camp in brioler meat under additional information.

2.2.4 Campylobacter in animals

A. Thermophilic Campylobacter in Gallus gallus

Monitoring system

Sampling strategy

The Swedish Campylobacter monitoring programme covers 99% of slaughtered broilers. All flocks in the programme are sampled. The programme includes seven abattoirs, six of them are members of Swedish Poultry Meat Association (SPMA, Svensk Fagel) and one non-member. The programme is financed by the Swedish Board of Agriculture (SJV) and the SPMA.

Frequency of the sampling

At slaughter

Other: ____Every slaughter batch is sampled.

Type of specimen taken

At slaughter

caecum samples

Methods of sampling (description of sampling techniques)

Rearing period

Samples not taken during rearing period.

At slaughter

From every slaughter batch caecum of ten birds is taken and pooled to form one composite sample.

Case definition

At slaughter

A case is defined as a slaughter batch that tested positive for thermophilic Campylobacter in a ceacum sample. The epidemiological unit is the slaughter batch.

Diagnostic/analytical methods used

At slaughter

Bacteriological method: ISO 6579:2002

Vaccination policy

Chicken are not vaccinated against Campylobacter.

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 advice to each producer is also given by the SPMA. The majority of the slaughter companies pay extra for Campylobacter free broilers, as a bonus to encourage efforts to reduce the introduction of Campylobacter into the broiler flocks.

Control program/mechanisms

The control program/strategies in place

In the current monitoring programme of Campylobacter in broilers flocks are sampled at slaughter. The programme is voluntary and financed by the SPMA and the SJV.

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 Salmonella, welfare and classification program.

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 colonization.

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

In 2008, thermophilic Campylobacter was detected in 12,3% of the slaughter batches. A EU-wide baseline survey was performed in 2008. Prevalence in caecal samples in the baseline study was similar to the national Campylobacter programme (12,4%) and the prevalence in carcasses was 13.4%.

In 2008, the 14 holdings which often have problems with Campylobacter were visited in order to find measures to reduce the incidence. These farms had either deficiencies in the biosecurity routines or closely situated livestock holdings or high populations of wild birds in the neighbourhood.

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

Since 2001, the number of Campylobacter positive slaughter batches has decreased from round 20% to 12%. The decreasing trend could be due to increased awareness of the farmer about the importance of hygienic barriers.

The broiler producers can be divided into three groups on the basis of the delivery of Campylobacter positive slaughter batches. Approximately 50% of the producers seldom or sporadically deliver Campylobacter positive slaughter batches whereas 38% of the producers have seasonal problems with the pathogen. The remaining group of producers (12-13%) have been found to often deliver Campylobacter positive slaughter batches. This group accounts for 40% of the Campylobacter load.

Relevance of the findings in animals to findings in foodstuffs and to human cases

Consumption of poultry meat is regarded an important source of domestically acquired Campylobacter infection in humans, even if there are other sources of importance.

Additional information

Table Campylobacter in animals

	Source of information	Sampling unit	Units tested	Total units positive for thermophilic Campylobacter spp.	C. coli	C. jejuni	C. lari	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Gallus gallus (fowl) - broilers - at slaughterhouse - animal sample - caecum - Monitoring - industry sampling ( )	SVA	flock	2398	298		229			69

2.2.5 Antimicrobial resistance in Campylobacter isolates

A. Antimicrobial resistance in Campylobacter jejuni and coli in pigs

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial resistance in Campylobacter from different animal species is regularly monitored in the Swedish Veterinary Antimicrobial Resistance Monitoring Programme, SVARM. In 2008 isoolates from slaughter pigs were tested.

Type of specimen taken

Intestinal content (caecum or colon) from slaughter pigs were sampled at slaughter. Each animal is from a unique herd.

Methods of sampling (description of sampling techniques)

Campylobacter from pigs were cultured from samples of colon content (n=129) collected at abattoirs. Nine geographically separated abattoirs participated in collection of samples. The abattoirs accounted for 92% of the total volume of pigs slaughtered in Sweden 2007. At each abattoir, an equal number of samples were collected during each of four periods (February-March, April-May, August- September and October-November). The number of samples collected at each abattoir was proportional to the annual volume of pigs slaughtered at an abattoir and each sample represents a unique herd.

Procedures for the selection of isolates for antimicrobial testing

All isolates (n=97) obtained from culture of the samples collected were tested for antimicrobial susceptibility.

Laboratory methodology used for identification of the microbial isolates

Campylobacter spp. from pigs were isolated and identified at Dept. of Animal Health and Antibiotic Strategies, SVA. Briefly, samples were cultured directly on Preston selective agar for thermophilic Campylobacter spp. and incubation at 42oC for 48h. 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

See tables.

Breakpoints used in testing

EUCAST epidemiological cut-off values were used.

Results of the investigation

Among Campylobacter spp. resistance to gentamicin did not occur and only one and two isolates were resistant to erythromycin and tetracycline, respectively. Resistance to quinolones (ciprofloxacin and nalidixic acid) or streptomycin was common and occurred in about one third and about half of the isolates respectively. Resistance in an isolate was mostly to a single substance but 18 isolates were resistant to both quinolones and streptomycin and of these one isolate was resistant also to erythromycin. In addition one isolate was resistant to tetracycline and streptomycin. Of the two isolates of C. jejuni one was resistant to quinolones and the other was susceptible to all antimicrobials tested.

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

The results for 2008 tally with previous data from SVARM. No trends are discernable in the period since 1999. Resistance to quinolones is common among Campylobacter spp. from pigs although neither quinolones nor fluoroquinolones are authorised or used for treatment of groups of pigs via feed or water in Sweden. Injectables, i.e. enrofloxacin and danofloxacin, are authorised but the extent of usage in pigs is unknown. These drugs are unlikely to be used in fattening pigs older than 12 weeks but probably to some extent in piglets and sows. Selection for quinolone resistance in Campylobacter therefore probably occurs in younger pigs and/or sows before pigs are moved to the finishing stage. The high prevalence (39%) of quinolone resistance in Campylobacter spp. from piglets <12 weeks old reported in SVARM 2006 supports this hypothesis.

Occurrence of streptomycin resistance in Campylobacter spp. is remarkably high (57%) but since previous data on resistance in Swedish isolates are lacking trends in resistance cannot be evaluated. A high prevalence of streptomycin resistance in C. coli from pigs and cattle is reported also from other countries (EFSA, 2007). No isolate of C. jejuni from Swedish broilers was resistant to streptomycin (see below). Such resistance is reported also in C. jejuni from poultry and cattle although it seems to be much less common than in C. coli from pigs (EFSA, 2007). This could reflect a difference between species of Campylobacter in the ability to acquire resistance determinants. But since C. coli is mostly isolated from pigs and C. jejuni from poultry and cattle, differences in resistance between the two bacterial species could also be due to differences in selection pressure between poultry, pig and cattle populations.

Streptomycin resistance in Campylobacter spp. from Swedish pigs is difficult to explain in the of context selection by use since streptomycin is rarely used in pigs in recent years. Neither is co selection by use of other substance likely

since 65% of the streptomycin resistant isolates were resistant only to this antimicrobial. However, similar aadA2 encoding class 1 integrons, encoding streptomycin/spectinomycin resistance, have been identified in Campylobacter , Escherichia coli and Salmonella (O'Halloran et al., 2004). Accordingly, streptomycin resistance could be a marker for the presence of a transferable resistance element and the issue deserves further study.

B. Antimicrobial resistance in Campylobacter jejuni and coli in poultry

Sampling strategy used in monitoring

Frequency of the sampling

Isolates from broilers are from the 2008 survey on prevalence of Campylobacter in broilers initiated by a decision of the European Commission (2007/516/EC). The protocol of the survey is given in the directive. Briefly, samples of caeca from healthy broilers were collected at slaughter and cultured for Campylobacter. Samples were collected all year.

Type of specimen taken

Ceacal samples were collected at slaughter.

Procedures for the selection of isolates for antimicrobial testing

All isolates obtained (n=38) were tested for antimicrobial susceptibility.

Methods used for collecting data

All samples were cultured at SVA and data stored in a database.

Laboratory methodology used for identification of the microbial isolates

Samples from broilers were isolated at Dept. of Bacteriology, SVA, according to ISO 10272:1, 2006 and ISO 10272:2, 2006.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Gentamicin, streptomycin, nalidixic acid, ciprofloxacin, tetracycline and erythromycin.

Breakpoints used in testing

Epidemiological cut-off values according to EUCAST were used.

Results of the investigation

None of the 38 isolates was resistant to any of the antimicrobials tested.

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

The results tally with previous swedish studies showing that resistance in C jejuni from Swedish broilers is rare.

Table Antimicrobial susceptibility testing of C. jejuni - qualitative data

C. jejuni		Gallus gallus (fowl) - broilers - sampling in the framework of the broiler baseline study - at slaughterhouse - animal sample - caecum - Survey - EU baseline survey	
Isolates out of a monitoring program (yes/no)		yes	
Number of isolates available in the laboratory		38	
Antimicrobials:		N	n
Aminoglycosides	Gentamicin	38	0
	Streptomycin	38	0
Fluoroquinolones	Ciprofloxacin	38	0
Macrolides	Erythromycin	38	0
Quinolones	Nalidixic acid	38	0
Tetracyclines	Tetracyclin	38	0

Table Antimicrobial susceptibility testing of C. jejuni in Gallus gallus (fowl) - at slaughterhouse - animal sample - caecum - Survey - EU baseline survey - quantitative data [Dilution method]

C. jejuni		Gallus gallus (fowl) - at slaughterhouse - animal sample - caecum - Survey - EU baseline survey																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		38																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	*1*	38	0					1	7	29	1													0.12	16
	Streptomycin	*2*	38	0							2	27	9												0.5	64
Fluoroquinolones	Ciprofloxacin	1	38	0				11	24	2	1														0.06	8
Macrolides	Erythromycin	*4*	38	0							34	1	3												0.5	64
Quinolones	Nalidixic acid	*16*	38	0									13	20	4	1									1	64
Tetracyclines	Tetracyclin	2	38	0					37		1														0.12	16

Table Antimicrobial susceptibility testing of Thermophilic Campylobacter spp., unspecified in Pigs - fattening pigs - at slaughterhouse - animal sample - caecum - Monitoring - quantitative data [Dilution method]

Thermophilic Campylobacter spp.,		Pigs - fattening pigs - at slaughterhouse - animal sample - caecum - Monitoring																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		97																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	97	0						2	10	84	1												0.12	16
	Streptomycin	4	97	55								1	4	37	3			18	34						0.5	64
Fluoroquinolones	Ciprofloxacin	1	97	29				5	29	28	6			2	7	20									0.06	8
Macrolides	Erythromycin	16	92	1							12	32	40	6	1				1						0.5	64
Quinolones	Nalidixic acid	32	97	28										23	31	14	1	6	22						1	64
Tetracyclines	Tetracyclin	2	97	2					37	42	11	5				1	1								0.12	16

Table Antimicrobial susceptibility testing of Thermophilic Campylobacter spp., unspecified - qualitative data

Thermophilic Campylobacter spp.,		Pigs - fattening pigs - at slaughterhouse - Monitoring	
Isolates out of a monitoring program (yes/no)		yes	
Number of isolates available in the laboratory		97	
Antimicrobials:		N	n
Aminoglycosides	Gentamicin	97	0
	Streptomycin	97	55
Fluoroquinolones	Ciprofloxacin	97	29
Macrolides	Erythromycin	97	1
Quinolones	Nalidixic acid	97	28
Tetracyclines	Tetracyclin	97	2

Table Breakpoints used for antimicrobial susceptibility testing

Test Method Used	
Disc diffusion	○
Agar dilution	○
Broth dilution	◉
E-test	○

Standards used for testing
NCCLS

			Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		Disk content	Breakpoint Zone diameter (mm)		
		Standard for breakpoint	Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Aminoglycosides	**Gentamicin**	EUCAST	2		2	0.12	16				
	Streptomycin	EUCAST	4		4						
Fluoroquinolones	**Ciprofloxacin**	EUCAST	1		1	0.06	8				
Macrolides	**Erythromycin**	EUCAST	16		16	0.12	64				
Quinolones	**Nalidixic acid**	EUCAST	32		32	1	64				
Tetracyclines	**Tetracyclin**	EUCAST	2		2	0.12	16				

Footnote:

Break-points are for hippurate negative Campylobacter, most likely C. coli. For C. jejuni breakpoint for erythromycin, gentamicin, nalidixic acid and streptomycin are lower than breaklpoint given above.

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

Listeriosis is a notifiable disease under the Communicable Disease Act (both from the laboratory and from the physician).
Between 35 and 67 cases have been reported annually since 1999. The majority of these are immuno-suppressed cases, pregnant women or elderly.

In animals, an increased number of cases was observed in the late 1990s which might be due to increased usage of big bale silage and/or increased number of autopsies (as part of the TSE surveillance). Since then the number of reported cases vary around 35 per year.

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

The number of reported cases seems to be increasing. The highest number of reported cases was 67 in 2001. In 2002-2006 40-48 cases were reported annually. In 2001 56 cases and in 2008 60 were reported. The majority were infected in Sweden. In 2008 60% of the infected cases were men. Most years men have been more often infected Among the infected, 55 % of the cases belonged to the age group above 70 years.

In animals the situation seems to be stable.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases

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

No outbreaks were reported in 2008. The source of transmission remains unknown for most of the cases.

2.3.2 Listeriosis in humans

A. Listeriosis in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Case definition

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

Diagnostic/analytical methods used

Cultivation from blood and cerebral spinal fluid.

Notification system in place

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

History of the disease and/or infection in the country

Around 25-35 cases were previously reported on a yearly basis, most of them from vulnerable groups (immuno-suppressed persons, pregnant women and elderly). The number of cases increased during 2000 (n=53) and peaked in 2001 (n=67).

Results of the investigation

After a peak in the number of reported human cases in 2001 the annual number has decreased and the situation has been stable until last year. In 2008 there was an increase in the number of reported cases, 60 cases were notified and the majority were infected in Sweden. 60 % of the infected were men, which differs from 2006 when the number of female cases dominated. Among the infected, cases in the age group above 70 years were the most common.

Relevance as zoonotic disease

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

2.3.3 Listeria in foodstuffs

A. Listeria spp. in food

Monitoring system

Sampling strategy

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

Frequency of the sampling

At the production plant

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

At retail

Other: According to the local authorities own decisions.

Definition of positive finding

At the production plant

A sample positive for L. monocytogenes

At retail

A sample positive for L. monocytogenes

Diagnostic/analytical methods used

At the production plant

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

At retail

NMKL 136. For diagnosis, an in-house (NFA) 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

For results reported in 2008 see the prevalence tables for food

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.

Table Listeria monocytogenes in milk and dairy products

Footnote:

Local authorities report 2 (SIC) samples from cheese. Type of cheeses not reported, result unknown.
No other samples from milk and dairy products reported 2008.

Table Listeria monocytogenes in other foods

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for L.monocytogenes	Units tested with detection method	Listeria monocytogenes presence in x g	Units tested with enumeration method	> detection limit but <= 100 cfu/g	L. monocytogenes > 100 cfu/g
Crustaceans - unspecified - cooked - at retail - Monitoring - official sampling - objective sampling [1)]	local	single	25 grams	3						
Fish - smoked - at retail - Surveillance - official controls - objective sampling (samples may be smoked fish, gravad fish and raw fish) [2)]	local	single	25 grams	153	21	153				
Meat from bovine animals - fresh - at retail - Monitoring - official sampling - objective sampling (both beef and pork included) [3)]	local	single	25 grams	10	5	10				
Meat from bovine animals - meat products - cooked, ready-to-eat - at retail - Monitoring - official sampling - objective sampling (both beef and pork products included) [4)]	local	single	25 grams	67	0	67				

Comments:

[1)] no resuls reported
[2)] no quantitative results reported
[3)] no quantitative results reported
[4)] no quantitative results reported

Footnote:

Local authorities report 252 samples of vegetables with one sample being positive for listeria (quantity unknown) and 497 samples of ready-to-eat food (unspecified) of which 7 were positive (quantity unknown).

2.3.4 Listeria in animals

A. Listeria spp. in animal - all animals

Monitoring system

Sampling strategy

There is no active surveillance system. Animals are sampled on the basis of 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/or histopathology or, (3) positive immunohistochemistry and histopathology or 4) positive bacteriology. 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 2008, 27 sheep, 8 cattle, 2 goats, 1 horse and 1 dog tested positive for Listeria. The number of tested animals is not reported.

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).

Relevance of the findings in animals to findings in foodstuffs and to human cases

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 in animals

	Source of information	Sampling unit	Units tested	Total units positive for Listeria spp.	L. monocytogenes	Listeria spp., unspecified
Cattle (bovine animals)	SJV	animal		8		
Dogs	SJV/SVA	animal		1	1	
Goats	SJV	animal		2	2	
Sheep	SJV	animal		27	27	
Solipeds, domestic - horses	SJV/SVA	animal		1	1	

Footnote:

The number of animals tested is not available.

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 in cattle are only notifiable when associated with human EHEC.

Between 1997 and 2002 annual prevalence studies of VTEC among cattle at slaughter were conducted. Results showed that the prevalence was around 1%. In the prevalence study 2005/2006 the prevalence was 3.4%. These figures can not be compared as the laboratory methodology had been slightly modified.

Up to 2003, the number of human VTEC O157 infections varied from 80-90, apart from 2002 when 129 cases were reported. This was due to an outbreak of VTEC O157 infection (including 28 cases) in southern Sweden (county of Skane), caused by contaminated locally produced fermented cold-smoked sausages.

In 2004, the Communicable Diseases Act was changed to include all serotypes of VTEC instead of only VTEC O157. This change has caused a great increase in reported cases to a total number of 198.

In 2005 there was an extraordinary peak in the number of EHEC cases (385 ill people in total). The peak was partly due to a large outbreak including 135 cases, caused by contaminated salad.

Of the total cases of human VTEC about 60 % are domestic.

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 specific cluster of VTEC O157, perhaps more pathogenic than others. Furthermore, most of the VTEC positive farms are located in the same area. Domestically produced food has been the source of infection in two larger outbreaks (see above). It cannot be excluded that outbreaks caused by domestic produced foods may occur in the future.

In 2005 there was an overall increase of human cases with EHEC. One explanation to this is the change in the legislation in 2004, to include all the serotypes. There was also a large outbreak involving 135 cases.

In 2008 the number of reported cases was higher than in 2006 and 2007 (304) but is explained by the higher percentage of cases infected abroad than in the previous years.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases

In case of human infection, trace back investigation is performed. If the infection is traced back to a farm with animals, special recommendations are given, for example about improved hygiene. The majority of human cases of sporadic EHEC O157 infection are reported from the area with the highest herd prevalence of VTEC O157, that is the western part of Sweden.

Recent actions taken to control the zoonoses

In 2006, a commission to perform a risk profile of VTEC in humans, food and animals was given to a number of national authorities by the Ministry of Agriculture.

In 2007 the national recommendations were renewed.

2.4.2 E. coli infections in humans

A. Verotoxigenic Escherichia coli infections in humans

Reporting system in place for the human cases

Surveillance is based on passive case findings.

Case definition

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

Diagnostic/analytical methods used

Cultivation and nucleic acid amplification. PFGE.

Notification system in place

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

History of the disease and/or infection in the country

In late 1995 and early 1996, there was an outbreak of EHEC O157 (VTEC O157) including approximately 120 cases. The outbreak increased the awareness of EHEC O157 and after this event most people with haemorrhagic diarrhoea are investigated for EHEC O157.

Between 1998 and 2001, the number of human cases varied between 78 and 95.

In 2002, physicians and laboratories reported 129 cases. This sudden increase in number of cases was caused by two outbreaks caused by water (n=11) and contaminated cold-smoked sausage (n=28), respectively. In 2003 the number of cases was lower again (n=72).

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 198.

In 2005 there was an extraordinary peak in the number of EHEC cases (385 ill people in total). The peak was partly due to a large outbreak including 135 cases, which was caused by contaminated lettuce.

In 2006, 2007 and 2008 there were mostly sporadic cases and no outbreaks and the number of cases are therefore lower.

Results of the investigation

In 2008 304 EHEC cases were reported, of which 48 % had acquired their infection in Sweden. The number of cases was about the same as previous year but the proportion of foreign cases has increased.
Like previous years, most domestic cases were reported from the south-western parts of the country. Children in the agegroup 0-9 years were most representated with 37 % of those cases and 59 % were women.
A majority of the domestic cases were reported during the summer months but many were also reported during autumn and early winter.
The serotype O157:H7 was dominating among the domestic cases. About half of those shared the same PFGE pattern.

During 2008 mainly sporadic and family outbreak related cases were reported. In 2008 two sporadic cases (O157 and SF O157) in children led to death.

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

Please see "Results of the investigation" for trends.

During 2008 there were manly sporadic cases and no major outbreaks and the source of infection therefore remains unknown in most cases.
For the few cases where the sources were known or suspected, they were mainly food related such as unpasteurised milk from farms that later were found to be contaminated or for example minced meat that was not properly cooked. Secondary cases within the same family were common.

Relevance as zoonotic disease

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

2.4.3 Escherichia coli, pathogenic in foodstuffs

Table VT E. coli in food

Footnote:

the reports on VTEC from local authorities is very unreliable. Most of reported analyses are actually pres. E. coli and not VTECs. It is at present not feasable to go back to the local authorities to sort out the samples that are VTECs but the laboratories confirm that they are very few.

2.4.4 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 Officer in a Swedish county suspects that a human VTEC infection has been acquired after a contact with a farm, the County Veterinary Officer will be informed, and state a request to the Swedish Board of Agriculture for sampling animals on the relevant farm. Sampling is targeted mainly against young stock, as they are more prone to shed the bacteria, and performed by a veterinarian.

PREVALENCE STUDIES:
Prevalence studies will be conducted in approximately every 3rd year. The last study was conducted 2005/06. In these surveys, around 2000 faecal samples are collected randomly throughout the year from cattle at the slaughterhouses for bacteriological investigation of VTEC O157. Samples are collected by veterinarians.

Frequency of the sampling

Animals at farm

Other: Trace back of human VTEC infection.

Animals at slaughter (herd based approach)

Other: study (animal based): 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: study (animal based): faeces, ear samples; trace back: carcass swabs

Methods of sampling (description of sampling techniques)

Animals at farm

TRACE BACK OF HUMAN INFECTION: Up to 100 individual faecal samples per farm are collected. Mainly young animals are sampled. Most samples are analysed as pooled samples with up to five individual samples pooled to one consisting of 25 g. For individual faecal samples, approximately 30 g of faeces is collected.

Animals at slaughter (herd based approach)

TRACE BACK OF HUMAN INFECTION: A total of 30x20-25 cm or a total of approximately 700cm2 area of the carcass is swabbed.
SINGLE STUDY (ANIMAL BASED APPROACH):
After slaughter 30 g of faeces were collected from the rectum with disposable plastic gloves and placed in plastic cups. Also, the outer 1/3 of the ear was removed after slaughter. Samples collected in the study were analysed individually.

Case definition

Animals at farm

A case is defined as an animal from which the investigated VTEC serotype 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 the VTEC serotype investigated for.

Diagnostic/analytical methods used

Animals at farm

Other: NMKL No 164:2005 2nd ed

Animals at slaughter (herd based approach)

Other: NMKL No 164:2005 2nd ed

Vaccination policy

Vaccination is not used.

Other preventive measures than vaccination in place

The guidelines established in 1997 were revised in 2008. They give recommendations on how to minimize spread of VTEC to other animals, neighboring farms and to people (especially children). In 2008, 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. In 2008 a recommendation was given on setting up a control programme for VTEC.

Control program/mechanisms

The control program/strategies in place

A control program for VTEC O157 is being planned.

Recent actions taken to control the zoonoses

In 2006, a risk profile for VTEC was made by the National Food Administration (SLV), Board of Agriculture (SJV), National Veterinary Institute (SVA), Institute of Infectious Disease Control (SMI), Board of Health and Welfare (SoS) and the Swedish Environmental Protection Agency (NV).
A baseline study was performed sept 2006- sept 2007. 753 cattle carcasses were swabbed before chilling after evisceration. 2 % of the samples were positive for VTEC (VT1 and/or VT2 and eae or saa).
The results are much in line with earlier prevalence studies in sweden.

Suggestions to the Community for the actions to be taken

Harmonisation of monitoring programs for VTEC prevalence in cattle within the EU.

Measures in case of the positive findings or single cases

The guidelines include recommendations on how to handle VTEC in cattle when associated with human VTEC infection. 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

Fifteen cattle farms were sampled for VTEC in trace back of human infection. On five of these farms, VTEC O157 indistinguishable with the human isolates was detected.

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. A large proportion of human VTEC O157 cases are reported from the western part of Sweden (county of Halland). It has also been shown that a large proportion of VTEC O157 positive farms are in the same area. It seems to be a special cluster of VTEC O157 in this region, perhaps more pathogenic than others.

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

Direct or indirect contact with cattle is an important source of human infection. Another important source is consumption of contaminated foods, for example unpasteurised milk. Two outbreaks caused by domestic food have been recorded: 1) 28 cases were reported in 2002. The source of infection was locally produced sausage. 2) In 2005 an outbreak including 135 cases was reported. The cource of infection was locally produced salad that had been irrigated by contaminated water from a nearby canal. Both outbreaks were reported from areas where VTEC O157 is prevalent in cattle farms.

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.

From 1996-2007, one to ten farms have been investigated annually as suspected sources of human infection. Of those, 1-4 farms per year have been confirmed as sources of infection (in total 38 herds). VTEC O157 have been detected on all farms but four (VTEC O8, O26, O121 and O103). One of the herd was a goat herd and two had sheep.

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 334-968 carcass swabs at the slaughterhouses. Sporadic positive samples were found during four years.

Another study has showed that 9% of the dairy herds in Sweden were positive for VTEC O157, of these, 23% were situated in the Western part of Sweden (the county of Halland).

Between 1997 and 2002, prevalence studies for VTEC O157 in cattle have been conduceted at slaughterhouse level. The results showed an overall individual prevelance of 0.3-1.7%. The highest prevalence (5.3%) was recorded in calves 7-9 months of age, followed by young stock 12-18 months of age (1.6%) and adult cattle (0.7%). As results did not change much throughout between the years additional prevalence studies will be performed approx every 3rd year. The last study was conducted 2005/06.

Table VT E. coli in animals

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Verotoxigenic E. coli (VTEC)	Verotoxigenic E. coli (VTEC)-VTEC O157	Verotoxigenic E. coli (VTEC)-VTEC non-O157	Verotoxigenic E. coli (VTEC)-VTEC, unspecified
Cattle (bovine animals) - - faeces (suspect sampling)	SVA	herd		15	7	7		
Sheep - - faeces - Survey - national survey		animal		492	9	9		
Sheep - at slaughterhouse - animal sample - Survey - national survey (Ear samples)		animal		105	2	2		

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. Until 1978, sporadic cases occurred in cattle. Compulsory tuberculin testing of all cattle was abolished in 1970 and the national bovine TB control in cattle was 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. The rpogramme is near finalisation and the vast majority of all deer herds are officially free.

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 2005, M. tuberculosis was diagnosed in elephants and giraffes at a zoo in eastern part of Sweden, and in one elephant at a zoo in the western 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 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 zoo animals is small, but cannot be ruled out as elephants, and other relevant animals at zoos, might carry subclinical infection.

2.5.2 Tuberculosis, mycobacterial diseases in humans

A. Tuberculosis due to Mycobacterium bovis in humans

Reporting system in place for the human cases

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

Case definition

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

Diagnostic/analytical methods used

The diagnostic methods used are cultivation and isolation of M. bovis in clinical specimen in addition to possible direct detection of nucleic acid. Further verification is however needed by means of different molecular genetic techniques.

Notification system in place

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

Results of the investigation

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

Relevance as zoonotic disease

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

2.5.3 Mycobacterium in animals

A. Mycobacterium bovis in bovine animals

Status as officially free of bovine tuberculosis during the reporting year

The entire country free

Sweden was declared free from bovine tuberculosis in 1958. When Sweden joined the EU in 1995, the status of Officially Tuberculosis Free (OTF) was obtained (former Decision 95/63/EC, Commission Decision 03/046/EG, as last amended by 04/230/EG. Sweden fulfils the requirements for control measures in OTF member states (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 (Council Directive 64/432/EEC). Sampling is also performed in case of clinical suspicion.

Frequency of the sampling

All cattle are 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 are investigated by histology and direct smears. If TB cannot be ruled out by these methods, culture is performed. For culture, lymph nodes are pooled (including at least two lymph nodes from each region) whereas organs with pathological lesions are cultured separately. Culture is performed
according to the method SVA 4120 and SVA 4122. 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, 5 cattle were investigated for M. bovis in 2007. The reason for investigation was that TB could not be ruled out at slaughter inspection.
Culture was performed in one animal.

Relevance of the findings in animals to findings in foodstuffs and to human cases

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 M. bovis in 2008. For example, 46 pigs were investigated, following suspicion at meat inspection. After histological investigation and direct smears 34 were cultured. All were negative. Other animal species tested are shown in Table Tuberculosis in other animals.

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 or whole herd slaughter are performed in all herds to obtain free status and any herd found positive for TB is depopulated. Furthermore, all deer are inspected at slaughter. All animals >1 year that are found dead or euthanized are subjected to autopsy. Sampling is also performed in case of clinical suspicion.

Frequency of the sampling

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

SAMPLING IN THE CONROL PROGRAMME
In brief, a herd obtains Bovine TBfree status (Astatus) after three consecutive whole herd tuberculin tests of all deer older than one year, with negative results. Only herds with Astatus may sell live deer and to maintain the A status all female deer have to be tested after three years without reactors. Bovine TB free status can also be obtained by slaughter of the whole herd and repopulation with deer from TB free herds (A status). Herds declared free after whole herd slaughter obtain Bstatus

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. Lymph nodes 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 necropsy/ meat inspection are investigated by histology and direct smears. The results from these tests determine if culture is performed. Culture is performed according to the method SVA 4120 and SVA 4122, on solid media (Lowenstein Jensen,Stonebrink and modified Middlebrook). 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, reculture 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

The official TB control programme in farmed deer is compulsory for all herds.

Recent actions taken to control the zoonoses

The control programme has changed so that herds having tested negative four times do not need to continue testing. However, it is still required to identify all animals >1 year of age with ear tags and inspect all slaughtered, euthanised or dead deer for TB. The last herds that were not declared free were slaughtered in 2008.

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. tuberculosiscomplex, is notifiable in all animal species on the basis of suspicion (for ex clinicalor post mortem suspicion).

Results of the investigation

All deer herds in Sweden except one (where some other animal species are still present on the holding after slaughter of the deer) have undergone actions to declare freedom. However, 4 herds are still exempted from testing and will

continue yearly slaughter inspections of 20% of the animals for a total of 15 years until declared free.
In the control programme, tuberculin tests were performed on 259 animals from 9 herds. One herd was tested twice. 16 deer were investigated by histology and direct smears after suspicion at meat inspection. All samples were negative. Har inte dessa siffror, sorry, kola m BKT o SvDHV/Sanna

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

As the control programme is very close to being finalized, the situation remains favourable.

Relevance of the findings in animals to findings in foodstuffs and to human cases

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

Additional information

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.

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. Also tracheal and trunk samples may be taken.

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 necessary, tracheal 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 TBcomplex 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 SVA 4120, on solid media (Lowenstein Jensen,Stonebrink and modified Middlebrook). Cultures are read once/week for eight weeks and microscopy of suspected colonies is performed. If deemed necessary, reculture is carried out at four weeks. If growth of acidfast 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, trunkor 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. Tuberculin testing is also performed on some ungulates.

Control program/mechanisms

The control program/strategies in place

There is no specific control programme for Zoo animals.

Suggestions to the Community for the actions to be taken

To make all findings of mycobacteria in the M. tuberculosis complex compulsory notifiable in all animal species.

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 TBcomplex is notifiable in all animal species on the basis of clinical suspicion.

Results of the investigation

No case of Tb was detected in zoo animals in 2008.

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

The Zoo animals that were positive for M. tuberculosis in previous years 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. The risk for Zoo visitors to become infected is regarded as very small due to the low level of 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. An epidemiological link was found between the two Zoos, and subtyping of the bacterial isolates confirmed this link.
In 2005, one giraffe from a Zoo at the eastern part of Sweden was culture positive for M. Tuberculosis.

Table Tuberculosis in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Mycobacterium spp.	M. bovis	M. tuberculosis	Mycobacterium spp., unspecified
Cats	SJV & SVA	animal	1	0			
Dogs	SJV & SVA	animal	1	0			
Pigs	SJV & SVA	animal	46	0			
Sheep	SJV & SVA	animal	4	0			
Solipeds, domestic - horses	SJV & SVA	animal	1	0			

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

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	23878	1559725	23878	100	0	0				3	0
Total	23878	1559725	23878	100.0	0	0.0	0	0	0	3	0
Total - 1											

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	632	19927	613	96.99	19	3.01				5	0
Total	632	19927	613	96.99	19	3.01	0	0	0	5	0

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, no case of brucellosis has been diagnosed in any other animal species. Sweden was declared officially brucellosis free (OBF) in goats and sheep (OBmF) 1994, in cattle 1995 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 executed in the cattle-, sheep- and goat populations as well as from extensive testing performed in pigs. Since the start of the surveillance (mid 1990s), no positive sample has been detected.

There are usually a few yearly clinical suspicions of brucella infection in animals, mainly presenting as abortions or genital infections, all of which have so far been negative on further serological and/or bacteriological analyses. The situation regarding human cases remains stable.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases

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

2.6.2 Brucellosis in humans

A. Brucellosis in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Case definition

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

Diagnostic/analytical methods used

Cultivation from blood and bonemarrow.

Notification system in place

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

History of the disease and/or infection in the country

From the 1st of July 2004 brucellosis is a notifiable disease and before that the figures were based on voluntary laboratory reports.
During the last 10 years, up to eleven cases have been reported annually. None of these were suspected to be of domestic origin.

Results of the investigation

Eight cases were reported in 2007, all infected abroad.

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

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

Relevance as zoonotic disease

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

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 1994, Decision 2003/467/EC last amended by Decision 2005/764/EC (originally in Act of Accession of Austria, Finland and Sweden and in former Decisions 94/972/EC and 94/74/EC). Current surveillance standards for bovine brucellosis are given in the EU legislation, Directive 64/432/EEC.

Monitoring system

Sampling strategy

The surveillance for Brucella abortus is multi layered;

- Passive surveillance via a control program including bulk milk samples from dairy herds and serum samples from beef cattle
- Active surveillance via post mortem examination and culture of aborted foetuses
- Additional serological testing of cattle prior to import and export and at breeding centers
- Investigation of herds with clinical symptoms or suspicions

Frequency of the sampling

During 2008, serum samples from 1 000 beef cattle from 774 different herds and bulk tank milk samples from 2022 dairy herds were analyzed. Bulk milk samples are collected bi-annually and serum samples from beef cattle are obtained at slaughter. The control program is coordinated with the control programs for Bovine virus diarrhea (BVD) and enzootic bovine leucosis (EBL) organized by the Swedish Dairy Association. Samples for Brucella abortus were obtained from the larger pool of samples retrieved in the other control programs by convenience sampling (in other words not strictly random), evenly distributed throughout the sampling period.

Moreover, in 2008 15 foetuses were examined within the active surveillance, 317 animals were tested at breeding centers, 38 for import or export reasons and

three herds were investigated due to clinical suspicion.

Type of specimen taken

Serum- and bulk milk samples for serology and organ samples for cultures.

Methods of sampling (description of sampling techniques)

From dairy cattle bulk milk samples are collected. For herds with more than 50 cows the milk is pooled in groups of maximum 50 cows. From beef cattle older than two years serum samples are collected at slaughter. Each sample contains at least 0.5 ml sera. If applicable, organ samples for culture are collected at post mortem examination. Clinical suspicions are investigated with examinations and relevant sampling in the herd.

Case definition

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

Diagnostic/analytical methods used

The diagnostic test used for analyzing serum- and milk samples is an indirect ELISA. For confirmation the complement fixation test, and sometimes the tube agglutination test, is used. If relevant material is available (e.g. aborted foetuses), culture is performed.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

If brucellosis was 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

One serum sample from the surveillance program tested positive for the presence of antibodies, but tested negative with the complement fixation test and a buffered antigen test (Rose Bengal). At the time of running the tests the individual cow was already slaughtered. The herd of origin had not, nor had had, any individuals with clinical signs indicative of Brucella infection. Serum samples were collected from ten percent of the cows within the herd and none of these tested positive. The positive test result was interpreted as false positive.

All other samples tested, including cultures from 15 aborted fetuses, serum samples from 317 breeding animals and 38 animals for import/export as well as samples from three herds investigated due to clinical symptoms, were negative. In summary no herd or any individual animal was diagnosed with Brucella abortus infection during 2008.

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 any other animal species.

Relevance of the findings in animals to findings in foodstuffs and to human cases

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.

In addition several other animal species have been tested, mainly before breeding or at import/export, (see table "Brucellosis in other animals") with no positive results.

B. Brucella melitensis in sheep

Status as officially free of ovine brucellosis during the reporting year

The entire country free

Brucellosis has never been diagnosed in Swedish sheep or goats. Sweden is declared officially brucellosis free in goats and sheep (OBmF) since 1994 (94/972/EC). Current surveillance standards are given in EU legislation, Directive 91/68/EEC.

Monitoring system

Sampling strategy

Surveillance for brucellosis in sheep and goats is based on serological surveys according to EU-legislation Directive 91/68/EEC. The samples from the sheep are collected within the control program for Maedi-Visna. The numbers of sheep sampled each year represent approximately 5% of the sheep population. Besides, animals are tested before export or import and all clinically suspected cases are investigated and tested.

Frequency of the sampling

Serological sampling is done annually, in 2008 12100 serum samples from 888 sheep flocks were analyzed for Brucella melitensis. An additional six sheep were tested due to import or export. In case of clinical suspicions herds are investigated and tested, no such cases took place in 2008.

Frequency of the sampling

Serological sampling is done annually, in 2008 12100 serum samples from 888 sheep flocks were analyzed for Brucella melitensis. An additional six sheep were tested due to import or export. In case of clinical suspicions herds are investigated and tested, no such cases took place in 2008.

Type of specimen taken

Blood samples for serology and organ samples for culture.

Methods of sampling (description of sampling techniques)

Serum is collected from the jugular vein of live sheep. The serum samples size is at least 0.5 ml sera. If applicable, organ samples for culture are collected at post mortem examination.

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

A buffered antigen test (Rose Bengal) was used and confirmation was done by a complement fixation test.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

If brucellosis was 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

Within the control program two samples from two different sheep herds were found positive when tested for the presence of antibodies. Both herds were further investigated, no signs indicating Brucella infection were found and additional serum samples were taken from several animals in both herds. All these subsequent samples tested negative. The positive test results were interpreted as false positives. All other animals tested for Brucella melitensis in 2008 including 12100 sheep within the control program and six sheep tested at export/import were negative. In summary no herd or individual animal was diagnosed with Brucella melitensis. infection during 2008.

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

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

Relevance of the findings in animals to findings in foodstuffs and to human cases

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 goats

Status as officially free of caprine brucellosis during the reporting year

The entire country free

Brucellosis has never been diagnosed in Swedish sheep or goats. Sweden is declared officially brucellosis free in goats and sheep (OBmF) since 1994 (94/972/EC). Current surveillance standards are given in EU legislation, Directive 91/68/EEC.

Monitoring system

Sampling strategy

Surveillance for brucellosis in sheep and goats is based on serological surveys according to EU-legislation Directive 91/68/EEC. Serum samples from goats are collected within the control program for Caprine Arthrit Encephalitis (CAE). Furthermore, animals are tested before export or import and all clinically suspected cases are investigated and tested.

Frequency of the sampling

Serological sampling is done annually, in 2008 116 serum samples from 15 goat flocks were analyzed for Brucella melitensis. An additional six goats were tested due to import or export. In case of clinical suspicions herds are investigated and tested, no such cases took place in 2008.

Type of specimen taken

Blood samples for serology and organ samples for culture.

Methods of sampling (description of sampling techniques)

Serum is collected from the jugular vein of live goats. The serum samples size is at least 0.5 ml sera. If applicable, organ samples for culture are collected at post mortem examination.

Case definition

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

Diagnostic/analytical methods used

The buffered antigen test (Rose Bengal), and for confirmation a complement fixation test, is used.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

If brucellosis was 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

All samples tested, including 116 serum samples from goats within the control program and six sheep tested at export/import, were negative when analysed for antibodies against Brucella melitensis. In summary no herd or any individual animal was diagnosed with Brucella abortus infection during 2008.

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

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

Relevance of the findings in animals to findings in foodstuffs and to human cases

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.

D. Brucella spp. in animal - Pigs

Monitoring system

Sampling strategy

Sweden has a very stable epidemiological situation for brucellosis in pigs with no cases ever detected in the species despite frequent sampling, and no cases in any other species since 1957 (last case of bovine brucellosis). In order to monitor the situation, active as well as passive surveillance is carried out. Passive surveillance for Brucella suis has been carried out yearly since 1995 with approximately 3000 serum samples collected in coordination with the control program for Aujeszky's disease (AD). This passive surveillance was not executed in 2008. During 2008 an enhanced active surveillance was performed by means of post mortem examination and culture of aborted foetuses, and in addition pigs were tested at breeding stations and in connection with import/export. Furthermore all clinically suspected cases are investigated and tested.

Frequency of the sampling

In 2008 37 aborted foetuses from 22 litters were examined at post mortem and cultured, moreover 2142 pigs were tested at breeding centers, 64 after import and 16 before export.

Type of specimen taken

Blood samples for serology and organ samples for culture.

Methods of sampling (description of sampling techniques)

Serum is collected from the jugular vein of live pigs. The serum samples size is at least 0.5 ml sera. If applicable, organ samples for culture are collected at post mortem examination.

Case definition

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

All samples tested, including cultures from 37 aborted fetuses, serum samples from 2146 breeding animals, 64 animals for import and 16 animals for export, were negative. In summary no herd or animal tested positive for Brucella suis in 2008.

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

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

Relevance of the findings in animals to findings in foodstuffs and to human cases

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

From 1995 to 2007, Brucella suis has been screened for in approximately 3000 serum samples every year. Out of all these samples, none have been confirmed positive.

Table Brucellosis in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Brucella spp.	B. abortus	B. melitensis	B. suis	Brucella spp., unspecified
Alpacas	SVA	animal	42	0				
Dogs - Clinical investigations	SVA	animal	142					
Moose [1)]	SVA	animal	3	0				
Pigs [2)]	SVA	animal	2259	0				
Reindeers - semi-domesticated	SVA	animal	301	0				
Solipeds, domestic - horses	SVA	animal	1	0				
Wild boars - Control and eradication programmes	SVA	animal	333	0				
Zoo animals, all	SVA	animal	24	0				

Comments:

[1)] import or export

[2)] control program, clinical suspicions, export and import control, breeding animals

Footnote:

Zoo animals included 11 camels, 6 zebras, 5 antilopes and 2 viscents.

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			Information about			Epidemiological investigation					
	Herds	Animals	Number of herds	%	Number of herds	%	Number of bovine herds tested	Number of animals tested	Number of infected herds	Number of bovine herds tested	Number of animals or pools tested	Number of infected herds	Number of notified abortions whatever cause	Number of isolations of Brucella infection	Number of abortions due to Brucella abortus	Number of animals tested with serological blood tests	Number of suspended herds	Number of positive animals		Number of animals examined microbiologically	Number of animals positive microbiologically
																		Sero logically	BST		
SVERIGE	23878	1559725	23878	100	0	0		1000			2022					377		0			
Total	23878	1559725	23878	100.0	0	0.0	0	1000	0	0	2022	0	0	0	0	377	0	0	0	0	0
Total - 1																					

Footnote:

Note that numbers of animals and herds are from 2007.
In addition, 317 breeding animals were tested at breeding centers.

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

Region	Total number of existing		Officially free herds		Infected herds		Surveillance			Investigations of suspect cases				
	Herds	Animals	Number of herds	%	Number of herds	%	Number of herds tested	Number of animals tested	Number of infected herds	Number of animals tested with serological blood tests	Number of animals positive serologically	Number of animals examined microbio logically	Number of animals positive microbio logically	Number of suspended herds
SVERIGE	8014	508921	8014	100	0	0		12227						
Total	8014	508921	8014	100.0	0	0.0	0	12227	0	0	0	0	0	0
Total - 1														

Footnote:

Note that numbers of animals and number of herds are from 2007 and include only sheep.
Breeding animals and animals tested at import/export are not present here as they were not sampled as "investigation of suspected cases".

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 occurrence 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 550-800 cases per year have been reported.

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

Approximately 70% of human yersinia infections are of domestic origin. Of these, children below the age of six years predominate.
In 2005, for the first time in many years, less cases were reported than during the year before. In 2006 the trend was still pointing downwards and in 2007 the number of cases was stable.
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 pigs are common asymptomatic carriers of Yersinia it can be expected that meat from pigs is one of the sources of human infection.

Recent actions taken to control the zoonoses

2.7.2 Yersiniosis in humans

A. Yersinosis in humans

Reporting system in place for the human cases

Surveillance is based on passive case findings.

Case definition

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

Diagnostic/analytical methods used

Cultivation, serotyping and serology (antibody detection).

Notification system in place

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

History of the disease and/or infection in the country

Prior to 1996, yersiniosis was only reported from laboratories. In the beginning of the 1990â€™s, more than 1000 cases were reported. Until the turn of the century there was a steady decrease that probably was due to improved hygienic technique during slaughter of swine and/or less sampling for Yersinia spp. in patients. However, from 2002 there was an increase in the number of cases. In 2005 the trend was pointing downwards again and this decrease continued in 2006 and the number was stable in 2007.

Results of the investigation

During 2006 the trend of yersiniosis cases was pointing downwards for the second year in a row and the number of cases was stable during 2007. In domestically acquired cases there was as light increase of 7 %. During the months July-August more cases were reported than during the other 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.

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

According to the reports from the physicians, 30 % of the cases suspected food or water being the source of infection.

Relevance as zoonotic disease

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

2.7.3 Yersinia in foodstuffs

A. Yersinia spp. in food

Monitoring system

Sampling strategy

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

Diagnostic/analytical methods used

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

Measures in case of the positive findings or single cases

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

Results of the investigation

In 2007 the local authorities reported altogether 122 samples of various foods analysed for Yersinia in various categories of foods. No positive samples were reported. In 2008 only one sample was reported from the local authorities. This sample was negative

Sept2006-Sept 2007 a study of cattle carcasses was performed . 753 carcasses were swabbed and analysed.Of these 5% were positive for Y.enterocolitica when using realtime-PCR but no positive samples could be found by culture.

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

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 in food

Footnote:

Only one sample (pig meat) was reported from the local authorities in 2008.

2.7.4 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. Sporadic cases have been reported in sylvatic or farmed wild boars and other wild life.

The last domestic outbreak with human cases occurred in 1969.
Since the beginning of the 1990´s three sporadic cases have been reported, in 1997, in 2004 and in 2007. The two last cases had consumed cold smoked pork abroad or imported cold smoked pork sausage.

The Directive 2075/2005 has been implemented in Sweden, with the exception of trichinella free holdings/areas.

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

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, such as freezing, are necessary.

2.8.2 Trichinellosis in humans

A. Trichinellosis in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Notification system in place

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

Description of the positive cases detected during the reporting year

No cases were reported during 2008.

2.8.3 Trichinella in animals

A. Trichinella in pigs

Number of officially recognised Trichinella-free holdings

Sweden has not implemented a system of trichinella free holdings.

Monitoring system

Sampling strategy

General

Sweden has not implemented a system of trichinella free holdings, or defined regions with negligible Trichinella risk.
All domestic pigs are routinely monitored for Trichinella at slaughter according to Directive 2075/2005.

Frequency of the sampling

General

Every slaughtered pig is sampled.

Type of specimen taken

General

Diaphragm muscle.

Methods of sampling (description of sampling techniques)

General

Methods used are in accordance to Commission Regulation 2075/2005.

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 (magnetic stirrer method as detailed in Annex 1 to 2075/2005).

Measures in case of the positive findings or single cases

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

Notification system in place

Trichinosis is compulsory notifiable in animals.

Results of the investigation including description of the positive cases and the

All slaughtered pigs were negative for Trichinella spp.

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

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

Relevance of the findings in animals to findings in foodstuffs and to human cases

The risk of obtaining domestic trichinosis from farmed pigs is negligble.

Additional information

In 2007, 1 wolf, 2 wild boars and 7 lynxes were positive for Trichinella.

B. Trichinella in horses

Monitoring system

Sampling strategy

All horses are controlled for Trichinella at slaughter according to Directive 2075/2005/EU.

Frequency of the sampling

Every slaughtered horse (soliped) is sampled.

Type of specimen taken

Samples from the masseter or tongue are analysed.

Methods of sampling (description of sampling techniques)

Methods used are in accordance with EU Directive 2075/2005.

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 (magnetic stirrer method as detailed in Annex 1 to 2075/2005).

Results of the investigation including the origin of the positive animals

All slaughtered horses 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 notifiable under the Communicable Diseases Act.

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

Trichinosis in horses sent for slaughter has never been reported in Sweden.

Relevance of the findings in animals to findings in foodstuffs and to human cases

The risk of obtaining trichinosis from horses slaughtered in Sweden is negligble.

Table Trichinella in animals

	Source of information	Sampling unit	Units tested	Total units positive for Trichinella spp.	T. spiralis	T. britovi	T. nativa	Trichinella spp., unspecified
Badgers - wild	SVA	animal	4	0				
Bears	SVA	animal	167	0				
Birds - wild	SVA	animal	11	0				
Foxes	SVA	animal	347	1				1
Foxes - wild - artic fox	SVA	animal	1	0				
Lynx	SVA	animal	149	7		1	6	
Marine mammals [1)]	SVA	animal	1	0				
Otter	SVA	animal	12	0				
Pigs	SJV	animal	3015835	0				
Raccoon dogs	SVA	animal	3	0				
Solipeds, domestic - horses	SJV	animal	3414	0				
Wild animals [2)]	SVA	animal	10	0				
Wild boars - wild	SVA	animal	27131	1				1
Wolves	SVA	animal	20	1		1		
Zoo animals, all [3)]	SVA	animal	4	0				

Comments:

[1)] Common seal
[2)] Wolverine
[3)] Lion

Footnote:

The total number of analyses for all except for pigs and horses is the number of analyses performed at the SVA.

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 in animals was in 1997 (one reindeer) and 2000 (one moose). E. multilocularis has never been diagnosed in the country.
Voluntary notification of echinococcosis in humans was initiated in 1994 and since then 3-24 cases have been reported annually, all assumed to have been infected abroad.

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, presumably in England and Ireland. 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 have tested positive in 2001-2008.
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 antihelmintics was performed (see text "E. multilocularis").

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases

E. multilocularis has never been diagnosed in Sweden. However, the risk assessment showed 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 anthelmintic 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 countries free from E. multilocularis from countries with the infection.

2.9.2 Echinococcosis in humans

A. Echinococcus spp. in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Case definition

A case is defined as a person in whom echinococcosis has been diagnosed.

Diagnostic/analytical methods used

Histopathology or serology.

Notification system in place

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

History of the disease and/or infection in the country

Notification of echinococcosis (based on voluntary reports by laboratories) was initiated in 1994 and since then 3-24 cases have been reported annually, all are assumed to have been infected abroad.

Results of the investigation

In 2008, 13 cases of Echinococcus spp. were reported, which was in the same range as in the years before. Out of all cases, 5 were women and eight men, mainly in the age 20 to 40 years. They originated from and were assumed to have been infected in endemic areas, mainly Iraq, Turkey and parts of former Yugoslavia.

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

Echinococcosis is not spread in the country, but sometimes persons, originating from places where the disease exists, are found being infected.

Relevance as zoonotic disease

Currently none of the Echinococcus species represents any threat to humans in Sweden. However, due to the spread of the tapeworm (E. multilocularis) in other European countries, including findings of the parasite in Denmark, the situation might change and an increased awareness is necessary. However, it can not be excluded that echinococcosis can be introduced through the increased illegal movement of dogs into Sweden, that has been seen during the last years.

2.9.3 Echinococcus in animals

A. E. granulosus in animal

Monitoring system

Sampling strategy

All livestock are macroscopically examined at slaughter. Upon suspicion of echinococcosis, samples are investigated microscopically.
Carcasses of wild life e.g. wolves and raccoon dogs are sampled sporadically at necropsy.

Type of specimen taken

Sporadically

Methods of sampling (description of sampling techniques)

At routine carcass inspection at abattoirs:
On suspicion, cyst material is collected from livestock.

From foxes, domestic cats and dogs:
Faeces samples are analyzed by copro-ELISA

Case definition

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

Diagnostic/analytical methods used

Copro Elisa test

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. This treatment also prevents additional introduction of E. granulosus.

Measures in case of the positive findings or single cases

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

Notification system in place

Echinococcosis is a notifiable disease in all animals.

Results of the investigation

All livestock carcasses were investigated macroscopically, and microscopically if deemed necessary. All were negative. All sylvatic carnivores and domestic pets examined were negative.

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

See Echinococcus general evaluation. Furthermore, in the last two years there

has been an increased movement of raccoon dogs across the Finnish border to Sweden. A new screening program is being developed to sample them. The raccoon dog is not native to Fennoscandia and is viewed as a potential risk with regard to Echinococcus.

Relevance of the findings in animals to findings in foodstuffs and to human cases

The risk of obtaining domestic echinococcosis is small.

B. E. multilocularis in animal

Monitoring system

Sampling strategy

All livestock are macroscopically examined at slaughter. Upon suspicion of echinococcosis, samples are investigated microscopically.
Carcasses of wildlife e.g. wolves and raccoon dogs are sampled sporadically at necropsy.
Approximatly 300 foxes are sampled annually within the frame of a domestic screening programme.

Type of specimen taken

Other:

Methods of sampling (description of sampling techniques)

At routine carcass inspection at abattoirs:
On suspicion, cyst material is collected from livestock.

From foxes, domestic cats and dogs:
Faeces samples are analyzed by copro-ELISA. For foxes included in the screening programme, gut contents were subsequently sedimented and examined microscopically for adult tapeworms.

Case definition

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

Diagnostic/analytical methods used

Macroscopic (visual) examination of organs

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 anthelmintics.

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

All animals investigated were 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.
Furthermore, in the last two years there has been an increased movement of raccoon dogs across the Finnish border to Sweden. A new screening program is being developed to sample them. The raccoon dog is not native to Fennoscandia and is viewed as a potential risk with regard to Echinococcus.

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

The risk of obtaining domestic echinococcosis is small.

Table Echinococcus in animals

	Source of information	Sampling unit	Units tested	Total units positive for Echinococcus spp.	E. granulosus	E. multilocularis	Echinococcus spp., unspecified
Foxes	SVA	animal	244	0			

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 in humans 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.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases

There is little information about the most common sources of infection, however undercooked or raw meat is considered important. Oocysts released in faeces of cats is also a potential risk if accidentially ingested.

2.10.2 Toxoplasmosis in humans

A. Toxoplasmosis in humans

Reporting system in place for the human cases

Since the first of July 2004, toxoplasmosis is no longer a notifiable disease under the Communicable Disease Act.

Case definition

A case is defined as a person in whom toxoplasmosis has been verified.

Diagnostic/analytical methods used

Antibody detection in serum and cerebro-spinal fluid by direct agglutination, IFL and immunosorbent agglutination assay.
Nucleic acid amplification test.

Notification system in place

Since the first of July 2004 toxoplasmosis is not a notifiable disease under the Communicable Disease Act.

History of the disease and/or infection in the country

During the last 10 years between 4 and 18 cases have been reported annually. In 2003, 17 cases were reported. Of these, 8 were known to be of domestic origin. In 2004, 5 cases were reported. From the first of July in 2004 there is no mandatory reporting of toxoplasmosis.

Results of the investigation

Relevance as zoonotic disease

Clinical toxoplasmosis is most important in immuno-suppressed persons and in pregnant women. The infection can be transmitted from the mother to the foetus and cause serious and fatal injury. There is little information about the most common sources of infection, however undercooked or raw meat is considered important.
As a preventive measure for pregnant women it is recommended that they refrain from cleaning up faeces from cats.

2.10.3 Toxoplasma in animals

A. T. gondii in animal

Monitoring system

Sampling strategy

There is no official surveillance for Toxoplasma spp in animals. Sampling, mainly of sheep, goats, cats or dogs, is performed in case of clinical suspicion of toxoplasmosis.

Notification system in place

Toxoplasmosis is not notifiable in animals.

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

Results for toxoplasma investigations were previously reported when a majority of the samples were analysed at the SVA. Nowadays, it is not known how large proportion of samples are being analysed at other laboratories and, therefore, results for toxoplasmosis have been omitted.

Relevance of the findings in animals to findings in foodstuffs and to human cases

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.

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.

Two humans, one in 1974 and one in 2000, contracted rabies after having had contact with dogs in India and Thailand, respectively. Apart from that, there have been no human cases reported in modern times.

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

The special provisions that Sweden has in the current legislation of movement of dogs and cats is under evaluation. For information about conducted risk assessment, see "Rabies in dogs".

2.11.2 Rabies in humans

A. Rabies in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Case definition

A case is a person with positive rabies diagnostic.

Diagnostic/analytical methods used

Serology, antigen detection and isolation of the virus.

Notification system in place

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

History of the disease and/or infection in the country

Two persons, one in 1974 and one in 2000, contracted rabies after having had contact with dogs in India and Thailand, respectively. Apart from that, there have been no human cases reported in modern times.

Results of the investigation

No human case of rabies was reported.

Relevance as zoonotic disease

As Sweden is free from rabies in animals since 1886 and import of animals is strictly regulated, the risk of contracting rabies in Sweden is negligible. However, it can not be excluded that rabies can be introduced through the increased illegal movement of dogs into Sweden, that has been seen during the last years.

2.11.3 Lyssavirus (rabies) in animals

A. Rabies in dogs

Monitoring system

Sampling strategy

The surveillance of rabies in Sweden is passive.

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 allowed but usually only traveling dogs and cats are vaccinated. 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 from the rest of EU was completed during summer 2006. The risk was assessed as very low.

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

No dogs were investigated.

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 certain third countries (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 2008 were: 17 bats, 11, dogs, 2 cats, 1 otter and 1 ferret, 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 addition, in 2008 an active surveillance programme was performed for the first time in Sweden. 153 dead or wounded and euthanized bats were sent in for rabies examination and also blood samples and oral swabs were taken from 53 bats that were caught by using mist net. The serology results are still pending.

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 2006, 348 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	Classical rabies virus (genotype 1)	European Bat Lyssavirus - unspecified
Bats - wild	SVA	animal	17	0			
Cats	SVA	animal	2	0			
Dogs	SVA	animal	11	0			
Ferrets	SVA	animal	1	0			
Otter	SVA	animal	1	0			

2.12 Q-FEVER

2.12.1 General evaluation of the national situation

A. Coxiella burnetii (Q-fever) general evaluation

History of the disease and/or infection in the country

Q-fever is a notifiable disease in humans in Sweden. Sporadic human cases of Q-fever are yearly notified in Sweden. Since 2004, 1-7 cases have been reported each year. These cases have been considered to be acquired abroad. However, 29% of sheep farmers, 13% of veterinarians and 6-7% of two control groups (draftees and hospital personnel) had antibodies against C. burnetii in a Swedish study performed in the 1990's.

A low percentage of sheep (0,3%) and cattle (1,3%) were serologically positive according to an in-house ELISA-test in the 1990's. C. burnetii has been detected in placenta in two occasional cases in two different herds on the island of Gotland. The farmers of these herds were serologically positive. In addition, cleaning a barn with moldy hay caused a clinical case of Q-fever in the 1990's.

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

See history of the disease.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases

As the number of notified cases is low and most cases are sporadic little is known about the sources. The number of cases is highly underestimated.

Recent actions taken to control the zoonoses

A serological tank milk survey was performed in randomly selected dairy herds in November 2008. All herds with positive serological response in the first test will be sampled more profoundly in 2009.

Suggestions to the Community for the actions to be taken

Q-fever should be notifiable in humans in all MS.
Encourage MS to perform national surveys in animal and human populations.

2.12.2 Coxiella (Q-fever) in animals

Table Coxiella burnetii (Q fever) in animals

	Source of information	Sampling unit	Units tested	Total units positive for Coxiella (Q-fever)	C. burnetii
Cattle (bovine animals) - - milk - Survey - national survey (tank milk samples)	SVA	herd	1000	85	85

3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE

3.1 ENTEROCOCCUS, NON-PATHOGENIC

3.1.1 General evaluation of the national situation

3.1.2 Antimicrobial resistance in Enterococcus, non-pathogenic isolates

A. Antimicrobial resistance of Enterococcus spp., unspecified in animal

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial resistance in indicatorbacteria (E. coli and enterocooci)from healthy animals and food is regularly monitored in the Swedish Veterinary Antimicrobial Resistance Monitoring programme (SVARM).

Type of specimen taken

Intestinal content or faeces from healty animals are sampled on farm or at slaughter.Each sample is from a unique farm. Fresh meat of Swedish origin is sampled at retail.

Procedures for the selection of isolates for antimicrobial testing

All isolates obtained from culture are tested for antimicrobial susceptibility.

Methods used for collecting data

Results of antimicrobial susceptibility testing and information on origin of isolates were stored in a database at SVA. For compiling statistics, relevant data were extracted from the database.

Laboratory methodology used for identification of the microbial isolates

Isolation and antimicrobial susceptibility testing was performed at the National Veterinary institute

Colon content from pigs was diluted as described for E. coli and cultured on solid media without antibiotics. Twenty-five mL of the saline from shaken pork (above) was mixed with 25 mL double concentrated Enterococcosel broth and incubated at 44C over night. Caecal content from broilers was diluted in the same way as the colon content from pigs but cultured only on selective plates with vancomycin (16 mg/L).
Culture without selective antibiotics: Diluted colon content (0.1 mL) was spread onto Slanetz-Bartley (SlaBa) agar. The plates were incubated for 48 h at 37C. From the Enterococcosel broth 0.1 mL was cultured on SlaBa agar and incubated at 44C for 48 h. One colony, randomly chosen, was sub-cultured on bile-esculin agar and blood agar (37C, 24 h). Colonies with morphology consistent with enterococci, and with a positive reaction on bile-esculin agar were tested for antimicrobial susceptibility and identified to species level according to Devriese et al. (1993) by use of the following biochemical tests:

mannitol, sorbitol, arabinose, saccharose, ribose, raffinose and methyl--D-glucopyranoside.

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, 2008) using VetMIC panels produced at the Dept. of Antibiotics, SVA.

Laboratory used for detection for resistance

Breakpoints used in testing

Epidemiological cut-off values issued by EUCAST are used.

Results of the investigation

Prevalence of antimicrobial resistance in indicator bacteria from healty animals and food is low in an international perspective and without obviuos unwanted trends.

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

The situation is favourable regarding antimicrobial resistance in commensal bacteria.

Table Antimicrobial susceptibility testing of E. faecium in Sheep - at farm - Monitoring - quantitative data [Dilution method]

E. faecium		Sheep - at farm - Monitoring																							
Isolates out of a monitoring program (yes/no)																									
Number of isolates available in the laboratory																									
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	32	15	0										1	11	3								2	256
	Kanamycin	1024	15	0													10	3	1	1				16	2048
	Streptomycin	*128*	15	1												1	2	10	1	1				8	1024
Amphenicols	Chloramphenicol	32	15	0										2	13									0.5	64
Glycopeptides (Cyclic peptides, Polypeptides)	Bacitracin	32	15	0								1			3	9	2							1	128
	Vancomycin	4	15	0								10	1	4										1	128
Ionophores	Narasin	*4*	15	0						2	8	5												0.25	32
Macrolides	Erythromycin	4	15	0							10	4	1											0.5	64
Oxazolidines	Linezolid	4	15	0							2	8	5											0.5	64
Penicillins	Ampicillin	4	15	0						3	6	5	1											0.25	32
Streptogramins	Virginiamycin	*4*	15	0							1	2	8	4										0.5	64
Tetracyclines	Tetracyclines	2	15	1							6	8				1								0.5	64

Table Antimicrobial susceptibility testing of E. faecium - qualitative data

E. faecium		Sheep - at farm - Monitoring		Pigs - at slaughterhouse - Monitoring	
Isolates out of a monitoring program (yes/no)		yes		yes	
Number of isolates available in the laboratory		15		39	
Antimicrobials:		N	n	N	n
Aminoglycosides	Gentamicin	15	0	39	0
	Kanamycin	15	0	39	0
	Streptomycin	15	1	39	1
Amphenicols	Chloramphenicol	15	0	39	0
Fully sensitive	Fully sensitive	15	13	39	25
Glycopeptides (Cyclic peptides, Polypeptides)	Bacitracin	15	0	39	4
	Vancomycin	15	0	39	0
Ionophores	Narasin	15	0	39	0
Macrolides	Erythromycin	15	0	39	5
Oxazolidines	Linezolid	15	0	39	0
Penicillins	Ampicillin	15	0	39	0
Resistant to 1 antimicrobial	Resistant to 1 antimicrobial	15	2	39	13
Resistant to 2 antimicrobials	Resistant to 2 antimicrobials	15	0	39	0
Resistant to 3 antimicrobials	Resistant to 3 antimicrobials	15	0	39	1
Streptogramins	Virginiamycin	15	0	39	0
Tetracyclines	Tetracyclines	15	1	39	6

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

E. faecium		Pigs - at slaughterhouse - Monitoring																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		39																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	32	39	0										9	26	4								2	256
	Kanamycin	1024	39	0													2	12	13	10	2				16	2048
	Streptomycin	*128*	39	1													10	28				1			8	1024
Amphenicols	Chloramphenicol	32	39	0										8	31										0.5	64
Glycopeptides (Cyclic peptides, Polypeptides)	Bacitracin	32	39	4									3	2	2	24	4	2		2					1	128
	Vancomycin	4	39	0								34	4	1											1	128
Ionophores	Narasin	*4*	39	0							21	18													0.12	16
Macrolides	Erythromycin	4	39	5							13	4	4	13	4	1									0.5	64
Oxazolidines	Linezolid	4	39	0									11	28											0.5	16
Penicillins	Ampicillin	4	39	0							8	25	5	1											0.25	32
Streptogramins	Virginiamycin	*4*	39	0							17	2	14	6											0.5	64
Tetracyclines	Tetracyclines	2	39	6							31	2					1	5							0.5	64

Table Antimicrobial susceptibility testing of E. faecalis in Sheep - at farm - Monitoring - quantitative data [Dilution method]

E. faecalis		Sheep - at farm - Monitoring																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		24																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	32	24	0									1		1	18	4								2	256
	Kanamycin	1024	24	0													2	18	4						16	2048
	Streptomycin	512	24	1												1		1	20	1			1		8	1024
Amphenicols	Chloramphenicol	32	24	0										5	19										0.5	64
Glycopeptides (Cyclic peptides, Polypeptides)	Bacitracin	32	24	0										3	16	4	1								1	128
	Vancomycin	4	24	0									17	7											1	128
Ionophores	Narasin	2	24	0						16	8														0.12	16
Macrolides	Erythromycin	4	24	0							1	8	10	5											0.5	64
Oxazolidines	Linezolid	4	24	0									23	1											0.5	16
Penicillins	Ampicillin	4	24	0							3	20	1												0.25	32
Streptogramins	Virginiamycin	32	24	0										2	9	11	2								0.5	64
Tetracyclines	Tetracyclines	2	24	2							17	5					1	1							0.5	64

Table Antimicrobial susceptibility testing of E. faecalis - qualitative data

E. faecalis		Pigs - at slaughterhouse - Monitoring		Sheep - at farm - Monitoring	
Isolates out of a monitoring program (yes/no)		yes		yes	
Number of isolates available in the laboratory		68		24	
Antimicrobials:		N	n	N	n
Aminoglycosides	Gentamicin	68	2	24	0
	Kanamycin	68	2	24	0
	Streptomycin	68	9	24	1
Amphenicols	Chloramphenicol	68	1	24	0
Fully sensitive	Fully sensitive	68	20	24	22
Glycopeptides (Cyclic peptides, Polypeptides)	Bacitracin	68	0	24	0
	Vancomycin	68	0	24	0
Ionophores	Narasin	68	0	24	0
Macrolides	Erythromycin	68	16	24	0
Oxazolidines	Linezolid	68	0	24	0
Penicillins	Ampicillin	68	0	24	0
Resistant to 1 antimicrobial	Resistant to 1 antimicrobial	68	31	24	1
Resistant to 2 antimicrobials	Resistant to 2 antimicrobials	68	15	24	1
Resistant to 3 antimicrobials	Resistant to 3 antimicrobials	68	0	24	0
Resistant to 4 antimicrobials	Resistant to 4 antimicrobials	68	0	24	0
Resistant to >4 antimicrobials	Resistant to >4 antimicrobials	68	2	24	0
Streptogramins	Virginiamycin	68	0	24	0
Tetracyclines	Tetracyclines	68	42	24	2

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

E. faecalis		Pigs - at slaughterhouse - Monitoring																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		68																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	32	68	2											6	43	17				2				2	256
	Kanamycin	1024	68	2													3	55	8				1	1	16	2048
	Streptomycin	512	68	9														8	51					9	8	1024
Amphenicols	Chloramphenicol	32	68	1										6	60	1		1							0.5	64
Glycopeptides (Cyclic peptides, Polypeptides)	Bacitracin	32	68	0								2		16	42	8									1	128
	Vancomycin	4	68	0								14	43	11											1	128
Ionophores	Narasin	2	68	0						33	29	6													0.12	16
Macrolides	Erythromycin	4	68	16							8	15	19	10			1		15						0.5	64
Oxazolidines	Linezolid	4	68	0								2	47	19											0.5	16
Penicillins	Ampicillin	4	68	0								63	5												0.25	64
Streptogramins	Virginiamycin	32	68	0									2		6	54	6								0.5	64
Tetracyclines	Tetracyclines	2	68	42							15	10	1				14	26	2						0.5	64

Table Antimicrobial susceptibility testing of E. faecalis - qualitative data

E. faecalis		Meat from pig - at retail - Monitoring	
Isolates out of a monitoring program (yes/no)		yes	
Number of isolates available in the laboratory		17	
Antimicrobials:		N	n
Aminoglycosides	Gentamicin	17	0
	Kanamycin	17	0
	Streptomycin	17	0
Amphenicols	Chloramphenicol	17	0
Fully sensitive	Fully sensitive	17	13
Glycopeptides (Cyclic peptides, Polypeptides)	Bacitracin	17	0
	Vancomycin	17	0
Ionophores	Narasin	17	0
Macrolides	Erythromycin	17	0
Oxazolidines	Linezolid	17	0
Penicillins	Ampicillin	17	0
Resistant to 1 antimicrobial	Resistant to 1 antimicrobial	17	4
Streptogramins	Virginiamycin	17	0
Tetracyclines	Tetracyclines	17	4

Table Antimicrobial susceptibility testing of E. faecalis in Meat from pig - at retail - Monitoring - quantitative data [Dilution method]

E. faecalis		Meat from pig - at retail - Monitoring																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		17																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	32	17	0										4	10	3									2	256
	Kanamycin	1024	17	0												1	10	6							16	2048
	Streptomycin	512	17	0												2	13	2							8	1024
Amphenicols	Chloramphenicol	32	18	0										5	12	1									0.5	64
Glycopeptides (Cyclic peptides, Polypeptides)	Bacitracin	32	17	0										4	12	1									1	128
	Vancomycin	4	17	0								2	7	8											1	128
Ionophores	Narasin	2	17	0						5	11	1													0.25	32
Macrolides	Erythromycin	4	17	0							6	4	5	2											0.5	64
Oxazolidines	Linezolid	4	17	0									13	4											0.5	16
Penicillins	Ampicillin	4	17	0								14	3												0.25	32
Streptogramins	Virginiamycin	32	17	0								1			4	11	1								0.5	64
Tetracyclines	Tetracyclines	2	17	4							3	10						4							0.5	64

Table Breakpoints for antibiotic resistance of Enterococcus, non-pathogenic

Test Method Used	
Disc diffusion	○
Agar dilution	○
Broth dilution	◉
E-test	○

Standards used for testing
NCCLS

			Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		Disk content	Breakpoint Zone diameter (mm)		
		Standard for breakpoint	Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Aminoglycosides	**Gentamicin**	EUCAST	32		32	2	256				
	Kanamycin	SVARM	1024		1024	16	2048				
	Streptomycin	EUCASt	512		512	8	1024				
Amphenicols	**Chloramphenicol**	EUCAST	32		32	0.5	64				
Glycopeptides (Cyclic peptides, Polypeptides)	**Bacitracin**	EUCAST	32		32	1	128				
	Vancomycin	EUCAST	4		4	1	128				
Ionophores	**Narasin**	EUCAST	2		2	0.12	16				
Macrolides	**Erythromycin**	EUCAST	4		4	0.5	64				
Oxazolidines	**Linezolid**	EUCAST	4		4	0.5	16				
Penicillins	**Ampicillin**	EUCAST	4		4	0.25	32				
Streptogramins	**Virginiamycin**	EUCAST	32		32	0.5	64				
Tetracyclines	**Tetracyclines**	EUCAST	2		2	0.5	64				

Footnote:

The breakpoint for resistance given above aply for E. faecalis. For E. faecium breakpoints for some antimicrobials (narasin, streptomycin, virginiamycin) are different.

Table Breakpoints for antibiotic resistance of Enterococcus, non-pathogenic

Test Method Used	
Disc diffusion	○
Agar dilution	○
Broth dilution	◉
E-test	○

Standards used for testing
NCCLS

			Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		Disk content	Breakpoint Zone diameter (mm)		
		Standard for breakpoint	Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Aminoglycosides	**Gentamicin**	EUCAST	32		32	2	256				
	Kanamycin	SVARM	1024		1024	16	2048				
	Streptomycin	EUCASt	512		512	8	1024				
Amphenicols	**Chloramphenicol**	EUCAST	32		32	0.5	64				
Glycopeptides (Cyclic peptides, Polypeptides)	**Bacitracin**	EUCAST	32		32	1	128				
	Vancomycin	EUCAST	4		4	1	128				
Ionophores	**Narasin**	EUCAST	2		2	0.12	16				
Macrolides	**Erythromycin**	EUCAST	4		4	0.5	64				
Oxazolidines	**Linezolid**	EUCAST	4		4	0.5	16				
Penicillins	**Ampicillin**	EUCAST	4		4	0.25	32				
Streptogramins	**Virginiamycin**	EUCAST	32		32	0.5	64				
Tetracyclines	**Tetracyclines**	EUCAST	2		2	0.5	64				

Footnote:

The breakpoint for resistance given above aply for E. faecalis. For E. faecium breakpoints for some antimicrobials (narasin, streptomycin, virginiamycin) are different.

3.2 ESCHERICHIA COLI, NON-PATHOGENIC

3.2.1 General evaluation of the national situation

3.2.2 Antimicrobial resistance in Escherichia coli, non-pathogenic

A. Antimicrobial resistance of E.coli in animal

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial resistance in indicatorbacteria (E. coli and enterocooci)from healthy animals and food is regularly monitored in the Swedish Veterinary Antimicrobial Resistance Monitoring programme (SVARM).

Type of specimen taken

Intestinal content or faeces from healty animals are sampled on farm or at slaughter. Each sample is from a unique farm. Fresh meat of Swedish origin is sampled at retail.

Procedures for the selection of isolates for antimicrobial testing

All isolates obtained from culture are tested for antimicrobial susceptibility.

Methods used for collecting data

Results of antimicrobial susceptibility testing and information on origin of isolates were stored in a database at SVA. For compiling statistics, relevant data were extracted from the database.

Laboratory methodology used for identification of the microbial isolates

Isolation and antimicrobial susceptibility testing was performed at the National Veterinary institute.

Approximately 0.5 g of colon content from pig was diluted in 4.5 mL saline. After thorough mixing, 0.1 mL of this suspension was spread on MacConkey agar and MacConkey agar with cefotaxime 1mg/L and incubated overnight at 370C.
Approximately 100 g of pork was thoroughly shaken 1-2 min with 50 mL saline. Ten mL was thereafter transferred to 90 mL MacConkey broth and incubated at 44C for 18-24 h. From the pre-enrichment 0.1 mL of was spread on MacConkey agar and MacConkey agar with cefotaxime 1mg/L and incubated overnight at 44oC.
One lactose positive colony with morphology typical for E. coli was sub-cultured onto horse-blood agar (5% v/v), after which the isolate was tested for production of tryptophanase (indole) and -glucuronidase (p-nitrophenyl--D- glucopyranosiduronic acid, PGUA). Only lactose-positive isolates with typical morphology and positive reactions in both tests were selected for susceptibility tests. Colonies growing on MacConkey agar with cefotaxime were sub-cultured

on horse-blood agar (5% v/v) and further tested for ESBL detection.

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,2008) using VetMIC panels produced at the Dept. of Antibiotics, SVA.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Antimicrobial susceptibility was tested using dilution methods in cation adjusted MuellerHinton broth (CAMBH). The tests were performed following the standards for microdilution of the NationalCommittee of Clinical Laboratory Standards (NCCLS, 2008) using VetMIC panels produced at the Dept. of Antibiotics, SVA.

Breakpoints used in testing

Epidemiological cut-off values issued by EUCAST are used.

Results of the investigation

Prevalence of antimicrobial resistance in indicator bacteria from healty animals and food is low in an international perspective and without obviuos unwanted trends.

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

The situation is favourable regarding antimicrobial resistance in commensal bacteria.

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

E. coli		Pigs - at slaughterhouse - animal sample - caecum - Monitoring																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		349																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	349	1						2	93	229	24	1											0.25	32
	Kanamycin	8	349	4								2	83	214	46	3	1								1	16
	Neomycin		0	0																						
	Streptomycin	16	349	48									2	68	203	28	8	13	16	7	4				2	256
Amphenicols	Chloramphenicol	16	349	10									17	257	62	3	6	3			1				2	256
	Florfenicol	16	349	1									4	185	151	8	1								2	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.25	349	0				267	76	6															0.06	8
Fluoroquinolones	Ciprofloxacin	0.06	349	4		46	289	10			1	3													0.008	8
	Enrofloxacin		0	0																						
Penicillins	Ampicillin	8	349	20							2	74	233	20				1	19						0.5	64
Quinolones	Nalidixic acid	16	349	4									170	170	3	2			1	2	1				2	256
Sulfonamides	Sulfonamide	256	349	30											108	138	71	2					30		8	1024
Tetracyclines	Tetracyclin	8	349	31								190	126		2	2	4	13	12						0.5	64
Trimethoprim	Trimethoprim	2	376	19						82	205	40	30		2			17							0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Antimicrobial susceptibility testing of E. coli in Sheep - at farm - animal sample - faeces - Monitoring - quantitative data [Dilution method]

E. coli		Sheep - - faeces - Monitoring																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		115																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	114	3							15	79	17	2	1										0.5	64
	Kanamycin	8	115	2									10	79	24	2									2	16
	Neomycin		0	0																						
	Streptomycin	16	115	3										16	77	19	2			1					2	256
Amphenicols	Chloramphenicol	16	115	0									3	84	27	1									1	128
	Florfenicol	16	114	0										42	71	1									4	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.25	115	0				76	33	6															0.06	2
Fluoroquinolones	Ciprofloxacin	0.06	115	1		2	55	57	1																0.008	1
	Enrofloxacin		0	0																						
Penicillins	Ampicillin	8	115	2							2	9	81	19	2	1		1							0.25	32
Quinolones	Nalidixic acid	16	115	0								1	54	58	1	1									1	128
Sulfonamides	Sulfonamide	256	111	2												43	53	11	2				2		16	2048
Tetracyclines	Tetracyclin	8	115	1								65	47	2				1							0.5	64
Trimethoprim	Trimethoprim	2	112	2						40	59	10	1		1			1							0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Antimicrobial susceptibility testing of E. coli in animals

E. coli		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Turkeys		Sheep - at farm - Monitoring	
Isolates out of a monitoring program (yes/no)				yes						yes	
Number of isolates available in the laboratory				349						115	
Antimicrobials:		N	n	N	n	N	n	N	n	N	n
Aminoglycosides	Gentamicin			349	1					115	3
	Kanamycin			349	4					115	2
	Streptomycin			349	48					115	3
Amphenicols	Chloramphenicol			349	10					115	0
	Florfenicol			349	1					115	0
Cephalosporins	Cefotaxim			349	0					115	0
Fluoroquinolones	Ciprofloxacin			349	4					115	1
Fully sensitive	Fully sensitive			349	274					115	101
Penicillins	Ampicillin			349	20					115	2
Quinolones	Nalidixic acid			349	4					115	0
Resistant to 1 antimicrobial	Resistant to 1 antimicrobial			349	36					115	10
Resistant to 2 antimicrobials	Resistant to 2 antimicrobials			349	11					115	3
Resistant to 3 antimicrobials	Resistant to 3 antimicrobials			349	8					115	0
Resistant to 4 antimicrobials	Resistant to 4 antimicrobials			349	15					115	1
Resistant to >4 antimicrobials	Resistant to >4 antimicrobials			349	5					115	0
Sulfonamides	Sulfonamide			349	30					115	6
Tetracyclines	Tetracyclin			349	31					115	1
Trimethoprim	Trimethoprim			349	19					115	2

Table Antimicrobial susceptibility testing of E. coli in food

E. coli		Meat from pig		Meat from bovine animals		Meat from broilers (Gallus gallus)		Meat from other poultry species	
Isolates out of a monitoring program (yes/no)		yes							
Number of isolates available in the laboratory		19							
Antimicrobials:		N	n	N	n	N	n	N	n
Aminoglycosides	Gentamicin	19	0						
	Kanamycin	19	0						
	Streptomycin	19	0						
Amphenicols	Chloramphenicol	19	1						
Cephalosporins	Cefotaxim	19	0						
Fluoroquinolones	Ciprofloxacin	19	0						
Fully sensitive	Fully sensitive	19	18						
Penicillins	Ampicillin	19	1						
Quinolones	Nalidixic acid	19	0						
Resistant to 1 antimicrobial	Resistant to 1 antimicrobial	19	0						
Resistant to 2 antimicrobials	Resistant to 2 antimicrobials	19	0						
Resistant to 3 antimicrobials	Resistant to 3 antimicrobials	19	1						
Resistant to 4 antimicrobials	Resistant to 4 antimicrobials	19	0						
Resistant to >4 antimicrobials	Resistant to >4 antimicrobials	19	0						
Sulfonamides	Sulfonamide	19	1						
Tetracyclines	Tetracyclin	19	0						
Trimethoprim	Trimethoprim	19	0						

Table Antimicrobial susceptibility testing of E. coli in Meat from pig - at retail - Monitoring - quantitative data [Dilution method]

E. coli		Meat from pig - at retail - Monitoring																							
Isolates out of a monitoring program (yes/no)		yes																							
Number of isolates available in the laboratory		19																							
Antimicrobials:		break points	N	n	<=0.008	0.015	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
Aminoglycosides	Gentamicin	2	19	0							15	4													0.25	32
	Kanamycin	8	19	0									11	8											1	16
	Neomycin		0	0																						
	Streptomycin	16	19	0										14	5										2	256
Amphenicols	Chloramphenicol	16	19	1									3	12	3		1								2	256
	Florfenicol	16	19	0										11	8										2	32
Cephalosporins	3rd generation cephalosporins		0	0																						
	Cefotaxim	0.25	19	0				12	7																0.06	8
Fluoroquinolones	Ciprofloxacin	0.06	19	0		12	7																		0.008	8
	Enrofloxacin		0	0																						
Fully sensitive	Fully sensitive		0	0																						
Penicillins	Ampicillin	8	19	1								1	11	6					1						0.5	64
Quinolones	Nalidixic acid	16	19	0									1	15	3										2	256
Sulfonamides	Sulfonamide	256	19	1											9	8	1						1		8	1024
Tetracyclines	Tetracyclin	8	19	0								11	8												0.5	64
Trimethoprim	Trimethoprim	2	19	0						2	15	2													0.25	32
Trimethoprim + sulfonamides	Trimethoprim + sulfonamides		0	0																						

Table Breakpoints used for antimicrobial susceptibility testing

Test Method Used	
Disc diffusion	○
Agar dilution	○
Broth dilution	◉
E-test	○

Standards used for testing
NCCLS

			Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		Disk content	Breakpoint Zone diameter (mm)		
		Standard for breakpoint	Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Aminoglycosides	**Gentamicin**	EUCAST	2		2	0.25	32				
	Kanamycin	EUCAST	8		8	1	16				
	Streptomycin	EUCAST	16		16	2	256				
Amphenicols	**Chloramphenicol**	EUCAST	16		16	2	256				
	Florfenicol	EUCAST	16		16	2	32				
Cephalosporins	**Cefotaxim**	EUCAST	0.25		0.25	0.06	8				
Fluoroquinolones	**Ciprofloxacin**	SVARM	0.06		0.06	0.008	8				
Penicillins	**Ampicillin**	EUCAST	8		8	0.5	64				
Quinolones	**Nalidixic acid**	EUCAST	16		16	2	256				
Sulfonamides	**Sulfonamide**	SVARM	256		256	8	1024				
Tetracyclines	**Tetracyclin**	EUCAST	8		8	0.5	64				
Trimethoprim	**Trimethoprim**	EUCAST	2		2	0.25	32				

Table Breakpoints used for antimicrobial susceptibility testing

Test Method Used	
Disc diffusion	○
Agar dilution	○
Broth dilution	◉
E-test	○

Standards used for testing
NCCLS

			Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		Disk content	Breakpoint Zone diameter (mm)		
		Standard for breakpoint	Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Aminoglycosides	**Gentamicin**	EUCAST	2		2	0.25	32				
	Kanamycin	EUCAST	8		8	1	16				
	Streptomycin	EUCAST	16		16	2	256				
Amphenicols	**Chloramphenicol**	EUCAST	16		16	2	256				
	Florfenicol	EUCAST	16		16	2	32				
Cephalosporins	**Cefotaxim**	EUCAST	0.25		0.25	0.06	8				
Fluoroquinolones	**Ciprofloxacin**	SVARM	0.06		0.06	0.008	8				
Penicillins	**Ampicillin**	EUCAST	8		8	0.5	64				
Quinolones	**Nalidixic acid**	EUCAST	16		16	2	256				
Sulfonamides	**Sulfonamide**	SVARM	256		256	8	1024				
Tetracyclines	**Tetracyclin**	EUCAST	8		8	0.5	64				
Trimethoprim	**Trimethoprim**	EUCAST	2		2	0.25	32				

4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS

4.1 HISTAMINE

4.1.1 General evaluation of the national situation

4.1.2 Histamine in foodstuffs

4.2 ENTEROBACTER SAKAZAKII

4.2.1 General evaluation of the national situation

4.2.2 Enterobacter sakazakii in foodstuffs

4.3 STAPHYLOCOCCAL ENTEROTOXINS

4.3.1 General evaluation of the national situation

4.3.2 Staphylococcal enterotoxins in foodstuffs

5. FOODBORNE

Foodborne outbreaks are incidences of two or more human cases of the same disease or infection where the cases are linked or are probably linked to the same food source. Situation, in which the observed human cases exceed the expected number of cases and where a same food source is suspected, is also indicative of a foodborne outbreak.

A. Foodborne outbreaks

System in place for identification, epidemological investigations and reporting of

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. We do not classify the outbreaks in "verified" or "possible". Instead we classify the agent as verified, suspected or unknown; and the food as verified, probable, possible or unknown. In the list of agents we also have nitrite, copper and tin. The date of the reporting of the food-borne outbreak to the municipal environmental/public health authorities is the main date of the report and determines the reporting year of the report, i.e. not the onset of symptoms.

Foodborne Outbreaks: summarized data

	Total number of outbreaks	Outbreaks	Human cases	Hospitalized	Deaths	Number of verified outbreaks
Bacillus	3	1	4	0	0	2
Campylobacter	2	2	10	1	0	0
Clostridium	0	0	unknown	unknown	unknown	0
Escherichia coli, pathogenic	2	2	7	6	0	0
Foodborne viruses	20	19	775	1	0	1
Listeria	0	0	unknown	unknown	unknown	0
Other agents	4	3	30	3	0	1
Parasites	1	1	21	0	0	0
Salmonella	8	6	51	1	0	2
Staphylococcus	6	5	23	0	0	1
Unknown	109	109	472	1	0	0
Yersinia	0	0	unknown	unknown	unknown	0

Footnote:

Outbreaks caused by microbes which cannot be analyzed using routine laboratory detection methods are more likely to be categorized as possible.

Verified Foodborne Outbreaks: detailed data

1

	Value
Code	ID 09/0168
Subagent Choice	
Outbreak type	Household
Human cases	5
Hospitalized	0
Deaths	0
Foodstuff implicated	Cheese
More Foodstuff	home-made fresh cheese
Type of evidence	Laboratory detection in implicated food, Laboratory detection in human cases, Laboratory characterization of food and human isolates
Setting	Household
Place of origin of problem	Household, domestic kitchen
Origin of foodstuff	Domestic
Contributory factors	Unprocessed contaminated ingredient
Outbreaks	1
Comment	

S. Napoli

	Value
Code	ID 09/0170
Subagent Choice	
Outbreak type	General
Human cases	13
Hospitalized	2
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	raw rucola lettuce
Type of evidence	Laboratory detection in implicated food, Laboratory characterization of food and human isolates, Laboratory detection in human cases
Setting	Household
Place of origin of problem	Farm (primary production)
Origin of foodstuff	Intra community trade
Contributory factors	Unprocessed contaminated ingredient
Outbreaks	1
Comment	RASFF-reported; PFGE-analysis; publ in EPI-aktuellt vol.7, no 49 (4 Dec 2008)

Verified Foodborne Outbreaks: detailed data

B. cereus

	Value
Code	ID 08/0133
Subagent Choice	
Outbreak type	General
Human cases	5
Hospitalized	0
Deaths	0
Foodstuff implicated	Cereal products including rice and seeds/pulses (nuts, almonds)
More Foodstuff	cooked rice
Type of evidence	Laboratory detection in implicated food
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	Inadequate chilling
Outbreaks	1
Comment	

B. cereus

	Value
Code	ID 09/0086
Subagent Choice	
Outbreak type	General
Human cases	115
Hospitalized	0
Deaths	0
Foodstuff implicated	Cereal products including rice and seeds/pulses (nuts, almonds)
More Foodstuff	cooked rice
Type of evidence	Laboratory detection in implicated food, Analytical epidemiological evidence
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	Inadequate chilling
Outbreaks	1
Comment	meal with rice: RR 55,72; 95% CI:7.92-391,71; rice eaten by 121 of 123 persons

Verified Foodborne Outbreaks: detailed data

S. aureus

	Value
Code	ID 08/0122
Subagent Choice	Bacillus; B. cereus
Outbreak type	Household
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	meal
Type of evidence	Laboratory detection in implicated food
Setting	Household
Place of origin of problem	Take-away
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	

Verified Foodborne Outbreaks: detailed data

Calicivirus (including norovirus)

	Value
Code	ID V09/0004
Subagent Choice	
Outbreak type	General
Human cases	2000
Hospitalized	unknown
Deaths	unknown
Foodstuff implicated	Tap water, including well water
More Foodstuff	
Type of evidence	Analytical epidemiological evidence, Laboratory detection in human cases
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Domestic
Contributory factors	Unknown
Outbreaks	1
Comment	

Verified Foodborne Outbreaks: detailed data

S. sonnei

	Value
Code	ID 08/0156
Subagent Choice	
Outbreak type	General
Human cases	145
Hospitalized	5
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	carrots
Type of evidence	Analytical epidemiological evidence, Laboratory detection in human cases
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Domestic
Contributory factors	Infected food handler
Outbreaks	1
Comment	mannitol neg Shigella; carrots grated raw