

SWEDEN

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

TRENDS AND SOURCES OF ZOONOSSES AND ZOO NOTIC AGENTS IN HUMANS, FOODSTUFFS, ANIMALS AND FEEDINGSTUFFS

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

IN 2009

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 2009 .

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.

* 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 with numbers from June 2009. 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 2009.

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

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

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

The dairy sector plays a central role in Swedish agriculture. The number of dairy cows has, however, been decreasing over long period of time.

The number of farms with livestock is decreasing whereas those that remain increase their number of animals between 2008 and 2009.

In 2009, there were dairy cows in around 6000 farms. This is a decrease with 7% compared with 2008. On the same time, herd size increased from 55 cows/herd to 59 cows/herd.

In 2009 there were roughly 2000 pig farms in Sweden. That is a decrease by around 92% since 1980. Also, the numbers of pigs are falling, and the decrease was greatest during the 1980's.

In 2009 there were 80 400 less pigs than in 2008. The average herd size for fattening pigs was 531.

The numbers of sheep herds are increasing with about 3% in 2009 compared to 2008. The numbers of farms has slightly increased and so has also the average herd size. The total numbers of animals have increased with 3%.

The farms with hens have decreased in 2009 compared to 2008. Egg production is dominant for hens despite that the numbers of animals decreased with around 285 500 hens since 2008. Also the number of farms decreased.

For broilers there was a decreasing with about 15% animals.

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

* Only if different than current reporting year

Animal species	Category of animals	Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
		Data	Year*	Data	Year*	Data	Year*	Data	Year*
Cattle (bovine animals)	meat production animals					191505	2009	11922	2009
	dairy cows and heifers ¹⁾					356776	2009	6020	2009
	calves (under 1 year)			29241	2009	488070	2009	18965	2009
	- in total			426504	2009	1558281	2009	21733	2009
Deer	farmed - in total ²⁾			3994		16490		663	
Ducks	- in total			1049	2009				
Gallus gallus (fowl)	parent breeding flocks, unspecified - in total			559376	2009				
	broilers			75015144	2009	5262269	2009	183	2009
	laying hens			3243870	2009	5260612	2009		
	- in total					12420871	2009		
Geese	- in total			8376	2009				
Goats	- in total			773	2009	5509	2003		
Pigs	breeding animals					160265	2009	2007	2009

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	Data	Year*	Data	Year*	Data	Year*	Data	Year*
Pigs	fattening pigs					942521	2009	1773	2009
	- in total			2942912	2009	1528740	2009	2027	2009
Reindeers	farmed - in total ³⁾			54432		250267			
Sheep	animals over 1 year					253916	2009	8169	2009
	animals under 1 year (lambs)					286570	2009	7047	2009
	- in total			252873	2009	540487	2009	8245	2009
Solipeds, domestic	horses - in total			3807	2009	283100			
Turkeys	- in total			476652	2009	100743	2009	130	2007

Comments:

- ¹⁾ only beef cows
- ²⁾ 2008/2009
- ³⁾ renaret 2008/2009

2. INFORMATION ON SPECIFIC ZOOSES 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 program was initiated in 1961. In 1995, parts of the program covering cattle, pigs and poultry were approved by the EU (95/50/EC) and extended surveillance was initiated. The results showed that Swedish red and white meat and eggs are virtually free from Salmonella. Of the reported human cases, only approximately 20% are reported as domestic acquired salmonella infection.

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

The national situation has been very favorable. The number of infected broiler flocks, swine and cattle herds decreased in the late 1980's. In 2008-2009 more cattle herds have been detected with Salmonella than in previous years. However, this higher number might be a consequence of increased sampling with a bulk-milk screening of dairy herds in a region with historically known higher incidence of S. Dublin infected herds compared to other regions in Sweden.

The total number of notified human cases has significantly decreased between 1997-2009 but a trend could not be seen for the domestic cases.

For human outbreaks the trend has been changing from large meat outbreaks towards smaller outbreaks with vegetable sources.

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

Travel and imported food are considered most important sources of Salmonella infections. An increased awareness regarding the risk of Salmonella in nontraditional sources such as leafy green vegetables is needed as these products are commonly not cooked or heated prior to eating as compared to meat products and they are quite frequently found to be contaminated with Salmonella.

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. According to the Communicable Disease Act, the source of the Salmonella infection has to be investigated to prevent further spread. Also, contact persons are sampled when there are cases/outbreaks of salmonellosis. Information about country of origin is available only in the reports from the physicians.

Case definition

A case is defined as a person from whom Salmonella, of any serotype, has been isolated, including subclinical infections. A case is considered to be of foreign origin if the person has been traveling abroad during the incubation period.

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. Phagotyping of *S. Typhimurium* and *S. Enteritidis*. Other subtyping (such as PFGE, MLVA) when needed.

Notification system in place

Salmonellosis is a notifiable disease in Sweden according to the Communicable Disease Act. Notification is for both the physicians and the laboratories.

History of the disease and/or infection in the country

Sweden has statistical data for Salmonella infection in humans dating back to 1875. Earlier, the statistics were based on clinical diagnostics and later also voluntary laboratory reporting. Since 1996 laboratory reporting is mandatory. Around 3000-4000 cases are reported every year to the Swedish Institute for Infectious Disease Control. A majority of these (around 80-85 %) are infected abroad. Few larger outbreaks are reported and the source is more often imported food than domestic.

Results of the investigation

In 2009, 3054 cases were reported with Salmonella, which is a decrease with more than 1000 cases compared to 2008. A total of 593 cases were infected in Sweden with an incidence of 6.3 cases per 100 000 inhabitants. Travel-associated infections decreased by 31 % and domestic by 13 % compared to 2008.

Young children (0-4 years) and adults (30 years and above) were dominating among the domestic cases. The gender distribution was even. The decrease in domestic cases was most evident in the age groups 50 years and above.

The majority of the Salmonella cases are infected abroad (80 % in 2009). As in previous years, the infection was most commonly acquired in Thailand (809 cases) followed by Turkey (258), Egypt (162) and Spain (122) in 2009.

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

The total number of notified human cases has significantly decreased between 1997-2009 but a trend could not be identified for the domestic cases. An increased awareness regarding the risk of Salmonella in nontraditional sources such as leafy green vegetables is needed as these products are commonly not cooked or heated prior to eating as compared to meat products and they are quite frequently found to be contaminated with Salmonella.

Relevance as zoonotic disease

Salmonellosis is the second most notified bacterial zoonosis in humans in Sweden. However, the risk of contracting salmonellosis from domestic animals and food products is very low. 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.

Additional information

2.1.3 Salmonella in foodstuffs

A. 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 program approved by EU (95/50/EC). The programs are supervised by the SJV and the SLV. All sampling in the control program 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 program, 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 carcasses with 90% CI will be taken. Sampling will 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 carcasses 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

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

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

Carcass swabs: Approx. 1400 square cm/carcass is swabbed. Cutting plants: crushed meat

At meat processing plant

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

At retail

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 moistened 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 4°C until results are ready. In case of a positive result each broth will be analyzed separately.

Crushed meat: each sample of 25 g is individually analyzed 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

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

At meat processing plant

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

At retail

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

Preventive measures in place

The salmonella control program. 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 Program (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, 5989 carcass swabs from pigs (2732 from breeding pigs and 3257 from fattening pigs) were analyzed. Salmonella was not detected from any carcass swabs.

From cutting plants, 3888 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 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 a source of infection)

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

In 1995-2009, 81134 swabs have been analysed and of those 11 (0.01%) have been positive.

B. 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 systematically 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 carcasses 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 carcasses 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 carcasses 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

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

carcass swabs: approx. 1400 square cm/carcass, cutting plants: crushed meat from equipment and surfaces and trimmings

At meat processing plant

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

At retail

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 4°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

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

At meat processing plant

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

At retail

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, 1514 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 3621 carcass swabs were analysed. All were negative for Salmonella.

From cutting plants, 3888 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 a source of infection)

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 2009, 45804 lymph nodes from cattle have been sampled . Of those, 38 (0.08%) were positive for salmonella. Furthermore, 45782 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

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samples of ice-cream and deserts were all negative.

It should be observed that the reporting from the local authorities is far from complete.

C. 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 the 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, cutting plants 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 scheme 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

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

decided by the local authorities

Type of specimen taken

At slaughterhouse and cutting plant

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

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.

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

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

At meat processing plant

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

At retail

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. 5260 neckskins were analysed in 2009 - no positive samples were found. In cutting plants 1432 samples were taken - no positive samples were found. The local municipalities reported 33 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 1441 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 a source of infection)

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 2009, 59461 neck skin samples were collected and of those, 17 (0.03%) were positive.

D. 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 usually include salmonella in their in-house sampling plan.

Definition of positive finding

Eggs at egg packing centres (foodstuff based approach)

a positive (confirmed) Salmonella sample.

Eggs at retail

a positive salmonella sample

Raw material for egg products (at production plant)

a positive salmonella sample

Egg products (at production plant and at retail)

a positive salmonella sample

Control program/mechanisms

The control program/strategies in place

see above - sampling strategies

Recent actions taken to control the zoonoses

no actions needed

Measures in case of the positive findings

A positive layer flock can only send eggs for production of egg products. Positive products are considered unfit for human consumption regardless of serotype and will be destroyed.

Notification system in place

all findings of Salmonella in eggs and egg products are notifiable.

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

The national situation is good. Salmonella in eggs and egg products is not considered to be a problem.

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

findings in foodstuffs and in humans is seldom related to consumption of contaminated eggs and egg products in Sweden.

E. 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 2009.

Table Salmonella in poultry meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Meat from poultry, unspecified - carcass - at slaughterhouse - Control and eradication programmes - official sampling - objective sampling (Neck skin)	NFA	Single	10 g	5260	0			
Meat from poultry, unspecified - fresh - at cutting plant - Control and eradication programmes - official sampling - objective sampling (Meat scrapings)	NFA	Single	25 g	1432	0			

Footnote:

The local competent authorities report 18 samples from poultry meat and 15 samples from poultry meat products.

None of these were positive for Salmonella.

Poultry species were not identified in the report. Sample size is normally 25 g.

Table Salmonella in red meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Meat from bovine animals - carcass - at slaughterhouse - animal sample - carcass swabs - Control and eradication programmes - official sampling - objective sampling ¹⁾	NFA/SVA	Single	10 g	3366	0			
Meat from bovine animals - carcass - at slaughterhouse - animal sample - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Low capacity abattoirs)	NFA/SVA	Single	10 g	255	0			
Meat from bovine animals and pig - fresh - at cutting plant - Control and eradication programmes - official sampling - objective sampling (Meat scrapings)	NFA/SVA	Single		3888	0			
Meat from pig - carcass - at slaughterhouse - animal sample - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Breeding animals) ²⁾	NFA/SVA	Single	10 g	2732	0			
Meat from pig - carcass - at slaughterhouse - animal sample - carcass swabs - Control and eradication programmes - official sampling - objective sampling (Fattening pigs low-capacity abattoirs)	NFA/SVA	Single	10 g	26	0			
Meat from pig - carcass - at slaughterhouse - animal sample - carcass swabs - Control and eradication programmes - official sampling - objective sampling (High-capacity abattoirs) ³⁾	NFA/SVA	Single	10 g	3231	0			

Comments:

¹⁾ High capacity abattoirs²⁾ 1 sample was from a low-capacity abattoir

Table Salmonella in red meat and products thereof

3) Fattening pigs

Footnote:
the local authorities report 1399 samples of red meat - no positives found and 115 red meat products - one sample was positive.

2.1.4 Salmonella in animals

A. Salmonella spp. in Gallus Gallus - breeding flocks

Monitoring system

Sampling strategy

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

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 200, 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 (as a source of infection)

See Salmonella in Gallus gallus broiler flocks

B. 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 with an annual production of 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.

In case of a suspicion of Salmonella additional samplings are performed.

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 broiler houses 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 houses 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 houses 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 programs.

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 the laboratory has to notify the Swedish Board of Agriculture (SJV) and the County Administration (of the holding) irrespective of the serotype. The County 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 analysis to the sending laboratory, SJV, the food business operator and County Administration.

In addition, the laboratory must report the County Administration on the results of testings of all poultry holdings situated in the county. This reporting is performed on a quarterly basis. The County Administration summarizes the results of the holdings each year. This summary is sent to the SJV.

Results of the investigation

In 2009, Salmonella was detected in four flocks. S. Goldcoast was isolated from two flocks of one holding. S. Agona was isolated from one flock of a holding with consecutive isolation of the same serotype in subsequent flocks although the infected birds were killed and the holding was cleaned and disinfected between the rounds. S. Typhimurium RDNC was isolated from one small 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). In 2009, goslings purchased from one holding with geese breeders were a source of Salmonella Typhimurium infection in 10 poultry flocks of different species. This holding also had fattening geese and turkeys and a history of Salmonella infection in recent years with clinical salmonellosis in children. With the exception of the breeding holding, most of the infected flocks were small. 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 (as a source of infection)

The risk of getting Salmonella from domestic broiler products is low.

C. 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 consumption 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 fecal 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 fecal 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 centers.

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 layer houses 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 houses 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 program 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 County Administration (of the holding) irrespective of the serotype. The County 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 analysis to the sending laboratory, SJV, the food business operator and County Administration.

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

Results of the investigation

In 2009, Salmonella was detected in 3 flocks of laying hens: *S. Typhimurium* RDNC in one flock, *S. Livingstone* in one and *S. enterica* sp. *diarizonae* in one. The layer flock with *S. Typhimurium* was infected via goslings bought from a breeder farm. The detection of *S. enterica* sp. *diarizonae* in one layer flock might have been false. The veterinarian had visited a sheep farm prior to entering the layer house and one of the socks was broken.

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.

D. 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, whereas 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

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)

see lymph nodes at "Animals at farms"

Type of specimen taken

Animals at farm

Faeces

Animals at slaughter (herd based approach)

lymph nodes

Methods of sampling (description of sampling techniques)

Animals at farm

FECAL SAMPLING:

Sampling procedure:

For individual sampling, at least 10 g feces from each animal is collected. From pens with calves/young stock pooled fecal 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

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 3652 lymph nodes were analyzed in the Salmonella control program: 3391 at category A slaughterhouses and 261 at category B. Salmonella was isolated from three lymph nodes at category A slaughterhouses and from three at cat. B slaughterhouses.
 - 2) In 2009, Salmonella was detected in 19 new cattle herds. S. Dublin was detected in eight herds, S. Reading in five, S. Typhimurium in five, and a monophasic Salmonella 4,5,12:i:- in one herd. An additional serotype was detected on five farms: S. D sseldorf on two farms, a monophasic Salmonella on two farms and Typhimurium NT on one. In total, 35 farms were under restrictive measures in 2009 due to an infection detected in 2007-2009. By the end of 2009, 18 farms were under restriction.
- Seven herds were detected in a bulk milk screening survey and seven herds were detected in trace-back investigations. Two herds were detected after a finding in the control program performed at slaughterhouses and one after a finding at necropsy.

In 2009, all herds with S. Dublin were detected in a bulk-milk screening for antibodies against S. Dublin including all herds on the island of Öland or in trace-back investigations from these herds. In the screening 33 (16.2%) of 204 herds were positive for antibodies against S. Dublin, one of these herds was already, since 2008, under restrictions and seven of the herds were positive on culture after whole-herd samplings. One herd was detected at trace-back investigations.

S. Reading was detected in five new cattle herds in 2009. The farms were situated in close proximity to each other, but at some distance from the previously infected region in the county of Skåne. Also in this new area S. Reading was isolated from water streams and wild birds. An investigation of herds along water streams in the new region as well as trace-back investigation from the first detected herd in the new region was performed. The same subtype was isolated from one cattle herd in June, from pasture of one beef herd in July and from two dairy herds in August. The first detected herd in the new region was sampled due to detection of S. Reading in one employee.

A monophasic Salmonella was isolated from three herds. Two of these herds were neighbours and located along a river and the third herd had bought calves from one of the other two herds. One herd was already under restrictions due to S. Dublin. Three persons with exposure to the same river or farm were diagnosed with the same subtype of S. subspecies I.

3) In addition, Salmonella was detected at necropsy of cattle originating from four farms. Serotype Dublin was detected from calves of two herds, Typhimurium DT 120 from calf of one herd and S. enterica sp. diarizonae from calf of one herd. S. Typhimurium DT1 was also isolated from pasture with beef cattle but not from the animals.

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

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 2008-2009, the number of infected farms has increased which is worrying. Only two of these 19 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. In two regions, the county of Skåne with S. Reading and the county of Östergötland. S. subspecies I was suspected to have been spread via water streams. Further investigations are being planned.

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

The risk of contracting salmonella from Swedish produced food of cattle origin 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.

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

Monitoring system

Sampling strategy

Breeding flocks

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC), 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, cutting plants 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 practiced 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

at the age of 4 weeks and 2 weeks before moving

Breeding flocks: Production period

every second week

Meat production flocks: Before slaughter at farm

2

Meat production flocks: At slaughter (flock based approach)

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

socks or faeces

Meat production flocks: At slaughter (flock based approach)

: 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 voluntary 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 disinfection 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 Typhimurium RDNC was isolated from one small flock of ducks. The infection was traced to a breeder flock of geese.

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.

F. 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

at 4 weeks and 2 weeks prior to moving

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

2nd

Meat production flocks: Before slaughter at farm

1-2

Meat production flocks: At slaughter (flock based approach)

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

socks or faeces

Meat production flocks: At slaughter (flock based approach)

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

S. Typhimurium RDNC was isolated from five meat production flocks and from one breeding flock.

The breeding holding also had fattening geese and turkeys and a history of Salmonella infection in recent years with clinical salmonellosis in children. With the exception of the breeding holding, most of the infected flocks were small.

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 is very small but the few holdings struggle with Salmonella.

G. 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 carcasses with 90% CI will be taken. Sampling will 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

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

- 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

- 1) lymph nodes at Category A: daily, Category B: spread out evenly over the year , 2) sampling at suspicion/outbreak

Fattening herds at slaughterhouse (herd based approach)

The sampling unit is the pig, not the herd

Type of specimen taken

Breeding herds

Lymph nodes and faeces

Multiplying herds

Lymph nodes and faeces

Fattening herds at farm

Lymph nodes and faeces

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 faecal 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 +4°C 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 faecal 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

ISO 6579:2002 or NMKL No 71:1999

Multiplying herds

ISO 6579:2002 or NMKL No 71:1999

Fattening herds at farm

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 environmental 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, 5963 lymph nodes were analysed from category A slaughterhouses (2737 adult swine, 3226 fattening pigs) and 26 lymph nodes at category B abattoirs (2 adult swine, 24 slaughter pigs). Of these, 8 were positive.

2) In 2009, Salmonella was detected in three new swine herds: two after an isolation of in the control programme and one after trace-back. Six additional herds were under restrictive measures due to an infection detected in 2007 or 2008. Serotype Typhimurium was detected on seven of these farms, Infantis and Reading on one farm, respectively. At the end of 2009, five swine herds were under restrictive measures.

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 may 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 (as a source of infection)

Since 1996 the percentage of Swedish pigs infected with salmonella has varied from 0,04 (2004) to 0,38 (2007). There might 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.

H. 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 mandatory 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
at 4 weeks and 2 weeks prior to moving

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

Meat production flocks: Day-old chicks

Every flock is sampled

Meat production flocks: Before slaughter at farm

2

Meat production flocks: At slaughter (flock based approach)

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

socks or faeces

Meat production flocks: At slaughter (flock based approach)

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 was detected in four turkey flocks. Serotype Sandiego was isolated from three flocks of one holding and Typhimurium RDNC from one flock of a holding having geese breeders and meat production geese.

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

The Swedish turkey production is small. Since 1996, none to a few infected flocks have been detected every year. Salmonella prevalence in turkey flocks might be higher than in broiler flocks.

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

In 2007-2009 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.

I. 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 are 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

In 2009, eight establishments including parts of an animal hospital were under restrictive measures due to an infection with serotype Typhimurium in horses. Phagetype (PT) 146 infected horses at two animal hospitals and one stud farm, and phagetype RDNC at another stud farm. PT 41 was isolated from one sporadic case in a horse.

Salmonella was reported in 117 cats. Of these, 33 were serotyped to Typhimurium. Furthermore, Salmonella was detected in 9 dogs, one sheep and 8 reptile pets. Salmonella Typhimurium was detected in 20 wild birds and a monophasic Salmonella in three wild birds. Salmonella was also isolated from seven hedgehogs, from one seal, one wild boar and one zoo animal.

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

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

A veterinarian at one horse clinic was positive for Typhimurium PT 146. Salmonella is endemic in Swedish passerine birds. Findings of salmonella in reptiles kept as pets pose a risk for transmission of Salmonella

to humans.

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).

Table Salmonella in breeding flocks of Gallus gallus

	Number of existing flocks	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Hadar	S. Infantis	S. Typhimurium	S. Virchow	Salmonella spp., unspecified
Gallus gallus (fowl) - parent breeding flocks for egg production line - during rearing period	13	Swedish Eggs	Flock	13	0						
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult	19	Swedish Eggs	Flock	19	0						
Gallus gallus (fowl) - grandparent breeding flocks for egg production line	0	Swedish Eggs	Flock								
Gallus gallus (fowl) - elite breeding flocks for egg production line	0	Swedish Eggs	Flock								
Gallus gallus (fowl) - parent breeding flocks for broiler production line - during rearing period	107	Swedish Poultry Association	Flock	107	0						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult	123	Swedish Poultry Association	Flock	123	0						
Gallus gallus (fowl) - elite breeding flocks for broiler production line	0	Swedish Poultry Association	Flock								
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - adult - at farm - environmental sample - boot swabs - Control and eradication programmes - official and industry sampling - objective sampling	20	Swedish Poultry Association	Flock	20	0						
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes - official and industry sampling - objective sampling	12	Swedish Poultry Association	Flock	12	0						

Table Salmonella in breeding flocks of Gallus gallus

	S. Kanifing
Gallus gallus (fowl) - parent breeding flocks for egg production line - during rearing period	
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult	
Gallus gallus (fowl) - grandparent breeding flocks for egg production line	
Gallus gallus (fowl) - elite breeding flocks for egg production line	
Gallus gallus (fowl) - parent breeding flocks for broiler production line - during rearing period	
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult	
Gallus gallus (fowl) - elite breeding flocks for broiler production line	
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - adult - at farm - environmental sample - boot swabs - Control and eradication programmes - official and industry sampling - objective sampling	
Gallus gallus (fowl) - grandparent breeding flocks for broiler production line - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes - official and industry sampling - objective sampling	

Table Salmonella in other poultry

	Number of existing flocks	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Agona	S. Goldcoast	S. Livingstone
Gallus gallus (fowl) - laying hens - during rearing period	127	SVA	Flock	127	0						
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - official and industry sampling ¹⁾	904	SVA	Flock	904	3		1				1
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - sampling by industry	904	SVA	Flock	904	1						1
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - official sampling - objective sampling	904	SVA	Flock	252	1						
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - official sampling - suspect sampling	904	SVA	Flock	2	1		1				
Gallus gallus (fowl) - broilers - before slaughter - at farm - Control and eradication programmes - official and industry sampling	2713	SVA	Flock	2713	4		1		1	2	
Turkeys - meat production flocks	186	SVA	Flock	186	4		1				
Ducks - breeding flocks, unspecified	0	SVA	Flock								
Ducks - meat production flocks	8	SVA	Flock	8	1		1				
Geese - breeding flocks, unspecified	1	SVA	Flock	1	1		1				
Geese - meat production flocks	16	SVA	Flock	16	5		5				
Birds - pet animals (Hobby flocks)			Flock	11111	2		2				

Table Salmonella in other poultry

	Number of existing flocks	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Agona	S. Goldcoast	S. Livingstone
Turkeys - parent breeding flocks - adult - at farm - environmental sample - boot swabs - Control and eradication programmes - official and industry sampling - objective sampling	4	SVA	Flock	4	0						
Turkeys - parent breeding flocks - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes - official and industry sampling - objective sampling	4	SVA	Flock	4	0						

	S. Sandiego	S. enterica subsp. diarizonae
Gallus gallus (fowl) - laying hens - during rearing period		
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - official and industry sampling ¹⁾		1
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - sampling by industry		
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - official sampling - objective sampling		1
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - official sampling - suspect sampling		

Table Salmonella in other poultry

	S. Sandiego	S. enterica subsp. diarizonae
Gallus gallus (fowl) - broilers - before slaughter - at farm - Control and eradication programmes - official and industry sampling		
Turkeys - meat production flocks	3	
Ducks - breeding flocks, unspecified		
Ducks - meat production flocks		
Geese - breeding flocks, unspecified		
Geese - meat production flocks		
Birds - pet animals (Hobby flocks)		
Turkeys - parent breeding flocks - adult - at farm - environmental sample - boot swabs - Control and eradication programmes - official and industry sampling - objective sampling		
Turkeys - parent breeding flocks - during rearing period - at farm - environmental sample - boot swabs - Control and eradication programmes - official and industry sampling - objective sampling		

Comments:

¹⁾ The total number of existing flocks is the number of tested flocks.

Table Salmonella in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Derby	S. Dublin	S. Duesseldorf	S. Montevideo
Cattle (bovine animals) ¹⁾	SVA	Holding	103	19	0	4			8	2	
Pigs ²⁾	SVA, SJV	Holding	7	3		3					
Sheep ³⁾	SVA, SJV	Holding	4	2		1					
Solipeds, domestic ⁴⁾	SVA	Holding	103	8		8					
Cats ⁵⁾	SVA	Animal	437	117		33	84				
Cattle (bovine animals) - at farm - animal sample - faeces (Prevalence) ⁶⁾	SVA, SJV	Holding	138	35	2	9			15	2	
Cattle (bovine animals) - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Major abattoirs)	SVA, SLV	Animal	3391	3		3					
Cattle (bovine animals) - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Minor abattoirs)	SVA, SLV	Animal	261	3		2		1			
Dogs - pet animals ⁷⁾	SVA	Animal	254	9	1	5	2				1
Hedgehogs - wild ⁸⁾	SVA	Animal	68	7	3	4					
Pigs - breeding animals - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Minor abattoirs)	SVA, SLV	Animal	2	0							
Pigs - breeding animals - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Samples are taken at major abattoirs)	SVA, SLV	Animal	2737	4		3					

Table Salmonella in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Derby	S. Dublin	S. Duesseldorf	S. Montevideo
Pigs - fattening pigs - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Major abattoirs) ⁹⁾	SVA, SLV	Animal	3226	3		3					
Pigs - fattening pigs - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Minor abattoirs)	SVA, SLV	Animal	24	0							
Reptiles ¹⁰⁾	SVA	Animal	16	8	7						
Seals - wild ¹¹⁾	SVA	Animal	37	1					1		
Wild boars ¹²⁾	SVA	Animal	4	1							

	S. Newport	S. Reading	S. enterica subsp. arizonae	S. enterica subsp. diarizonae	S. enterica, monophasic
Cattle (bovine animals) ¹⁾		5		1	3
Pigs ²⁾					
Sheep ³⁾				2	
Solipeds, domestic ⁴⁾					
Cats ⁵⁾					
Cattle (bovine animals) - at farm - animal sample - faeces (Prevalence) ⁶⁾		9			3

Table Salmonella in other animals

	S. Newport	S. Reading	S. enterica subsp. arizonae	S. enterica subsp. diarizonae	S. enterica, monophasic
Cattle (bovine animals) - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Major abattoirs)					
Cattle (bovine animals) - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Minor abattoirs)					
Dogs - pet animals ⁷⁾					
Hedgehogs - wild ⁸⁾					
Pigs - breeding animals - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Minor abattoirs)					
Pigs - breeding animals - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Samples are taken at major abattoirs)		1			
Pigs - fattening pigs - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Major abattoirs) ⁹⁾					
Pigs - fattening pigs - at slaughterhouse - animal sample - lymph nodes - Control and eradication programmes - official sampling - objective sampling (Minor abattoirs)					
Reptiles ¹⁰⁾				1	
Seals - wild ¹¹⁾					

Table Salmonella in other animals

	S. Newport	S. Reading	S. enterica subsp. arizonae	S. enterica subsp. diarizonae	S. enterica, monophasic
Wild boars ¹²⁾				1	

Comments:

- ¹⁾ Incidence. Duesseldorf was isolated on one farm with S. Dublin and one farm with Typhimurium. Typhimurium was isolated on one farm with Reading. Monophasic Salmonella was isolated on farm farm with Typhimurium.
- ²⁾ Incidence
- ³⁾ The other sheep farm was under restrictive measures due to S. Typhimurium detected in poultry. Diarizonae and Typhimurium were detected in sheep of that farm.
- ⁴⁾ No. units tested only for analyses performed at SVA
- ⁵⁾ No. units tested only for analyses performed at SVA
- ⁶⁾ Duesseldorf was isolated on one farm with S. Dublin and one farm with Typhimurium. Typhimurium was isolated on one farm with Reading. Monophasic Salmonella was isolated on farm with Typhimurium and one farm with Dublin.
- ⁷⁾ No. units tested only for analyses performed at SVA
- ⁸⁾ No. units tested only for analyses performed at SVA
- ⁹⁾ Major abattoirs
- ¹⁰⁾ No. units tested only for analyses performed at SVA
- ¹¹⁾ No. units tested only for analyses performed at SVA
- ¹²⁾ No. units tested only for analyses performed at SVA

Footnote:

Duesseldorf was isolated on one farm with S. Dublin and one farm with Typhimurium. Typhimurium was isolated on one farm with Reading. Monophasic Salmonella was isolated on farm farm with Typhimurium.

Table Salmonella in other birds

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Ostriches ¹⁾	SVA	Flock	21	0			
Birds - wild	SVA	Animal	465	23		20	3

Comments:

¹⁾ Before slaughter

2.1.5 Salmonella in feedingstuffs

A. Salmonella spp. in feed

History of the disease and/or infection in the country

The work in Sweden began in the late 1950s, in an agreement between the National Veterinary Institute (SVA) and the feed industry organization. Studies carried out in the 1950s showed that imported feed materials including animal proteins contained Salmonella and heat pelleting was shown to be an effective procedure to remove the contamination. In 1991 a new control program for Salmonella in feed was launched based on HACCP (Hazard Analysis Critical Control Points) principles. This program became mandatory in 1993 when it was implemented by the National Board of Agriculture.

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.

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

Data from 2009 showed a different picture compared to other periods because *S. Typhimurium* was the most frequently isolated serotype in feed mills, a situation which could be attributed to a lengthy contamination in one major feed mill. The results showed that this serotype could become established in feed mill environments and present a risk for feed-borne infections in livestock.

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

Feed is considered the most important source of Salmonella for animals and the most important risk factor in feed production is the feed materials. According to previous experience, feed materials of animal origin as well as certain vegetable origin are considered hazardous. However, due to restrictions on the use of feed materials of animal origin, certain feed materials of vegetable origin are presently the most important risk factor.

If this risk is minimized it is possible to reduce the findings in animals and humans. However, an epidemiological link between findings in feed and animals and humans, as was found in an outbreak caused by *S. Reading* in 2007-2009, are often difficult to verify.

Recent actions taken to control the zoonoses

Studies were performed to compare the standard method used for isolation of Salmonella in feed in the Nordic countries, the NMKL71 method (Nordic Committee on Food Analysis) with the Modified Semisolid Rappaport Vassiliadis method (MSRV) and the international standard method (EN ISO 6579:2002).

Five different feed materials were investigated, wheat grain, soybean meal, rape seed meal, palm kernel meal, pellets of pig feed and also scrapings from a feed mill elevator. Four different levels of the Salmonella serotypes *S. Typhimurium*, *S. Cubana* and *S. Yoruba* were added to each feed material, respectively. The results obtained with all three methods showed no differences in detection levels, with an accuracy and sensitivity of 65% and 56%, respectively. However, Müller-Kauffmann tetrathionate-novobiocin broth (MKTn), performed less well due to many false-negative results on Brilliant Green agar (BGA) plates. Compared to other feed materials palm kernel meal showed a higher detection level with all serotypes and methods tested (Koyuncu and Haggblom, 2009).

Suggestions to the Community for the actions to be taken

A risk-based Salmonella control programme covering all steps from feed raw material to food should be established.

B. Salmonella spp. in Feed All feedingstuffs - in total - Surveillance

Monitoring system

Sampling strategy

The aim of the bacteriological monitoring is to check on the salmonella status of ingredients as well as the environmental hygiene of the premises, esp. the production lines, and also to take corrective actions when positive samples are detected. Feed mills and feed material suppliers are included in the monitoring which is based on HACCP-principles following a risk analysis. Feed materials have to be tested negative, according to a sampling plan that detects salmonella with a 99% probability, before being used in feed processing. Feed samples collected by the feed operator and also officials are investigated when outbreaks occur in food producing animals.

Frequency of the sampling

Domestic feed material of plant origin

Other: ____Products in their natural state, official controls are carried out according to a sampling plan.

In premises where products derived from industrial processing are produced the frequency of sampling is following a sampling plan based on risk assessment. The samples are taken in the processing line/environment as dust samples/scrapings.

Domestic feed material of animal origin

Other: ____Products in their natural state, fresh or preserved, official controls are carried out according to a sampling plan.

Premises where products derived from industrial processing the frequency of sampling is following a sampling plan based on risk assessment. The samples are taken in the processing line/environment as dust samples/scrapings.

Imported feed material of plant origin

Other: ____According to national legislation feed materials are categorized according to risk for salmonella contamination, and those consignments of feed ingredients found to have a high risk have to be tested negative for salmonella contamination before they can be used for feed production. In practice they are not allowed to enter the feed mill before a negative test result are at hand. The sampling plan for feed materials is designed to detect Salmonella with a 99% probability.

Imported feed material of animal origin

Other: ____According to national legislation feed materials are categorized according to risk for salmonella contamination (e.g. fish meal), and those consignments of feed ingredients found to have a high risk have to be tested negative for salmonella contamination before they can be used for feed production. In practice they are not allowed to enter the feed mill before a negative test result are at hand. The sampling plan for feed materials is designed to detect Salmonella with a 99% probability.

Official sampling of dog snacks are carried out according to a sampling plan.

Process control in feed mills

Once a week

Compound feedingstuffs

Other: ____The strategy is to monitor ingredients as well as the environmental hygiene of the premises, esp. the production lines are not contaminated with Salmonella. For that reason no sampling are done on the compound feed except official controls according to a sampling plan.

Type of specimen taken

Domestic feed material of plant origin

Products in their natural state, official controls are carried out according to a sampling plan.

In premises where products derived from industrial processing are produced the frequency of sampling is following a sampling plan based on risk assessment. The samples are taken in the processing line/environment as dust samples/scrapings.

Domestic feed material of animal origin

Official controls of raw materials are carried out according to a sampling plan.

In premises where products derived from industrial processing are produced the frequency of sampling is following a sampling plan based on risk assessment. The samples are taken in the processing line/environment as dust samples/scrapings.

Imported feed material of plant origin

According to national legislation feed materials are categorized according to risk for salmonella contamination, and those consignments of feed ingredients found to have a high risk have to be tested negative for salmonella contamination before they can be used for feed production. In practice they are not allowed to enter the feed mill before a negative test result are at hand. A large number of increments are collected and pooled into analytical samples. The sampling plan for feed materials is designed to detect Salmonella with a 99% probability.

Imported feed material of animal origin

According to national legislation feed materials are categorized according to risk for salmonella contamination (e.g. fish meal), and those consignments of feed ingredients found to have a high risk have to be tested negative for salmonella contamination before they can be used for feed production. In practice they are not allowed to enter the feed mill before a negative test result are at hand. A large number of increments are collected and pooled into analytical samples. The sampling plan for feed materials is designed to detect Salmonella with a 99% probability.

Official sampling of dog snacks are carried out according to a sampling plan.

Process control in feed mills

The samples collected are scrapings and dust samples, see also "Methods of sampling".

Compound feedingstuffs

The strategy is to monitor ingredients as well as the environmental hygiene of the premises, esp. the production lines are not contaminated with Salmonella. For that reason no sampling are done on the compound feed except official controls according to a sampling plan.

Methods of sampling (description of sampling techniques)

Domestic feed material of plant origin

Official sampling according to Commission Regulation (EC) No 152/2009.

Premises where products derived from industrial processing the frequency of sampling is following a sampling plan based on risk assessment. The samples are taken in the processing line/environment as dust samples/scrapings.

Domestic feed material of animal origin

Official sampling according to Commission Regulation (EC) No 152/2009

Premises where products derived from industrial processing the frequency of sampling is following a

sampling programme based on risk assessment. The samples are taken in the processing line/environment as dust samples/scrapings.

Imported feed material of plant origin

The surveillance of feed ingredients is based on a sampling procedure which takes into consideration an uneven distribution of salmonella contamination and is designed to detect a contamination in 5% of the batch with 95% probability. The size of the analytical sample is 25 gram, each consisting of 10 pooled subsamples of 2.5 gram. The number of analyzed samples depends on the imported feed material and the size of the consignment (according to national legislation).

Besides the bacteriological monitoring above official controls according to Commission Regulation (EC) No 152/2009 are also carried out.

Imported feed material of animal origin

The surveillance of feed ingredients (e.g. fish meal) is based on a sampling procedure which takes into consideration an uneven distribution of salmonella contamination and is designed to detect a contamination in 5% of the batch with 95% probability. The size of the analytical sample is 25 gram, each consisting of 10 pooled subsamples of 2.5 gram. The number of analyzed samples depends on the imported feed material and the size of the consignment (according to national legislation).

Besides the bacteriological monitoring above official controls according to Commission Regulation (EC) No 152/2009 are also carried out.

Process control in feed mills

In national legislation the following five control points in the processing line were identified in feed mills manufacturing compound feed for food producing animals:

1. Top of bin for final feed (compound feed).
2. Room for pellet coolers.
3. Top of pellet cooler.
4. Dust from the aspiration system (filter).
5. Intake pit/bottom part of elevator for feed materials.

At these critical control points dust samples or scrapings are collected.

When poultry feed is produced, a minimum of one environmental sample has to be taken at each of the above five control points on a weekly basis and checked for the absence of salmonella. When only non-poultry feed is produced the corresponding requirement is limited to control points 1 and 5. These samples are taken by the operator and all samples have to be sent to the National Veterinary Institute (SVA) for analysis and control that the number of samples is in accordance with the legislation. However, most operators normally take additional environmental samples.

Besides the bacteriological monitoring above an official sampling of the production line and in the environment in the feed mills are also carried out.

Compound feedingstuffs

Official sampling according to Commission Regulation (EC) No 152/2009.

Definition of positive finding

Domestic feed material of plant origin

All findings of Salmonella spp.

Domestic feed material of animal origin

All findings of Salmonella spp.

Imported feed material of plant origin

All findings of Salmonella spp.

Imported feed material of animal origin

All findings of Salmonella spp.

Process control in feed mills

All findings of Salmonella spp.

Compound feedingstuffs

All findings of Salmonella spp.

Diagnostic/analytical methods used

Domestic feed material of plant origin

Bacteriological method: NMKL No 71:1999

Domestic feed material of animal origin

Bacteriological method: NMKL No 71:1999

Imported feed material of plant origin

Bacteriological method: NMKL No 71:1999

Imported feed material of animal origin

Bacteriological method: NMKL No 71:1999

Process control in feed mills

Bacteriological method: NMKL No 71:1999

Compound feedingstuffs

Bacteriological method: NMKL No 71:1999

Preventive measures in place

An important part is the HACCP-based process control system in the feed mill, where the main hazards first are identified in the processing line.

Main risk factors are the raw materials and for that reason many producer audit their suppliers of raw material to minimize the risk.

Control program/mechanisms

The control program/strategies in place

In the control program for feed the emphasis is on control of ingredients, the heat treatment process and preventive measures regarding recontamination of heat treated feed. The purpose is to ensure the absence of Salmonella in the production lines and the feed mill environment.

Measures in case of the positive findings

Domestic feed material of plant origin

Salmonella positive findings in products in their natural state, fresh or preserved are usually treated with

organic acids, such as formic acid. After acid treatment the feed material has to be re-tested with negative result before using it in feed production. Feed materials that have been treated with acid are only allowed to be used in feed that are supposed to be heat treated.

In premises where products derived from industrial processing larger sampling is made in the production line if Salmonella is detected in the monitoring and different measures are then undertaken. If Salmonella is found the contaminated part of the production line is thoroughly cleaned and disinfected, usually by dry cleaning, followed by disinfection. Environmental sampling must show negative results before production is resumed.

Domestic feed material of animal origin

Has to be withdrawn from the market and handled according to Regulation (EC) No 178/2002.

Contaminated parts in the premises at the raw material producer have to be thoroughly cleaned and disinfected.

Imported feed material of plant origin

Consignments found to be salmonella contaminated are subjected to a decontamination procedure by using organic acids followed by re-testing with negative result. Feed materials that have been treated with acid are only allowed to be used in feed that are supposed to be heat treated.

Contaminated parts in the premises have to be thoroughly cleaned and disinfected.

Imported feed material of animal origin

Imported feed material of animal origin containing Salmonella has to be withdrawn from the market and handled according to Regulation (EC) No 178/2002.

Contaminated parts in the premises have to be thoroughly cleaned and disinfected.

Process control in feed mills

A larger sampling is made immediately in the production line if Salmonella is detected in the weekly monitoring and different measures are then undertaken. If Salmonella is found before heat treatment the contaminated part of the production line is thoroughly cleaned and disinfected, usually by dry cleaning, followed by disinfection. If Salmonella is found after heat treatment, the feed mill has to be thoroughly cleaned and disinfected. Environmental sampling must show negative results before production is resumed.

Compound feedingstuffs

Compound feed containing Salmonella has to be withdrawn from the market and handled according to Regulation (EC) No 178/2002.

Notification system in place

Findings of Salmonella in feed materials/compound feed after heat treatment must be reported directly to National Board of Agriculture. If no heat treatment exists in the production line a notification also must be done directly to the National Board of Agriculture. Findings of Salmonella in feed materials and compound feeds are reported within the Rapid Alert System for Food and Feed (RASFF).

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

Data from 2009 showed a different picture compared to other periods because S. Typhimurium was the most frequently isolated serotype in feed mills, a situation which could be attributed to a lengthy contamination in one major feed mill. The results showed that this serotype could become established in feed mill environments and present a risk for feed- borne infections in livestock.

Table Salmonella in compound feedingstuffs

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Aarhus	S. Adelaide	S. Agona
Compound feedingstuffs, not specified - final product - at feed mill - imported - Surveillance - official controls		Single		17	0						
Compound feedingstuffs, not specified - process control - at feed mill - domestic production - Control and eradication programmes - industry sampling - objective sampling (surveillance, HACCP or own checks by industry)		Single		9629	42	0	21	4	1	1	1
Compound feedingstuffs, not specified - process control - at feed mill - environmental sample - Surveillance - official controls (Environmental sampling)		Single		497	4						
Pet food - dog snacks (pig ears, chewing bones) - at feed mill - Surveillance - official controls		Single		41	1						
	S. Havana	S. Infantis	S. Livingstone	S. London	S. Mbandaka	S. Meleagridis	S. Montevideo	S. Rissen	S. Ruiru	S. Schwarzengrund	S. Senftenberg
Compound feedingstuffs, not specified - final product - at feed mill - imported - Surveillance - official controls											
Compound feedingstuffs, not specified - process control - at feed mill - domestic production - Control and eradication programmes - industry sampling - objective sampling (surveillance, HACCP or own checks by industry)	1			3	1	1	1	1	1	1	1

Table Salmonella in compound feedingstuffs

	S. Havana	S. Infantis	S. Livingstone	S. London	S. Mbandaka	S. Meleagridis	S. Montevideo	S. Rissen	S. Ruiru	S. Schwarzengrund	S. Senftenberg
Compound feedingstuffs, not specified - process control - at feed mill - environmental sample - Surveillance - official controls (Environmental sampling)			1		2		1				
Pet food - dog snacks (pig ears, chewing bones) - at feed mill - Surveillance - official controls		1									

	S. Tennessee	S. Yoruba
Compound feedingstuffs, not specified - final product - at feed mill - imported - Surveillance - official controls		
Compound feedingstuffs, not specified - process control - at feed mill - domestic production - Control and eradication programmes - industry sampling - objective sampling (surveillance, HACCP or own checks by industry)	1	2
Compound feedingstuffs, not specified - process control - at feed mill - environmental sample - Surveillance - official controls (Environmental sampling)		
Pet food - dog snacks (pig ears, chewing bones) - at feed mill - Surveillance - official controls		

Table Salmonella in other feed matter

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Kentucky	S. Lexington	S. Livingstone
Feed material of cereal grain origin - barley derived ¹⁾	SJV	Batch		1	0						
Feed material of cereal grain origin - maize - derived ²⁾	SJV	Batch		60	2		1				1
Feed material of cereal grain origin - other cereal grain derived ³⁾	SJV	Batch		13	0						
Feed material of oil seed or fruit origin - groundnut derived ⁴⁾	SJV	Batch		7	0						
Feed material of oil seed or fruit origin - palm kernel derived ⁵⁾	SJV	Batch		41	1				1		
Feed material of oil seed or fruit origin - rape seed derived ⁶⁾	SJV	Batch		972	7			1			3
Feed material of oil seed or fruit origin - soya (bean) derived ⁷⁾	SJV	Batch		1799	6					1	
Feed material of oil seed or fruit origin - sunflower seed derived ⁸⁾	SJV	Batch		14	2						
Other feed material - forages and roughages		Batch		1	0						
Other feed material - other plants ⁹⁾	SJV	Batch		9	0						
Compound feedingstuffs, not specified - final product - Surveillance - HACCP and own checks (return to feed business operator)		Single		42	0						
Feed material of oil seed or fruit origin - rape seed derived - at feed mill - domestic production - Control and eradication programmes - industry sampling (Environmental sampling , HACCP)	SJV	Single		788	4						

Table Salmonella in other feed matter

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Kentucky	S. Lexington	S. Livingstone
Feed material of oil seed or fruit origin - rape seed derived - at feed mill - domestic production - Surveillance - HACCP and own checks	SJV	Single		1725	0						

	S. Mbandaka	S. Meleagridis	S. Ohio	S. Senftenberg	S. Soerenga	S. Tennessee	S. Worthington	S. Yoruba
Feed material of cereal grain origin - barley derived ¹⁾								
Feed material of cereal grain origin - maize - derived ²⁾								
Feed material of cereal grain origin - other cereal grain derived ³⁾								
Feed material of oil seed or fruit origin - groundnut derived ⁴⁾								
Feed material of oil seed or fruit origin - palm kernel derived ⁵⁾								
Feed material of oil seed or fruit origin - rape seed derived ⁶⁾	1		1	1				
Feed material of oil seed or fruit origin - soya (bean) derived ⁷⁾				1	1	1	1	1
Feed material of oil seed or fruit origin - sunflower seed derived ⁸⁾		1		1				
Other feed material - forages and roughages								
Other feed material - other plants ⁹⁾								

Table Salmonella in other feed matter

	S. Mbandaka	S. Meleagridis	S. Ohio	S. Senftenberg	S. Soerenga	S. Tennessee	S. Worthington	S. Yoruba
Compound feedingstuffs, not specified - final product - Surveillance - HACCP and own checks (return to feed business operator)								
Feed material of oil seed or fruit origin - rape seed derived - at feed mill - domestic production - Control and eradication programmes - industry sampling (Environmental sampling , HACCP)				4				
Feed material of oil seed or fruit origin - rape seed derived - at feed mill - domestic production - Surveillance - HACCP and own checks								

Comments:

- 1) Imported
- 2) Imported
- 3) Imported
- 4) Imported
- 5) Imported
- 6) Imported
- 7) Imported
- 8) Imported
- 9) Imported

Footnote:

SJV - National Board of Agriculture

Table Salmonella in feed material of animal origin

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Agona	S. Isangi	S. Kedougou
Feed material of land animal origin - meat meal ¹⁾	SJV	Batch		67	1						1
Feed material of marine animal origin - fish meal ²⁾	SJV	Batch		61	1						
Feed material of marine animal origin - other fish products ³⁾	SJV	Batch		2	0						
Feed material of land animal origin - blood meal (blood products and environmental sampling) ⁴⁾	SJV	Batch		90	0						
Feed material of land animal origin - bone meal (products and environmental sampling) ⁵⁾	SJV	Batch		160	0						
Feed material of land animal origin - greaves (products and environmental sampling) ⁶⁾	SJV	Batch		1463	7			5			
Feed material of land animal origin - meat and bone meal (products and environmental sampling) ⁷⁾	SJV	Batch		402	13				11		
Feed material of land animal origin - poultry offal meal (/feather meal) ⁸⁾	SJV	Batch		92	13					13	
Other feed material (glucose amine) ⁹⁾	SJV	Batch		1	0						
Other feed material - yeast ¹⁰⁾	SJV	Batch		1	0						

	S. Livingstone	S. Mbandaka	S. Montevideo	S. Ohio
Feed material of land animal origin - meat meal ¹⁾				
Feed material of marine animal origin - fish meal ²⁾				1

Table Salmonella in feed material of animal origin

	S. Livingstone	S. Mbandaka	S. Montevideo	S. Ohio
Feed material of marine animal origin - other fish products ³⁾				
Feed material of land animal origin - blood meal (blood products and environmental sampling) ⁴⁾				
Feed material of land animal origin - bone meal (products and environmental sampling) ⁵⁾				
Feed material of land animal origin - greaves (products and environmental sampling) ⁶⁾	1		1	
Feed material of land animal origin - meat and bone meal (products and environmental sampling) ⁷⁾		2		
Feed material of land animal origin - poultry offal meal (/feather meal) ⁸⁾				
Other feed material (glucose amine) ⁹⁾				
Other feed material - yeast ¹⁰⁾				

Comments:

- ¹⁾ Imported
- ²⁾ Imported
- ³⁾ Imported
- ⁴⁾ Domestic
- ⁵⁾ Domestic
- ⁶⁾ Domestic
- ⁷⁾ Domestic
- ⁸⁾ Imported
- ⁹⁾ Imported
- ¹⁰⁾ Imported

Table Salmonella in feed material of animal origin

Footnote:
SJV - National Board of Agriculture

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

Serovar	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
Sources of isolates								
Number of isolates in the laboratory	48		14		8		12	
Number of isolates serotyped	48	0	14	0	8	0	12	0
Number of isolates per serovar								
S. Agona					1			
S. Derby	1							
S. Dublin	17							
S. Duesseldorf	2							
S. Enteritidis	2							
S. Goldcoast					2			

Table Salmonella serovars in animals

Serovar	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
Sources of isolates								
Number of isolates in the laboratory	48		14		8		12	
Number of isolates serotyped	48	0	14	0	8	0	12	0
Number of isolates per serovar								
S. Infantis			1					
S. Livingstone					1			
S. Reading	9		2					
S. Sandiego							3	
S. Typhimurium	14		11		3		9	
S. enterica subsp. diarizonae					1			
S. enterica, monophasic	3							

Footnote:

All isolates are summarized in the category of Monitoring.

Table Salmonella Enteritidis phage types in animals

Phagetype	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry		Dogs		Hedgehogs	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
	2		0		0		0		1		3	
	2	0	0	0	0	0	0	0	0	0	2	0
1	2											
RDNC											2	

Footnote:

All isolates are summarized in the column of Monitoring.

Table Salmonella Typhimurium phagetypes in animals

Phagetype	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
	14		11		3		9	
	14	0	11	0	3	0	9	0
1	1							
DT 104	1		1					
DT 120	3		4					
DT 40	1		2				1	
DT 41	1		1					
Not typeable	2							
RDNC	4		3		3		8	
U 277	1							

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 2009 and in incidents previously notified and still under restrictions 2009. Also included are isolates obtained 2009 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 Accreditation and Conformity Assessment (SWEDAC) according to SS-EN ISO/IEC 17025 and regularly participates in external quality assurance.

Cut-off values 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 43 incidents of Salmonella in cattle 2009, 5 incidents involved strains resistant to one or more antimicrobials.

Three incidents involved multiresistant *S. enterica* 4,5,12:i:-.

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.

Cut-off values 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 10 incidents of Salmonella in pigs 2009 no incident involved resistant strains.

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 167 incidents in pigs, of which 93 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.

Cut-off values 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 93 reported incidents since the start of the monitoring programme SVARM year 2000, 48 have involved S. Typhimurium. Of these incidents only two have involved strains resistant to four or more antimicrobials.

Table Antimicrobial susceptibility testing of Salmonella in Pigs

Salmonella	S. Enteritidis		S. Typhimurium		Salmonella spp.	
Isolates out of a monitoring program (yes/no)	yes		yes		yes	
Number of isolates available in the laboratory	0		9		1	
Antimicrobials:	N	n	N	n	N	n
Amphenicols - Chloramphenicol			9	0	1	0
Amphenicols - Florfenicol			9	0	1	0
Fluoroquinolones - Ciprofloxacin			9	0	1	0
Quinolones - Nalidixic acid			9	0	1	0
Trimethoprim			9	0	1	0
Sulfonamides - Sulfonamide			9	0	1	0
Aminoglycosides - Streptomycin			9	0	1	0
Aminoglycosides - Gentamicin			9	0	1	0
Aminoglycosides - Kanamycin			9	0	1	0
Penicillins - Ampicillin			9	0	1	0
Tetracyclines - Tetracycline			9	0	1	0
Fully sensitive			9	9	1	1

Table Antimicrobial susceptibility testing of Salmonella in Gallus gallus (fowl)

Salmonella Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory Antimicrobials:	S. Enteritidis		S. Typhimurium		Salmonella spp.	
	yes		yes		yes	
	0		3		4	
	N	n	N	n	N	n
Amphenicols - Chloramphenicol			3	0	4	0
Amphenicols - Florfenicol			3	0	4	0
Fluoroquinolones - Ciprofloxacin			3	0	4	0
Quinolones - Nalidixic acid			3	0	4	0
Trimethoprim			3	0	4	0
Sulfonamides - Sulfonamide			3	0	4	0
Aminoglycosides - Streptomycin			3	0	4	0
Aminoglycosides - Gentamicin			3	0	4	0
Aminoglycosides - Kanamycin			3	0	4	0
Penicillins - Ampicillin			3	0	4	0
Tetracyclines - Tetracycline			3	0	4	0
Fully sensitive			3	3	4	4

Table Antimicrobial susceptibility testing of Salmonella in Cattle (bovine animals)

Salmonella Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory Antimicrobials:	S. Enteritidis		S. Typhimurium		Salmonella spp.		S. 4,5,12:i:-		S. Dublin	
	yes		yes		yes		yes		yes	
	0		11		16		3		13	
	N	n	N	n	N	n	N	n	N	n
Amphenicols - Chloramphenicol			11	0	16	0			13	0
Amphenicols - Florfenicol			11	0	16	0			13	0
Fluoroquinolones - Ciprofloxacin			11	0	16	0			13	1
Quinolones - Nalidixic acid			11	0	16	0			13	0
Trimethoprim			11	0	16	0			13	0
Sulfonamides - Sulfonamide			11	0	16	1			13	0
Aminoglycosides - Streptomycin			11	0	16	1			13	0
Aminoglycosides - Gentamicin			11	0	16	0			13	0
Aminoglycosides - Kanamycin			11	0	16	0			13	0
Penicillins - Ampicillin			11	0	16	0			13	0
Tetracyclines - Tetracycline			11	0	16	1			13	0
Fully sensitive			11	11	16	15	3	0	13	12
Resistant to 1 antimicrobial									13	1
Resistant to 3 antimicrobials					16	1				
Resistant to 4 antimicrobials							3	3		
Number of multiresistant S. Typhimurium - with penta resistance			0	0						
Number of multiresistant S. Typhimurium - resistant to other antimicrobials			0	0						

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

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

S. Typhimurium	Cattle (bovine animals)																								
	yes																								
	11																								
	Cut-off value	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
Amphenicols - Chloramphenicol	16	11	0									3	8											2	128
Amphenicols - Florfenicol	2	11	0									4	7											2	32
Tetracyclines - Tetracycline	8	11	0								5	6												0.5	64
Fluoroquinolones - Ciprofloxacin	0.06	11	0			8	3																	0.008	8
Quinolones - Nalidixic acid	16	11	0										11											2	256
Trimethoprim		11	0						6	5														0.25	32
Sulfonamides - Sulfonamide	256	11	0													1	7	3						8	1024
Aminoglycosides - Streptomycin	32	11	0											3	8									2	256
Aminoglycosides - Gentamicin	2	11	0							3	8													0.25	32
Aminoglycosides - Kanamycin	16	11	0									5	6											0.5	16
Penicillins - Ampicillin	4	11	0								11													0.5	64
Cephalosporins - Cefotaxim	0.5	11	0				4	7																0.06	8

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

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

S. Dublin	Cattle (bovine animals)																								
	yes																								
	13																								
	Cut-off value	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
Amphenicols - Chloramphenicol	16	13	0									10	2	1										2	128
Amphenicols - Florfenicol	2	13	0									8	4		1									2	32
Tetracyclines - Tetracycline	8	13	0								12		1											0.5	64
Fluoroquinolones - Ciprofloxacin	0.06	13	1			12		1																0.008	8
Quinolones - Nalidixic acid	16	13	0									2	10	1										2	256
Trimethoprim	2	13	0						1	11	1													0.25	32
Sulfonamides - Sulfonamide	256	13	0													4	6	2	1					8	1024
Aminoglycosides - Streptomycin	32	13	0												10	3								2	256
Aminoglycosides - Gentamicin	2	13	0							9	4													0.25	32
Aminoglycosides - Kanamycin	16	13	0								1	9	3											0.5	16
Penicillins - Ampicillin	4	13	0							7	5	1												0.5	64
Cephalosporins - Cefotaxim	2	13	0				12			1														0.06	8

Table Antimicrobial susceptibility testing of S. 4,5,12:i:- in Cattle (bovine animals) - Monitoring - quantitative data [Dilution method]

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

S. 4,5,12:i:- Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory Antimicrobials:	Cattle (bovine animals) - Monitoring																								
	yes																								
	3																								
	Cut-off value	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
Amphenicols - Chloramphenicol	16	3	0										2	1										2	128
Amphenicols - Florfenicol	2	3	0										2	1										2	32
Tetracyclines - Tetracycline	8	3	3															3						0.5	64
Fluoroquinolones - Ciprofloxacin	0.06	3	0				3																	0.008	8
Quinolones - Nalidixic acid	16	3	0										2	1										2	256
Trimethoprim		3	0						3															0.25	32
Sulfonamides - Sulfonamide	256	3	3																			3		8	1024
Aminoglycosides - Streptomycin	32	3	3															3						2	256
Aminoglycosides - Gentamicin	2	3	0							1	2													0.25	32
Aminoglycosides - Kanamycin	16	3	0									1	2											0.5	16
Penicillins - Ampicillin	4	3	3															3						0.5	64
Cephalosporins - Cefotaxim	0.5	3	0				1	2																0.06	8

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

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

Salmonella spp.	Cattle (bovine animals) - Monitoring																									
	yes																									
	16																									
Antimicrobials:	Cut-off value	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	
Amphenicols - Chloramphenicol	16	16	0									4	11	1										2	128	
Amphenicols - Florfenicol	2	16	0									5	10	1										2	32	
Tetracyclines - Tetracycline	8	16	1								11	4						1						0.5	64	
Fluoroquinolones - Ciprofloxacin	0.06	16	0			13	3																	0.008	8	
Quinolones - Nalidixic acid	16	16	0										15	1										2	256	
Trimethoprim		16	0						10	6														0.25	32	
Sulfonamides - Sulfonamide	256	16	1													3	3	9				1		8	1024	
Aminoglycosides - Streptomycin	32	16	1											2	8	5				1				2	256	
Aminoglycosides - Gentamicin	2	16	0							7	6	3												0.25	32	
Aminoglycosides - Kanamycin	16	16	0								2	8	6											0.5	16	
Penicillins - Ampicillin	4	16	0							1	15													0.5	64	
Cephalosporins - Cefotaxim	0.5	16	0				6	10																0.06	8	

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

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

S. Typhimurium	Pigs																								
	yes																								
	9																								
	Cut-off value	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
Amphenicols - Chloramphenicol	16	9	0									2	7											2	128
Amphenicols - Florfenicol	16	9	0									3	6											2	32
Tetracyclines - Tetracycline	8	9	0								1	8												0.5	64
Fluoroquinolones - Ciprofloxacin	0.06	9	0			4	5																	0.008	8
Quinolones - Nalidixic acid	16	9	0									1	8											2	256
Trimethoprim		9	0						4	5														0.25	32
Sulfonamides - Sulfonamide	256	9	0														7	1	1					8	1024
Aminoglycosides - Streptomycin	32	9	0											4	4	1								2	256
Aminoglycosides - Gentamicin	2	9	0							3	6													0.25	32
Aminoglycosides - Kanamycin	16	9	0									3	6											0.5	16
Penicillins - Ampicillin	4	9	0								9													0.5	64
Cephalosporins - Cefotaxim	0.5	9	0				2	7																0.06	8

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

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

Salmonella spp.	Pigs - Monitoring																								
	yes																								
	1																								
	Cut-off value	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
Amphenicols - Chloramphenicol	16	1	0										1											2	128
Amphenicols - Florfenicol	2	1	0										1											2	32
Tetracyclines - Tetracycline	8	1	0									1												0.5	64
Fluoroquinolones - Ciprofloxacin	0.06	1	0				1																	0.008	8
Quinolones - Nalidixic acid	16	1	0										1											2	256
Trimethoprim		1	0						1															0.25	32
Sulfonamides - Sulfonamide	256	1	0															1						8	1024
Aminoglycosides - Streptomycin	32	1	0													1								2	256
Aminoglycosides - Gentamicin	4	1	0								1													0.25	32
Aminoglycosides - Kanamycin	16	1	0										1											0.5	16
Penicillins - Ampicillin	4	1	0								1													0.5	64
Cephalosporins - Cefotaxim	0.5	1	0					1																0.06	8

Table Antimicrobial susceptibility testing of *S. Typhimurium* in *Gallus gallus* (fowl) - quantitative data [Dilution method]

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

S. Typhimurium	Gallus gallus (fowl)																								
	yes																								
	3																								
	Cut-off value	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
Amphenicols - Chloramphenicol	16	3	0										3											2	128
Amphenicols - Florfenicol	16	3	0										3											2	32
Tetracyclines - Tetracycline	8	3	0								1	2												0.5	64
Fluoroquinolones - Ciprofloxacin	0.06	3	0			1	2																	0.008	8
Quinolones - Nalidixic acid		3	0										3											2	256
Trimethoprim		3	0						2	1														0.25	32
Sulfonamides - Sulfonamide	256	3	0														1	2						8	1024
Aminoglycosides - Streptomycin	32	3	0											2	1									2	256
Aminoglycosides - Gentamicin	2	3	0								3													0.25	32
Aminoglycosides - Kanamycin	4	3	0										3											0.5	16
Penicillins - Ampicillin	4	3	0								3													0.5	64
Cephalosporins - Cefotaxim	0.5	3	0				1	1	1															0.06	8

Table Antimicrobial susceptibility testing of *Salmonella* spp. in *Gallus gallus* (fowl) - quantitative data [Dilution method]

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

Salmonella spp.	Gallus gallus (fowl)																								
	yes																								
	4																								
	Cut-off value	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
Amphenicols - Chloramphenicol	16	4	0										3	1										2	128
Amphenicols - Florfenicol	2	4	0										3	1										2	32
Tetracyclines - Tetracycline	8	4	0								2	2												0.5	64
Fluoroquinolones - Ciprofloxacin	0.06	4	0			1	3																	0.008	8
Quinolones - Nalidixic acid	16	4	0									1	2	1										2	256
Trimethoprim		4	0						2	2														0.25	32
Sulfonamides - Sulfonamide	256	4	0															3	1					8	1024
Aminoglycosides - Streptomycin	32	4	0											2	1	1								2	256
Aminoglycosides - Gentamicin	2	4	0								3	1												0.25	32
Aminoglycosides - Kanamycin	16	4	0								3	1												0.5	16
Penicillins - Ampicillin	4	4	0								4													0.5	64
Cephalosporins - Cefotaxim	0.5	4	0				2	1	1															0.06	8
Sulfonamides	256	4	0														3	1						8	1024

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

Test Method Used	Standard methods used for testing
Broth dilution	NCCLS/CLSI

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

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

Test Method Used	Standard methods used for testing

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

Test Method Used	Standard methods used for testing

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

Broiler production:

From 1991 to June 2001, a voluntary Campylobacter programme was run. During this period the prevalence varied between 9 and 16%. The program was extended in 2001 to be part of a poultry health control programme. During 2001-2005 cloacal swabs or caecal samples and neck skin samples were collected at slaughter. In this programme the flock prevalence increased up to 20%. It is likely that the increase was due changes in sampling strategy and a more sensitive analytical method. Since 2001 there has been a decreasing trend of positive slaughter groups from 20 to 12%.

Humans:

The number of reported cases during the last decade has varied between approximately 6000 and 8600. Of these, approximately 1800-2800 (30-45%) were reported as domestic cases. T

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 2001-2009, a decreasing trend in number of positive slaughter batches has been observed.

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 (as a source of infection)

Consumption of poultry meat is regarded as an important source of infection for human campylobacteriosis. However, case-control studies have also shown other risk factors for domestic campylobacteriosis, for example consumption of unpasteurized milk, barbecue 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. A performance objective for Campylobacter in broiler meat should be discussed in the EU.

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

Infection with Campylobacter is notifiable according to the Communicable Disease Act and cases must be reported to the Swedish Institute for Infectious Disease Control and the County Medical Office in the affected county.

History of the disease and/or infection in the country

Infection with Campylobacter became notifiable in 1989. The number of reported cases during the last decade has varied between approximately 6000 and 8600. Of these, approximately 1800-2800 (30-45%) were reported as domestic cases.

Results of the investigation

During 2009, 7179 cases were notified, which was a decrease by 7% from the previous year. However, domestic cases increased by 20% to 2714. The majority of the domestic cases were reported in July and August. Domestic infection was most common in the age group of 40-49 years. Men were dominating in all age groups infected in Sweden. Of the 4149 persons infected abroad, 1147 were reported from Thailand, mostly during December-April. Among persons infected abroad women were dominating in the age groups between 15-24 years.

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

A trend analysis demonstrated a slight but significant downward trend at a 10% level among domestic cases during the last 12-year period with an average annual decrease of the incidence of 0.5 cases per 100 000 inhabitants. The incidence of the total number of cases demonstrated no significant trend. A decrease in the prevalence of Campylobacter positive slaughter batches of broiler has been seen during the same time period. Import of chicken meat has increased, which might partly explain the increase in domestic infections. There are other sources that also should be considered.

Relevance as zoonotic disease

Campylobacteriosis is the most notified zoonosis in Sweden. A significant part (30-45 %) of the cases of campylobacteriosis are domestic. The sources of campylobacteriosis are not fully investigated.

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

Infrequent sampling.

At meat processing plant

Infrequent sampling.

At retail

Infrequent sampling.

Type of specimen taken

At slaughterhouse and cutting plant

No information available.

At meat processing plant

No information available.

At retail

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.

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

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

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

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

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 are 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 tested positive for thermophilic Campylobacter in a caecal sample. The epidemiological unit is the slaughter batch.

Diagnostic/analytical methods used

At slaughter

Other: ____ ISO 10272:2006

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

Broiler 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.

Recent actions taken to control the zoonoses

Since domestic flies has been associated with spread of the infection a fly control program has been introduced in some broiler houses.

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

Campylobacter infection is not notifiable.

Results of the investigation

In 2009, thermophilic Campylobacter was detected in 12% of the slaughter batches.

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 (as a source of infection)

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 Campylobacter	C. coli	C. jejuni	C. lari	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Gallus gallus (fowl) - broilers - at slaughterhouse ¹⁾	SVA	Slaughter batch	3219	386					386

Comments:

¹⁾ Caecal samples

2.2.5 Antimicrobial resistance in Campylobacter isolates

Table Cut-off values used for antimicrobial susceptibility testing of Campylobacter in Animals

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Tetracyclines	Tetracycline		2	
Fluoroquinolones	Ciprofloxacin		1	
Aminoglycosides	Gentamicin		1	
	Streptomycin		2	
Macrolides	Erythromycin		4	

Table Cut-off values used for antimicrobial susceptibility testing of Campylobacter in Food

Test Method Used		Standard methods used for testing		

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

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 in humans and animals. During the last ten years approximately 40-60 human cases have been annually notified. Most cases are older persons, 1-2 pregnant women are notified every year.

Most cases are sporadic. Outbreaks have been associated with vacuum-packaged fish (1995-1996) and with cheese made of raw goat milk (2001).

In animals, an increased number of cases was observed in the late 1990s. Since then the number of reported cases vary around 35 per year.

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

In 2009, 73 human cases of listeriosis were reported, which is the highest number ever reported in Sweden and an increase with 22 % compared to 2008. The increasing trend in the Swedish incidence during 1997-2009 is statistically significant. The reasons for this increase remain unclear and should be elucidated because of the severity of the infection.

In animals the situation seems to be stable.

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

Food borne transmission is thought to be most important. No outbreaks were reported during the year, however many investigations were made to explain the increase of cases. A certain cluster was observed during 2009 with seven isolates with identical PFGE pattern. This particular strain was not identified in the previous year. The source of infection for these cases has yet not been found but investigation is continuing in 2010.

Recent actions taken to control the zoonoses

The Commission has initiated a baseline study of *L. monocytogenes* in ready-to-eat foods in 2010 and a national baseline study is also undertaken this year. As a compliment, all human isolates will be sent to the Swedish Institute for Infectious Disease Control for subtyping to compare with the food isolates.

2.3.2 Listeriosis in humans

A. Listeriosis in humans

Reporting system in place for the human cases

Surveillance is mainly 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

Bacteriological cultivation especially from blood and cerebral spinal fluid.

Notification system in place

Listeriosis is notifiable according to the Communicable Disease Act and cases must be reported to the Swedish Institute for Infectious Disease Control and to the County Medical Office. The reporting is both physician-based and laboratory-confirmed.

History of the disease and/or infection in the country

Listeriosis has been a notifiable disease in Sweden since 1960. During the latest ten years around 40-60 cases have been reported every year to the Swedish Institute for Infectious Disease Control. In Sweden, outbreaks have been associated with vacuum-packaged fish (1995-1996) and with cheese made of raw goat milk (2001).

Results of the investigation

In 2009, 73 human cases of listeriosis were reported, which is the highest number ever reported in Sweden and an increase with 22 % compared to 2008. Older persons dominated among the cases, 85 % were above 60 years. The gender distribution was even.

Information about underlying disease or other reason for a compromised immune system was available for around half of the cases. Among these, cancer diseases were the most common. Two newborn babies were infected during birth but survived.

Around one fifth of the cases died within a month after the onset of disease and as many as one third had died within three months. The three largest counties reported most cases, but the northern counties, Västernorrland and Jämtland had the highest notified incidence. Other northern counties also have a slightly higher incidence than many other counties in Sweden.

Listeriosis is most often a domestic infection. During 2009, 60 cases were reported with Sweden as country of infection. Two cases were infected abroad and 11 cases had missing information about country of infection.

Forty-six isolates (63 %) were serotyped. Of these, 83% belonged to serogroup 1 and the rest to serogroup 4. The observed increase was for serogroup 1.

No outbreaks were reported during the year, however many investigations were made to explain the increase of cases.

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

The increasing trend in the Swedish incidence during 1997-2009 is statistically significant. The increase in cases was mainly in the older age groups and not among the younger people or among pregnant women.

Sweden - 2009 Report on trends and sources of zoonoses

Most cases are sporadic and domestic. In 2009, no outbreaks were reported, however many investigations were made to explain the increase of cases. A certain cluster was observed during 2009 with seven isolates with identical PFGE pattern. This particular strain was not identified in 2008. The source of infection for these cases has yet not been found but investigation is continuing in 2010.

Relevance as zoonotic disease

The main sources of human listeriosis are contaminated food products, such as smoked or marinated vacuum-packaged fishery products, meat products and soft cheeses or other ready-to-eat foods with long shelf-life.

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 program 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

According to in-house control at each production plant.

At retail

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 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 2009 see the prevalence tables for food

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

The situation is stable. Vacuumpackaged 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.

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) isolation of *L. monocytogenes* and/or histopathology or, (3) positive immunohistochemistry and histopathology or 4) isolation of *L. monocytogenes*. The animal is the epidemiological unit.

Diagnostic/analytical methods used

The diagnostic methods used include histopathology, immunohistochemistry and detection either by a direct cultivation method or by enrichment (modified IDF Standard 143A:1995)

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 2009, 31 sheep and 6 cattle 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 a source of infection)

As *Listeria* spp are present in the environment and also to a small degree in food-producing animals, a risk of contracting domestic listeriosis does exist. However, human listeriosis is mostly food-borne.

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

Only sporadic cases of VTEC infections were reported in Sweden until 1995 when 114 human cases of infection caused by VTEC O157:H7 were notified. 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. In the autumn 2002 an outbreak of VTEC O157:H7 in the county of Skåne affecting 30 patients was caused by consumption of cold smoked fermented sausage. The biggest Swedish outbreak so far occurred in the summer of 2005 when 135 cases, including 11 (8%) HUS (haemorrhagic uraemic syndrome) cases, were infected with O157:H7 after eating contaminated fresh lettuce irrigated with water positive for verocytotoxin 2. Identical strains from humans and cattle faeces from a farm upstream confirmed the implicated source and control measures that lead to the termination of the outbreak were implemented.

Around 200-300 cases of EHEC are reported annually, of which 50 -65% are domestically acquired. Most of the cases are reported during the period July to August.

National guidelines were established in 1997 and were revised in 2008. The aim is to minimize the spread of VTEC to humans and animals. The guidelines give for instance general recommendations to all farms and special recommendations to farms associated with human infections. Sampling is mainly targeted on young cattle because they more often shed the bacterium. Washing of hands after contact with animals is recommended as well as avoiding drinking unpasteurised milk. A risk profile was produced by the responsible authorities in 2007.

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

A decreasing trend in domestic EHEC infections has been observed, and in 2009, especially, the number of O157 was lower than in many earlier years. The highest notification rates in humans are in counties with higher cattle-density, i.e. in southern Sweden but for 2009 also these numbers were lower than in previous years. It is still too early to predict if the observed decreasing trend is stable. The established recommendations and increased awareness may, at least partly, explain the decreasing trend of notified human cases.

Because of modifications of the detection methods, the results of the different prevalence surveys cannot be directly compared. Therefore it is difficult to determine whether the observed increase in animal prevalence from one to three percent is true or merely an effect of improved detection methods. Measures to decrease the animal prevalence are being investigated.

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

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 PCR. Typing by PFGE and MLVA.

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 hemorrhagic diarrhea 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 2009, 228 human cases were reported, a decrease by 25 % from the year before (304 cases). Around half (54 %) of the cases were domestically infected which follows the last years decrease in domestic cases (15 % decrease from 2008). The incidence of notified domestic VTEC infections was 1.34 cases per 100 000 population in 2009 which was the lowest incidence compared to previous years.

Children and adolescents below 20 years accounted for almost half of the domestic cases in 2009. The largest age group was very young children between 1-4 years with almost one fourth of the domestic cases.

Most domestic cases were reported from the counties Västra Götaland, Skåne, Stockholm and Jönköping. Jönköping in the south of Sweden had the highest incidence (3.0 cases/ 100 000 population). Previously, the incidence has been highest in the county Halland. It is too early to say if it is a change in trends or just an observation of a single year.

Around half of the cases were infected abroad (42%). This number decreased during 2009 with 38 % compared to 2008. A similar decrease was also seen for several other food and waterborne infections and can be explained by a decrease in international travel during 2009. Egypt and Turkey were the main countries of infection acquired abroad.

O157:H7 was the most common serotype with 45 cases of which half were domestic infections. The number of O157 has not been so low since 2001. The most common subtypes of O157:H7 (the Halland types) were dominating during 2009, however the common variant (smi-H) decreased considerably which can partly explain the total decrease in domestic cases. It is still too early to say if the decrease in O157 is a significant trend.

The second most common serotype was O26, followed by O121, O103 and O145.

A majority of the human cases were sporadic and the few clusters reported during 2009 were family members or epidemiologically connected to farms. In the summer of 2009, a family was infected with EHEC O145 after drinking water from a contaminated well in a small community. An indistinguishable subtype of VTEC O145 was isolated from the untreated well water and the human cases. The samples from drinking water were positive by PCR positive but the bacterium could not be isolated. The serotype O145 could not be identified from any other sources such as water, farms and environment despite sampling efforts. Control measures for the well and water quality were successfully implemented.

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

Please see "Results of the investigation" for trends.

During 2008 there were mainly 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

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well as their zoonotic impact.

2.4.3 Escherichia coli, pathogenic in foodstuffs

Table VT E. coli in food

	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
Fruits	local authorities	Single	25 gram	2	0			
Meat from bovine animals	local authorities	Single	25 gram	11	0			
Vegetables	local authorities	Single	25 gram	57	3	3		

Footnote:

40 samples of ready-to -eat foods were reported by local authorities - 0 positive;

10 samples of Ice- cream were reported by local authorities - 0 positive;

41 samples of spices and herbs were reported by local authorities - 1 positive for E. coli O157.

No details on analytical methods were in the reports from the local authorities.

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 associated 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 these bacteria, and performed by a veterinarian.

PREVALENCE STUDIES:

Prevalence studies will be conducted approximately every 3rd year. The last study was conducted 2008/09. In these surveys, around 2000 fecal samples are collected randomly throughout the year from cattle at the slaughterhouses. Samples are collected under the supervision of veterinarians at the abattoirs.

Frequency of the sampling

Animals at farm

Trace back of human VTEC infection.

Animals at slaughter (herd based approach)

study (animal based): sampling distributed evenly throughout the year

Type of specimen taken

Animals at farm

Feces and/or environmental samples.

Animals at slaughter (herd based approach)

study (animal based): feces, 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 fecal samples per farm are collected. Mainly young animals are sampled. Most samples are analyzed as pooled samples with up to five individual samples pooled to one consisting of 25 g.

For individual fecal samples, approximately 30 g of feces 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 feces 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

NMKL No 164:2005 2nd ed., with the modification that immunomagnetic separation (IMS), is only performed after pre-enrichment for 18-24 h (the IMS step after 6-8 h pre-enrichment is excluded) and that the immunomagnetic beads are plated out on only one agar plate (CT-SMAC).

Animals at slaughter (herd based approach)

NMKL No 164:2005 2nd ed., with the modification that immunomagnetic separation (IMS), is only performed after pre-enrichment for 18-24 h (the IMS step after 6-8 h pre-enrichment is excluded) and that the immunomagnetic beads are plated out on only one agar plate (CT-SMAC).

Vaccination policy

Vaccination is not used.

Other preventive measures than vaccination in place

The guidelines established in 1997 were revised in 2008. These 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 re much in line with earlier prevalence studies in Sweden.

Suggestions to the Community for the actions to be taken

Harmonized monitoring programs for VTEC in cattle in 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. Fecal 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

Eleven cattle and three sheep farms were sampled for VTEC in trace back of human infection. On one sheep farm, VTEC O157 indistinguishable with the human isolates was detected from an environmental sample.

In the abattoir survey conducted in 2008-2009 VTEC O157 was detected in 3.3% of faecal and 8.2% of 500 ear samples. In these studies, VTEC O157:H7 has predominantly been isolated from cattle in the south of Sweden whereas very seldom from the northern two thirds of the country. However, in the latest survey, VTEC O157:H7 was isolated from one ear sample from Luleå in the northern part of Sweden. This is the most northern isolate in the Swedish slaughterhouse surveys performed.

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

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.

During 1996-2009, one to fifteen 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 cattle, surveys during 1997-2002 showed a prevalence of approximately 1%. In the study done in 2005-2006, VTEC O157 was detected in 3.4% of faecal samples.

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

Direct or indirect contact with cattle is an important 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 source of the infection was locally produced salad irrigated by contaminated water from a nearby canal. Both outbreaks were reported in areas of high cattle density.

Additional information

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.

In another study, VTEC O157 was detected in 9% of the Swedish dairy herds. Of these, 23% were situated in the Western part of Sweden (the county of Halland).

VTEC O157 was detected in 9 (1.8%) of 492 fecal and 2 (1.9%) of 105 ear samples from sheep in a survey performed in 2007-2008.

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) - unspecified - at farm - animal sample - faeces (Suspect sampling in human trace back investigation.)	SVA	Holding		11	0			
Cattle (bovine animals) - unspecified - at slaughterhouse - animal sample - ear - Monitoring - official sampling - objective sampling (The monitoring was conducted during 2008/09 under a 12 month period.)	SVA	Animal		500	41	41		
Cattle (bovine animals) - unspecified - at slaughterhouse - animal sample - faeces - Monitoring - official sampling - objective sampling (The monitoring was conducted during 2008/09 under a 12 month period.)	SVA	Animal		1993	65	65		
Sheep - at farm - animal sample - faeces (Suspect sampling in human trace back investigation.) ¹⁾	SVA	Holding		3	1	1		

Comments:

¹⁾ VTEC O157 isolated from an environmental sample.

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 reported 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 programme 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 a source of infection)

As Sweden is OTF, the risk of contracting domestic TB from livestock and other animals is negligible. The risk for animal keepers to contract infection with M. tuberculosis from 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 staff employed by the National Food Administration. If TB is suspected, samples are collected and analysed at the SVA. Furthermore, tuberculin tests are performed at artificial insemination centres 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 a positive tuberculin test.

Type of specimen taken

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, mediastinal, tracheobronchial, mesenteric, iliacal and inguinal lymph nodes. Lymph nodes are pooled for culture, whereas 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*-complex, is compulsory notifiable in all animal species on the basis of suspicion (e.g. clinical- or post mortem suspicion).

Results of the investigation

In total, 31 cattle were investigated for *M. bovis* in 2009. The reason for investigation was that TB could not be ruled out at slaughter inspection.

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

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

Additional information

Animals other than cattle:

Apart from the tested cattle mentioned above, other animals were also tested for *M. bovis* in 2009. For example, 74 pigs and 5 deer were investigated, following suspicion at meat inspection.

All were negative for TB but bacteria from the *Mycobacterium avium*/intracellulare-complex were isolated in 16 cases (15 pigs, one deer).

B. Mycobacterium bovis in farmed deer

Monitoring system

Sampling strategy

In 1994, a voluntary 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 CONTROL PROGRAMME

In brief, a herd obtains Bovine TB free status (A status) after three consecutive whole herd tuberculin tests of all deer older than one year, with negative results.

Only herds with A status may sell live deer and to maintain the A status all female deer have to be tested after three years without reactors. A secondary whole herd test is performed after another 5 years. Herds with A status must have all animals ear-tagged and individually identified. Bovine TB free status can also be obtained by slaughter of the whole herd and repopulation with deer from TB free herds (A status).

Type of specimen taken

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, mediastinal, tracheobronchial, mesenteric, iliacal and inguinal lymph nodes. Lymph nodes are pooled for culture, whereas 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 checked for growth 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.

Measures in case of the positive findings or single cases

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

Notification system in place

Infection with *M. bovis*, *M. tuberculosis*, or other mycobacteria in the *M. tuberculosis* complex, is notifiable in all animal species on the basis of suspicion (for ex clinical or post mortem suspicion).

Results of the investigation

The total number of registered holdings for farmed deer was close to 600. However, a large proportion of these do not keep deer after obtaining TB free status. The number of herds that were considered active, i.e. kept deer and had obtained TB free status were 336. A total of 19 herds were still exempted from testing and allowed to perform meat inspections and necropsies for 15 years to obtain free status. Out of these, three will be depopulated in the near future. Another three herds will be depopulated due to their application of exemption from testing being rejected. No TB was detected in any tested deer herds.

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

The situation remains favourable and Sweden is close to declaring the country free from tuberculosis in farmed deer.

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

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

Additional information

The voluntary control programme became compulsory in 2003. Since the programme'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. 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 the Board of Agriculture 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

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. In some zoos, serological monitoring is performed in certain animal species.

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive tuberculin test, due to clinical symptoms or for other reasons, the animal is euthanized and 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, mediastinal, tracheobronchial, mesenteric, iliacal and inguinal lymph nodes. Lymph nodes are pooled for culture, whereas 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 *M. tuberculosis* complex has been isolated.

Diagnostic/analytical methods used

Samples collected at necropsy are investigated by histology and direct smears.

The result from these tests 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 checked for growth 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 acid fast rods is seen, a molecular probe for the *M. tuberculosis* complex is used on colony material. In case mycobacteria in the *M. tuberculosis* complex are isolated the strain is further subtyped.

Vaccination policy

Vaccination is not allowed.

Other preventive measures than vaccination in place

Trunk or tracheal lavage for detection of mycobacteria in the *M. tuberculosis* complex in elephants and other relevant zoo animals, are sometimes performed in Zoos. Moreover, serological monitoring is sometimes performed on a voluntary basis.

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 M. tuberculosis complex 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 2009.

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

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

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

The Zoo animals that were positive for M. tuberculosis 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	M. bovis	M. tuberculosis	Mycobacterium spp., unspecified
Pigs	SVA, SJV	Animal	74	15	0	0	15
Sheep	SVA, SJV	Animal	1	0	0	0	0
Cats	SVA, SJV	Animal	2	0	0	0	0
Cattle (bovine animals)	SVA, SJV	Animal	31	0	0	0	0
Deer - farmed	SVA, SJV	Animal	5	1	0	0	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	633	16500	633	100	0	0		0		5	0
Total : ¹⁾	633	16500	633	100	0	0	N.A.	0	0	5	0

Comments:

¹⁾ N.A.

Footnote:

Free herds:
611 officially free herds, 22 not yet officially free, but NOT suspected of infection.

Routine tuberculin testing:
All A herds have completed their mandatory testing (5 whole herd tests during 10 years).

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	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	21733	1558281	21733	100	0	0				31	0
Total : ¹⁾	21733	1558281	21733	100	0	0	N.A.	0	0	31	0

Comments:

¹⁾ N.A.

Footnote:

Number of herds = Number of holdings for bovine 2009

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 ever been diagnosed in any other food producing animal species. Sweden was declared officially brucellosis free in goats and sheep (OBmF) 1994, in cattle (OBF) 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-, goat- and pigpopulations, as well as from targeted surveillance performed on aborted fetuses from cattle, sheep, goats and pigs. Since the start of the serological 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 (as a source of infection)

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

2.6.2 Brucellosis in humans

A. Brucellosis in humans

Reporting system in place for the human cases

Surveillance is based on passive case finding.

Case definition

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

Diagnostic/analytical methods used

Cultivation from blood and bonemarrow.

Notification system in place

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

History of the disease and/or infection in the country

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 executed by clinicians and official veterinarians in accordance with the Swedish Epizootic Act requiring all suspected cases of brucellosis in food producing animals to be reported and subsequently investigated.
- Active 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 fetuses.
- Additional serological testing of cattle prior to import and export and at breeding centers.

Frequency of the sampling

During 2009, serum samples from 1 092 beef cattle and bulk tank milk samples from 756 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, 17 fetuses were examined within the active surveillance at post mortem examinations and four herds were investigated due to clinical suspicion.

In addition animals were tested at breeding centers and for import or export reasons.

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 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 (SVANOVIR® *Brucella*-Ab I-ELISA, Svanova, Biotech, Uppsala, Sweden). For confirmation, the complement fixation test was used.

If relevant material is available (e.g. aborted fetuses), 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 food producing animal species on the basis of clinical suspicion.

Results of the investigation

All samples tested, including serum samples from 1 092 beef cattle and bulk tank milk samples from 756 dairy herds, cultures from 17 aborted fetuses, additional serum samples from breeding animals and animals for import/export as well as samples from four herds investigated due to clinical symptoms, were negative.

In summary no herd or any individual animal was diagnosed with *Brucella abortus* infection during 2009.

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

The last case of bovine brucellosis was reported in 1957. Brucellosis has never been diagnosed in any other food producing animal species.

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

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

Additional information

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

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 during 2009.

B. 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 Arthritis 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 2009 261 serum samples were analyzed for *Brucella melitensis*. In addition goats are tested due to import or export. In case of clinical suspicions herds are investigated and tested, no such cases took place in 2009.

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 food producing animal species on the basis of clinical suspicion.

Results of the investigation

All samples tested were negative when analysed for antibodies against *Brucella melitensis*. In summary no herd or any individual animal was diagnosed with *Brucella melitensis* infection during 2009.

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

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

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

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

Additional information

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

C. 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, active surveillance is performed in the form of post mortem examinations of aborted fetuses, 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 2009 7000 serum samples were analyzed for *Brucella melitensis*.

Moreover 29 fetuses were examined within the active surveillance at post mortem examinations and in addition animals were tested at breeding centers and for import or export reasons. In case of clinical suspicions herds are investigated and tested, no such cases took place in 2009.

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 food producing animal species on the basis of clinical suspicion.

Results of the investigation

All animals tested for *Brucella melitensis* in 2009 including 7000 sheep within the control program and 29 aborted fetuses tested at post mortem examination were negative.

In summary no herd or individual animal was diagnosed with *Brucella melitensis* infection during 2009.

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

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

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

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

Additional information

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

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 food producing animal species since 1957 (last case of bovine brucellosis). In order to monitor the situation, active as well as passive surveillance is carried out.

Active 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). Moreover active surveillance is performed in the form of post mortem examinations of aborted fetuses, animals are tested before export or import and all clinically suspected cases are investigated and tested.

Frequency of the sampling

In 2009 serum samples from 1806 pigs were analyzed for *Brucella suis* and in addition 62 aborted fetuses were examined and cultured at post mortem. In addition pigs were tested at breeding centers and for import or export reasons.

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. 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 measures would be implemented in accordance with the Swedish Act of Epizootics.

Notification system in place

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

Results of the investigation

All samples tested for *Brucella suis*, including 1806 samples from the serological survey and cultures from 62 aborted fetuses, serum samples from breeding animals, and animals tested for import and export, were negative. In summary no herd or animal tested positive for *Brucella suis* in 2009.

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

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

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

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

Additional information

From 1995 to 2009, *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	B. abortus	B. melitensis	B. suis	Brucella spp., unspecified
Pigs	SVA, SJV	Animal	1806	0				
Wild boars	SVA, SJV	Animal	500	0				

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 microbiologically	Number of animals positive microbiologically	Number of suspended herds
Sverige	8245	540487	8245	100	0	0		7000						
Total : ¹⁾	8245	540487	8245	100	0	0	0	7000	0	0	0	0	0	0

Comments:

¹⁾ N.A.

Footnote:

Note that numbers of animals and herds include only sheep.

Breeding animals and animals tested at import/export are not present here as they are not sampled as "investigation of suspected cases".

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

	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 microbio logically	Number of animals positive microbio logically
Region																		Sero logically	BST		
Sverige	21733	1558281	21733	100	0	0		1092			756										
Total : ¹⁾	21733	1558281	21733	100	0	0	0	1092	0	0	756	0	0	0	0	0	0	0	0	0	0

Comments:
¹⁾ N.A.

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 notifiable in humans but not in animals or food. There is no active surveillance in animals or food.

In the beginning of the 1990's approximately 1000 human cases were yearly notified.

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

Yersiniosis in humans is considered food-borne. Outbreaks are rare and most infections seem to be sporadic. Approximately 70% of the infected cases are domestic. Case-control studies suggest consumption of pork products as a risk factor. Yersiniosis is still one of the most notified zoonoses in Sweden although the number of notifications has decreased from 1000 cases to 400. This decrease has occurred without any active measures in the food chain. Neither do we know whether the number of human samples tested has decreased.

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

Pathogenic *Y. enterocolitica* are common in swine. A baseline survey performed in Swedish slaughterhouses in 2006 showed pathogenic *Y. enterocolitica* on 16% of 541 swine carcasses.

Recent actions taken to control the zoonoses

2.7.2 Yersiniosis in humans

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

History of the disease and/or infection in the country

Prior to 1996, yersiniosis was only reported from laboratories. In the beginning of the 1990's, more than 1000 cases were reported. Notifications decreased at the end of the 1990's to 550 cases but increased again to 800 cases in 2004. Since 2005, a decreasing trend has been observed.

Results of the investigation

In 2009, 398 cases were reported and 303 (76%) of them were domestic. As in previous years children between 0 and 4 years was the most affected group (31%). Of the 64 cases infected abroad, 17 were infected in Spain, which was the most common country of infection.

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

However, since 2005, the number of notified yersiniosis cases in humans has decreased to approximately 400 cases. This decrease has occurred without any active measures in the food chain. Outbreaks are rare and most infections seem to be sporadic. Case-control studies suggest consumption of pork products as a risk factor.

Relevance as zoonotic disease

Yersiniosis is one of the most notified zoonoses in Sweden. Yersiniosis in humans is considered foodborne. A significant part (approximately 70 %) of the human infections are of domestic origin. A third of the notified cases are children younger than 4 y. Case-control studies suggest consumption of pork products as a risk factor.

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.

In 2009 two samples of pig meat were reported by the local authorities, both were 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 infection)

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

Additional information

In 2004 the SLV performed a survey to investigate the presence of Yersinia in food. Out of 933 samples collected from fresh pig meat at retail 97 (10%) were positive, 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

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Yersinia	Y. enterocolitica	Y. pseudotuberculosis	Yersinia spp., unspecified	Y. enterocolitica - O:3	Y. enterocolitica - O:9	Y. enterocolitica - Y. enterocolitica, unspecified
Meat from pig - fresh	local authority	Single	25 gram	2	0						

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.

Additional information

Y. enterocolitica is occasionally isolated from clinical faecal samples of dogs and cats. Y. pseudotuberculosis is yearly isolated from clinical cases of animals.

Table Yersinia in animals

	Source of information	Sampling unit	Units tested	Total units positive for Yersinia	Y. enterocolitica	Y. pseudotuberculosis	Yersinia spp., unspecified	Y. enterocolitica - O:3	Y. enterocolitica - O:9	Y. enterocolitica - Y. enterocolitica, unspecified
Antelopes - zoo animal	SVA	Animal	5	1		1				
Deer	SVA	Animal	5	2		2				
Hares - wild	SVA	Animal	8	2		2				

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, bears, etc.) is low to very low, while it is higher in carnivorous wildlife such as foxes, lynxes, wolves and wolverines.

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

The risk of obtaining domestic trichinosis is negligible as all slaughtered pigs and horses are subject to meat inspection. However, for meat originating from wildlife, that might be infected with *Trichinella*, meat inspection is 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 2009.

2.8.3 Trichinella in animals

A. 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 taken are in accordance with Directive 2075/2005/EU.

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. The competent Authority will also investigate the source and possible spread of infection.

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 (as a source of infection)

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

B. 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 a negligible risk for Trichinella.

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

Samples taken are in accordance with Directive 2075/2005/EU.

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 notifiable in animals.

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

All slaughtered pigs were negative for Trichinella spp.

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

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

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

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

Additional information

In 2009, 14 lynxes, 5 wolves, 2 wild boars, 2 foxes, one bear and one wolverine were positive for *Trichinella*.

Table Trichinella in animals

	Source of information	Sampling unit	Units tested	Total units positive for Trichinella	T. spiralis	Trichinella spp., unspecified	T. britovi	T. nativa
Bears	SVA	Animal	201	1				1
Foxes	SVA	Animal	269	2			1	1
Pigs	SJV	Animal	2969690	0				
Solipeds, domestic - horses	SJV	Animal	3810	0				
Wild boars - wild	SVA	Animal	47902	2	1		1	
Badgers - wild	SVA	Animal	33	0				
Birds - wild	SVA	Animal	10	0				
Deer - wild - roe deer	SVA	Animal	1	0				
Lion - zoo animals	SVA	Animal	2	0				
Lynx - wild	SVA	Animal	200	14		3		11
Otter	SVA	Animal	10	0				
Raccoon dogs - wild	SVA	Animal	51	0				
Seals - wild (Grey seal)	SVA	Animal	1	0				
Wolverine	SVA	Animal	5	1				1
Wolves - wild	SVA	Animal	15	2				2

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 2001-2009.

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 anthelmintics was performed (see text "*E. multilocularis*").

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

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 remains implemented and complied with.

Recent actions taken to control the zoonoses

Since 1994 all dogs that are brought in from countries other than Finland, Ireland, Malta, Norway and UK 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

Echinococcus multilocularis and granulosus may cause a serious, life-threatening illness. So far, Echinococcus multilocularis has not been detected in Sweden. The parasite is endemic in several other European countries and seems to be emerging. There is a risk of introducing the parasite with pets infected with E. multilocularis from endemic regions. The consequences of introduction of the parasite in Sweden would be serious especially as the parasite would probably remain undetected for several years.

2.9.3 Echinococcus in animals

A. E. granulosus in animal

Monitoring system

Sampling strategy

All livestock, including reindeer, 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.

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

Import of food-producing animals is very restricted. In order to prevent the introduction of *E. multilocularis*, dogs that are brought in from countries other than Finland, Norway, UK, Ireland and Malta 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.

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

The risk of obtaining domestic echinococcosis is 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. Approximately 300 foxes are sampled annually within the frame of a domestic screening programme.

Type of specimen taken

Faeces

Methods of sampling (description of sampling techniques)

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.

At routine carcass inspection at abattoirs:

On suspicion, cyst material is collected from livestock.

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, Ireland, Malta, Norway or UK 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 (as a source of infection)

Currently, the risk of obtaining domestic echinococcosis is small.

Table Echinococcus in animals

	Source of information	Sampling unit	Units tested	Total units positive for Echinococcus	E. granulosus	E. multilocularis	Echinococcus spp., unspecified	E. oligarthrus
Cattle (bovine animals)	SJV	Animal	426504	0				
Foxes	SVA	Animal	305	0		0		
Goats	SJV	Animal	773	0				
Pigs	SJV	Animal	2942912	0				
Reindeers ¹⁾	Sametinget	Animal	54432	0				
Sheep	SJV	Animal	252873	0				
Solipeds, domestic	SJV	Animal	3807	0				
Deer - farmed ²⁾	SJV	Animal	3994	0				

Comments:

¹⁾ Slaughtering season 2008/2009²⁾ Slaughtering season

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 (as a source of infection)

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 accidentally 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

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 analyzed 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 (as a source of infection)

A risk of contracting domestic Toxoplasma spp infection does exist. However, the relevance of clinical toxoplasmosis is considered 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

Sweden has been free from classical rabies since 1886.

During the last decades, two persons have been hospitalized for rabies in Sweden. In 1974, a Swedish man fell ill after having been infected in India and in 2000 a woman fell ill after a visit in Thailand. Both patients had most probably been infected by rabid dogs.

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

Since Sweden has been free from classical rabies, the risk of acquiring the disease from Swedish animals is negligible. Illegally imported dogs are probably the greatest threat to the rabies free status of Sweden even though the risk of introducing rabies is rather low. Illegal importation of pets, mostly dogs, has increased since 2004.

European Bat Lyssa Virus (EBLV) has not been isolated from bats in Sweden but antibodies to EBLV were detected in eight bats in 2009.

Recent actions taken to control the zoonoses

Since 1998, a passive bat rabies surveillance program has been in place where dead bats have been examined for the presence of rabies virus. In addition, active surveillance was started in 2008.

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

imprints from brain tissue

Methods of sampling (description of sampling techniques)

Specimens from brain tissue are analyzed 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

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 brought into the country have to be tested for levels of protective antibodies .

Control program/mechanisms

The control program/strategies in place

To prevent the introduction of rabies, dogs and cats have to fulfill certain provisions before entering Sweden. Depending on the country of origin they either have to be placed in quarantine or have to be rabies vaccinated and have their antibody titer tested. The rules are set in the EU Regulation 998/2003 and Sweden may keep these rules until 31 December 2011.

Recent actions taken to control the zoonoses

Two risk assessments have been made on the risk of introduction of rabies with illegally imported dogs. In the first performed in 2005, the risk of introducing rabies with illegally imported dogs was assessed as low and dependent on the origin and the number of dogs imported. In the second performed in 2006, the risk of legal importation of dogs and cats from the rest of EU was assessed as very low.

Suggestions to the Community for the actions to be taken

It could be motivated 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

In 2009, three dogs were examined for rabies due to clinical suspicion.

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

Classical rabies has not occurred in Sweden since 1886. Presently the increased number of illegal import of dogs is of great concern.

Additional information

In 2009, three cats were tested for rabies with negative results.

B. European Bat Lyssavirus - unspecified in Animals Bats - wild

Monitoring system

Sampling strategy

Passive surveillance: annual information about the survey has been sent to different interested parties with an appeal to send in bats and with instructions how to handle the dead bats to reduce the risk of rabies infection.

Active surveillance: catching bats according to a yearly plan designed.

Type of specimen taken

Other: ____ Passive surveillance: dead bats

Active surveillance: blood and oral swab samples

Methods of sampling (description of sampling techniques)

Passive: dead, euthanised or wounded bats sent by general public

Active: Catching by nets

Case definition

Bat with the isolation of virus or detection by PCR

Diagnostic/analytical methods used

Passive surveillance The diagnostic method used was based on the detection of antigens in brain tissue by use of a fluorescent antibody test, FAT.

Active surveillance: serology using FAVN-method with EBLV-1 virus. The oral swabs were analyzed by real-time PCR for the detection of EBLV by The Swedish Institute for Infectious Disease Control.

Vaccination policy

Bats are not vaccinated against EBLV.

Control program/mechanisms

Recent actions taken to control the zoonoses

Since 1998, a passive surveillance program has been in place where dead bats have been examined for the presence of rabies virus.

In addition, active surveillance was started in 2008. The program is run as a cooperation project with The Swedish Institute for Infectious Disease Control and The Swedish Environmental Protection Agency.

Results of the investigation

77 Daubenton's bats (*Myotis daubentonii*) and 47 Northern bats (*Eptesicus Nilssonii*) were caught in the County of Skåne and Uppsala respectively by using mist nets. Blood samples and oral swabs were taken and the species and age were determined. Eight Daubenton's bats (*Myotis daubentonii*) caught in Skåne were serologically positive for EBLV, but no virus was detected by PCR. All other bats tested were negative for rabies.

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

During 2009 both Northern Bats and Daubenton's bats have been especially investigated for EBLV and the results suggest that EBLV is present in Sweden. There are 18 different species of bats in Sweden, all insectivorous belonging to the family of Vespertilionidae. Daubenton's bat (*Myotis dabentonii*), associated

with EBLV-2 infections, is common and may be found from the south up to the county of Ångermanland in the north. Six other *Myotis* species may also be found in Sweden. The Serotine Bat (*Eptesicus serotinus*), associated with findings of EBLV-1 in Europe, is found in certain habitats in the south of Sweden. The Northern Bat (*Eptesicus Nilsonii*), which is related to the Serotin Bat, is the most common in Sweden, and may be found all over the country.

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

Until far, no human cases have been notified in Sweden due to EBLV.

Table Rabies in animals

	Source of information	Sampling unit	Units tested	Total units positive for Lyssavirus (rabies)	Lyssavirus, unspecified	Classical rabies virus (genotype 1)	European Bat Lyssavirus - unspecified
Bats - wild ¹⁾	SVA	Animal	40	0			
Cats	SVA	Animal	3	0			
Dogs	SVA	Animal	3	0			
Bats - wild (Active surveillance)	SVA	Animal	124	0			

Comments:

¹⁾ Passive surveillance

Footnote:

Passive surveillance: 72 dead or wounded and euthanized bats were sent but 32 bats were in no condition to be examined for rabies, mostly due to missing brain. Thus, 40 bats could be analyzed.
Active surveillance: eight bats serologically positive for EBLV but the virus was not detected by PCR.

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

Animals

The presence of *C. burnetii* in domestic animal populations in Sweden is known since the early 1990's, when the bacterium was first isolated from a sheep placenta in a herd on the Isle of Gotland. In 1993, a survey on Swedish sheep and cattle showed a low seroprevalence (0.3% in sheep (n=1001) and 1.3% in cattle (n=784).

After these investigations, Q fever was not subject to further studies in animal populations until 2008, when a survey on dairy herds was performed. Overall, 8% of the herds were antibody positive in bulk milk, but there were large regional differences, with highest prevalence on the isles of Gotland and Öland (59 and 35%, respectively).

Humans

In the 1980's and the 1990's, only a single sporadic domestic case was reported every decade. During the same period, a serosurvey in humans identified 28% of sheep farmers and 13% of veterinarians to be antibody positive, indicating a larger extent of the exposure. However, a prospective study on cases of endocarditis showed that only one of 329 patients had antibodies to *C. burnetii* indicating that the chronic Q fever endocarditis is rare. Since Q-fever became notifiable in humans in 2004, one to three cases have been reported annually until 2008, when an increase could be observed. However, only one case was classified as domestic during that period.

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

Up to 2008, diagnostic investigations regarding Q-fever were more or less only performed in conjunction with export. Due to recent investigations in dairy cattle in Sweden, and also as a result of the development within the EU, the awareness has increased and an increased number of samples are being submitted for investigation of reproductive disorders in domestic ruminants. A similar increase in awareness is seen on the human medical side. However, there is no evidence to indicate that the prevalence or distribution of the infection has changed since the findings in early 1990's. Investigations in small ruminant populations (sheep and dairy goats) are being conducted in 2010.

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

As the number of notified domestic cases in humans is very low (1 person since 2004), little is known about the significance of animals as a source. The number of cases is, however, likely to be highly underestimated. The findings from the serosurveys in humans in the early 90's indicate that professional exposure to domestic ruminants can be a risk factor for infection.

Recent actions taken to control the zoonoses

There is no official control in place for Q-fever. However, the authorities on the veterinary and human side have jointly issued recommendations directed towards people in contact with herds likely or known to be infected with *Coxiella burnetii*. These include advice on hygienic measures to reduce exposure to potentially infectious material, for both animals and people, and also identify work tasks associated with a higher risk of exposure, that should be avoided by people belonging to risk groups.

Also, several research activities are ongoing that aim to increase our knowledge about *Coxiella* infections

in Sweden.

Suggestions to the Community for the actions to be taken

It would be valuable if Q-fever was made notifiable in humans and animals in all MS.

It would be advisable to encourage MS to perform objective surveys at the national level in animal and human populations.

Additional information

A research project has been running in 2009 where approximately 50% of all dairy herds with positive serological response in a national bulk milk survey in 2008 were re-tested for antibodies and also tested for presence of the agent. A study on within-herd prevalence of seropositive and/or shedding animals in dairy herds is ongoing.

2.12.2 Coxiella (Q-fever) in animals

A. C. burnetii in Animals Cattle (bovine animals) - dairy cows - Survey - national survey (bulk milk)

Monitoring system

Sampling strategy

Single survey; Objective sampling (systematic random sample) of bulk milk samples. The survey was a continuation of the survey initiated in November 2008 and was limited to certain pick-up routes in mid-Sweden. Samples were collected from materials submitted for testing within the national control scheme on Bovine Viral Diarrhoea Virus, where an absolute majority (>95%) of all dairy herds are tested on bulk milk. The samples were first collected at milk quality laboratories and thereafter submitted to the National Veterinary Institute for laboratory investigations for BVDV, after which they were systematically sampled for the Q fever survey.

Frequency of the sampling

Once in June 2009.

Type of specimen taken

bulk milk

Methods of sampling (description of sampling techniques)

For a description of procedures on how the samples are collected; see Sampling strategy. Sample size in June 2009 was n=537 (which together with the samples collected in Nov 2008 resulted in 1537 samples for the entire survey). For systematic sampling, the laboratory was asked to select every 4th sample that was submitted from the study population. After being analysed for BVDV, the samples were stored at -20 degrees C before being analysed for antibodies to Coxiella burnetii.

Case definition

The bulk milk survey was based on antibody detection, which is not conclusive in terms of defining herds as being infected.

Definition of a positive bulk milk sample is given by the instructions of the manufacturer of the diagnostic test.

Diagnostic/analytical methods used

Commercial indirect ELISA (CHEKIT Q Fever Antibody ELISA Test Kit, Idexx).

Vaccination policy

Vaccines against Coxiella burnetii are not available in Sweden.

Other preventive measures than vaccination in place

Authorities on the veterinary and human side have jointly issued recommendations directed towards people in contact with herds likely or known to be infected with Coxiella burnetii. These include advice on hygienic measures to reduce exposure to potentially infectious material (e.g. separate calving area, cleaning and disinfection of calving area, secure disposal of placentas and aborted fetuses etc), for both animals and people, and also identify work tasks associated with a higher risk of exposure, that should be avoided by people belonging to risk groups.

The possibility exists to test for Q fever in conjunction with animal trade; however, this is not used to date.
In general, commercial distribution of unpasteurized milk and cream is not allowed in Sweden.

Control program/mechanisms

The control program/strategies in place

None.

Measures in case of the positive findings or single cases

None.

Results of the investigation

In all, 41 of the 537 herds tested positive for antibodies to *Coxiella burnetii* in bulk milk.

B. C. burnetii in Animals Cattle (bovine animals) - dairy cows - Survey (bulk milk)

Monitoring system

Sampling strategy

Single survey: Selective sampling of dairy herds where antibodies to *Coxiella burnetii* were detected in bulk milk in 2008. The study was a follow-up on the target group in question, to retest bulk milk for antibodies and also to test presence for the agent.

Farmers were recruited on a voluntary basis. Of 85 farmers asked to participate, 41 eventually submitted a new bulk milk sample.

Frequency of the sampling

Once between June-October 2009.

Type of specimen taken

bulk milk

Methods of sampling (description of sampling techniques)

Bulk milk samples were collected directly from the tank by the farmer, with instructions to collect the sample at a time when all lactating cows had contributed to the bulk.

Case definition

A herd where *Coxiella burnetii* is detected in bulk milk by PCR.

Diagnostic/analytical methods used

Commercial PCR kit: Adiavet Cox PCR detection kit, AdiaGene, Saint Brieuc, France

Measures in case of the positive findings or single cases

Notification.

Notification system in place

Q-fever in animals has been notifiable since before 1991, as dictated in national legislation issued by the Board of Agriculture (SJVFS 2002:16). The basis for notification is active infection, indicated by detection of the agent and/or an increase in antibody levels in paired samples.

Results of the investigation

Of the 41 retested herds, 35 were still antibody positive. Of these 35, the agent could be detected in 29 (83%). Of six antibody negative herds, one was PCR-positive.

In all, 30 cases were notified as a result of these investigations.

Additional information

The herds were all located in southern Sweden, in the counties of Halland, Skåne, Blekinge, Kalmar and Gotland.

C. C. burnetii in Animals Cattle (bovine animals) - unspecified - at farm - animal sample - Clinical investigations

Monitoring system

Sampling strategy

Suspected sampling, national coverage.

Type of specimen taken

Various specimen; Bulk milk (n=2), individual milk (n=1), fetal material (n=1) and blood/serum samples (n=16) from, in all, six different herds.

Case definition

The definition of an infected animal/herd is based on detection of the agent, i.e. an animal where *Coxiella burnetii* is detected by PCR in individual milk or in placenta, or a herd where *Coxiella burnetii* is detected by PCR in bulk milk.

An animal/herd is considered to be antibody positive if antibodies are present at a level above the cut-off defined by the manufacturer in milk or blood.

Diagnostic/analytical methods used

A commercial indirect ELISA (CHEKIT Q Fever Antibody ELISA Test Kit, Idexx) for antibody detection.

A commercial PCR kit (Adiavet Cox PCR detection kit, Adiagene, Saint Briec, France) for detection of the agent.

Measures in case of the positive findings or single cases

Notification.

Notification system in place

Q-fever in animals has been notifiable since before 1991, as dictated in national legislation issued by the Board of Agriculture (SJVFS 2002:16). The basis for notification is active infection, indicated by detection of the agent and/or an increase in antibody levels in paired samples.

Results of the investigation

PCR was performed on three samples (individual milk, fetal material, bulk milk) and ELISA was performed on 18 samples (blood/serum, bulk milk). One antibody positive blood sample was detected; the remaining investigations were negative. Consequently, there were no notifications as a result of clinical investigations.

Additional information

Prior to 2009, there are no records of clinical investigations on Q-fever. Thus, although the number is limited, they can be seen as a first sign of increasing awareness of the infection.

D. C. burnetii in Animals Goats - at farm - animal sample - blood - Clinical investigations

Monitoring system

Sampling strategy

Suspected sampling, national coverage.

Type of specimen taken

Blood

Case definition

An animal/herd is considered to be antibody positive if antibodies are present at a level above the cut-off defined by the manufacturer in milk or blood.

Diagnostic/analytical methods used

A commercial indirect ELISA (CHEKIT Q Fever Antibody ELISA Test Kit, Idexx) for antibody detection.

Measures in case of the positive findings or single cases

None, as these investigations were only single sera for antibody detection.

Results of the investigation

Three animals from one herd were tested. All tested negative for antibodies to *Coxiella burnetii*.

E. C. burnetii in Animals Cattle (bovine animals) - breeding bulls - at AI station - Surveillance - official controls (export testing)

Monitoring system

Sampling strategy

Surveillance in conjunction with export of semen, directed towards breeding bulls and performed on request by the importing country.

Because semen may be exported long after bulls are slaughtered, some of the samples tested are from sera stored at the AI station.

Frequency of the sampling

On request.

Type of specimen taken

Blood

Case definition

An animal is considered to be antibody positive if antibodies are present at a level above the cut-off defined by the manufacturer in milk or blood.

Diagnostic/analytical methods used

As requested by the importer, either a commercial indirect ELISA (CHEKIT Q Fever Antibody ELISA Test Kit, Idexx), or a Complement Fixation test (), is used.

Results of the investigation

In all, blood/sera from fifteen bulls were tested for antibodies to *Coxiella burnetii*. Eight were tested by both CFT and ELISA, six were tested by CFT only and one by ELISA only. All results were negative.

Table *Coxiella burnetii* (Q fever) in animals

	Source of information	Sampling unit	Units tested	Total units positive for <i>Coxiella</i> (Q-fever)	<i>C. burnetii</i>
Cattle (bovine animals) - breeding bulls - at AI station - Surveillance - official controls (export testing) ¹⁾	SVA	Animal	15	0	0
Cattle (bovine animals) - dairy cows - Survey (bulk milk) ²⁾	SVA	Herd	41	30	30
Cattle (bovine animals) - dairy cows - Survey - national survey (bulk milk) ³⁾	SVA	Herd	537	41	41
Cattle (bovine animals) - dairy cows - at farm - Clinical investigations (bulk milk) ⁴⁾	SVA	Herd	2	0	0
Cattle (bovine animals) - unspecified - at farm - Clinical investigations ⁵⁾	SVA	Animal	18	1	1
Goats - at farm - animal sample - blood - Clinical investigations (autopsy) ⁶⁾	SVA	Animal	3	0	0

Comments:

- ¹⁾ CFT and/or ELISA
- ²⁾ PCR, selective sampling of herds previously antibody positive in bulk milk in 2008.
- ³⁾ ELISA
- ⁴⁾ ELISA and/or PCR
- ⁵⁾ ELISA or PCR
- ⁶⁾ ELISA

2.13 TULARAEMIA

2.13.1 General evaluation of the national situation

2.13.2 Francisella in animals

A. F. tularensis in Animals

Monitoring system

Sampling strategy

No active surveillance is performed in animals. Surveillance is based on voluntary submission of animals found dead or euthanized diseased hares by hunters and the general public.

Frequency of the sampling

See above

Type of specimen taken

Organs/tissues: ____ Spleen, liver, bone marrow, lung

Case definition

Animal with positive detection of *F. tularensis*.

Diagnostic/analytical methods used

Direct immunofluorescence of the sample spread, seldom culture.

Notification system in place

Tularaemia is notifiable in animals (and in humans).

Results of the investigation

F. tularensis was not isolated detected from animals in 2009 with immunofluorescence.

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

Sweden has reported cases of endemic tularaemia since 1931. Ever since the first Swedish tularaemia case was reported a discrete endemic centre has been identified in the northern parts of central Sweden. The infection in humans in Sweden is most often domestic.

The mountain hare has been the animal species mostly affected. However, in recent years, tularaemia has been detected in the European brown hare in new geographic areas.

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

The yearly numbers of notified cases range from a few cases to more than 2700 cases in 1967. During the last decade the epidemiology of tularaemia has changed and the number of reported human cases infected south of the identified endemic region has increased. In animals, Outbreaks of tularaemia have elsewhere been considered to be associated with rises in rodent and hare populations, but this has not been observed in Sweden.

The reservoir for *F. tularensis* is not yet clearly elucidated. In Sweden, surveys in dead animals are used for monitoring tularaemia. It is possible that the European brown hare has become an important carrier of

F. tularensis and might act as a reservoir in many areas. .

Table Francisella in Animals

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Francisella	F. tularensis
All animals ¹⁾	SVA	Animal		29	0	

Comments:

¹⁾ 25 hares, 3 squirrels, one beaver

2.14 CYSTICERCOSIS, TAENIOSIS

2.14.1 General evaluation of the national situation

2.14.2 Cysticerci in animals

A. Cysticerci spp., unspecified in Animals - Control and eradication programmes - official sampling - objective sampling

Monitoring system

Sampling strategy

Cattle and swine are inspected at slaughter for lesions of Cysticerci.

Frequency of the sampling

All animals slaughtered

Type of specimen taken

Other: ____ Incisions of mandibular, retropharyngeal, and parotideal lymph nodes and M. masseter

Case definition

Animal with lesions in the above-mentioned sites

Control program/mechanisms

Suggestions to the Community for the actions to be taken

Meat inspection should be risk-based and only necessary incisions should be included. Current methods are not sensitive enough to detect infected carcasses. The lesions can be detected when inspecting the heart or breast muscles.

Measures in case of the positive findings or single cases

Carcasses with mild lesions are frozen, carcasses with massive lesions condemned

Notification system in place

Cysticercus is a notifiable disease.

Results of the investigation

In 2009, 4 cattle carcasses were detected with Cysticercus. These four carcasses were condemned. Cysticercus was not detected in swine.

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

Very few infected animals are detected in meat inspection. In 2008, 10 cattle were detected with mild infection. The carcasses were frozen. Cysticercus has not been detected in swine for years.

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

Infected animals rarely detected. The illness in humans is mostly of a mild character and can be treated.

Table Cysticerci in Animals

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Cysticerci	Cysticerci spp., unspecified
Cattle (bovine animals) - at slaughterhouse	SLV	Animal		426504	4	4
Pigs - at slaughterhouse	SLV	Animal		2969690	0	

3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE

3.1 ESCHERICHIA COLI, NON-PATHOGENIC

3.1.1 General evaluation of the national situation

3.1.2 Antimicrobial resistance in Escherichia coli, non-pathogenic

A. Antimicrobial resistance of E.coli in animal

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial resistance in indicator bacteria (E. coli and enterococci) 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 healthy animals are sampled on farm or at slaughter. Each sample is from a unique farm.

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 37°C.

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 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.

Cut-off values used in testing

Epidemiological cut-off values issued by EUCAST are used.

Results of the investigation

Prevalence of antimicrobial resistance in indicator bacteria from healthy animals is low in an international perspective and without obvious 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 Cattle (bovine animals)

Escherichia coli, non-pathogenic Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	E.coli, non-pathogenic, unspecified	
	yes	
	223	
	N	n
Antimicrobials:		
Amphenicols - Chloramphenicol	223	0
Amphenicols - Florfenicol	223	0
Fluoroquinolones - Ciprofloxacin	223	0
Quinolones - Nalidixic acid	223	0
Trimethoprim	223	1
Sulfonamides - Sulfonamide	223	4
Aminoglycosides - Streptomycin	223	10
Aminoglycosides - Gentamicin	223	0
Aminoglycosides - Kanamycin	223	1
Penicillins - Ampicillin	223	1
Tetracyclines - Tetracycline	223	4
Fully sensitive	223	212
Resistant to 1 antimicrobial	223	6
Resistant to 2 antimicrobials	223	2
Resistant to 3 antimicrobials	223	2
Resistant to 4 antimicrobials	223	0
Resistant to >4 antimicrobials	223	1

Table Antimicrobial susceptibility testing of E. coli in Cattle (bovine animals) - meat production animals - calves (under 1 year) - at slaughterhouse - animal sample - caecum - quantitative data [Dilution method]

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

E.coli, non-pathogenic, unspecified	Cattle (bovine animals) - meat production animals - calves (under 1 year) - at slaughterhouse - animal sample - caecum																									
	yes																									
	223																									
	Antimicrobials:	Cut-off value	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
Amphenicols - Chloramphenicol	16	223	0									24	152	47										2	256	
Amphenicols - Florfenicol	16	223	0									4	105	113	1									2	32	
Tetracyclines - Tetracycline	8	223	4							1	133	85					2	2						0.5	64	
Fluoroquinolones - Ciprofloxacin	0.03	223	0		11	195	17																	0.008	8	
Quinolones - Nalidixic acid	16	223	0									72	142	9										2	256	
Trimethoprim	2	223	1						67	126	28	1					1							0.25	32	
Sulfonamides - Sulfonamide	256	223	4											32	112	70	5					4		8	1024	
Aminoglycosides - Streptomycin	16	223	10										73	128	12		3	5	2					2	256	
Aminoglycosides - Gentamicin	2	223	0							69	143	11												0.25	23	
Aminoglycosides - Kanamycin	8	223	1									63	143	16		1								0.5	16	
Penicillins - Ampicillin	8	223	1							1	27	142	51	1				1						0.5	64	
Cephalosporins - Cefotaxim	2	223	0				155	67	1															0.06	8	

Table Cut-off values used for antimicrobial susceptibility testing of *Escherichia coli*, non-pathogenic in Animals

Test Method Used	Standard methods used for testing
Broth dilution	NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Amphenicols	Chloramphenicol	EUAST	16	
	Florfenicol	EUCAST	16	
Tetracyclines	Tetracycline	EUCAST	8	
Fluoroquinolones	Ciprofloxacin	SVARM	0.06	
Quinolones	Nalidixic acid	EUCAST	16	
Trimethoprim	Trimethoprim	EUCAST	2	
Sulfonamides	Sulfonamide	SVARM	256	
	Sulfonamides	SVARM	256	
Aminoglycosides	Streptomycin	EUCAST	16	
	Gentamicin	EUCAST	2	
	Kanamycin	EUCAST	8	
Cephalosporins	Cefotaxim	EUCAST	0.25	
Penicillins	Ampicillin	EUCAST	8	

Table Cut-off values used for antimicrobial susceptibility testing of *Escherichia coli*, non-pathogenic in Food

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Amphenicols	Chloramphenicol		16	
Tetracyclines	Tetracycline		8	
Fluoroquinolones	Ciprofloxacin		0.03	
Quinolones	Nalidixic acid		16	
Trimethoprim	Trimethoprim		2	
Sulfonamides	Sulfonamides		256	
Aminoglycosides	Streptomycin		16	
	Gentamicin		2	
Cephalosporins	Cefotaxim		0.25	
Penicillins	Ampicillin		8	

Table Cut-off values used for antimicrobial susceptibility testing of *Escherichia coli*, non-pathogenic in Feed

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Amphenicols	Chloramphenicol		16	
Tetracyclines	Tetracycline		8	
Fluoroquinolones	Ciprofloxacin		0.03	
Quinolones	Nalidixic acid		16	
Trimethoprim	Trimethoprim		2	
Sulfonamides	Sulfonamides		256	
Aminoglycosides	Streptomycin		16	
	Gentamicin		2	
Cephalosporins	Cefotaxim		0.25	
Penicillins	Ampicillin		8	

3.2 ENTEROCOCCUS, NON-PATHOGENIC

3.2.1 General evaluation of the national situation

3.2.2 Antimicrobial resistance in Enterococcus, non-pathogenic isolates

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

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial resistance in indicator bacteria (E. coli and enterococci) 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 healthy animals are sampled on farm or at slaughter. Each sample is from a unique farm.

Procedures for the selection of isolates for antimicrobial testing

One randomly selected isolate from each culture is tested for antimicrobial susceptibility.

Methods used for collecting data

Results of antimicrobial susceptibility testing and information on origin of isolates are stored in a database at SVA. For compiling statistics, relevant data are 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 was diluted as described for E. coli and cultured on solid media without antibiotics.

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 37°C. From the Enterococcus broth 0.1 mL was cultured on SlaBa agar and incubated at 44°C for 48 h. One colony, randomly chosen, was sub-cultured on bile-esculin agar and blood agar (37°C, 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

Cut-off values used in testing

Epidemiological cut-off values issued by EUCAST are used.

Results of the investigation

Prevalence of antimicrobial resistance in indicator bacteria from healthy animals and food is low in an international perspective and without obvious 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 Enterococcus, non-pathogenic in Cattle (bovine animals) - meat production animals - calves (under 1 year) - at slaughterhouse - animal sample - caecum

Enterococcus, non-pathogenic Isolates out of a monitoring program (yes/no) Number of isolates available in the laboratory	E. faecalis		E. faecium	
	yes		yes	
	10		24	
	N	n	N	n
Antimicrobials:				
Amphenicols - Chloramphenicol	10	0	24	0
Tetracyclines - Tetracycline	10	3	24	0
Aminoglycosides - Streptomycin	10	0	24	0
Aminoglycosides - Gentamicin	10	0	24	0
Aminoglycosides - Kanamycin	10	0	24	0
Penicillins - Ampicillin			24	0
Fully sensitive	10	7	24	22
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	10	0	24	1
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	10	0	24	0
Ionophores - Narasin	10	0	24	0
Macrolides - Erythromycin	10	0	24	1
Oxazolidines - Linezolid	10	0	24	0
Resistant to 1 antimicrobial	10	3	24	2

Table Antimicrobial susceptibility testing of *E. faecalis* in Cattle (bovine animals) - meat production animals - calves (under 1 year) - at slaughterhouse - animal sample - caecum - quantitative data [Dilution method]

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

E. faecalis	Cattle (bovine animals) - meat production animals - calves (under 1 year) - at slaughterhouse - animal sample - caecum																										
	yes																										
	10																										
Antimicrobials:	Cut-off value	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		
Amphenicols - Chloramphenicol	32	10	0										5	5										0.5	64		
Tetracyclines - Tetracycline	2	10	3							2	5					3								0.5	64		
Aminoglycosides - Streptomycin	512	10	0														5	5						8	1024		
Aminoglycosides - Gentamicin	512	10	0											6	4									2	256		
Aminoglycosides - Kanamycin	1024	10	0													2	7	1						16	2048		
Penicillins - Ampicillin	4																							0.25	32		
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	32	10	0										2	6	1	1								1	128		
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	4	10	0								1	3	6											1	128		
Ionophores - Narasin	2	10	0						6	3	1													0.12	16		
Macrolides - Erythromycin	4	10	0								2	6	2											0.5	64		
Oxazolidines - Linezolid	4	10	0								1	8	1											0.5	16		
Streptogramins - Virginiamycin	32	10	0							1					7	2								0.5	64		

Table Antimicrobial susceptibility testing of *E. faecium* in Cattle (bovine animals) - meat production animals - calves (under 1 year) - at slaughterhouse - animal sample - caecum - quantitative data [Dilution method]

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

E. faecium	Cattle (bovine animals) - meat production animals - calves (under 1 year) - at slaughterhouse - animal sample - caecum																											
	Isolates out of a monitoring program (yes/no)																											
	Number of isolates available in the laboratory																											
	Antimicrobials:	Cut-off value	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		
Amphenicols - Chloramphenicol	32	24	0									1	10	13											0.5	64		
Tetracyclines - Tetracycline	8	24	0							15	9														0.5	64		
Aminoglycosides - Streptomycin	128	24	0												1	2	19	2							8	1024		
Aminoglycosides - Gentamicin	512	24	0									1	6	14	3										2	256		
Aminoglycosides - Kanamycin	1024	24	0													2	6	12	3	1					16	2048		
Penicillins - Ampicillin	4	24	0						3	4	14	2	1												0.25	32		
Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin	32	24	1										7	3	10	3			1						1	128		
Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin	4	24	0								14	6	4												1	128		
Ionophores - Narasin	4	24	0						1	15	8														0.12	16		
Macrolides - Erythromycin	4	24	1							8	1	5	9	1											0.5	64		
Oxazolidines - Linezolid	4	24	0									20	4												0.5	16		
Streptogramins - Virginiamycin	4	24	0							1	9	4	10												0.5	64		

Table Cut-off values for antibiotic resistance of Enterococcus, non-pathogenic in Animals

Test Method Used	Standard methods used for testing
Broth dilution	NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Streptomycin	EUCAST	512	
	Gentamicin	EUCAST	32	
	Kanamycin	SVARM	1024	
Amphenicols	Chloramphenicol	EUCAST	32	
Penicillins	Ampicillin	EUCAST	4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin	EUCAST	4	
	Bacitracin	EUCAST	32	
Macrolides	Erythromycin	EUCAST	4	
Streptogramins	Quinupristin/Dalfopristin	EUCAST	32	
	Virginiamycin	EUCAST	32	
Tetracyclines	Tetracycline	EUCAST	4	
Oxazolidines	Linezolid	EUCAST	4	
Ionophores	Narasin	EUCAST	2	

Table Cut-off values for antibiotic resistance of Enterococcus, non-pathogenic in Animals

Footnote:
BPs above are for E. faecalis, For E. faecium, EUCAST are the same except for; streptomycin >128,narasin >4, virginiamycin >4.

Table Cut-off values for antibiotic resistance of Enterococcus, non-pathogenic in Food

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Streptomycin		512	
	Gentamicin		32	
Amphenicols	Chloramphenicol		32	
Penicillins	Ampicillin		4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Streptogramins	Quinupristin/Dalfopristin		32	
Tetracyclines	Tetracycline		2	
Oxazolidines	Linezolid		4	

Table Cut-off values for antibiotic resistance of Enterococcus, non-pathogenic in Feed

Test Method Used		Standard methods used for testing		
			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Aminoglycosides	Streptomycin		512	
	Gentamicin		32	
Amphenicols	Chloramphenicol		32	
Penicillins	Ampicillin		4	
Glycopeptides (Cyclic peptides, Polypeptides)	Vancomycin		4	
Macrolides	Erythromycin		4	
Streptogramins	Quinupristin/Dalfopristin		32	
Tetracyclines	Tetracycline		2	
Oxazolidines	Linezolid		4	

4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS

4.1 ENTEROBACTER SAKAZAKII

4.1.1 General evaluation of the national situation

4.2 HISTAMINE

4.2.1 General evaluation of the national situation

4.3 STAPHYLOCOCCAL ENTEROTOXINS

4.3.1 General evaluation of the national situation

5. FOODBORNE

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

A. Foodborne outbreaks

System in place for identification, epidemiological investigations and reporting of foodborne outbreaks

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.

Table Foodborne Outbreaks: summarised data

	Total number of outbreaks	Outbreaks	Human cases	Hospitalized	Deaths	Number of verified outbreaks
Bacillus	0	0	unknown	unknown	unknown	0
Campylobacter	4	4	59	2	0	0
Clostridium	0	0	unknown	unknown	unknown	0
Escherichia coli, pathogenic	1	0	unknown	unknown	unknown	1
Foodborne viruses	26	21	1635	1	0	5
Listeria	0	0	unknown	unknown	unknown	0
Other agents	9	7	18	1	0	2
Parasites	0	0	unknown	unknown	unknown	0
Salmonella	7	5	53	5	0	2
Staphylococcus	4	1	6	0	0	3
Unknown	174	174	563	4	0	0
Yersinia	1	1	2	0	0	0

nnnn

Table Verified Foodborne Outbreaks: detailed data for Escherichia coli, pathogenic

Please use CTRL for multiple selection fields

E.coli, pathogenic, unspecified

Value

Code	
Outbreaks	1
Human cases	4
Hospitalized	0
Deaths	0
Foodstuff implicated	Tap water, including well water
More Foodstuff information	
Type of evidence	Laboratory detection in implicated food
Outbreak type	unknown
Setting	unknown
Place of origin of problem	unknown
Origin of foodstuff	Domestic
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

Table Verified Foodborne Outbreaks: detailed data for Foodborne viruses

Please use CTRL for multiple selection fields

Calicivirus - norovirus (Norwalk-like virus)

Value

Code	10/0062
Outbreaks	1
Human cases	53
Hospitalized	0
Deaths	0
Foodstuff implicated	Crustaceans, shellfish, molluscs and products thereof
More Foodstuff information	sandwich layer-cake
Type of evidence	Analytical epidemiological evidence;Laboratory detection in human cases
Outbreak type	General
Setting	Take-away or fast-food outlet
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	unknown
Contributory factors	Cross-contamination;Infected food handler
Other Agent (Mixed Outbreaks)	
Comment	

Calicivirus - norovirus (Norwalk-like virus)

Value

Code	
Outbreaks	1
Human cases	173
Hospitalized	0
Deaths	0
Foodstuff implicated	Tap water, including well water
More Foodstuff information	
Type of evidence	Laboratory characterization of food and human isolates;Laboratory detection in human cases;Laboratory detection in implicated food
Outbreak type	General
Setting	unknown
Place of origin of problem	unknown
Origin of foodstuff	Domestic
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

Calicivirus - norovirus (Norwalk-like virus)

Value

Code	10/0115
Outbreaks	1
Human cases	26
Hospitalized	0
Deaths	0
Foodstuff implicated	Dairy products (other than cheeses)
More Foodstuff information	garlic-salad-dressing
Type of evidence	Analytical epidemiological evidence;Laboratory detection in human cases
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	unknown
Origin of foodstuff	unknown
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

Calicivirus - norovirus (Norwalk-like virus)

Value

Code	10/0013
Outbreaks	1
Human cases	28
Hospitalized	0
Deaths	0
Foodstuff implicated	Cereal products including rice and seeds/pulses (nuts, almonds)
More Foodstuff information	sushi-rice
Type of evidence	Analytical epidemiological evidence;Laboratory detection in human cases
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	unknown
Contributory factors	Cross-contamination;Infected food handler
Other Agent (Mixed Outbreaks)	
Comment	

Calicivirus - norovirus (Norwalk-like virus)

Value

Code	09/0245
Outbreaks	1
Human cases	130
Hospitalized	0
Deaths	0
Foodstuff implicated	Fruit, berries and juices and other products thereof
More Foodstuff information	raspberries
Type of evidence	Analytical epidemiological evidence;Laboratory detection in human cases
Outbreak type	General
Setting	School, kindergarten
Place of origin of problem	unknown
Origin of foodstuff	Intra community trade
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

Table Verified Foodborne Outbreaks: detailed data for Other agents

Please use CTRL for multiple selection fields

Histamine

Value

Code	09/0116
Outbreaks	1
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Fish and fish products
More Foodstuff information	Tunafish
Type of evidence	Analytical epidemiological evidence;Laboratory detection in implicated food
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	unknown
Origin of foodstuff	Imported from outside EU
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

Shigella - S. dysenteriae

Value

Code	
Outbreaks	1
Human cases	35
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff information	Sugersnaps
Type of evidence	Analytical epidemiological evidence;Laboratory detection in human cases
Outbreak type	General
Setting	Household
Place of origin of problem	unknown
Origin of foodstuff	Imported from outside EU
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

Table Verified Foodborne Outbreaks: detailed data for Salmonella

Please use CTRL for multiple selection fields

S. Napoli

Value

Code	10/0129
Outbreaks	1
Human cases	5
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff information	Ruccula
Type of evidence	Laboratory characterization of food and human isolates;Laboratory detection in human cases;Laboratory detection in implicated food
Outbreak type	Household
Setting	Household
Place of origin of problem	Farm (primary production)
Origin of foodstuff	unknown
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

Salmonella spp.

Value

Code	09/0163
Outbreaks	1
Human cases	8
Hospitalized	unknown
Deaths	unknown
Foodstuff implicated	Turkey meat and products thereof
More Foodstuff information	
Type of evidence	Analytical epidemiological evidence;Laboratory characterization of food and human isolates;Laboratory detection in human cases;Laboratory detection in implicated food
Outbreak type	Household
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Domestic
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

Table Verified Foodborne Outbreaks: detailed data for Staphylococcus

Please use CTRL for multiple selection fields

S. aureus

Value

Code	10/0135
Outbreaks	1
Human cases	14
Hospitalized	0
Deaths	0
Foodstuff implicated	Cheese
More Foodstuff information	
Type of evidence	Laboratory detection in implicated food
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Farm (primary production)
Origin of foodstuff	unknown
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

S. enterotoxins

Value

Code	10/0055
Outbreaks	1
Human cases	15
Hospitalized	0
Deaths	0
Foodstuff implicated	Cheese
More Foodstuff information	
Type of evidence	Laboratory detection in implicated food
Outbreak type	Household
Setting	Household
Place of origin of problem	unknown
Origin of foodstuff	unknown
Contributory factors	
Other Agent (Mixed Outbreaks)	
Comment	

S. aureus

Value

Code	09/0218
Outbreaks	1
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Crustaceans, shellfish, molluscs and products thereof
More Foodstuff information	
Type of evidence	Laboratory detection in implicated food
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Domestic
Contributory factors	Cross-contamination;Storage time/temperature abuse
Other Agent (Mixed Outbreaks)	
Comment	