



SWEDEN

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

TRENDS AND SOURCES OF ZOO NOSES 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 2006

INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Country: **Sweden**

Reporting Year: **2006**

PREFACE

This report is submitted to the European Commission in accordance with Article 9 of Council Directive 2003/99/EC¹. 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 2006. 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.

¹ Directive 2003/99/EC of the European Parliament and of the Council of 12 December 2003 on the monitoring of zoonoses and zoonotic agents, amending Decision 90/424/EEC and repealing Council Directive 92/117/EEC, OJ L 325, 17.11.2003, p. 31

LIST OF CONTENTS

| | |
|---|-----|
| 1. ANIMAL POPULATIONS | 1 |
| 2. INFORMATION ON SPECIFIC ZOOSES AND ZOONOTIC AGENTS | 4 |
| 2.1. <i>SALMONELLOSIS</i> | 5 |
| 2.1.1. General evaluation of the national situation | 5 |
| 2.1.2. Salmonella in foodstuffs | 7 |
| 2.1.3. Salmonella in animals | 31 |
| 2.1.4. Salmonella in feedingstuffs | 111 |
| 2.1.5. Salmonella serovars and phagetype distribution | 119 |
| 2.1.6. Antimicrobial resistance in Salmonella isolates | 126 |
| 2.2. <i>CAMPYLOBACTERIOSIS</i> | 153 |
| 2.2.1. General evaluation of the national situation | 153 |
| 2.2.2. Campylobacter in foodstuffs | 155 |
| 2.2.3. Campylobacter in animals | 161 |
| 2.2.4. Antimicrobial resistance in Campylobacter isolates | 167 |
| 2.3. <i>LISTERIOSIS</i> | 176 |
| 2.3.1. General evaluation of the national situation | 176 |
| 2.3.2. Listeria in foodstuffs | 177 |
| 2.3.3. Listeria in animals | 182 |
| 2.4. <i>E. COLI INFECTIONS</i> | 185 |
| 2.4.1. General evaluation of the national situation | 185 |
| 2.4.2. Escherichia coli, pathogenic in foodstuffs | 187 |
| 2.4.3. Escherichia coli, pathogenic in animals | 188 |
| 2.5. <i>TUBERCULOSIS, MYCOBACTERIAL DISEASES</i> | 196 |
| 2.5.1. General evaluation of the national situation | 196 |
| 2.5.2. Mycobacterium in animals | 198 |
| 2.6. <i>BRUCELLOSIS</i> | 212 |
| 2.6.1. General evaluation of the national situation | 212 |
| 2.6.2. Brucella in foodstuffs | 214 |
| 2.6.3. Brucella in animals | 214 |
| 2.7. <i>YERSINIOSIS</i> | 228 |
| 2.7.1. General evaluation of the national situation | 228 |
| 2.7.2. Yersinia in foodstuffs | 230 |
| 2.7.3. Yersinia in animals | 233 |
| 2.8. <i>TRICHINELLOSIS</i> | 235 |
| 2.8.1. General evaluation of the national situation | 235 |
| 2.8.2. Trichinella in animals | 236 |
| 2.9. <i>ECHINOCOCCOSIS</i> | 242 |
| 2.9.1. General evaluation of the national situation | 242 |
| 2.9.2. Echinococcus in animals | 244 |
| 2.10. <i>TOXOPLASMOSIS</i> | 251 |
| 2.10.1. General evaluation of the national situation | 251 |
| 2.10.2. Toxoplasma in animals | 252 |
| 2.11. <i>RABIES</i> | 254 |
| 2.11.1. General evaluation of the national situation | 254 |

| | |
|--|-----|
| 2.11.2. Lyssavirus (rabies) in animals | 255 |
| 2.12. <i>Q-FEVER</i> | 259 |
| 2.12.1. General evaluation of the national situation | 259 |
| 2.12.2. Coxiella (Q-fever) in animals | 259 |
| 3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE | 260 |
| 3.1. <i>ENTEROCOCCUS, NON-PATHOGENIC</i> | 261 |
| 3.1.1. General evaluation of the national situation | 261 |
| 3.1.2. Antimicrobial resistance in Enterococcus, non-pathogenic isolates | 261 |
| 3.2. <i>ESCHERICHIA COLI, NON-PATHOGENIC</i> | 269 |
| 3.2.1. General evaluation of the national situation | 269 |
| 3.2.2. Antimicrobial resistance in Escherichia coli, non-pathogenic isolates | 269 |
| 4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS | 278 |
| 4.1. <i>HISTAMINE</i> | 279 |
| 4.1.1. General evaluation of the national situation | 279 |
| 4.1.2. Histamine in foodstuffs | 279 |
| 4.2. <i>ENTEROBACTER SAKAZAKII</i> | 280 |
| 4.2.1. General evaluation of the national situation | 280 |
| 4.2.2. Enterobacter sakazakii in foodstuffs | 280 |
| 4.3. <i>STAPHYLOCOCCAL ENTEROTOXINS</i> | 281 |
| 4.3.1. General evaluation of the national situation | 281 |
| 4.3.2. Staphylococcal enterotoxins in foodstuffs | 281 |
| 5. FOODBORNE OUTBREAKS | 282 |

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 2006, Swedish Board of Agriculture, including data from 2005. 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 2005.

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

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

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

The dairy sector plays a central role in Swedish agriculture. The number of dairy cows has, however, been decreasing over a long period of time. The number of farms with livestock is decreasing whereas those that remain increase their number of animals. For example, all herds with fewer number of cows than cows has decreased. In 2005, there were dairy cows in around 8500 farms. This is a decrease with 7 % compared with 2004. On the same time, herd size increased from 44 cows/herd to 46 cows/herd.

In 2005 there were roughly 2800 pig farms in Sweden. This is a decrease by around 85% since 1980. Also, the number of pigs are falling, and the decrease was greatest during the 1980's. Around 98 % of the fattening pigs are found in herds with at least 100 animals.

The number of sheep herds are decreasing, but the increasing herd sizes have resulted in a slight increase in the total number of animals. Egg production is dominated by few but large flocks. Around 90 % of the hens of laying breed are found in herds with at least 5 000 hens. The number of hens increased during the 1980's but have now reached the lowest level in many years.

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

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

Table Susceptible animal populations

* Only if different than current reporting year

| Animal species | Category of animals | Livestock numbers (live animals) | | Number of slaughtered animals | | Number of herds or flocks | | Number of holdings | |
|-------------------------|--|----------------------------------|-------|-------------------------------|-------|---------------------------|-------|--------------------|-------|
| | | | Year* | | Year* | | Year* | | Year* |
| Cattle (bovine animals) | mixed herds (1) | | | | | | | | |
| | dairy cows and heifers (2) | 393263 | 2005 | | | | | 8548 | 2005 |
| | meat production animals | 176613 | 2005 | | | | | 12821 | 2005 |
| | calves (under 1 year) | 508495 | 2005 | 32481 | 2006 | | | 22888 | 2005 |
| | in total | 1604933 | 2005 | 465225 | 2006 | | | 26179 | 2005 |
| Deer | farmed - in total | 22361 | 2006 | | | | | 635 | 2006 |
| Ducks | in total | | | 20710 | 2006 | | | | |
| Gallus gallus (fowl) | parent breeding flocks, unspecified - in total | | | 666781 | 2006 | | | | |
| | laying hens | | | 3209807 | 2006 | | | | |
| | broilers | | | 72905571 | 2006 | | | | |
| Geese | in total | | | 22576 | 2006 | | | | |
| Goats | in total | 5509 | 2003 | 560 | 2006 | | | | |
| Ostriches | farmed | | | 852 | 2006 | | | | |
| Pigs | breeding animals | 188112 | 2005 | | | | | 3026 | 2005 |
| | fattening pigs | 1085304 | 2005 | | | | | 2306 | 2005 |
| | in total (3) | 1811216 | 2005 | 3033740 | 2006 | | | 2794 | 2005 |
| Reindeers | farmed - in total (4) | 262000 | | 71633 | | | | | |
| Sheep | animals under 1 year (lambs) | 249275 | 2005 | | | | | 6666 | 2005 |
| | animals over 1 year | 222009 | 2005 | | | | | 7595 | 2005 |
| | in total | 471284 | 2005 | 212548 | 2006 | | | 7653 | 2005 |
| Solipeds, domestic | horses - in total | 283100 | 2004 | 3009 | 2006 | | | 56000 | 2004 |
| Turkeys | in total | | | 489921 | 2006 | | | | |
| Wild boars | farmed - in total (5) | | | 142 | 2006 | | | | |

(1): only dairy cows

(2): only beef cows

(3): Numbers from June 2005

(4): Renaret 2005/2006

(5): slaughtered at slaughterhouse

2. INFORMATION ON SPECIFIC ZONOSSES AND ZONOTIC AGENTS

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

2.1. SALMONELLOSIS

2.1.1. General evaluation of the national situation

A. General evaluation

History of the disease and/or infection in the country

The Swedish Salmonella control programme was initiated in 1961. In 1995, the parts of the programme that covered cattle, pigs, poultry and eggs, were approved by the EU (95/50/EC) and extended surveillance was initiated. The results showed that Swedish red and white meat and eggs virtually are free from Salmonella.

Of the reported human cases, only about 15% are reported as domestic acquired salmonella infection. This figure has been stable throughout the years and is based on information reported from the physicians.

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

The national situation remains very favourable. The last four years the number of reported human cases has been very stable with an annual incidence of about 40/100 000, including domestic and imported cases, and 6-9/100 000 for the domestic cases. In food producing animals, only a few cattle and poultry farms are put under restriction following reported salmonella infection per year, and none or only a few pig farms.

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

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

Recent actions taken to control the zoonoses

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

2.1.2. Salmonella in foodstuffs

A. Salmonella spp. in eggs and egg products

Monitoring system

Sampling strategy

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

There is no control programme for packing centers or for eggs at retail.

B. Salmonella spp. in broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Swedish Salmonella control programme:

Sampling strategies are described in the Swedish Salmonella control programme approved by 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.

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

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

producing <5 tons/week.

At retail

Other: decided by the local authorities

Type of specimen taken

At slaughterhouse and cutting plant

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

At meat processing plant

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

At retail

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

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: 10 neckskin samples are pooled and analyzed as 1 sample. From 10 carcasses at least 10g, approx. 3 x 3 cm of neck skin is cut off and put into a plastic bag. Each sample shall be marked with the 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 neck-skin from 10-15 birds. The pooled sample is mixed well and pre-enriched in buffered peptone water and examined for salmonella according to NMKL. If salmonella is isolated from a pooled sample each individually stored neck-skin are examined.

Crushed meat: Each sample of 25 g of crushed meat from equipment etc or from trimmings is individually analysed according to NMKL.

Definition of positive finding

At slaughterhouse and cutting plant

A confirmed positive sample.

At meat processing plant

A confirmed positive sample.

At retail

A confirmed positive sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

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

At meat processing plant

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

At retail

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

Preventive measures in place

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

Control program/mechanisms

The control program/strategies in place

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

Recent actions taken to control the zoonoses

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

Measures in case of the positive findings or single cases

All positive findings 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 very low. The local municipalities reported 74 samples from broiler meat or products thereof. All of these were negative for salmonella.

From Cat A slaughter houses 3340 neck skins were analysed and 29 from Cat B slaughter houses. 4 samples were positive: 3 S. Agona and 1 S. Rubislaw.

At cutting plants 1 047 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 very 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 Swedish produced red and white meat, and eggs virtually are free from salmonella, the risk of contracting salmonella from domestic produced animal products is small.

Additional information

In the surveillance described in the salmonella control programme, approximately 4000 neck skin sample from the slaughter houses are analysed yearly. Between 1995 and 2006, 45637 neck skin samples were collected and of those, 15 (0.03%) were positive.

C. Salmonella spp. in turkey meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

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

However the turkey production in Sweden is very small and the reports from the salmonella control do not distinguish between turkeys and broilers. The turkeys are thus included in the figures reported for broilers. They represent a very small part of the numbers reported.

Even so no Salmonella was found in turkey neck-skins or at cutting plants.

D. Salmonella spp. in pig meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Sampling strategies are described in the Swedish Salmonella control programme approved by EU (95/50/EC). The programmes are supervised by the SJV and the SLV. All sampling in the control programme is supervised by the competent authority, that is official veterinarians. They are responsible for the sampling in the herds, flocks, hatcheries, cutting plants and in the slaughter houses.

Within the programme, lymph nodes and carcass swabs are systematically collected from pigs at slaughter to ensure that the samples are representative of the population of slaughtered pigs at each slaughterhouse. Sampling of lymph nodes is described under "Salmonella in pigs".

Slaughter houses have been divided into two categories: Category A slaughtering 90% of all pigs and Category B slaughtering 10% of all pigs.

Category A: At each slaughterhouse a sufficient number of samples is collected to detect at least 5% salmonella infected/contaminated carcasses with 95% confidence interval (CI) in the annual slaughter. Sampling is performed daily in Category A. Samples are collected evenly distributed over the day and if slaughter is performed on separate lines, each will be sampled separately.

Category B: These slaughterhouses are controlled as one unit. Enough samples to detect a prevalence of 1% salmonella infected 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

Other: Carcass swabs: representative sampling spread out evenly over the year; cutting plants: once/day in plants producing >100 tons/week, once/week in plants producing >20 tons/week, once/month in plants producing >5 tons/week, twice/year in plants producing <5 tons/week.

At meat processing plant

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

At retail

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

Type of specimen taken

At slaughterhouse and cutting plant

Other: Carcass swabs: Approx. 1400 square cm/carcass is swabbed. Cuttingplants: crushed meat

At meat processing plant

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

At retail

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

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

Carcass swabs: The carcasses are sampled before the carcass is refrigerated. The upper inner part of the hind legs including the pelvic entrance will be tested. A total of 30 cm x 20-25 cm will be swabbed. The cut surface area of the abdomen and the chest including approximately 5 cm of the skin surface will be tested. Approx. 70-80 cm x 8-10 cm will be swabbed. In total approx 1400 cm² will be swabbed. Two sterile swabs moistured with PBS are used. The swabs from one carcass will be place in a plastic bag in 100 ml of PBS. Samples are kept refrigerated until they are sent to the laboratory.

To each sample of two swabs 100 ml of buffered peptone water is added. The sample is incubated overnight. One drop off pre-enrichment broth from each of 10 to 15 animals is pooled in RV broth and examined according to NMKL. Each pre-enrichment broth is stored at 4o C until results are ready. In case of a positive result each broth will be analysed separately.

Crushed meat: each sample of 25 g is individually analysed according to NMKL.

At meat processing plant

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

At retail

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

Definition of positive finding

At slaughterhouse and cutting plant

A confirmed positive sample.

At meat processing plant

A confirmed positive sample.

At retail

A confirmed positive sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

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

At meat processing plant

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

At retail

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

Preventive measures in place

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

Control program/mechanisms

The control program/strategies in place

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

Recent actions taken to control the zoonoses

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

Measures in case of the positive findings or single cases

All positive findings 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 spp. in pigs" are implemented.

Notification system in place

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

Results of the investigation

Salmonella prevalence in animal products of Swedish origin is very low. Results from sampling of

fresh meat or meat products from cattle and pig are reported under "Salmonella spp in bovine meat and products thereof".

Also, 5918 carcass swabs from pigs (2767 from breeding pigs and 3151 from fattening pigs) were analysed. All of these samples were negative.

From cutting plants, 3898 samples from both cattle and pigs were collected, all but one were negative. The positive sample was from bovine meat. 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 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, virtually are free from Salmonella the risk of contracting salmonella from domestically produced food is very small.

Additional information

Between 1996 and 2006, 63 095 lymph nodes from fattening- and adult pigs have been sampled in total. Of those, 81 (0.1%) were positive for salmonella. Similarly, 63 118 swabs have been analysed and of those 7 (0.01%) have been positive. Furthermore, only in a few cases when salmonella were isolated from lymph nodes or swabs was salmonella re-isolated at farm level.

E. Salmonella spp. in bovine meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Sampling strategies are described in the Swedish Salmonella control programme (95/50/EC). The programmes are supervised by the SJV and the SLV and All sampling is supervised by the competent authority, that is the official veterinarian. Official veterinarians are responsible for the sampling in the herds, flocks, hatcheries, cuttingplants and in the slaughter houses.

Within the programme, lymph nodes and carcass swabs are 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 meat processing plant

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

At retail

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

Type of specimen taken

At slaughterhouse and cutting plant

Other: carcass swabs: approx. 1400 square cm/carcass, cuttingplants: crushed meat

At meat processing plant

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

At retail

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

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

Carcass swabs: The carcasses are sampled before the carcass is refrigerated.

The upper inner part of the hind legs including the pelvic entrance will be tested. A total of 30x20-25 cm will be swabbed. The cut surface area of the abdomen and the chest including approximately 5 cm of the skin surface will be tested. Approx. 70-80 cm x 8-10 cm will be swabbed. In total approx 1400 cm² will be swabbed. Two sterile swabs moistured with PBS are used. The swabs from one carcass will be placed in a plastic bag in 100 ml of PBS. Samples are kept refrigerated until they are sent to the laboratory.

To each sample of two swabs 100 ml of buffered peptone water is added. The sample is incubated overnight. One drop of pre-enrichment broth from each of 10 to 15 animals is pooled in RV broth and examined according to NMKL. Each pre-enrichment broth is stored at 4o C until results are ready. In case of a positive result each broth will be analysed separately.

Crushed meat: each sample of 25 g is individually analysed according to NMKL.

At meat processing plant

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

At retail

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

Definition of positive finding

At slaughterhouse and cutting plant

A confirmed positive sample.

At meat processing plant

A confirmed positive sample.

At retail

A confirmed positive sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

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

At meat processing plant

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

At retail

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

Preventive measures in place

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

Control program/mechanisms

The control program/strategies in place

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

Recent actions taken to control the zoonoses

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

Measures in case of the positive findings or single cases

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

If salmonella is isolated from a lymph node trace-back investigation is always performed at the farm of origin. If salmonella is re-isolated at the farm, measures described in section "Salmonella in bovine animals" are implemented.

Notification system in place

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

Results of the investigation

Salmonella prevalence in animal products of Swedish origin is very low. At retail, 771 samples from

fresh meat or meat products (including pork and pork products) were reported from the local municipalities, none of these were positive.

In the surveillance in the control programme 3510 carcass swabs were analysed. Of those, 1 was positive (S. Typhimurium DT 104).

From cutting plants, 3898 samples from both cattle and pigs were analysed, one beef sample was positive (S. Typhimurium). 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 2006, 35287 lymph nodes from cattle have been sampled in total. Of those, 23 (0.06%) were positive for salmonella. Furthermore, 35301 swabs have been analysed and of those 8 (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 2006 and reported by local competent authorities:

The local municipalities reported 1774 samples of ready-to-eat foods, all but one negative. In herbs and spices, 23 reported samples were all negative. One out of 233 fruits and vegetables was positive. One out of 60 samples of crustaceans was Salmonella positive. Finally, 28 samples from table eggs at retail and 151 fishery products were negative for Salmonella. It should be observed that the reporting from the local authorities is far from complete.

Table Salmonella in poultry meat and products thereof

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for Salmonella spp. | S. Enteritidis | S. Typhimurium | Salmonella spp., unspecified | S. Agona | S. Rubislaw |
|--|------------------------|---------------|---------------|--------------|--|----------------|----------------|------------------------------|----------|-------------|
| Meat from broilers (Gallus gallus) | | | | | | | | | | |
| fresh (1) | local health authority | single | 25 g | 74 | 0 | | | | | |
| - at cutting plant - domestic production - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling | SLV | single | 25g | 1047 | 0 | | | | | |
| carcass | | | | | | | | | | |
| - at slaughterhouse - animal sample - neck skin - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (2) | SLV | single | 25g | 3369 | 4 | | | | 3 | 1 |

(1) : broiler meat or products thereof
 (2) : Slaughterhouse contamination.

Footnote

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

Table Salmonella in milk and dairy products

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for Salmonella spp. | S. Enteritidis | S. Typhimurium | Salmonella spp., unspecified |
|--|-----------------------|---------------|---------------|--------------|--|----------------|----------------|------------------------------|
| | | | | | | | | |

Table Salmonella in red meat and products thereof

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for Salmonella spp. | S. Enteritidis | S. Typhimurium | Salmonella spp., unspecified |
|---|--------------------------------|---------------|---------------|--------------|--|----------------|----------------|------------------------------|
| Meat from pig | | | | | | | | |
| fresh (1) | reports from local authorities | single | 25g | 432 | 0 | | | |
| meat products | | | | | | | | |
| raw but intended to be eaten cooked (2) | reports from local authorities | single | 25g | 339 | 0 | | | |
| Meat from bovine animals | | | | | | | | |
| fresh | see footnote | --- | | | | | | |
| meat products | | | | | | | | |
| raw but intended to be eaten cooked | see footnote | --- | | | | | | |
| Meat from bovine animals and pig | | | | | | | | |
| fresh | | | | | | | | |
| - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling | | single | 25 g | 3898 | 1 | | 1 | |

(1) : include meat from cattle and pig

(2) : include meat from cattle and pig

Footnote

The data given for both meat and meat products include both pigs and cattle. The reports do not separate the two species and do not specify if the meat is minced or not. regarding samples within the Swedish Salmonella control Programme - see text file.

Table Salmonella in other food

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for Salmonella spp. | S. Enteritidis | S. Typhimurium | Salmonella spp., unspecified |
|--|------------------------|---------------|---------------|--------------|--|----------------|----------------|------------------------------|
| Eggs | | | | | | | | |
| table eggs | | | | | | | | |
| - at retail | local health authority | single | 25 g | 28 | 0 | | | |
| Fishery products | local health authority | single | 25 g | 108 | 0 | | | |
| Crustaceans | local health authority | single | 25 g | 60 | 1 | | | |
| Fruits and vegetables | local health authority | single | 25 g | 233 | 1 | | | |
| Other processed food products and prepared dishes | | | | | | | | |
| unspecified | | | | | | | | |
| ready-to-eat foods | local health authority | single | 25 g | 1774 | 1 | | | |
| Spices and herbs | local health authority | single | 25 g | 23 | 0 | | | |

Footnote

The local health authorities do not report serotypes.

2.1.3. Salmonella in animals

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

Monitoring system

Sampling strategy

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

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.

All sampling performed according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official veterinarian or under his/her supervision if sampling is delegated to farmers/companies.

The control constitutes of clinical surveillance and sampling. The clinical surveillance include general surveillance and surveillance related to the control programme where an official veterinarian visits breeding establishments every 8 week, laying hen farms once a year and meat producing poultry farm twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination.

Breeders and hatchery:

Sampling of breeding flocks is carried out according to the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.

Elite and Grand Parent: samples are taken on 5 separate occasions during rearing. Tissue samples from dead chicks and chicken box linings are taken as a supplement

to the faecal sampling. During egg production faecal samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

The parent generation is tested at 3 occasions during the rearing period through tissue sampling as well as faecal sampling. During eggproduction samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

Laying hens flocks

See "Breeding flocks"

Pullets and layers for table egg production:

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

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

Frequency of the sampling

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

Other: see 'rearing period'

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

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

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

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

Laying hens: Day-old chicks

Every flock is sampled

Laying hens: Rearing period

2 weeks prior to moving

Laying hens: Production period

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

Laying hens: Before slaughter at farm

3-4 weeks prior to slaughter

Laying hens: At slaughter

Other: see Salmonella in broiler meat and products thereof

Type of specimen taken

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

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

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

Other: ceacal and faecal samples

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

Faeces

Laying hens: Day-old chicks

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

Laying hens: Rearing period

Faeces

Laying hens: Production period

Faeces

Laying hens: Before slaughter at farm

Faeces

Laying hens: At slaughter

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

Methods of sampling (description of sampling techniques)

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

Chicken box lining:

The lining from chicken boxes are cut into smaller pieces and put into plastic bags. The lining from at most five boxes may be put into one bag as one pooled sample. The plastic bag shall be marked and sent to the laboratory the same day.

The pooled sample is cut into smaller pieces and mixed well. At least 25 g material is examined for Salmonella according to Nordic Committee on Food Analysis.

Dead birds:

Ceaca from 10 animals are taken out and pooled into one stomacher bag (one pooled sample). The stomacher bag shall be marked and sent to the laboratory the same day.

The pooled sample is homogenized in a stomacher. If the sample comes from day old chickens, at least 10g material shall be examined. If the samples comes from older birds, at least 25g material shall be examined. All samples are examined for Salmonella according to Nordic Committee on Food Analysis.

Meconium:

Meconium from 250 newly hatched chickens are collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The pooled sample is homogenized in a stomacher. At least 30g material is analyzed for Salmonella according to Nordic Committee on Food Analysis.

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

From each epidemiological unit; 60g(30gx2)fresh faecal material and, 10 caeca pooled into 1 sample.

Dead birds:

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

Faecal samples:

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

Breeding flocks: Production period

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

Laying hens: Day-old chicks

see "Breeding flocks: Day-old chicks"

Laying hens: Rearing period

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

Laying hens: Production period

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

Laying hens: Before slaughter at farm

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

Laying hens: At slaughter

see "Salmonella in broiler meat and products thereof"

Case definition

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

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

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

See "Breeding flocks: Day-old chicks"

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

See "Breeding flocks: Day-old chicks"

Laying hens: Day-old chicks

See "Breeding flocks: Day-old chicks"

Laying hens: Rearing period

See "Breeding flocks: Day-old chicks"

Laying hens: Production period

See "Breeding flocks: Day-old chicks"

Laying hens: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Laying hens: At slaughter

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

Diagnostic/analytical methods used

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Laying hens: Day-old chicks

Bacteriological method: NMKL No 71:1999

Laying hens: Rearing period

Bacteriological method: NMKL No 71:1999

Laying hens: Production period

Bacteriological method: NMKL No 71:1999

Laying hens: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Laying hens: At slaughter

Bacteriological method: NMKL No 71:1999

Vaccination policy

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

Vaccination against salmonellosis is not allowed in poultry.

Laying hens flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

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

necessary)

In food-producing animals salmonella control in feed- and feed production (HACCP based approach) is integrated in the salmonella control.

Strict hygiene rules are enforced through the whole production chain as preventive measures for salmonella. These rules are implemented by the Prophylactic 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.

Laying hens flocks

See "Breeding flocks"

Control program/mechanisms

The control program/strategies in place

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

In food-producing animals salmonella control in feed- and feed production (HACCP based approach) is integrated in the control.

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

are covered.

The control consists of clinical surveillance and sampling. The clinical surveillance includes general surveillance and surveillance related to the control programme. The official veterinarian visits every poultry holding with breeders, layers and meat production establishments as required according to the control programme. All categories of poultry are sampled for bacteriological examination as described above.

Laying hens flocks

See "Breeding flocks"

Measures in case of the positive findings or single cases

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

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

Laying hens flocks

See "Breeding flocks"

In laying hens flocks, finding of invasive salmonella serotype results in destruction of the flock and all eggs in storage.

Finding of non invasive salmonella serotypes results in destruction or sanitary slaughter of the flock. In those cases: a)The meat may be used for human consumption after heat treatment in the processing plant. b)Eggs from a flock infected with non invasive salmonella may be used for human consumption after pasteurization. However, this is not practised in Sweden.

Notification system in place

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

Results of the investigation

One flock of laying hens was infected with *S. Typhimurium* during rearing period. No Salmonella was isolated in breeding flocks.

Results from sampling of neck skins and crushed meat in the control programme is presented under the section "Salmonella in broiler meat and products thereof".

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

Since 1996, the situation has remained stable with only 3 to 4 infected flocks per year. The favourable situation is also reflected in the yearly sampling of approximately 4000 neck skin samples at the slaughter houses. Between 1995 and 2006, 45 608 neck skin samples were collected and of those, 16 (0.04%) were positive.

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

As Swedish produced red and white meat, and eggs virtually are free from salmonella, the risk of

contracting salmonella from domestic produced food of animal origin is very small.

Additional information

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

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

Monitoring system

Sampling strategy

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

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.

All sampling performed according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official veterinarian or under his/her supervision if sampling is delegated to farmers/companies.

The control constitutes of clinical surveillance and sampling. The clinical surveillance includes general surveillance and surveillance related to the control programme where an official veterinarian visits breeding establishments every 8 week and meat producing poultry farms twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination. 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 the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.

There are no broiler Elite flocks in Sweden.

Grand Parent:

Samples are taken on 5 separate occasions during rearing. Tissue samples from dead chicken and chicken box linings are taken as a supplement to the faecal sampling. During egg production faecal samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

The parent generation is tested at 3 occasions during the rearing period through tissue sampling as well as faecal sampling. During egg production samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

Broiler flocks

All commercial meat-producing establishments have an official veterinarian assigned for salmonella control. The veterinarian is usually employed by the National Food Administration and stationed at the slaughterhouse where the flock is destined for slaughter. The veterinarian visits the farm at least twice a year for supervision and sampling.

Every flock is sampled 1-2 weeks prior to slaughter either by the veterinarian or by the farmer if sampling is delegated. The result must be notified to the veterinarian before sending the flock to the slaughterhouse.

Frequency of the sampling

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

Other: see "rearing period"

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

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

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

Once a month

Broiler flocks: Day-old chicks

Every flock is sampled

Broiler flocks: Rearing period

1-2 weeks prior to slaughter

Broiler flocks: Before slaughter at farm

1-2 weeks prior to slaughter

Broiler flocks: At slaughter (flock based approach)

Other: see Salmonella in broiler meat and products thereof

Type of specimen taken

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

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

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

Other: ceacal and faecal material

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

Faeces

Broiler flocks: Day-old chicks

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

Broiler flocks: Before slaughter at farm

Other: faecal and organs

Broiler flocks: At slaughter (flock based approach)

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

Methods of sampling (description of sampling techniques)

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

Chicken box lining:

The lining from chicken boxes are cut into smaller pieces and put into plastic bags. The lining from at most five boxes may be put into one bag as one pooled sample. The plastic bag shall be marked and sent to the laboratory the same day.

The pooled sample is cut into smaller pieces and mixed well. At least 25 g material is examined for Salmonella according to Nordic Committee on Food Analysis.

Dead birds:

Ceaca from 10 animals are taken out and pooled into one stomacher bag (one pooled sample). The stomacher bag shall be marked and sent to the laboratory the same day.

The pooled sample is homogenized in a stomacher. If the sample comes from day old chickens, at least 10g material shall be examined. If the samples comes from older birds, at least 25g material shall be examined. All samples are examined for Salmonella according to Nordic Committee on Food Analysis.

Meconium:

Meconium from 250 newly hatched chickens are collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The pooled sample is homogenized in a stomacher. At least 30g material is analyzed for Salmonella according to Nordic Committee on Food Analysis.

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

Sampling:

From each epidemiological unit, 60g (30gx2) fresh faecal material and 10 caeca (pooled into 1 sample) are collected.

Faecal samples:

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

Dead birds:

See "Breeding flocks: Day-old chicks"

Breeding flocks: Production period

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

Faecal samples:

See "Breeding flocks: Rearing period"

Broiler flocks: Day-old chicks

Chicken box lining, dead birds, meconium:

See "Breeding flocks: Day-old chicks"

Broiler flocks: Rearing period

no sampling between day-old and pre-slaughter

Broiler flocks: Before slaughter at farm

30g faecal material pooled into 1 sample and 30 caeca pooled 10x3 = 4 analyses

In houses with >2 epidemiological units or <500 birds/unit; 30gx2 (60g) faecal material and 10 organs pooled to 1 sample is taken

Faecal samples:

See "Breeding flocks: Rearing period"

Caecal sampling:

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

Broiler flocks: At slaughter (flock based approach)

see "Salmonella in broiler meat and products thereof"

Case definition

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

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

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

See "Breeding flocks: Day-old chicks"

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

See "Breeding flocks: Day-old chicks"

Broiler flocks: Day-old chicks

See "Breeding flocks: Day-old chicks"

Broiler flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Broiler flocks: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Broiler flocks: At slaughter (flock based approach)

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

Diagnostic/analytical methods used

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Broiler flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Broiler flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Broiler flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Broiler flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

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

Vaccination against salmonella is not allowed in poultry.

Broiler flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

Broiler flocks

In food-producing animals salmonella control in feed- and feed production (HACCP based approach) is integrated in the salmonella control.

Strict hygiene rules are enforced through the whole production chain as preventive measures for salmonella. These rules are implemented by the Prophylactic 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.

Control program/mechanisms

The control program/strategies in place

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

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

Broiler flocks

see "Breeding flocks"

Measures in case of the positive findings or single cases

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

The chicks would be traced, culled and sent for destruction and the premises where the chicks were sent to and the hatchery would be cleaned and disinfected. The farm/flock of origin is traced and put under restrictions. Official sampling is conducted and if the flock is positive, it is culled and either sent for destruction (in case of invasive serotype) or heat-treated (the latter is never practised in Sweden). An investigation in order to trace the source of infection is conducted by the official veterinarian. The premises/ contaminated houses are cleaned and disinfected and manure and feeding stuffs left on the farm are destroyed or decontaminated. Restrictions are not lifted until environmental samples from within the house are taken and

analyzed with negative results.

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

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

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

See "Breeding flocks: Rearing period"

Broiler flocks: Day-old chicks

See "Breeding flocks: Rearing period"

Broiler flocks: Rearing period

See "Breeding flocks: rearing period"

Broiler flocks: Before slaughter at farm

See "Breeding flocks: rearing period"

Broiler flocks: At slaughter (flock based approach)

see "Salmonella in broiler meat and products thereof"

Notification system in place

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

Results of the investigation

S. Typhimurium caused an outbreak including 10 flocks in total in December 2006. Most likely the index case was a grand parent flock. The outbreak continued in 2007.

S. Senftenberg was isolated in another grand parent flock.

The results from the surveillance of neck skins are presented under the section "Salmonella in broiler meat and products thereof".

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

Between 1996-2005, the situation was stable with only 1 to 2 infected flocks per year. In 2006 an outbreak increased the number of cases. Between 1995 and 2006, 45 608 neck skin samples were collected and of those 16 (0.04%) were positive.

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

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

Additional information

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

C. Salmonella spp. in turkey - breeding flocks and meat production flocks

Monitoring system

Sampling strategy

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

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.

All the sampling according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official veterinarian or under his/her supervision if sampling is delegated to farmers/companies.

The control constitutes of clinical surveillance and sampling. The clinical surveillance includes general surveillance and surveillance related to the control programme where an official veterinarian visits breeding establishments every 8 week, farms with laying hens once a year and meat producing poultry farm twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination. 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 the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.

Elite and Grand Parent:

There are no turkey elite or GP breeding flocks in Sweden.

The parent generation is tested at 3 occasions during the rearing period. During eggproduction samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

Meat production flocks

See "Breeding flocks"

Frequency of the sampling

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

Other: see 'rearing period'

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

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

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

Once a month

Meat production flocks: Day-old chicks

Every flock is sampled

Meat production flocks: Before slaughter at farm

1-2 weeks prior to slaughter

Meat production flocks: At slaughter (flock based approach)

Other: see Salmonella in broiler meat and products thereof

Type of specimen taken

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

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

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

Other: ceacal and faecal samples

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

Other: ceacal and faecal samples

Meat production flocks: Day-old chicks

Meconium

Meat production flocks: Before slaughter at farm

Faeces

Meat production flocks: At slaughter (flock based approach)

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

Methods of sampling (description of sampling techniques)

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

Pooled meconium from each flock at the hatchery every 14 day, chicken box linings and dead birds at arrival

Meconium:

Meconium from 250 newly hatched turkeys are collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day. The pooled sample is

homogenized in a stomacher. At least 30g material is analyzed for Salmonella according to Nordic Committee on Food Analysis.

Chicken box lining:

The lining from the boxes are cut into smaller pieces and put into plastic bags. The lining from at most five boxes may be put into one bag as one pooled sample. The plastic bag shall be

marked and sent to the laboratory the same day. The pooled sample is cut into smaller pieces and mixed well. At least 25 g material is examined for Salmonella according to Nordic Committee on Food Analysis.

Dead birds:

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

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

Dead birds:

"See Breeding flocks: Day-old chicks"

Faecal samples:

One pooled sample consists of droppings from 30 birds. From each individual at least 1g faeces is collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day.

The sample is examined for Salmonella according to Nordic Committee on Food Analysis.

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

See "Breeding flocks: rearing period"

Meat production flocks: Day-old chicks

Chicken box lining:

The lining from chicken boxes are cut into smaller pieces and put into plastic bags. The lining from at most five boxes may be put into one bag as one pooled sample. The plastic bag shall be marked and sent to the laboratory the same day.

The pooled sample is cut into smaller pieces and mixed well. At least 25 g material is examined for Salmonella according to Nordic Committee on Food Analysis.

Meconium:

See "Breeding flocks: Day-old chicks"

Dead birds:

See "Breeding birds: Day-old chicks"

Meat production flocks: Rearing period

no sampling between day-old and pre-slaughter

Meat production flocks: Before slaughter at farm

90g fresh faecal material pooled into 30gx3

Faecal samples:

One pooled sample consists of droppings from 30 birds. From each individual at least 1g faeces is

collected and put in a stomacher bag. The bag is marked and sent to the laboratory the same day.

The sample is examined for Salmonella according to Nordic Committee on Food Analysis.

Meat production flocks: At slaughter (flock based approach)

see Salmonella in broiler meat and products thereof

Case definition

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

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

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

See "Breeding flocks: Rearing period"

Meat production flocks: Day-old chicks

See "Breeding flocks: Rearing period"

Meat production flocks: Rearing period

See "Breeding flocks: Rearing period"

Meat production flocks: Before slaughter at farm

See "Breeding flocks: Rearing period"

Meat production flocks: At slaughter (flock based approach)

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

Diagnostic/analytical methods used

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Meat production flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Meat production flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Meat production flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Case definition

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

Vaccination policy

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

Vaccination against salmonellosis is not allowed in poultry.

Meat production flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

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

Strict hygiene rules are enforced through the whole production chain as preventive measures for salmonella. These rules are implemented by the Prophylactic 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

see "Breeding flocks"

Control program/mechanisms

The control program/strategies in place

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

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

programme. All serotypes of salmonella are covered. The control consists of clinical surveillance and sampling. The clinical surveillance includes general surveillance and surveillance related to the control programme. The official veterinarian

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

Meat production flocks

see "Breeding flocks"

Measures in case of the positive findings or single cases

The infected farm is put under restriction and the flock is culled and either sent for destruction (in case of invasive serotype) or heat-treated (the latter is never practised in Sweden). An investigation in order to trace the source of infection is conducted by the official veterinarian. The premises/contaminated houses are cleaned and disinfected and manure and feeding stuffs left on the farm are

destroyed or decontaminated. Restrictions are not lifted until environmental samples from within the house are taken and analyzed with negative results.

Notification system in place

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

Results of the investigation

No turkey breeders or meat producing flocks were infected with salmonella during 2006.

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

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

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

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

Additional information

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

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

Monitoring system

Sampling strategy

Breeding flocks

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.

All sampling according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for sampling in holdings, hatcheries, cutting plants and slaughterhouses. Samples are either taken by the official veterinarian or under his/her supervision if sampling is delegated to farmers/companies.

The control constitutes of clinical surveillance and sampling. The clinical surveillance include general surveillance and surveillance related to the control programme where an official veterinarian visits geese breeding establishments every 8 week and meat producing geese farms twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination. 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 the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.

There are no geese Elite and Grand Parent stock in Sweden.

The Parent generation is tested at 3 occasions during the rearing period. During eggproduction samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

Type of specimen taken

Imported feed material of animal origin

see "Salmonella spp in feed"

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

Other: faecal and ceacal

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

Faeces

Meat production flocks: Before slaughter at farm

Faeces

Meat production flocks: At slaughter (flock based approach)

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

Frequency of the sampling

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

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

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

Once a month

Meat production flocks: Before slaughter at farm

1-2 weeks prior to slaughter

Meat production flocks: At slaughter (flock based approach)

Other: see Salmonella in broiler meat and products thereof

Methods of sampling (description of sampling techniques)

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

Fresh faecal droppings are collected from 60 geese and the material is divided in 2 samples (30gx2)

Faecal samples:

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

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

See "Breeding flocks"

Meat production flocks: Before slaughter at farm

60 fresh faecal droppings pooled as 30gx2

Meat production flocks: At slaughter (flock based approach)

see "Salmonella in broiler meat and products thereof"

Case definition

Breeding flocks: Day-old chicks

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

Breeding flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Breeding flocks: Production period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Day-old chicks

See "Breeding flocks: Day-old chicks"

Meat production flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Meat production flocks: At slaughter (flock based approach)

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

Diagnostic/analytical methods used

Breeding flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Breeding flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Breeding flocks: Production period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Meat production flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Meat production flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Breeding flocks

Vaccination against salmonellosis is not allowed in poultry.

Meat production flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

Breeding flocks

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

Meat production flocks

Controlled feed, salmonella free ducklings

Control program/mechanisms

The control program/strategies in place

Breeding flocks

At some breeding establishments where geese are kept indoors the same strict hygiene rules are enforced as in the preventive 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 out-doors. Following rules are applied at some establishments: a) Rules for feed production and transport, b) salmonella free newly hatched geeslings are delivered from the hatcheries, c) precaution to stop spread of salmonella from an infected flock. At some holdings no preventive measures are applied.

Measures in case of the positive findings or single cases

Breeding flocks

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

Meat Production flocks

See "Breeding flocks"

Notification system in place

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

Results of the investigation

Salmonella was not isolated from any holding in 2006.

Results from surveillance of neck skins is presented under the section Salmonella in broiler meat and products thereof.

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

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

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

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

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

Monitoring system

Sampling strategy

Breeding flocks

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The salmonella control programme is supervised by the SJV and the SLV.

All sampling according to the salmonella programme is supervised by the competent authority. Official veterinarians are responsible for sampling in holdings, hatcheries, cuttingplants and slaughterhouses. Samples are either taken by the official

veterinarian or under his/her supervision if sampling is delegated to farmers/companies.

The control constitutes of clinical surveillance and sampling. The clinical surveillance include general surveillance and surveillance related to the control programme where an official veterinarian visits a duck breeding establishments every 8 week and meat producing duck farms twice a year as required according to the control programme. In the sampling, all categories of poultry are included for bacteriological examination. 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 the former Council Directive 92/117/EEC now replaced by Regulation 2160/2003/EEC.

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

The parent generation is tested at 3 occasions during the rearing period. During egg production samples are taken from the breeders themselves every month as a supplement to the sampling in the hatchery.

Meat production flocks

Mandatory sampling if >500 ducks are raised for slaughtered/year.

Every flock is sampled 1-2 weeks prior to slaughter. If thinning is practised additional sampling has to be done after 10 days. At 2 occasions/year this sampling is

done by an official veterinarian - usually the veterinarian responsible at the slaughterhouse where the ducks are admitted for slaughter.

Frequency of the sampling

Breeding flocks: Production period

Once a month

Meat production flocks: Before slaughter at farm

1-2 weeks prior to slaughter

Meat production flocks: At slaughter (flock based approach)

Other: see Salmonella in broiler meat and products thereof

Type of specimen taken

Breeding flocks: Rearing period

Faeces

Breeding flocks: Production period

Faeces

Meat production flocks: Before slaughter at farm

Faeces

Meat production flocks: At slaughter (flock based approach)

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

Methods of sampling (description of sampling techniques)

Breeding flocks: Rearing period

Fresh faecal droppings are collected from 60 ducks and the material is divided in 2 samples (30gx2) and 10 ceacal samples pooled into 1 sample.

Faecal samples:

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

Breeding flocks: Production period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Meat production flocks: At slaughter (flock based approach)

see "Salmonella in broiler meat and products thereof"

Case definition

Breeding flocks: Day-old chicks

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

Breeding flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Breeding flocks: Production period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Day-old chicks

See "Breeding flocks: Day-old chicks"

Meat production flocks: Rearing period

See "Breeding flocks: Day-old chicks"

Meat production flocks: Before slaughter at farm

See "Breeding flocks: Day-old chicks"

Meat production flocks: At slaughter (flock based approach)

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

Diagnostic/analytical methods used

Breeding flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Breeding flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Breeding flocks: Production period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Meat production flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Meat production flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Meat production flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Breeding flocks

Vaccination is prohibited

Meat production flocks

See "Breeding flocks"

Other preventive measures than vaccination in place

Breeding flocks

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

Meat production flocks

Controlled feed, salmonella free ducklings.

Control program/mechanisms

The control program/strategies in place

Breeding flocks

Strict hygiene rules are enforced on breeding stock which is kept indoors with the same preventive measures implemented as for other breeding poultry. The rules are in line with what is required within the Prophylactic 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 out-doors. Following rules may be applied at some holdings: a) Rules for feed production and transport, b) salmonella free newly hatched ducklings from the hatcheries, c) precaution to stop spread of salmonella from an infected flock

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

S. paratyphi Java was isolated from one meat production flock. S. Typhimurium was isolated from 2 holdings; one open farm and one small private farm.

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

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

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

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

F. Salmonella spp. in pigs

Monitoring system

Sampling strategy

Breeding herds

Sampling strategies are described in the Swedish Salmonella control programme (95/50/EC). The programmes are supervised by the SJV and the SLV. All sampling according to the salmonella programme is performed or supervised by the competent authority, that is official veterinarians. They are responsible for the sampling in the herds, cuttingplants and in the slaughter houses.

Within the programme, lymph nodes and carcass swabs 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 and at cutting plants are described under "Salmonella spp. in pig meat and products thereof".

CONTROL PROGRAMME

Sampling of lymph nodes at slaughter houses:

Slaughter houses have been divided into two categories: Category A slaughtering 90% of all pigs and Category B slaughtering 10% of all pigs.

Category A: At each slaughterhouse a sufficient number of samples is collected to detect at least 5% salmonella infected/contaminated carcasses with 95% confidence interval (CI) in the annual slaughter. Sampling is performed daily in Category A and samples consist of lymph nodes from the ileo-caecal region.

Samples are collected evenly distributed over the day and if slaughter is performed on separate lines, each will be sampled separately.

Category B: These slaughterhouses are controlled as one unit. Enough samples to detect a prevalence of 1% salmonella infected carcasses with 90% CI will be taken. These samples consist of lymph nodes from the ileo-caecal region. Sampling will be spread out over the slaughter days to avoid periodical sampling.

VOLUNTARY PROGRAMME

There is a voluntary additional sampling of faecal materials at herd level in a quality programme called BIS (Best In Sweden) run by the industry (Swedish meats). In this programme, integrated-, fattening-, piglet producing-, and satellite herds are included. Sampling is performed by the veterinarian.

OTHER SAMPLING

Sampling at farms and abattoirs is performed whenever there is a clinical suspicion. There is also mandatory sampling at import of animals.

Multiplying herds

see "breeding herds"

Fattening herds

see "breeding herds"

Frequency of the sampling

Breeding herds

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

Multiplying herds

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

Fattening herds at farm

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

Fattening herds at slaughterhouse (herd based approach)

Other: see "fattening herds at farm"

Type of specimen taken

Breeding herds

Other: faeces and lymph nodes

Multiplying herds

Other: faeces and lymph nodes

Fattening herds at farm

Other: faeces and lymph nodes

Fattening herds at slaughterhouse (herd based approach)

Other: see "fattening herds at farm"

Methods of sampling (description of sampling techniques)

Breeding herds

CONTROL PROGRAMME

1) Faecal sampling

Sampling procedure:

For individual sampling, at least 10 g faeces from each animal is collected. From pens with growers/finisher pigs pooled faecal samples of at least 50g (10g from each of at least 5 animals/pen) is collected. All samples should be analysed within 24-48 h after collection.

Bacteriological examination:

From individual samples, 5 g faeces is examined while the remaining part is stored at +4C until examination is completed. Material from at most 15 animals are pooled. If salmonella is isolated from a pooled sample, each of the individually stored samples

can be examined for salmonella separately.

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

2)Lymph nodes at slaughter:

At least 5 lymph nodes from the ileo-caecal region are aseptically removed and put in a plastic bag. The samples are kept refrigerated until sent to the laboratory. At the laboratory all lymph nodes from one sample 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

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

2) Faecal sampling in the voluntary programme (BIS).

Samples are taken every second year in all farms affiliated to the programme, including integrated-, fattening-, piglet producing- and satellite herds. Two pooled faecal samples from 5 pens, respectively, are collected.

Fattening herds at slaughterhouse (herd based approach)

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

Case definition

Breeding herds

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

Bacteriological method: NMKL No 71:1999

Multiplying herds

Bacteriological method: NMKL No 71:1999

Fattening herds at farm

Bacteriological method: NMKL No 71:1999

Fattening herds at slaughterhouse (herd based approach)

Other:

Vaccination policy

Breeding herds

Vaccination is not allowed in Sweden.

Multiplying herds

see under "breeding herd"

Fattening herds

see under "breeding herd"

Other preventive measures than vaccination in place

Breeding herds

In 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 virtually is free from Salmonella.

Apart from this, there is also a voluntary hygiene programme in herds since 2002 run by the industry and supervised by the SJV. In this programme, certain rules of hygiene and standardised preventive measures have to be implemented. Affiliation to the the voluntary control programme implies a higher level of economic compensation in case salmonella infection.

There is also voluntary additional sampling in a health programme called BIS (Best In Sweden or Baest i Sverige) run by the industry (Swedish meats).

Multiplying herds

see "breeding herds"

Fattening herds

see "breeding herds"

Control program/mechanisms

The control program/strategies in place

Breeding herds

The control programme is outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC). The programme is nation-wide, thus it covers all herds in Sweden, also those that may deliver their animals abroad.

The salmonella control programme is officially supervised and includes: a) Compulsory notification of all findings of salmonella, as well as suspicion of Salmonella, regardless of serotype, b) Compulsory action if Salmonella is isolated,

including prohibition on placing animals on the market, c) Examination for Salmonella in animals slaughtered under special conditions (e.g diseased animals or when salmonella is suspected), and d) Control programme at slaughter houses and in herds, and clinical surveillance in herds.

As breeding herds and multiplying herds constitute the top of the breeding pyramid, a complementary monitoring is performed in these herds at farm level.

Multiplying herds

see "breeding herds"

Fattening herds

see "breeding herds"

Measures in case of the positive findings or single cases

1) If Salmonella is isolated from pigs and other food-producing animals, indicating a herd infection, restrictions are put on the farm/herd. Such restrictions may include a ban of transport (unless transport to sanitary slaughter), collection of bacteriological samples of the whole herd, and institution of a sanitation plan, i.e. involving elimination of chronically infected animals, cleaning and disinfection, treatment of manure and sludge, and destruction of feeding stuffs. Trace-back and trace-forward investigations are also performed. Also, the feed supplier is investigated. Restrictions are lifted when faecal samples from all animals in the epidemiological unit (usually the herd) taken at two consecutive samplings one month apart are negative.

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

2) If salmonella is found from any lymph node collected in the control programme (including animals from breeding, multiplying and fattening herds) trace back of the infection to the farm of origin is always performed.

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

4) Every carcass that is contaminated by Salmonella is deemed unfit for human consumption.

Notification system in place

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

Results of the investigation

1) In 2006, there was an outbreak related to imported feed. Salmonella was detected in the feeding system of 25 farms and in the animals of 3 farms. S. Livingstone, S. Infantis, S. Agona and S. Typhimurium were isolated from animals. Two serotypes were detected at 3 farms (S. Livingstone & S. Agona, S. Livingstone & S. Schwarzgrund, S. Livingstone & S. Infantis). See 'Salmonella in feed' for serotypes isolated only in the feed.

2) S. Typhimurium DT 104 was detected at one farm with slaughter pigs. The same serotype was detected at a neighbouring cattle farm.

3) In the control programme, 5950 lymph nodes were analysed (2794 adult swine, 3153 fattening pigs). Of these, 10 were positive. Salmonella was isolated from 7 samples taken from adult swine: S. Typhimurium DT 40 (3 samples), S. Typhimurium DT 120, S. Agona, S. Braenderup and S. Oranienburg.

Salmonella was isolated from three samples from fattening pigs: S. Typhimurium DT 41, S. Typhimurium NT and S. Agona. At two occasions Salmonella was re-isolated at the farm of origin (S. Typhimurium DT 40 and DT 120). The same serotypes have been isolated from the two farms earlier. S. Typhimurium DT 120 was isolated from the farm during the feed outbreak in 2006 and S. Typhimurium DT 40 from the other farm in 2004.

4) In the voluntary control run by the industry (Swedish Meats) 550 pooled faecal samples from 976 herds were analysed. All were negative.

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

The situation in Sweden remains favourable. From the beginning of the 80's there has, in general, been less than 5 infected herds per year. There have been even less infected farms since 2000, with the exception of outbreaks caused by contaminated feed in 2003 (S. Cubana at 30 herds) and in 2006. Control of feed is extremely important in order to prevent Salmonella infections in swine.

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

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

As <0.1% of Swedish pigs are infected with salmonella, the risk of contracting salmonella from Swedish food produced from pigs is small.

Additional information

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

G. Salmonella spp. in bovine animals

Monitoring system

Sampling strategy

Sampling strategies are described in the Swedish Salmonella control programme (95/50/EC). The programmes are supervised by the SJV and the SLV. All sampling according to the salmonella programme is supervised by the competent authority, that is official veterinarians. They are responsible for the sampling in the herds, cutting plants 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. Sampling of lymph nodes in the programme is described here, whereas sampling of carcass swabs and at cutting plants are described under "Salmonella spp. in bovine meat and products thereof".

CONTROL PROGRAMME

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

OTHER SAMPLING

Sampling at farms is performed whenever there is a clinical suspicion. Animals that are bought to a farm under certain defined criteria are also sampled.

Frequency of the sampling

Animals at farm

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

Animals at slaughter (herd based approach)

Other: see lymph nodes at "Animals at farms"

Type of specimen taken

Animals at farm

Other: faeces and lymph nodes

Animals at slaughter (herd based approach)

Other: see Animals at farms

Methods of sampling (description of sampling techniques)

Animals at farm

FAECAL SAMPLING:

Sampling procedure:

For individual sampling, at least 10 g faeces from each animal is collected. From pens with calves/young stock pooled faecal samples of at least 50g (10g 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 is divided into two equal parts. One half is placed in a mortar and the other part is kept at 4o C. In the mortar lymph nodes from 15 animals are pooled and homogenised. If salmonella is isolated from a pooled sample of lymph nodes each of the individually stored samples will be analysed separately.

Animals at slaughter (herd based approach)

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

Case definition

Animals at farm

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

Animals at slaughter (herd based approach)

see "Animals at farm"

Diagnostic/analytical methods used

Animals at farm

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

Animals at slaughter (herd based approach)

Other: see Salmonella spp. in bovine meat and products thereof or Animals at farm

Vaccination policy

Vaccination is not allowed.

Other preventive measures than vaccination in place

In food-producing animals salmonella control in feed and 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 and suspicions of salmonella, regardless of serotype, b) Compulsory action if salmonella is isolated, including prohibition on placing animals on the market, c) Examination for salmonella in animals slaughtered under special conditions (e.g diseased animals or when salmonella is suspected), and d) Control programme at slaughter houses and in herds, and clinical surveillance in herds.

Measures in case of the positive findings or single cases

1) If Salmonella is isolated from cattle and other food-producing animals, indicating a herd infection, restrictions are put on the farm/herd. Such restrictions may include a ban of transport (unless transport to sanitary slaughter), collection of bacteriological samples of the whole herd, and institution of a sanitation plan, i.e. involving elimination of chronically infected animals, cleaning and disinfection, treatment of manure and sludge, and destruction of feeding stuffs. Trace-back and trace-forward investigations are also performed. Also, the feed supplier is investigated. Restrictions are lifted when faecal samples from all animals in the epidemiological unit (usually the herd) taken at two consecutive samplings one month apart are negative.

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

2) If salmonella is found from any lymph node collected in the control programme trace back of the infection to the farm of origin is always performed.

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

Contaminated carcasses are deemed unfit for human consumption.

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

In 2006, Salmonella was isolated from 9 farms. The following serotypes were isolated:

1) 5 S. Dublin.

2) 2 S. Typhimurium. S. Typhimurium NT and susceptible S. Typhimurium DT 104. DT 104 was also isolated at the neighbouring farm with slaughter pigs.

3) 1 S. Dusseldorf.

4) 1 S. Agona.

In 2006 in the surveillance in the control programme, 3518 lymph nodes were analysed. Of those, 2 were positive for S. Typhimurium NT. Salmonella could not be isolated at the farms of origin. One carcass swab sample was positive for multi-resistant S. Typhimurium DT 104.

In addition, Salmonella was isolated from 5 individual animals but the bacterium was not detected at farm. The five cases were:

2 S. Duesseldorf (necropsy and meat inspection), 1 S. Dublin (necropsy), S. Typhimurium DT 10 (cattle sale), S. Typhimurium NT (necropsy).

For results from sampling at cutting plants in the salmonella control programme, see "Salmonella spp. in bovine meat and products thereof".

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

The situation remains very favourable with few infected farms each year. During the 1980s the number of salmonella infected cattle farms declined rapidly. Since the end of the 1990s the number of farms infected varied from 4 to 13 per year.

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

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

Additional information

In 2006, one cattle farm was infected with a susceptible S. Typhimurium DT 104.

H. Salmonella spp. in animal

Monitoring system

Sampling strategy

Described here is salmonella in other animal species (such as horses, pets and wild life) than the ones covered in the salmonella control programme.

Sampling at farms/holdings or of individual animals is performed whenever there is a clinical suspicion. Sampling may also be performed at autopsy. Wild life sent to the SVA for autopsy may be tested for salmonella.

Case definition

Animals at farm

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

Vaccination policy

Vaccination is not used in Sweden.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

Early in 2006, there was an outbreak of *S. Typhimurium* in cats and 77 cases were reported. In addition, *S. Enteritidis* was isolated from 2 cats. It is suspected that the cats acquire the infection by wild birds.

Furthermore, Salmonella was isolated from 6 dogs, 1 horse, 6 reptile pets, 14 wild birds and 4 wild mammals. The various serotypes are shown in the table "Salmonella in other animals".

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

The situation remains stable.

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

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

Additional information

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.

Table Salmonella in breeding flocks of Gallus gallus

| | Source of information | Sampling unit | Units tested | Total units positive for Salmonella spp. | S. Enteritidis | S. Typhimurium | Salmonella spp., unspecified | S. Senftenberg |
|--|-----------------------|---------------|--------------|--|----------------|----------------|------------------------------|----------------|
| Gallus gallus (fowl) | | | | | | | | |
| parent breeding flocks for egg production line (1) | SJV | --- | | | | | | |
| day-old chicks during rearing period | SJV | flock | 37 | 0 | | | | |
| during production period | SJV | flock | 16 | 0 | | | | |
| | SJV | flock | 21 | 0 | | | | |
| grandparent breeding flocks for meat production line | SJV | flock | 15 | 2 | | 1 | | 1 |
| parent breeding flocks for meat production line (2) | SJV | --- | | | | | | |
| day-old chicks during rearing period | SJV | flock | 127 | 0 | | | | |
| during production period | SJV | flock | 64 | 4 | | 4 | | |
| | SJV | flock | 63 | 0 | | | | |

(1) : Total number of flocks is 37. None tested positive.

(2) : Total number of flocks is 127. Four flocks were positive for Salmonella.

Table Salmonella in other poultry

| | Source of information | Sampling unit | Units tested | Total units positive for Salmonella spp. | S. Enteritidis | S. Typhimurium | Salmonella spp., unspecified | S. Worthington | S. Paratyphi | S. Paratyphi B var. Java |
|-----------------------------|-----------------------|---------------|--------------|--|----------------|----------------|------------------------------|----------------|--------------|--------------------------|
| Gallus gallus (fowl) | | | | | | | | | | |
| laying hens | | --- | | | | | | | | |
| during rearing period | SJV | flock | 243 | 0 | | | | | | |
| during production period | SJV | flock | 670 | 1 | | 1 | | | | |
| broilers | | --- | | | | | | | | |
| during rearing period | SJV | flock | 2351 | 5 | | 5 | | | | |
| Ducks | SJV | holding | | 2 | | 2 | | | | |
| meat production flocks (1) | | flock | 20 | 1 | | | | 1 | | 1 |
| Geese | | --- | | | | | | | | |
| meat production flocks | | flock | 12 | 0 | | | | | | |
| Turkeys | | --- | | | | | | | | |
| breeding flocks | SJV | flock | 12 | 0 | | | | | | |
| meat production flocks | SJV | flock | 140 | 0 | | | | | | |

(1) : S. Paratyphi Java and S. Worthington were isolated from the duck flock.

Table Salmonella in other birds

| | Source of information | Sampling unit | Units tested | Total units positive for Salmonella spp. | S. Enteritidis | S. Typhimurium | Salmonella spp., unspecified |
|--------------|-----------------------|---------------|--------------|--|----------------|----------------|------------------------------|
| Birds | | | | | | | |
| wild | | animal | | 13 | | 13 | |

Table Salmonella in other animals

| Source of information | Sampling unit | Units tested | Total units positive for Salmonella spp. | S. Enteritidis | S. Typhimurium | Salmonella spp., unspecified | S. Florida | S. Agona | S. Oranienburg | S. Bredeney | S. Liverpool | S. Livingstone | S. Derby | S. Dublin | S. Dueseldorf | S. Braenderup | S. Infantis |
|--|---------------|--------------|--|----------------|----------------|------------------------------|------------|----------|----------------|-------------|--------------|----------------|----------|-----------|---------------|---------------|-------------|
| Cattle (bovine animals) adult cattle over 2 years - at slaughterhouse - animal sample - lymph nodes - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (2) | SJV | herd | 9 | 2 | 2 | | | 1 | | | | | | 5 | 1 | | |
| | SLV | single | 3518 | 2 | 2 | | | | | | | | | | | | |
| Pigs (1) - at slaughterhouse - animal sample - carcass swabs - Control or eradication programmes - national programmes (no Community co-financing) - official sampling - objective sampling (3) | SLV | single | 3510 | 1 | 1 | | | | | | | | | | | | |
| | SJV | herd | 5 | 2 | 2 | | | 2 | | | | | | | | | 1 |

| raised under controlled housing conditions in integrated production system | | Swedish herd | 976 | 0 | | | | | | | | | | | | | | | | |
|--|--|--------------|-----|----|---|----|---|--|--|---|---|--|--|--|--|--|--|--|--|---|
| | | Meats | | | | | | | | | | | | | | | | | | |
| Solipeds, domestic | | SVA animal | | 3 | 3 | | | | | | | | | | | | | | | |
| Dogs | | SVA animal | | 7 | 2 | 2 | | | | 1 | 1 | | | | | | | | | 1 |
| Cats | | SVA animal | | 79 | 2 | 77 | | | | | | | | | | | | | | |
| Reptiles | | | | | | | | | | | | | | | | | | | | |
| pet animals | | SVA animal | | 6 | 1 | 4 | 1 | | | | | | | | | | | | | |

- (1) : Two serotypes were detected at two farms: S. Agona & S. Livingstone in one and S. Infantis & S. Livingstone in the other.
- (2) : 3313 lymph nodes from major abattoirs and 205 from minor. Salmonella was not re-isolated in the herd of origin.
- (3) : 3301 carcass swabs from major abattoirs and 209 from minor.
- (4) : 2766 samples from major abattoirs, 28 from minor. Salmonella was re-isolated at two farms.
- (5) : 2739 swabs from major abattoirs, 28 from minor.
- (6) : 2913 lymph nodes from major abattoirs, 240 from minor. Salmonella was not re-isolated at the farm of origin.
- (7) : 2911 swabs from major abattoirs, 240 from minor.
- (8) : 550 pooled faecal samples from 976 herds in the voluntary programme BIS run by the industry.

2.1.4. Salmonella in feedingstuffs

A. Salmonella spp. in feed

History of the disease and/or infection in the country

(Note from the editors: Parts of the text below does not fit the premade text form, therefore text has been entered under "History of the disease...", "National evaluation..." and "Additional information". We include this text as Salmonella control in feed is integrated in the Swedish Salmonella control programme.

Current situation:

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

Analytical method used:

The bacteriological method used is NMKL method No 71 (5th ed., 1999). Serotyping is performed by slide agglutination. Certain serotypes are subtyped by molecular methods. The compulsory samples taken at the feed mills are analysed at the SVA. Also, samples taken by official feed inspectors and "hygiene groups", consisting of the county veterinarian and an official feed inspector, are analysed at the SVA. Other samples may be analysed at other accredited laboratories. Most analysing laboratories are accredited according to EN/150/17025.

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

Sampling at feed mills:

At the feed mills, samples are taken mainly according to Hazard Analysis Critical Control Point (HACCP) principles, both on the premises and along the production line. The HACCP system was initiated in 1991 and has proven to be effective for detecting and preventing Salmonella in feeding

stuffs. Feed mills that produce feeding stuffs for poultry are obliged to take a minimum of five samples per week from specified critical control points. Feed mills that produce feeding stuffs for ruminants, pigs or horses, are obliged to take two samples a week. The producer often takes additional voluntary samples. Official feed inspectors sample at specified points at the feed mills, one to five times a year, depending on production volume. Also, a so-called hygiene group makes yearly inspections at feed mills that produce more than 1000 tons of feeding stuffs annually. Feed mills that produce less are visited less frequently. At these inspections, samples are taken at critical points - especially in connection with coolers, aspirators and elevators.

Sampling of feed materials:

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

All consignments of feed materials classified as S1, S2 and S3 that is traded into Sweden have to be sampled, either in Sweden or in the country of origin. If the consignment was sampled outside Sweden, it must be proved that the required samples have been taken.

Feed material of animal origin has to be sampled according to regulation (EC) No 1774/2002. If the production is continuous, the number of samples to be taken is decided by the SJV. In addition to this, many voluntary samples are collected.

Sampling of compound feeding stuffs traded into Sweden:

All compound feeding stuffs (S1, S2 or S3) traded into Sweden and produced for ruminants, pigs or poultry, are tested for Salmonella following the same principles as feed raw materials.

Processing plants for animal by-products and feed material of animal origin: Feed materials of animal origin are sampled in accordance with the EU legislation. Many voluntary samples are also taken.

Pet food: Every company producing pet food is regularly inspected and the feed is sampled for Salmonella once a year by an official feed inspector. In addition to this, voluntary samples are taken. Every consignment of dog chews from a third country is sampled at the border inspection, even though it must be accompanied by a certificate showing that the pet food has been tested negative for Salmonella in compliance with the EU legislation. Dog chews that are found positive for Salmonella are rejected. Pet food produced by animal by-products have to be sampled for Salmonella according to regulation (EC) No 1774/2002.

Measures in case of positive findings: No feed materials containing, or suspected of containing, Salmonella may be used in the production of feeding stuffs. Positive Salmonella findings always give rise to further testing and decontamination.

Additional information

Heat treatment: All compound feeding stuffs for poultry have to be heat treated to $>75^{\circ}\text{C}$. In practice, a great amount of feeding stuffs for ruminants and pigs are also heat treated. Non heat-treated feed grains for sale, aimed for poultry on farm, have to originate from a storage plant that has been approved by the SJV. All storage facilities must fulfil certain requirements regarding sampling.

RESULTS FROM 2006 In the tables, the compulsory samples, the sample taken in the official control and the voluntary samples that have been reported to the SJV are presented. There is no obligation to report negative results from voluntary samples.

FEED MILLS AND COMPOUND FEEDING STUFFS In the HACCP control of feed mills, 8679 samples were reported and of those 40 were positive. The positive samples belonged to 13 serotypes (Table Salmonella in compound feeding stuffs). The most commonly isolated serotypes (each n=9) were S. Mbandaka, S. Senftenberg and S. Typhimurium.

FEED MATERIAL OF VEGETABLE ORIGIN In total, 3936 samples from derived material of soybean, maize, palm kernel and rape seed were analysed. Of those, 65 were positive. No sample from maize derive was positive. The most common serotype was S. Agona (n=6). Furthermore, 891 environmental samples from domestic rape seed processing plants were analysed. Of those, 18 were positive and all were of the serotype Mbandaka. (Table Salmonella in other feed materials)

PROCESSING PLANTS FOR ANIMAL BYPRODUCTS AND FEED MATERIALS OF ANIMAL ORIGIN Out of 2813 samples from feed materials of land animal origin, 12 were positive. (Table Salmonella in feed material of animal origin). One out of 272 samples from fish meal was positive.

SALMONELLA OUTBREAK IN FEED, 2006

In 2006, there was an outbreak related to imported feed. Salmonella was detected in the feeding system of 25 pig farms and in the animals in 3 pig farms. Seven different serotypes were detected: S. Livingstone (12 farms), S. Infantis (8 farms), S. Agona (8 farms), S. Lexington (1 farm), S. Ohio (1 farm), S. Schwarzgrund (1 farm) and S. Typhimurium DT 120 (1 farm). S. Livingstone, S. Infantis, S. Agona and S. Typhimurium were isolated from animals. Two serotypes were detected at 3 pig farms (S. Livingstone & S. Agona, S. Livingstone & S. Schwarzgrund, S. Livingstone & S. Infantis).

Table Salmonella in feed material of animal origin

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for Salmonella spp. | S. Enteritidis | S. Typhimurium | Salmonella spp., unspecified | S. Senftenberg | S. Oranienburg | S. Bredeney | S. Agona | S. Mbandaka | S. Montevideo |
|--|-----------------------|---------------|---------------|--------------|--|----------------|----------------|------------------------------|----------------|----------------|-------------|----------|-------------|---------------|
| Feed material of land animal origin | SJV | batch | | 72 | 0 | | | | | | | | | |
| | SJV | single | | 839 | 12 | | 3 | | | | 3 | | 2 | 1 |
| | SJV | single | | 1074 | 0 | | | | | | | | | |
| | SJV | batch | | 752 | 0 | | | | | | | | | |
| | SJV | single | | 76 | 0 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Feed material of marine animal origin | SJV | batch | | 272 | 1 | | | | | 1 | | | | |
| | | | | | | | | | | | | | | |

Footnote

Compulsory (national or EU requirements) and voluntary sampling is not included in the table as number of samples are unknown, thus, samples are collected from materials not included in the table. Sample weight is unknown and may vary between samples.

Table Salmonella in other feed matter (Part A)

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for Salmonella spp. | S. Typhimurium | S. Enteritidis | Salmonella spp., unspecified | S. Livingstone | S. Agona | S. Yoruba | Other serotypes | S. Tennessee | S. Mbandaka | S. Infantis | S. Minnesota | S. Adelaide | S. Senftenberg | S. Cubana | S. Meleagridis |
|--|---|---------------|---------------|--------------|--|----------------|----------------|------------------------------|----------------|----------|-----------|-----------------|--------------|-------------|-------------|--------------|-------------|----------------|-----------|----------------|
| Feed material of cereal grain origin | --- | batch | 184 | 0 | | | | | | | | | | | | | | | | |
| | maize derived | | | | | | | | | | | | | | | | | | | |
| Feed material of oil seed or fruit origin | rape seed derived (1) | SJV batch | 1128 | 11 | | | | | | 4 | 6 | | | | 1 | | | | | |
| | - at feed mill - environmental sample (3) | SJV single | 891 | 23 | | | | | | | | | | 17 | | | 5 | | 1 | |
| | - at feed mill - domestic production | SJV single | 1620 | 18 | | | | | | | | | | 18 | | | | | | |
| | palm kernel derived | SJV batch | 276 | 8 | | | | 6 | | 1 | | 1 | | | | | | | | |
| | soya (bean) derived (2) | SJV batch | 728 | 28 | | | | 5 | 2 | 1 | 2 | 3 | 1 | 2 | | 1 | 1 | 4 | 3 | 1 |

(1) : imported
 (2) : S. Subspecies I n=1 included in S. other serotypes
 (3) : samples from domestic rape seed processing plant

Footnote

Compulsory (national or EU requirements) and voluntary sampling. Negative voluntary sampling from the final product is not included in the table as number of samples are unknown, thus, samples are collected from materials not included in the table. Sample weight is unknown and may vary between materials.

Table Salmonella in other feed matter (Part B)

| | S. Muenster | S. Gabon |
|--|-------------|----------|
| Feed material of cereal grain origin | | |
| maize derived | | |
| Feed material of oil seed or fruit origin | | |
| rape seed derived (1) | | |
| - at feed mill - environmental sample (3) | | |
| - at feed mill - domestic production | | |
| palm kernel derived | | |
| soya (bean) derived (2) | 1 | 1 |

(1) : imported

(2) : S. Subspecies I n=1 included in S. other serotypes

(3) : samples from domestic rape seed processing plant

Footnote

Compulsory (national or EU requirements) and voluntary sampling from the final product is not included in the table as number of samples are unknown, thus, samples are collected from materials not included in the table. Sample weight is unknown and may vary between materials.

Table Salmonella in compound feedingstuffs

| Compound feedingstuffs, not specified process control | Source of information | | Sampling unit | Sample weight | Units tested | Total units positive for Salmonella spp. | S. Typhimurium | S. Enteritidis | Salmonella spp., unspecified | S. Cubana | S. Emek | S. Agona | S. Panama | S. Livingstone | S. Meleagridis | S. Cerro | S. Illia | S. Paratyphi B var. Java | S. Mbandaka | S. Senftenberg |
|---|-----------------------|--------|---------------|---------------|--------------|--|----------------|----------------|------------------------------|-----------|---------|----------|-----------|----------------|----------------|----------|----------|--------------------------|-------------|----------------|
| | SJV | single | | | | | | | | | | | | | | | | | | |
| - at feed mill - environmental sample - Surveillance - HACCP or own checks by industry - sampling by industry (1) | | | | | 8679 | 40 | 9 | | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 9 | 9 |

(1) : Mandatory weekly sampling

Footnote

Compulsory (national or EU requirements) and voluntary sampling. Sampling in the process is performed using the HACCP principles. Negative voluntary sampling from the final product is not included in the table as number of samples are unknown, thus, samples are collected from materials not included in the table.
 Sample weight is unknown and may vary between materials.

2.1.5. Salmonella serovars and phagetype distribution

Table Salmonella serovars in animals

| Serovars | Cattle (bovine animals) | | Pigs | | Gallus gallus (fowl) | | Other poultry | |
|--------------------------------------|-------------------------|------|------|------|----------------------|------|---------------|------|
| | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) |
| Sources of isolates | | | | | | | | |
| Number of isolates in the laboratory | N= 3 | | 10 | 6 | | | | |
| Number of isolates serotyped | N= 3 | 14 | 10 | 6 | 4 | 11 | 4 | 0 |
| Number of isolates per type | | | | | | | | |
| S. Agona | 1 | | 2 | 1 | 3 | | | |
| S. Braenderup | | | 1 | | | | | |
| S. Dublin | 6 | | | | | | | |
| S. Duesseldorf | 3 | | | | | | | |
| S. Infantis | | | | 1 | | | | |
| S. Livingstone | | | | 2 | | | | |
| S. Oranienburg | | 1 | | | | | | |
| S. Rubislaw | | | | | 1 | | | |
| S. Senftenberg | | | | | | 1 | | |
| S. Typhimurium | 3 | 4 | 6 | 2 | | 10 | 2 | |
| S. Worthington | | | | | | | | 1 |
| S. Paratyphi B var. Java | | | | | | | | 1 |
| Salmonella spp., unspecified | | | | | | | | |

Footnote

(*) M : Monitoring, C : Clinical
Isolates classified as Monitoring have been detected in the national control program. All primary isolates are listed in this table. Therefore the number of isolates is higher than the number of herds.

Table Salmonella serovars in food

| Serovars | Meat from bovine animals | | Meat from pig | | Meat from broilers (Gallus gallus) | | Other poultry | | Other products of animal origin | |
|--------------------------------------|--------------------------|------|---------------|------|------------------------------------|------|---------------|------|---------------------------------|------|
| | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) |
| Sources of isolates | | | | | | | | | | |
| Number of isolates in the laboratory | N= | | | | | | | | | |
| Number of isolates serotyped | N= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Footnote

(*) M : Monitoring, C : Clinical

Table Salmonella Enteritidis phagetypes in food

| Phagetype | Meat from bovine animals | | Meat from pig | | Meat from broilers (Gallus gallus) | | Other poultry | | Other products of animal origin | |
|--------------------------------------|--------------------------|------|---------------|------|------------------------------------|------|---------------|------|---------------------------------|------|
| | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) |
| Sources of isolates | | | | | | | | | | |
| Number of isolates in the laboratory | N= | | | | | | | | | |
| Number of isolates phagetyped | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Footnote

(*) M : Monitoring, C : Clinical

Table Salmonella Typhimurium phage types in animals

| Phagetype | Cattle (bovine animals) | | Pigs | | Gallus gallus (fowl) | | Other poultry | |
|--------------------------------------|-------------------------|------|------|------|----------------------|------|---------------|------|
| | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) |
| Sources of isolates | | | | | | | | |
| Number of isolates in the laboratory | N= 2 | 4 | 5 | 2 | | | | |
| Number of isolates phagetyped | N= 2 | 4 | 5 | 2 | 0 | 0 | 0 | 0 |
| Number of isolates per type | | | | | | | | |
| DT 104 | | 1 | | 1 | | | | |
| DT 120 | | | 1 | 1 | | | | |
| Not typable | 2 | 2 | 1 | | | | | |
| DT 40 | | | 3 | | | | | |
| DT 41 | | | | | | | | |
| DT 10 | | 1 | | | | | | |
| other | | | | | | | | |

Footnote

(*) M : Monitoring, C : Clinical
 The outbreak in the broiler production was caused by S. Typhimurium NST and DT 120 (Gallus Gallus).

Table Salmonella Typhimurium phage types in food

| Phagetype | Meat from bovine animals | | Meat from pig | | Meat from broilers (Gallus gallus) | | Other poultry | | Other products of animal origin | |
|--------------------------------------|--------------------------|------|---------------|------|------------------------------------|------|---------------|------|---------------------------------|------|
| | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) | M(*) | C(*) |
| Sources of isolates | | | | | | | | | | |
| Number of isolates in the laboratory | N= | | | | | | | | | |
| Number of isolates phagetyped | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Footnote

(*) M : Monitoring, C : Clinical

2.1.6. Antimicrobial resistance in Salmonella isolates

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

A. Antimicrobial resistance in Salmonella in cattle

Sampling strategy used in monitoring

Frequency of the sampling

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

Type of specimen taken

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

Procedures for the selection of isolates for antimicrobial testing

It is mandatory that at least one isolate from each notified incident of Salmonella is confirmed at SVA. From these isolates, the first from each warm-blooded animal species from each notified incident is tested for antimicrobial susceptibility at the Department of Antibiotics, SVA.

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 the Dept. of Antibiotics, SVA. As quality control, *Escherichia coli* ATCC 25922 was included. The Dept. of Antibiotics is accredited to perform the analyses by the Swedish Board for Accreditation and Conformity Assessment (SWEDAC) according to SS-EN ISO/IEC 17025 and regularly participates in external quality assurance.

Breakpoints used in testing

For cut-off values (breakpoints) for resistance see Table "Breakpoints for antibiotic resistance testing of Salmonella in Animals".

Microbiological cut-off values recommended by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) were used (<http://www.esmid.org>). When no cut-off value was available (kanamycin, streptomycin, sulphonamide) a cut-off value was defined on basis of the actual MIC distributions obtained in the SVARM programme.

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 21 incidents of Salmonella in cattle 2006 where antimicrobial susceptibility was tested, four incidents involved strains resistant to one or more antimicrobials.

One incident involved S.Typhimurium DT104, with penta resistance (ampicillin/chloramphenicol/streptomycin/sulpha/tetracycline). Two incidents involved S.Tm NT resistant to four antimicrobials (ampicillin/chloramphenicol/streptomycin/sulpha/tetracycline) and one incident involved S.Tm DT104 resistant to ampicillin and sulphonamides.

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

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

B. Antimicrobial resistance in Salmonella in pigs

Sampling strategy used in monitoring

Frequency of the sampling

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

Type of specimen taken

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

Laboratory methodology used for identification of the microbial isolates

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

Laboratory used for detection for resistance

Antimicrobials included in monitoring

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

Breakpoints used in testing

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

Preventive measures in place

See "Salmonella spp. in pigs".

Control program/mechanisms

The control program/strategies in place

See "Salmonella spp. in pigs".

Results of the investigation

Of the 13 incidents of Salmonella in pigs 2006, where antimicrobial susceptibility was tested, only one incident involved resistant strains. The isolate was S.Typhimurium DT104 resistant to ampicillin/streptomycin/sulpha/tetracycline).

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

The overall situation of antimicrobial resistance in Salmonella in pigs is favourable. Since the start of the monitoring programme SVARM year 2000, all 103 incidents except three has involved Salmonella sensitive to all antimicrobials tested. Of the resistant isolates, one was from 2000 (S. Tm DT12, resistant to nalidixic acid), one from 2005 (S. Typhimurium DT 104 resistant to ampicillin/chloramphenicol/streptomycin/tetracycline/sulpha) and one from 2006 (S.Tm DT 104 resistant to ampicillin/streptomycin/tetracycline/sulpha).

C. Antimicrobial resistance in Salmonella in poultry

Sampling strategy used in monitoring

Frequency of the sampling

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

Type of specimen taken

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

Methods of sampling (description of sampling techniques)

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

Procedures for the selection of isolates for antimicrobial testing

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

Laboratory methodology used for identification of the microbial isolates

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

Laboratory used for detection for resistance

Antimicrobials included in monitoring

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

Breakpoints used in testing

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

Preventive measures in place

See "Salmonella spp. in poultry".

Control program/mechanisms

The control program/strategies in place

See "Salmonella spp. in poultry".

Recent actions taken to control the zoonoses

See "Salmonella spp. in poultry".

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

The overall situation of antimicrobial resistance in Salmonella in poultry is favourable. Of the isolates from the 48 reported incidents since the start of the monitoring programme SVARM year 2000, only two have been resistant to any of the tested antimicrobials. In 2003 an isolate of *S. Typhimurium* DT 15a was resistant to sulphonamides and streptomycin and in 2000, an isolate of *S. spp.* was resistant to sulphonamides.

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

| Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to | | S. Dublin | | | | | | | | | | | | | | | | | | | | | |
|--|-------------------------------|-----------|--------|------|------|------|-----|----|---|---|---|----|----|----|-----|-----|-----|------|------|-------|--------|---------|--|
| Cattle (bovine animals) - in total - Control or eradication programmes | | | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | yes | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Number of isolates available in the laboratory | | 10 | | | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | | N | <=0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | |
| Tetracyclines | | | | | | | | | | | | | | | | | | | | | | | |
| | Tetracyclin | 10 | 0 | | | | 6 | 4 | | | | | | | | | | | | | 0.5 | 64 | |
| Amphenicols | | | | | | | | | | | | | | | | | | | | | | | |
| | Chloramphenicol | 10 | 0 | | | | 6 | 4 | | | | | | | | | | | | | 1 | 128 | |
| | Florfenicol | 10 | 0 | | | | | 10 | | | | | | | | | | | | | 4 | 32 | |
| Cephalosporins | | | | | | | | | | | | | | | | | | | | | | | |
| | 3rd generation cephalosporins | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| | Cefotaxim | 10 | 0 | 6 | 3 | 1 | | | | | | | | | | | | | | | 0.06 | 2 | |
| | Ceftiofur | 10 | 0 | | 1 | 6 | 2 | 1 | | | | | | | | | | | | | 0.12 | 16 | |
| Fluoroquinolones | | | | | | | | | | | | | | | | | | | | | | | |
| | Ciprofloxacin | 10 | 0 | 5 | 5 | | | | | | | | | | | | | | | | 0.008 | 1 | |
| | Enrofloxacin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Quinolones | | | | | | | | | | | | | | | | | | | | | | | |
| | Nalidixic acid | 10 | 0 | | | | | 6 | 4 | | | | | | | | | | | | 1 | 128 | |
| Sulfonamides | | | | | | | | | | | | | | | | | | | | | | | |
| | Sulfonamide | 10 | 0 | | | | | | 4 | 4 | 2 | | | | | | | | | | 16 | 2048 | |
| Trimethoprim | | | | | | | | | | | | | | | | | | | | | | | |
| | Trimethoprim | 10 | 0 | | | 1 | 6 | 2 | 1 | | | | | | | | | | | | 0.25 | 32 | |
| Aminoglycosides | | | | | | | | | | | | | | | | | | | | | | | |
| | Streptomycin | 10 | 0 | | | | | | | 2 | 4 | 4 | | | | | | | | | 2 | 256 | |
| | Gentamicin | 10 | 0 | | | 5 | | | | | | | | | | | | | | | 0.5 | 64 | |
| | Neomycin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| | Kanamycin | 10 | 0 | | | | 3 | 6 | 1 | | | | | | | | | | | | 2 | 16 | |
| Penicillins | | | | | | | | | | | | | | | | | | | | | | | |
| | Ampicillin | 10 | 0 | | | 3 | 4 | | | | | | | | | | | | | | 0.25 | 32 | |



Table Antimicrobial susceptibility testing of S. Enteritidis in animals

| n = Number of resistant isolates | | | | | | | | |
|--|-------------------------|----------|----------|----------|----------------------|----------|----------|----------|
| | S. Enteritidis | | | | | | | |
| | Cattle (bovine animals) | | Pigs | | Gallus gallus (fowl) | | Turkeys | |
| Isolates out of a monitoring programme | yes | | yes | | yes | | yes | |
| Number of isolates available in the laboratory | 0 | | 0 | | 0 | | 0 | |
| Antimicrobials: | | | | | | | | |
| | N | n | N | n | N | n | N | n |

Footnote

No isolates of S. Enteritidis in 2006.

Table Antimicrobial susceptibility testing of S.Typhimurium in animals

| n = Number of resistant isolates | | | | | | | | |
|--|-------------------------|----------|----------|----------|----------------------|----------|----------|----------|
| S. Typhimurium | | | | | | | | |
| | Cattle (bovine animals) | | Pigs | | Gallus gallus (fowl) | | Turkeys | |
| Isolates out of a monitoring programme | yes | | yes | | yes | | yes | |
| Number of isolates available in the laboratory | 7 | | 8 | | 4 | | 0 | |
| Antimicrobials: | N | n | N | n | N | n | N | n |
| Tetracyclines | | | | | | | | |
| Tetracyclin | 7 | 3 | 8 | 0 | 4 | 0 | 0 | 0 |
| Amphenicols | | | | | | | | |
| Chloramphenicol | 7 | 1 | 8 | 0 | 4 | 0 | 0 | 0 |
| Florfenicol | 7 | 1 | 8 | 0 | 4 | 0 | 0 | 0 |
| Cephalosporins | | | | | | | | |
| Cefotaxim | 7 | 0 | 8 | 0 | 4 | 0 | 0 | 0 |
| Ceftiofur | 7 | 0 | 8 | 0 | 4 | 0 | 0 | 0 |
| Fluoroquinolones | | | | | | | | |
| Ciprofloxacin | 7 | 0 | 8 | 0 | 4 | 0 | 0 | 0 |
| Quinolones | | | | | | | | |
| Nalidixic acid | 7 | 0 | 8 | 0 | 4 | 0 | 0 | 0 |
| Sulfonamides | | | | | | | | |
| Sulfonamide | 7 | 4 | 8 | 1 | 4 | 0 | 0 | 0 |
| Trimethoprim | 7 | 0 | 8 | 0 | 4 | 0 | 0 | 0 |
| Aminoglycosides | | | | | | | | |
| Streptomycin | 7 | 3 | 8 | 0 | 4 | 0 | 0 | 0 |
| Gentamicin | 7 | 0 | 8 | 0 | 4 | 0 | 0 | 0 |
| Kanamycin | 7 | 0 | 8 | 0 | 4 | 0 | 0 | 0 |
| Penicillins | | | | | | | | |
| Ampicillin | 7 | 4 | 8 | 1 | 4 | 0 | 0 | 0 |
| Fully sensitive | 7 | 3 | 8 | 7 | 4 | 4 | 0 | 0 |
| Resistant to 1 antimicrobial | 7 | 0 | 8 | 0 | 4 | 0 | 0 | 0 |
| Resistant to 2 antimicrobials | 7 | 1 | 8 | 1 | 4 | 0 | 0 | 0 |
| Resistant to 3 antimicrobials | 7 | 0 | 8 | 0 | 4 | 0 | 0 | 0 |
| Resistant to 4 antimicrobials | 7 | 2 | 8 | 0 | 4 | 0 | 0 | 0 |
| Resistant to >4 antimicrobials | 7 | 1 | 8 | 0 | 4 | 0 | 0 | 0 |
| Number of multiresistant S. Typhimurium DT104 | | | | | | | | |
| with penta resistance | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| resistant to other antimicrobials | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |

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

| Number of resistant isolates (n) and number of isolates with the concentration ($\mu\text{l/ml}$) or zone (mm) of inhibition equal to | | S. Typhimurium | | | | | | | | | | | | | | | | | | | | |
|---|-----|----------------|------|------|------|-----|---|---|---|---|----|----|----|-----|-----|-----|------|------|-------|--------|---------|--|
| Cattle (bovine animals) - in total - Control or eradication programmes | | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | yes | | | | | | | | | | | | | | | | | | | | | |
| | 7 | ≤ 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 | |
| Number of isolates available in the laboratory | | N | | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclines | | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclin | 7 | 3 | | | | | 4 | | | 1 | | | | 2 | | | | | | 0.5 | 64 | |
| Amphenicols | | | | | | | | | | | | | | | | | | | | | | |
| Chloramphenicol | 7 | 1 | | | | 1 | 2 | 3 | | | | | | 1 | | | | | | 1 | 128 | |
| Florfenicol | 7 | 1 | | | | | 6 | | 1 | | | | | | | | | | | 4 | 32 | |
| Cephalosporins | | | | | | | | | | | | | | | | | | | | | | |
| 3rd generation cephalosporins | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Cefotaxim | 7 | 0 | | 3 | 4 | | | | | | | | | | | | | | | 0.06 | 2 | |
| Ceftiofur | 7 | 0 | | | | 3 | 1 | | | | | | | | | | | | | 0.12 | 16 | |
| Fluoroquinolones | | | | | | | | | | | | | | | | | | | | | | |
| Ciprofloxacin | 7 | 0 | | 7 | | | | | | | | | | | | | | | | 0.008 | 1 | |
| Enrofloxacin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Quinolones | | | | | | | | | | | | | | | | | | | | | | |
| Nalidixic acid | 7 | 0 | | | | | 7 | | | | | | | | | | | | | 1 | 128 | |
| Sulfonamides | | | | | | | | | | | | | | | | | | | | | | |
| Sulfonamide | 7 | 4 | | | | | | | | | | | | 2 | 1 | | 4 | | | 16 | 2048 | |
| Trimethoprim | | | | | | | | | | | | | | | | | | | | | | |
| Trimethoprim | 7 | 0 | | | 3 | 4 | | | | | | | | | | | | | | 0.25 | 32 | |
| Aminoglycosides | | | | | | | | | | | | | | | | | | | | | | |
| Streptomycin | 7 | 3 | | | | | | | 3 | 1 | | | | 1 | 2 | | | | | 2 | 256 | |
| Gentamicin | 7 | 0 | | | | | | | | | 7 | | | | | | | | | 0.5 | 64 | |
| Neomycin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Kanamycin | 7 | 0 | | | | | | 6 | 1 | | | | | | | | | | | 2 | 16 | |
| Penicillins | | | | | | | | | | | | | | | | | | | | | | |
| Ampicillin | 7 | 4 | | | | | 2 | | | | | | 4 | | | | | | | 0.25 | 32 | |



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

| Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to | | <=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 | | |
|--|----------|----------|------------------|-------------|-------------|-------------|------------|----------|----------|----------|----------|-----------|-----------|-----------|------------|------------|------------|-------------|-------------|-----------------|---------------|----------------|--|
| S. Typhimurium | | | | | | | | | | | | | | | | | | | | | | | |
| Pigs - in total - Control or eradication programmes | | | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | yes | | | | | | | | | | | | | | | | | | | | | | |
| Number of isolates available in the laboratory | 8 | | | | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | N | n | <=0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | |
| Tetracyclines | | | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclin | 8 | 0 | | | | | 2 | 6 | | | | | | | | | | | | | 0.5 | 64 | |
| Amphenicols | | | | | | | | | | | | | | | | | | | | | | | |
| Chloramphenicol | 8 | 0 | | | | | | 1 | 7 | | | | | | | | | | | | 1 | 128 | |
| Florfenicol | 8 | 0 | | | | | | | 7 | 1 | | | | | | | | | | | 4 | 32 | |
| Cephalosporins | | | | | | | | | | | | | | | | | | | | | | | |
| 3rd generation cephalosporins | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| Cefotaxim | 8 | 0 | 1 | 4 | 3 | | | | | | | | | | | | | | | | 0.06 | 2 | |
| Ceftiofur | 8 | 0 | | | | 1 | 7 | | | | | | | | | | | | | | 0.12 | 16 | |
| Fluoroquinolones | | | | | | | | | | | | | | | | | | | | | | | |
| Ciprofloxacin | 8 | 0 | 2 | 6 | | | | | | | | | | | | | | | | | 0.008 | 1 | |
| Enrofloxacin | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| Quinolones | | | | | | | | | | | | | | | | | | | | | | | |
| Nalidixic acid | 8 | 0 | | | | | | | 6 | 2 | | | | | | | | | | | 1 | 128 | |
| Sulfonamides | | | | | | | | | | | | | | | | | | | | | | | |
| Sulfonamide | 8 | 1 | | | | | | | | | | | | 3 | 1 | 3 | | | 1 | 16 | 2048 | | |
| Trimethoprim | | | | | | | | | | | | | | | | | | | | | | | |
| Trimethoprim | 8 | 0 | | | 2 | 3 | 3 | | | | | | | | | | | | | 0.25 | 32 | | |
| Aminoglycosides | | | | | | | | | | | | | | | | | | | | | | | |
| Streptomycin | 8 | 0 | | | | | | | | 1 | 7 | | | | | | | | | | 2 | 256 | |
| Gentamicin | 8 | 0 | | | 1 | 6 | 1 | | | | | | | | | | | | | | 0.5 | 64 | |
| Neomycin | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| Kanamycin | 8 | 0 | | | | | | 7 | 1 | | | | | | | | | | | | 2 | 16 | |
| Penicillins | | | | | | | | | | | | | | | | | | | | | | | |
| Ampicillin | 8 | 1 | | | | | 2 | 3 | 2 | | | | | 1 | | | | | | | 0.25 | 32 | |



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

| Number of resistant isolates (n) and number of isolates with the concentration ($\mu\text{l/ml}$) or zone (mm) of inhibition equal to | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|--------|------|------|------|-----|---|---|---|---|----|----|----|-----|-----|-----|------|------|-------|--------|---------|--|
| <i>S. Typhimurium</i> | | | | | | | | | | | | | | | | | | | | | | |
| Gallus gallus (fowl) - in total - Control or eradication programmes | | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | yes | | | | | | | | | | | | | | | | | | | | | |
| | N | <=0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | |
| Number of isolates available in the laboratory | 4 | | | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclines | | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclin | 4 | 0 | | | | | 4 | | | | | | | | | | | | | 0.5 | 64 | |
| Amphenicols | | | | | | | | | | | | | | | | | | | | | | |
| Chloramphenicol | 4 | 0 | | | | | 2 | 2 | | | | | | | | | | | | 1 | 128 | |
| Florfenicol | 4 | 0 | | | | | 2 | 2 | | | | | | | | | | | | 4 | 32 | |
| Cephalosporins | | | | | | | | | | | | | | | | | | | | | | |
| 3rd generation cephalosporins | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Cefotaxim | 4 | 0 | | 2 | 2 | | | | | | | | | | | | | | | 0.06 | 2 | |
| Ceftiofur | 4 | 0 | | | | 4 | | | | | | | | | | | | | | 0.12 | 16 | |
| Fluoroquinolones | | | | | | | | | | | | | | | | | | | | | | |
| Ciprofloxacin | 4 | 0 | 1 | 3 | | | | | | | | | | | | | | | | 0.008 | 1 | |
| Enrofloxacin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Quinolones | | | | | | | | | | | | | | | | | | | | | | |
| Nalidixic acid | 4 | 0 | | | | | 4 | | | | | | | | | | | | | 1 | 128 | |
| Sulfonamides | | | | | | | | | | | | | | | | | | | | | | |
| Sulfonamide | 4 | 0 | | | | | | | | 4 | | | | | | | | | | 16 | 2048 | |
| Trimethoprim | | | | | | | | | | | | | | | | | | | | | | |
| Trimethoprim | 0 | 0 | | | | | | | | | | | | | | | | | | 0.25 | 32 | |
| Aminoglycosides | | | | | | | | | | | | | | | | | | | | | | |
| Streptomycin | 4 | 0 | | | | | | | | 4 | | | | | | | | | | 2 | 256 | |
| Gentamicin | 4 | 0 | | | | 4 | | | | | | | | | | | | | | 0.5 | 64 | |
| Neomycin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Kanamycin | 4 | 0 | | | | | 3 | 1 | | | | | | | | | | | | 2 | 16 | |
| Penicillins | | | | | | | | | | | | | | | | | | | | | | |
| Ampicillin | 4 | 0 | | | | | 1 | 3 | | | | | | | | | | | | 0.25 | 32 | |



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

| Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to | | S. Species | | | | | | | | | | | | | | | | | | | | |
|--|--|---|------|------|------|-----|----|----|----|-----|-----|-----|------|------|-------|--------|---------|------|-------|--------|---------|--|
| Gallus gallus (fowl) - in total - Control or eradication programmes | | Gallus gallus (fowl) - in total - Control or eradication programmes | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | Number of isolates available in the laboratory | yes | | | | | | | | | | | | | | | | | | | | |
| | | 4 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | | | | | |
| Antimicrobials: | N | ≤0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | |
| Tetracyclines | | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclin | 4 | 0 | | | | 1 | 3 | | | | | | | | | | | | | 0.5 | 64 | |
| Amphenicols | | | | | | | | | | | | | | | | | | | | | | |
| Chloramphenicol | 4 | 0 | | | | 1 | 3 | | | | | | | | | | | | | 1 | 128 | |
| Florfenicol | 4 | 0 | | | | 1 | 3 | | | | | | | | | | | | | 4 | 32 | |
| Cephalosporins | | | | | | | | | | | | | | | | | | | | | | |
| 3rd generation cephalosporins | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Cefotaxim | 4 | 0 | | 1 | 3 | | | | | | | | | | | | | | | 0.06 | 2 | |
| Ceftiofur | 4 | 0 | | | 2 | 2 | | | | | | | | | | | | | | 0.12 | 16 | |
| Fluoroquinolones | | | | | | | | | | | | | | | | | | | | | | |
| Ciprofloxacin | 4 | 0 | 4 | | | | | | | | | | | | | | | | | 0.008 | 1 | |
| Enrofloxacin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Quinolones | | | | | | | | | | | | | | | | | | | | | | |
| Nalidixic acid | 4 | 0 | | | | 3 | 1 | | | | | | | | | | | | | 1 | 128 | |
| Sulfonamides | | | | | | | | | | | | | | | | | | | | | | |
| Sulfonamide | 4 | 0 | | | | | | | | | 1 | 2 | 1 | | | | | | | 16 | 2048 | |
| Trimethoprim | | | | | | | | | | | | | | | | | | | | | | |
| Trimethoprim | 4 | 0 | | 1 | 3 | | | | | | | | | | | | | | | 0.25 | 32 | |
| Aminoglycosides | | | | | | | | | | | | | | | | | | | | | | |
| Streptomycin | 4 | 0 | | | | | | | | 1 | 1 | 2 | | | | | | | | 2 | 256 | |
| Gentamicin | 4 | 0 | | | | 1 | 3 | | | | | | | | | | | | | 0.5 | 64 | |
| Neomycin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Kanamycin | 4 | 0 | | | | | 2 | 2 | | | | | | | | | | | | 2 | 16 | |
| Penicillins | | | | | | | | | | | | | | | | | | | | | | |
| Ampicillin | 4 | 0 | | | | 1 | 2 | 1 | | | | | | | | | | | | 0.25 | 32 | |



Footnote

One isolate each of the serovars S.Agona, S.Senfenberg, S.Worthington, S.Rubislaw

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

| Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to | | | | | | | | | | | | | | | | | | | | | | |
|--|-----|-------|------|------|------|-----|----|----|----|-----|-----|-----|------|------|-------|--------|---------|------|-------|--------|---------|--|
| S. Species | | | | | | | | | | | | | | | | | | | | | | |
| Pigs - in total | | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | yes | | | | | | | | | | | | | | | | | | | | | |
| | 5 | 1 | 2 | 3 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | | | | | |
| Number of isolates available in the laboratory | | | | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | N | ≤0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | |
| Tetracyclines | 5 | 0 | | | | | 2 | 3 | | | | | | | | | | | | 0.5 | 64 | |
| Tetracyclin | | | | | | | | | | | | | | | | | | | | | | |
| Amphenicols | 5 | 0 | | | | | 4 | 1 | | | | | | | | | | | | 1 | 128 | |
| Chloramphenicol | | | | | | | | | | | | | | | | | | | | | | |
| Florfenicol | 5 | 0 | | | | | 2 | 3 | | | | | | | | | | | | 4 | 32 | |
| Cephalosporins | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| 3rd generation cephalosporins | 5 | 0 | 1 | 1 | 3 | | | | | | | | | | | | | | | 0.06 | 2 | |
| Cefotaxim | | | | | | | | | | | | | | | | | | | | | | |
| Ceftiofur | 5 | 0 | | | | 1 | 4 | | | | | | | | | | | | | 0.12 | 16 | |
| Fluoroquinolones | 5 | 0 | 2 | 3 | | | | | | | | | | | | | | | | 0.008 | 1 | |
| Ciprofloxacin | | | | | | | | | | | | | | | | | | | | | | |
| Enrofloxacin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Quinolones | 5 | 0 | | | | | 4 | 1 | | | | | | | | | | | | 1 | 128 | |
| Nalidixic acid | | | | | | | | | | | | | | | | | | | | | | |
| Sulfonamides | 5 | 0 | | | | | | | | | | | | | | | | | | 16 | 2048 | |
| Sulfonamide | 5 | 0 | | | | 2 | 3 | | | | | | | | | | | | | 0.25 | 32 | |
| Trimethoprim | 5 | 0 | | | | | | | | | | | | | | | | | | | | |
| Aminoglycosides | 5 | 0 | | | | | | | | | | | | | | | | | | 2 | 256 | |
| Streptomycin | 5 | 0 | | | | 2 | 2 | 1 | | 1 | 3 | 1 | | | | | | | | 0.5 | 64 | |
| Gentamicin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Neomycin | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| Kanamycin | 5 | 0 | | | | | | 5 | | | | | | | | | | | | 2 | 16 | |
| Penicillins | 5 | 0 | | | | | | | | | | | | | | | | | | 0.25 | 32 | |
| Ampicillin | 0 | 0 | | | | 2 | 3 | | | | | | | | | | | | | | | |
| Trimethoprim + sulfonamides | 5 | 0 | | | | | | | | | | | | | | | | | | | | |
| Trimethoprim + sulfonamides | 0 | 0 | | | | | | | | | | | | | | | | | | | | |

Footnote

Three isolates of *S. Agona*, 1 S. Baenderup, 1 S. Oranienburg

Table Antimicrobial susceptibility testing of Salmonella in animals

| n = Number of resistant isolates | | | | | | | | |
|--|-------------------------|----------|----------|----------|----------------------|----------|----------|----------|
| Salmonella spp. | | | | | | | | |
| | Cattle (bovine animals) | | Pigs | | Gallus gallus (fowl) | | Turkeys | |
| Isolates out of a monitoring programme | yes | | yes | | yes | | yes | |
| Number of isolates available in the laboratory | 14 | | 5 | | 4 | | 0 | |
| Antimicrobials: | N | n | N | n | N | n | N | n |
| Tetracyclines | | | | | | | | |
| Tetracyclin | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Amphenicols | | | | | | | | |
| Chloramphenicol | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Florfenicol | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Cephalosporins | | | | | | | | |
| Cefotaxim | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Ceftiofur | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Fluoroquinolones | | | | | | | | |
| Ciprofloxacin | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Quinolones | | | | | | | | |
| Nalidixic acid | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Sulfonamides | | | | | | | | |
| Sulfonamide | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Trimethoprim | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Aminoglycosides | | | | | | | | |
| Streptomycin | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Gentamicin | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Kanamycin | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Penicillins | | | | | | | | |
| Ampicillin | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Fully sensitive | 14 | 14 | 5 | 5 | 4 | 4 | 0 | 0 |
| Resistant to 1 antimicrobial | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Resistant to 2 antimicrobials | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Resistant to 3 antimicrobials | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Resistant to 4 antimicrobials | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |
| Resistant to >4 antimicrobials | 14 | 0 | 5 | 0 | 4 | 0 | 0 | 0 |

Footnote

Salmonella serovars other than S. Typhimurium

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

| Number of resistant isolates (n) and number of isolates with the concentration ($\mu\text{l/ml}$) or zone (mm) of inhibition equal to | | Salmonella spp. | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-----------------|---|-------------|------|------|------|-----|---|---|---|---|----|----|----|-----|-----|-----|------|------|-------|--------|---------|--|-------|------|--|
| Cattle (bovine animals) - in total - Control or eradication programmes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | yes | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | N | n | ≤ 0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | | | | |
| Number of isolates available in the laboratory | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclines | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclin | 4 | 0 | | | | | 1 | 3 | | | | | | | | | | | | | | | | | 0.5 | 64 | |
| Amphenicols | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chloramphenicol | 4 | 0 | | | | | 1 | | 1 | 1 | 2 | | | | | | | | | | | | | | 1 | 128 | |
| Florfenicol | 4 | 0 | | | | | | | 2 | 2 | | | | | | | | | | | | | | | 4 | 32 | |
| Cephalosporins | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3rd generation cephalosporins | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cefotaxim | 4 | 0 | | | 1 | 3 | | | | | | | | | | | | | | | | | | | 0.06 | 2 | |
| Ceftiofur | 4 | 0 | | | | 1 | 3 | | | | | | | | | | | | | | | | | | 0.12 | 16 | |
| Fluoroquinolones | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ciprofloxacin | 4 | 0 | | 4 | | | | | | | | | | | | | | | | | | | | | 0.008 | 1 | |
| Enrofloxacin | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Quinolones | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nalidixic acid | 4 | 0 | | | | | | 2 | 2 | | | | | | | | | | | | | | | | 1 | 128 | |
| Sulfonamides | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sulfonamide | 4 | 0 | | | | | | | | | | | | | | | | | | | 2 | 2 | | | 16 | 2048 | |
| Trimethoprim | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | 0.25 | 32 | |
| Aminoglycosides | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Streptomycin | 4 | 0 | | | | | | | | | 1 | 2 | 1 | | | | | | | | | | | | 2 | 256 | |
| Gentamicin | 4 | 0 | | | | 4 | | | | | | | | | | | | | | | | | | | 0.5 | 64 | |
| Neomycin | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kanamycin | 4 | 0 | | | | | 4 | | | | | | | | | | | | | | | | | | 2 | 16 | |
| Penicillins | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ampicillin | 4 | 0 | | | | | 1 | 3 | | | | | | | | | | | | | | | | | 0.25 | 32 | |



Footnote

One isolate of S.Agona, S.Livingstone, S.Duesseldorf S.Tomphson, respectively.

Table Breakpoints for antibiotic resistance testing in Animals

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| |
|-------|
| NCCLS |
|-------|

| Salmonella | Standard for breakpoint | Breakpoint concentration (microg/ml) | | | Range tested concentration (microg/ml) | | Disk content microg | Breakpoint Zone diameter (mm) | | |
|------------------------------------|-------------------------|--------------------------------------|--------------|-------------|--|---------|---------------------|-------------------------------|--------------|--------------|
| | | Susceptible <= | Intermediate | Resistant > | lowest | highest | | Susceptible >= | Intermediate | Resistant <= |
| Amphenicols | | | | | | | | | | |
| Chloramphenicol | EUCAST | 16 | | 16 | 1 | 128 | | | | |
| Florfenicol | EUCAST | 16 | | 16 | 4 | 32 | | | | |
| Tetracyclines | | | | | | | | | | |
| Tetracyclin | EUCAST | 8 | | 8 | 0.5 | 64 | | | | |
| Fluoroquinolones | | | | | | | | | | |
| Ciprofloxacin | EUCAST | 0.06 | | 0.06 | 0.008 | 1 | | | | |
| Enrofloxacin | | | | | | | | | | |
| Quinolones | | | | | | | | | | |
| Nalidixic acid | EUCAST | 16 | | 16 | 1 | 128 | | | | |
| Trimethoprim | EUCAST | 2 | | 2 | 0.25 | 32 | | | | |
| Sulfonamides | | | | | | | | | | |
| Sulfonamide | NCCLS | 256 | | 256 | 16 | 2048 | | | | |
| Aminoglycosides | | | | | | | | | | |
| Streptomycin | no standard available | 32 | | 32 | 2 | 256 | | | | |
| Gentamicin | EUCAST | 2 | | 2 | 0.5 | 64 | | | | |
| Neomycin | | | | | | | | | | |
| Kanamycin | no standard available | 16 | | 16 | 2 | 16 | | | | |
| Trimethoprim + sulfonamides | | | | | | | | | | |
| Cephalosporins | | | | | | | | | | |
| Cefotaxim | EUCAST | 0.5 | | 0.5 | 0.06 | 2 | | | | |
| Ceftiofur | EUCAST | 2 | | 2 | 0.12 | 16 | | | | |
| 3rd generation cephalosporins | | | | | | | | | | |
| Penicillins | | | | | | | | | | |
| Ampicillin | EUCAST | 4 | | 4 | 0.25 | 32 | | | | |

Table Breakpoints for antibiotic resistance testing in Food

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| Salmonella | Standard for breakpoint | Breakpoint concentration (microg/ml) | | | Range tested concentration (microg/ml) | | Disk content microg | Breakpoint Zone diameter (mm) | | |
|------------------------------------|-------------------------------|--------------------------------------|--------------|-------------|--|---------|---------------------|-------------------------------|--------------|--------------|
| | | Susceptible <= | Intermediate | Resistant > | lowest | highest | | Susceptible >= | Intermediate | Resistant <= |
| Amphenicols | | | | | | | | | | |
| | Chloramphenicol | | | | | | | | | |
| | Florfenicol | | | | | | | | | |
| Tetracyclines | | | | | | | | | | |
| | Tetracyclin | | | | | | | | | |
| Fluoroquinolones | | | | | | | | | | |
| | Ciprofloxacin | | | | | | | | | |
| | Enrofloxacin | | | | | | | | | |
| Quinolones | | | | | | | | | | |
| | Nalidixic acid | | | | | | | | | |
| Trimethoprim | | | | | | | | | | |
| Sulfonamides | | | | | | | | | | |
| | Sulfonamide | | | | | | | | | |
| Aminoglycosides | | | | | | | | | | |
| | Streptomycin | | | | | | | | | |
| | Gentamicin | | | | | | | | | |
| | Neomycin | | | | | | | | | |
| | Kanamycin | | | | | | | | | |
| Trimethoprim + sulfonamides | | | | | | | | | | |
| Cephalosporins | | | | | | | | | | |
| | Cefotaxim | | | | | | | | | |
| | Ceftiofur | | | | | | | | | |
| | 3rd generation cephalosporins | | | | | | | | | |
| Penicillins | | | | | | | | | | |
| | Ampicillin | | | | | | | | | |

Table Breakpoints for antibiotic resistance testing in Feedingstuff

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| Salmonella | Standard for breakpoint | Breakpoint concentration (microg/ml) | | | Range tested concentration (microg/ml) | | Disk content microg | Breakpoint Zone diameter (mm) | | |
|------------------------------------|-------------------------------|--------------------------------------|--------------|-------------|--|---------|---------------------|-------------------------------|--------------|--------------|
| | | Susceptible <= | Intermediate | Resistant > | lowest | highest | | Susceptible >= | Intermediate | Resistant <= |
| Amphenicols | | | | | | | | | | |
| | Chloramphenicol | | | | | | | | | |
| | Florfenicol | | | | | | | | | |
| Tetracyclines | | | | | | | | | | |
| | Tetracyclin | | | | | | | | | |
| Fluoroquinolones | | | | | | | | | | |
| | Ciprofloxacin | | | | | | | | | |
| | Enrofloxacin | | | | | | | | | |
| Quinolones | | | | | | | | | | |
| | Nalidixic acid | | | | | | | | | |
| Trimethoprim | | | | | | | | | | |
| Sulfonamides | | | | | | | | | | |
| | Sulfonamide | | | | | | | | | |
| Aminoglycosides | | | | | | | | | | |
| | Streptomycin | | | | | | | | | |
| | Gentamicin | | | | | | | | | |
| | Neomycin | | | | | | | | | |
| | Kanamycin | | | | | | | | | |
| Trimethoprim + sulfonamides | | | | | | | | | | |
| Cephalosporins | | | | | | | | | | |
| | Cefotaxim | | | | | | | | | |
| | Ceftiofur | | | | | | | | | |
| | 3rd generation cephalosporins | | | | | | | | | |
| Penicillins | | | | | | | | | | |
| | Ampicillin | | | | | | | | | |

2.2. CAMPYLOBACTERIOSIS

2.2.1. General evaluation of the national situation

A. Thermophilic Campylobacter general evaluation

History of the disease and/or infection in the country

From 1991 to June 2001, a voluntary Campylobacter programme was run. During this period the prevalence varied between 9 and 16%. Between July 2001 and Dec 2005, a new and more sampling intensive programme was implemented. In this programme the flock prevalence increased up to 20%. It is likely that the increase was due changes in sampling strategy and bacteriological analyses. However, between 2001-05 there was a decreasing trend of positive slaughter groups from 20-14%.

From 1995 to 2006, the number of reported domestic cases varied between 1781 and 2839, with the lowest number reported in 2006. Approximately 30-45% of the total number of cases are of domestic origin.

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

Campylobacteriosis is the most commonly reported zoonotic infection in Sweden, as in the rest of the EU. As 30-45% of the cases in Sweden are of domestic origin it is important to implement measures to reduce the incidence, an example of this is the Campylobacter programme. Since 2003, there has been a decreasing trend of reported human cases with the lowest number of notifications in 2006 during the last decade.

During the campylobacter programme 2001-2005, there was a decreasing trend in number of positive slaughter groups.

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

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

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

Suggestions to the Community for the actions to be taken

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

2.2.2. Campylobacter in foodstuffs

A. Thermophilic Campylobacter in Broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Industry decides. No reporting to the authorities is requested.

At meat processing plant

See above.

At retail

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

Frequency of the sampling

At slaughterhouse and cutting plant

Other: Infrequent sampling.

At meat processing plant

Other: Infrequent sampling.

At retail

Other: Infrequent sampling.

Type of specimen taken

At slaughterhouse and cutting plant

Other: No information available.

At meat processing plant

Other: No information available.

At retail

Other: Varies, mostly meat products.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

No information available.

At meat processing plant

No information available.

At retail

No information available.

Definition of positive finding

At retail

Campylobacter identified in the sample.

Diagnostic/analytical methods used

At retail

Bacteriological method: NMKL 119: 1990

Control program/mechanisms

Suggestions to the Community for the actions to be taken

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

Measures in case of the positive findings or single cases

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

Notification system in place

None.

Results of the investigation

In 2006, local health authorities reported 7 samples of fresh poultry meat and 16 samples of poultry meat products taken at retail.

However, no results were reported (For results from sampling of poultry meat at slaughter, see "Campylobacter in animals".)

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

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

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

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

Additional information

19 local authorities have reported altogether 266 Campylobacter samples taken in official control during 2006. Of these 157 were samples of ready-to-eat food (not specified) 14 vegetables, 23 poultry meat and products, 58 red meat and products thereof, 5 eggs and eggproducts. The remaining samples are not specified. One sample of ready-to-eat-foods were found unfit for human consumption due to Campylobacter load.

Table Campylobacter in poultry meat

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for thermophilic Campylobacter spp. | C. coli | C. lari | C. jejuni | C. upsaliensis | thermophilic Campylobacter spp., unspecified |
|--|-----------------------|---------------|---------------|--------------|--|---------|---------|-----------|----------------|--|
| | | | | | | | | | | |

Footnote

See text form Campylobacter in broiler meat and products. The information is not complete and therefore not reported in the table.

Table Campylobacter in other food

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for thermophilic Campylobacter spp. | C. jejuni | C. coli | C. upsaliensis | C. lari | thermophilic Campylobacter spp., unspecified |
|--|-----------------------|---------------|---------------|--------------|--|-----------|---------|----------------|---------|--|
| | | | | | | | | | | |

Footnote

Reports from 19 local authorities on Campylobacter in different foods include: 5 samples in eggs and egg products, 55 samples in pork and beef, 23 samples in poultry, 14 in vegetables and 157 in ready-to-eat-foods. However the results of the analyses were not reported. The information is not complete and therefore not reported in the table.

2.2.3. Campylobacter in animals

A. Thermophilic Campylobacter in Gallus gallus

Monitoring system

Sampling strategy

In the Campylobacter programme, all flocks of broilers are examined for Campylobacter at the slaughterhouse. The program includes all members of Swedish Poultry Meat Association (SPMA, Svensk Fagel) and some of the non-members and is financed by the Swedish Board of Agriculture (SJV) and the SPMA.

SINGLE STUDIES:

1) A study was conducted to investigate the variation of Campylobacter load within a flock. Samples were collected at slaughter.

2) Another study was performed with the aim to analyse the Campylobacter load in relation to when the broilers get colonised. Samples were collected at farm level and at slaughter.

Frequency of the sampling

At slaughter

Other: Every slaughter group is sampled

Type of specimen taken

At slaughter

Other: caecum samples

Methods of sampling (description of sampling techniques)

At slaughter

FROM EACH SLAUGHTER GROUP:

Ten caeca are taken from ten birds per slaughter group and pooled to form one composite sample.

SINGLE STUDIES

1) Twenty-nine flocks were sampled at farm level prior to slaughter, 10 caeca and 5 to 25 carcasses per flock were collected at slaughter. Each carcass was individually rinsed in 400 ml buffered peptone water and the number of *Campylobacter* cfu per ml rinse fluid was calculated.

2) From 220 flocks, sock samples were collected one week before slaughter and on the same day as transport to slaughter. From each flock one carcass rinse samples was analysed.

Case definition

Rearing period

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

Before slaughter at farm

See "Rearing priod"

At slaughter

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

Diagnostic/analytical methods used

Rearing period

Bacteriological method: NMKL 119:1990

Before slaughter at farm

Bacteriological method: NMKL 119:1990

At slaughter

Bacteriological method: ISO/TS 10272-1

Vaccination policy

Other preventive measures than vaccination in place

Preventive measures at primary production are hygiene barriers, cleaning and disinfection after slaughter of each flock and leaving the stable empty for a defined period before introducing a new flock. Specific advices to each producer is also given by the SPMA. The majority of the slaughter companies pay extra for *Campylobacter* free broilers, as a bonus to encourage efforts to reduce the introduction of *Campylobacter* into the broiler flocks.

Control program/mechanisms

The control program/strategies in place

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

The SPMA covers the entire production chain, from feed manufacturers, breeding companies, hatcheries, broiler producers, abattoirs and processing plants. Members of the SPMA produce approximately 99% of all broilers slaughtered in Sweden. The members are obliged to only use approved feed and to participate in stipulated animal health programs, such as Salmonella, welfare and classification program.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

From the producers affiliated to the SPMA 328 (13%) out of 2486 slaughter groups were positive for *Campylobacter*. From 86 slaughter groups not affiliated to the control programme 28 (33%) were positive.

SINGLE STUDIES:

1) Campylobacter was detected in carcasses from 22 flocks, out of 29 sampled. The 22 flocks had also been positive at farm level. From 7 positive flocks, 1 to 3 carcasses were negative, i.e. there was no Campylobacter above the detection limit of 1 cfu/ ml rinse fluid. The Campylobacter load within a flock varied between 1.0- 3.2 log cfu/ml carcass rinse fluid, which shows that it is difficult to decide the level of contamination in a flock if only one carcass is examined.

2) One carcass rinse sample was analysed from each of 220 flocks. From those flocks, campylobacter was found in 22% of the flocks sampled by sock samples one week before slaughter and in 36% of the flocks sampled on the same day as transport to slaughter. No difference was found in campylobacter load in carcass rinse samples between flocks that were colonised in the last days before slaughter compared with those colonised at least one week before slaughter. However, those flocks where campylobacter was only found in carcass rinse samples and not at farm level or caecal samples at slaughter had a significantly lower campylobacter incidence. These results confirm that campylobacter are often introduced during the last week prior to slaughter and logistic slaughter based on samples taken 1-2 weeks before slaughter is of limited value because most flocks become colonised during their last week.

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

From 2001-2005, the number of Campylobacter positive slaughter groups decreased (including cloacal- and neck skin samples). Results from 2006 were similar to those obtained in 2005. The decreasing trend could be due to increased awareness of the farmer about the importance of hygienic barriers.

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 also other sources of importance.

Additional information

Between 1991 and June 2001, a Campylobacter monitoring programme was run by the industry SPMA. During that period the prevalence varied between 9 and 16%. Between 1 July 2001 and 21 December 2005 a new and more sampling intensive Campylobacter programme was run. The

program was voluntary, financed by the SPMA and SJV, with additional funding from the European Commission and run by the SPMA, SJV, SLV, SVA and SMI.

Studies within the programme have shown that about one third of the producers seldom delivered campylobacter-positive slaughter batches. A seasonal variation with higher prevalence of Campylobacter infection in broiler flocks during late summer and early autumn has been observed.

In 2002 it was shown that in one fifth of the flocks the within flock prevalence was considerable lower than 100%.

In 2003, a study showed that the majority of positive flocks were infected during the last week before slaughter.

In 2004, it was shown that there was no difference in findings of Campylobacter outside the stables between different producers that often or seldomly deliver Campylobacter positive slaughter groups.

In 2005, two qualitative studies were conducted to compare different samples at farm level and at slaughter. Furthermore, a quantitative study was carried out on neck skin and whole carcass rinse samples

Table Campylobacter in animals

| | Source of information | Sampling unit | Units tested | Total units positive for thermophilic Campylobacter spp. | C. jejuni | C. coli | C. lari | C. upsaliensis | thermophilic Campylobacter spp., unspecified |
|-----------------------------|-----------------------|-----------------|--------------|--|-----------|---------|---------|----------------|--|
| Gallus gallus (fowl) | | | | | | | | | |
| broilers | | | | | | | | | |
| - at slaughterhouse (1) | SVA, SPMA | slaughter batch | 2572 | 356 | | | | | |

(1) : Approximately 95% of the isolates are C. jejuni.

Footnote

Flocks associated to the Swedish Poultry Meat Association (svensk fagel): 328/2486 (13%) positive slaughter groups. Flocks not associated to the SPMA: 28/68 (33%) positive slaughter groups.

2.2.4. Antimicrobial resistance in Campylobacter isolates

A. Antimicrobial resistance in Campylobacter jejuni and coli in cattle

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial resistance in Campylobacter from different animal species is regularly monitored in the Swedish Veterinary Antimicrobial Resistance Monitoring Programme, SVARM. In 2006, isolates from dairy cows were tested.

Type of specimen taken

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

Methods of sampling (description of sampling techniques)

In all 460 samples were collected from 11 abattoirs. The abattoirs account for 84% of the total volume of dairy cows slaughtered in Sweden in 2005. The number of samples collected at each abattoir was proportional to the slaughter volume of the abattoir.

Procedures for the selection of isolates for antimicrobial testing

All isolates (68) obtained from culture of the 470 samples were tested for antimicrobial susceptibility. Each isolate is from a unique dairy herd.

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

Campylobacter spp. were isolated and identified at SVA according to standard procedures. Briefly, samples were cultured for thermophilic Campylobacter spp. by a modified NMKL method (NMKL Nr 119, 1990) using enrichment in Preston broth followed by culture on Preston selective agar and incubation at 42°C. Identification was based on colony morphology, microscopic appearance including motility and the following phenotypic characteristics: production of oxidase, catalase, hippurate hydrolysis reaction and indoxyl-acetate reaction (Nachamkin, 1999). With these tests, hippurate-positive *C. jejuni* can be identified whereas other isolates are described as hippurate-negative thermophilic Campylobacter spp.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Antimicrobial susceptibility testing of Campylobacter from animals was performed at the Dept. of Antibiotics, SVA using a microdilution method according to NCCLS guidelines.

For antimicrobials tested and breakpoints used see table "Breakpoints used for antimicrobial susceptibility testing in Animals".

Preventive measures in place

No preventive measures regarding antimicrobial resistance in Campylobacter from animals are in place.

Control program/mechanisms

The control program/strategies in place

No control programme for antimicrobial resistance in Campylobacter from cattle is in place.

Measures in case of the positive findings or single cases

No specific measures are taken in case of resistance in Campylobacter from cattle.

Notification system in place

No notification system is in place

Results of the investigation

Of the 68 isolates of *C. jejuni* tested no isolate was resistant to erythromycin, gentamicin or tetracycline. One isolate was resistant to ampicilin and 5 and 6 isolates to enrofloxacin and nalidixic acid, respectively.

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

The results of the present study on *Campylobacter jejuni* from dairy cows are similar to the results of a study on isolates from yearling cattle performed in 1999-00. Resistance is overall rare and no isolate has been resistant to erythromycin, the antimicrobial commonly used to treat infections in human. The small number of isolates tested precludes valid conclusions on trends.

Table Antimicrobial susceptibility testing of C. jejuni - qualitative data

| n = Number of resistant isolates | | |
|---|----------|----------|
| C. jejuni | | |
| Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring | | |
| Isolates out of a monitoring programme | yes | |
| Number of isolates available in the laboratory | 68 | |
| Antimicrobials: | | |
| | N | n |
| Tetracyclines | | |
| Tetracyclin | 68 | 0 |
| Fluoroquinolones | | |
| Enrofloxacin | 68 | 5 |
| Quinolones | | |
| Nalidixic acid | 68 | 6 |
| Aminoglycosides | | |
| Gentamicin | 68 | 0 |
| Macrolides | | |
| Erythromycin | 68 | 0 |
| Penicillins | | |
| Ampicillin | 68 | 1 |
| Fully sensitive | 68 | 61 |
| Resistant to 1 antimicrobial | 68 | 7 |

Footnote

Nalidixic acid and enrofloxacin regarded as one substance in calculation of multiresistance

Table Antimicrobial susceptibility testing of C. jejuni in Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring - quantitative data [Dilution method]

| Number of resistant isolates (n) and number of isolates with the concentration ($\mu\text{l/ml}$) or zone (mm) of inhibition equal to | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-------------|------|------|------|-----|----|----|----|---|----|----|----|-----|-----|-----|------|------|-------|--------|---------|-----|
| C. jejuni | | | | | | | | | | | | | | | | | | | | | | |
| Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring | | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | yes | | | | | | | | | | | | | | | | | | | | | |
| Number of isolates available in the laboratory | 68 | | | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | N | ≤ 0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | |
| Tetracyclines | 68 | 0 | | | 66 | 2 | | | | | | | | | | | | | | | 0.25 | 32 |
| Fluoroquinolones | 0 | | | | | | | | | | | | | | | | | | | | | |
| Ciprofloxacin | 0 | | | | | | | | | | | | | | | | | | | | | |
| Enrofloxacin | 68 | 5 | 3 | 39 | 14 | 7 | 1 | 2 | 2 | 2 | | | | | | | | | | | 0.06 | 4 |
| Quinolones | 68 | 6 | | | | | | 24 | 31 | 7 | | | 1 | 2 | 3 | | | | | | 1 | 128 |
| Aminoglycosides | 68 | 0 | | | 2 | 37 | 29 | | | | | | | | | | | | | | 0.25 | 8 |
| Gentamicin | 68 | 0 | | | 2 | 37 | 29 | | | | | | | | | | | | | | 0.25 | 8 |
| Macrolides | 68 | 0 | | 1 | 4 | 28 | 29 | 4 | 2 | | | | | | | | | | | | 0.12 | 16 |
| Erythromycin | 68 | 0 | | 1 | 4 | 28 | 29 | 4 | 2 | | | | | | | | | | | | 0.12 | 16 |
| Penicillins | 68 | 1 | | | | 7 | 3 | 31 | 22 | 4 | | | 1 | | | | | | | | 0.5 | 64 |
| Ampicillin | 68 | 1 | | | | 7 | 3 | 31 | 22 | 4 | | | 1 | | | | | | | | 0.5 | 64 |

Table Breakpoints used for antimicrobial susceptibility testing in Animals

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| |
|-------|
| NCCLS |
|-------|

| Campylobacter | Standard for breakpoint | Breakpoint concentration (microg/ml) | | | Range tested concentration (microg/ml) | | Disk content microg | Breakpoint Zone diameter (mm) | | |
|-------------------------|-------------------------|--------------------------------------|--------------|-------------|--|---------|---------------------|-------------------------------|--------------|--------------|
| | | Susceptible <= | Intermediate | Resistant > | lowest | highest | | Susceptible >= | Intermediate | Resistant <= |
| Tetracyclines | | | | | | | | | | |
| Tetracyclin | EUCAST | 2 | | 2 | 0.25 | 32 | | | | |
| Fluoroquinolones | | | | | | | | | | |
| Ciprofloxacin | | | | | | | | | | |
| Enrofloxacin | No standard available | 0.5 | | 0.5 | 0.03 | 4 | | | | |
| Quinolones | | | | | | | | | | |
| Nalidixic acid | EUAST | 16 | | 16 | 1 | 128 | | | | |
| Aminoglycosides | | | | | | | | | | |
| Gentamicin | EUCAST | 1 | | 1 | 0.25 | 8 | | | | |
| Macrolides | | | | | | | | | | |
| Erythromycin | EUCAST | 4 | | 4 | 0.12 | 16 | | | | |
| Penicillins | | | | | | | | | | |
| Ampicillin | EUCAST | 8 | | 8 | 0.5 | 64 | | | | |

Footnote

Applies to Campylobacter jejuni

Table Breakpoints used for antimicrobial susceptibility testing in Food

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| Campylobacter | Standard for breakpoint | Breakpoint concentration (microg/ml) | | | Range tested concentration (microg/ml) | | Disk content microg | Breakpoint Zone diameter (mm) | | |
|-------------------------|-------------------------|--------------------------------------|--------------|-------------|--|---------|---------------------|-------------------------------|--------------|--------------|
| | | Susceptible <= | Intermediate | Resistant > | lowest | highest | | Susceptible >= | Intermediate | Resistant <= |
| Tetracyclines | | | | | | | | | | |
| | Tetracyclin | | | | | | | | | |
| Fluoroquinolones | | | | | | | | | | |
| | Ciprofloxacin | | | | | | | | | |
| | Enrofloxacin | | | | | | | | | |
| Quinolones | | | | | | | | | | |
| | Nalidixic acid | | | | | | | | | |
| Aminoglycosides | | | | | | | | | | |
| | Gentamicin | | | | | | | | | |
| Macrolides | | | | | | | | | | |
| | Erythromycin | | | | | | | | | |
| Penicillins | | | | | | | | | | |
| | Ampicillin | | | | | | | | | |

Table Breakpoints used for antimicrobial susceptibility testing in Feedingstuff

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| Campylobacter | Standard for breakpoint | Breakpoint concentration (microg/ml) | | | Range tested concentration (microg/ml) | | Disk content microg | Breakpoint Zone diameter (mm) | | |
|-------------------------|-------------------------|--------------------------------------|--------------|-------------|--|---------|---------------------|-------------------------------|--------------|--------------|
| | | Susceptible <= | Intermediate | Resistant > | lowest | highest | | Susceptible >= | Intermediate | Resistant <= |
| Tetracyclines | | | | | | | | | | |
| | Tetracyclin | | | | | | | | | |
| Fluoroquinolones | | | | | | | | | | |
| | Ciprofloxacin | | | | | | | | | |
| | Enrofloxacin | | | | | | | | | |
| Quinolones | | | | | | | | | | |
| | Nalidixic acid | | | | | | | | | |
| Aminoglycosides | | | | | | | | | | |
| | Gentamicin | | | | | | | | | |
| Macrolides | | | | | | | | | | |
| | Erythromycin | | | | | | | | | |
| Penicillins | | | | | | | | | | |
| | Ampicillin | | | | | | | | | |

2.3. LISTERIOSIS

2.3.1. General evaluation of the national situation

A. Listeriosis general evaluation

History of the disease and/or infection in the country

Between 25 and 67 cases are recorded annually, the majority of these are immuno-suppressed, pregnant women and elderly.

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

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

After a peak in the number of reported human cases in 2000 the annual number has decreased and the situation is now more stable. During 2006, 42 cases were notified. There was no change in the number of reported infected pregnant women. During 2006 one woman with listeriosis had a miscarriage.

In animals the situation is stable.

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

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

2.3.2. Listeria in foodstuffs

A. Listeria spp. in food

Monitoring system

Sampling strategy

Sampling is performed by local authorities on a random basis. No official control 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

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

At retail

Other: According to the local authorities own decisions.

Definition of positive finding

At the production plant

A sample positive for L. monocytogenes

At retail

A sample positive for L. monocytogenes

Diagnostic/analytical methods used

At the production plant

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

At retail

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

Preventive measures in place

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

Control program/mechanisms

The control program/strategies in place

There is no official surveillance of *L. monocytogenes* in food and surveillance is done through various projects initiated by the National food administration (SLV), municipalities and other research institutions.

Measures in case of the positive findings

If *Listeria* is found in food that will not be further heat-treated the food is regarded as unfit for human consumption if 3 out of 5 samples or more are found positive or 1 or more contains $\hat{\geq}100$ *L. monocytogenes*/gram. At retail level, where usually only one sample is taken the food will be regarded as unfit for human consumption if $\hat{\geq}100$ *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 2006 see the prevalence tables for food

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

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

Additional information

During 2001, the National Food Administration (SLV) and the local municipalities performed a project with the aim to investigate the prevalence of *L. monocytogenes* in different ready-to-eat-foods. Out of 3600 samples, 63 (1.7%) were positive. It was shown that fish products had the highest percentage (6.2%) of positive samples.

Table Listeria monocytogenes in milk and dairy products

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for L.monocytogenes | Listeria monocytogenes presence in x g | > detection limit but =< 100 cfu/g | L. monocytogenes > 100 cfu/g |
|--|-----------------------|---------------|---------------|--------------|--|--|------------------------------------|------------------------------|
| | | | | | | | | |

Footnote

The reports from the local authorities do not differentiate between milk and milkproducts from different species. 2 samples of pasteurised milk, 20 cheeses and one other milkproduct were reported for 2006. One sample of cheese was found unfit for human consumption. The information is not complete and therefore not reported in the table.

Table Listeria monocytogenes in other foods

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for L.monocytogenes | Listeria monocytogenes presence in x g | > detection limit but =< 100 cfu/g | L. monocytogenes > 100 cfu/g |
|--|-----------------------|---------------|---------------|--------------|--|--|------------------------------------|------------------------------|
| Fish | | | | | | | | |
| smoked | local authorities | single | 1 gram | 28 | | | | 1 |
| Other processed food products and prepared dishes | local authorities | single | 1 gram | 197 | | | | 1 |
| Meat from bovine animals and pig | local authorities | single | 1 gram | 159 | | | | 15 |
| Vegetables | local authorities | single | 1 gram | 10 | | | | 0 |

2.3.3. Listeria in animals

A. Listeria spp. in animal - all animals

Monitoring system

Sampling strategy

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

Frequency of the sampling

When there is a suspected case.

Case definition

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

Diagnostic/analytical methods used

The diagnostic methods used include histopathology, immunohistochemistry and bacteriology.

Measures in case of the positive findings or single cases

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

Notification system in place

Listeriosis is notifiable in all animal species.

Results of the investigation

In 2006, 33 sheep, 4 cattle and 1 goat tested positive for Listeria. Other animals that tested positive were 1 dog, 1 deer and 1 pigeon. The number of tested animals is unknown.

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

Before 1999, there were between 10 and 20 reported listeria infections in animals per year. However, the number of cases increased from 1999 and onward (33-51 per year). An explanation for this may be the increased use of big bale silage.

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

As Listeria spp are present in the environment and also to a small degree in food-producing animals, a risk of contracting domestic listeriosis does exist. However, cases of listeriosis in animals and listeriosis in humans are often not epidemiologically linked.

Table Listeria in animals

| | Source of information | Sampling unit | Units tested | Total units positive for Listeria spp. | L. monocytogenes | Listeria spp., unspecified |
|--------------------------------|-----------------------|---------------|--------------|--|------------------|----------------------------|
| Cattle (bovine animals) | SJV | animal | | 4 | | |
| Sheep | SJV | animal | | 33 | | |
| Goats | SJV | animal | | 1 | | |
| Dogs | | | | | | |
| pet animals | SJV | animal | | 1 | | |
| Deer | SJV | animal | | 1 | | |
| Birds (1) | SJV | animal | | 1 | | |

(1) : pigeon

Footnote

Units tested unknown.

2.4. E. COLI INFECTIONS

2.4.1. General evaluation of the national situation

A. Verotoxigenic Escherichia coli infections general evaluation

History of the disease and/or infection in the country

In 1996, VTEC O157 was isolated in Swedish cattle for the first time and human E. coli O157 infection was traced back to a cattle herd. The same year, VTEC O157 in cattle became notifiable. However, since 1999, VTEC O157 findings are only notifiable when associated with human EHEC.

Between 1997 and 2002 annual prevalence studies of VTEC among cattle at slaughter were conducted. Results showed that the prevalence was around 1%. In the prevalence study 2005/06 the prevalence was 3.4%. These figures cannot be compared as the laboratory methodology had been slightly modified.

Between 1998 and 2003, the number of domestic human VTEC O157 infections varied from 59-97, apart from 2002 when 129 cases were reported. This was due to an outbreak of VTEC O 157 infection (including 28 cases) in southern Sweden (county of Skane), caused by contaminated locally produced fermented cold-smoked sausages.

In 2004, the Communicable Diseases Act was changed to include all serotypes of VTEC instead of only VTEC O157. This change has caused a great increase in reported cases to a total number of 182.

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

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

VTEC infection is a serious zoonotic infection and cattle, or products there of, are important sources

of infection. The majority of human cases are reported from the western part of Sweden and in this region it seems to be a special cluster of VTEC O157, perhaps more pathogenic than others. Furthermore, most of the VTEC positive farms are located in the same area. Domestically produced food has been the source of infection at two larger outbreaks (see above). It cannot be excluded that outbreaks caused by domestic produced foods may occur in the future.

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

In 2006 the number of cases was lower again, as no large outbreaks were reported.

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.

2.4.2. Escherichia coli, pathogenic in foodstuffs

Table VT E. coli in food

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for Escherichia coli, pathogenic | E.coli, pathogenic, unspecified | Verotoxigenic E. coli (VTEC) | Verotoxigenic E. coli (VTEC) - VTEC O157 | Verotoxigenic E. coli (VTEC) - VTEC, unspecified |
|--|-----------------------|---------------|---------------|--------------|---|---------------------------------|------------------------------|--|--|
| | | | | | | | | | |

Footnote

The reports concerning VTEC from the local authorities in 2006 are not reliable. Most of the reported analyses are not VTEC but pres. E.coli and hence no reliable statistics can be given.

2.4.3. Escherichia coli, pathogenic in animals

A. Verotoxigenic Escherichia coli in cattle (bovine animals)

Monitoring system

Sampling strategy

TRACE BACK OF HUMAN INFECTION:

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

If a cattle herd has been linked to a human EHEC case and VTEC strains with identical subtyping pattern (PFGE) as the human isolate has been isolated from cattle, it is recommended that animals from this farm are sampled during slaughter. From those animals, carcase swabs are collected and the carcasses are arrested awaiting the answer of this investigation.

PREVALENCE STUDIES:

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

Frequency of the sampling

Animals at farm

Other: Trace back of human VTEC infection.

Animals at slaughter (herd based approach)

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

Type of specimen taken

Animals at farm

Other: Faeces and/or milkfilter.

Animals at slaughter (herd based approach)

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

Methods of sampling (description of sampling techniques)

Animals at farm

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

For individual faecal samples, approximately 30 g of faeces are collected.

Animals at slaughter (herd based approach)

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

SINGLE STUDY (ANIMAL BASED APPROACH):

After slaughter 30 g of faeces were collected from the rectum with disposable plastic gloves and placed in plastic cups. Also, the outer 1/3 of the ear was removed after slaughter. Samples collected in the study were analysed individually.

Case definition

Animals at farm

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

Animals at slaughter (herd based approach)

A positive herd is defined as a herd from which an animal tested positive for the VTEC serotype investigated for.

SINGLE STUDY:

A case was defined as an animal from which VTEC O157 was isolated.

Diagnostic/analytical methods used

Animals at farm

Other: NMKL No 164:2005 2nd ed

Animals at slaughter (herd based approach)

Other: NMKL No 164:2005 2nd ed

Other preventive measures than vaccination in place

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

Control program/mechanisms

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).

Suggestions to the Community for the actions to be taken

It could be discussed if it would be beneficial to harmonise monitoring of VTEC prevalence in cattle within the EU.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

5 cattle farms were sampled for VTEC in trace back of human infection. From 2 farms, identical VTEC O157 strains were isolated as from the patients, and from one farm VTEC O121. From the latter farm, VTEC O121 was also isolated from sheep. From additional two sheep farms the same strains of VTEC O157 and O103 was isolated as from human cases.

The prevalence study conducted at slaughter 2005-06 was finalised in 2006. During 2006, 1205 faecal samples were analysed and of those 37 (3%) were positive. Furthermore, 294 ear samples were analysed and 32 (11%) were positive.

Results from the whole study period (2005/06) were as follows: 61/1773 (3.4%) faecal samples were positive and 55/451 (12%) ear samples.

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

VTEC infection is regarded as a serious zoonotic infection and cattle, or products thereof, are important sources of human infection. A large proportion of human VTEC O157 cases are reported from the western part of Sweden (county of Halland). It has also been shown that a large proportion of VTEC O157 positive farms are in the same area. It seems to be a special cluster of VTEC O157 in this region, perhaps more pathogenic than others.

It cannot be excluded that outbreaks caused by domestic produced foods will occur in the future.

Compared with previous studies the prevalence increased from around 1% to 3.4%. Reasons for this can be a slightly modified bacteriological culture method, or a true increased prevalence.

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 un-pasteurised milk. Two outbreaks caused by domestic food has 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 infection was locally produced salad that had been irrigated by contaminated water from a nearby canal. Both outbreaks were reported from areas where VTEC O157 is prevalent in cattle farms.

Additional information

In 1996, VTEC O157 was isolated in Swedish cattle for the first time and human E. coli O157 infection was traced back to presence of VTEC O157 in a cattle herd. Restrictions were laid on the herd and surveillance was initiated. The same year, VTEC O157 in cattle became notifiable. However, since 1999, VTEC O157 findings are only notifiable when associated with human VTEC infection.

From 1996-2006, one to ten farms have been investigated annually as suspected sources of human infection. Of those, 1-4 farms per year have been confirmed as sources of infection (in total 38 herds). VTEC O157 have been detected on all farms but four (VTEC O8, O26, O121 and O103). One of the herd was a goat herd and two had sheep.

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

Between 1996 and 2003, the industry (Swedish Meats) analysed 334-968 carcass swabs at the slaughterhouses. Sporadic positive samples were found during four years.

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

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

Table VT E. coli in animals

| | Source of information | Sampling unit | Units tested | Total units positive for Escherichia coli, pathogenic | E.coli, pathogenic, unspecified | Verotoxigenic E. coli (VTEC) | Verotoxigenic E. coli (VTEC) - VTEC O157 | Verotoxigenic E. coli (VTEC) - VTEC, unspecified | Verotoxigenic E. coli (VTEC) - VTEC O103 | Verotoxigenic E. coli (VTEC) - VTEC O121 |
|--|-----------------------|---------------|--------------|---|---------------------------------|------------------------------|--|--|--|--|
| Cattle (bovine animals) (1) | SJV | herd | 5 | 3 | | 3 | 2 | | | 1 |
| - at slaughterhouse - animal sample - faeces - Surveillance - surveillance survey - objective sampling (3) | SJV | animal | 1205 | 37 | | 37 | 37 | | | |
| - at slaughterhouse - animal sample - Surveillance - surveillance survey - objective sampling (4) | SJV | animal | 294 | 32 | | 32 | 32 | | | |
| Sheep (2) | SJV | herd | 3 | 3 | | 3 | 1 | | 1 | 1 |
| Solipeds, domestic | SJV | animal | 1 | 0 | | | | | | |

- (1) : Trace back investigation of human VTEC infection. The O121 positive farm also had sheep positive for the same serotype.
 (2) : Trace back investigation of human VTEC infection. The farm positive for O121 also had O121 positive cattle.
 (3) : Faecal samples from the prevalence study 2006/07. 1205 out of 1773 samples were collected in 2006.
 (4) : Ear samples from the prevalence study 2006/07. 294 out of 451 ear samples were collected in 2006.

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.

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 elephants is small, but cannot be ruled out as elephants, and other relevant animals at zoos, might carry subclinical infection.

2.5.2. Mycobacterium in animals

A. Mycobacterium bovis in bovine animals

Status as officially free of bovine tuberculosis during the reporting year

The entire country free

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

Monitoring system

Sampling strategy

Monitoring is performed by meat inspections at slaughter of food producing animals. The inspection is performed by the SLV. If TB is suspected, samples are collected and analysed at the SVA. Furthermore, tuberculin tests are performed at artificial insemination stations and at export/import of animals as required according to EU-legislation (Council Directive 64/432/EEC). Sampling is also performed in case of clinical suspicion.

Frequency of the sampling

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

Type of specimen taken

Organs/ tissues: Samples from organs/tissues with suspected lesions and adjacent lymph nodes. Both fresh and formalin fixed samples.

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive 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, mesenterial, 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 (for ex clinical- or post mortem suspicion).

Results of the investigation

In total, 9 cattle were investigated for *M. bovis* in 2006, all were negative. Of those, reasons for investigation was that TB could not be ruled out at slaughter inspection (n=7) and at autopsy (n=2). Culture was performed in one animal.

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

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

Additional information

Animals other than cattle:

Apart from the tested cattle mentioned above, other animals were also tested for bovine TB in 2006. For example, 19 pigs were investigated, following suspicion at meat inspection. After histological investigation and direct smears 5 were cultured. All were negative. Other animal species tested are shown in Table Tuberculosis in other animals.

B. Mycobacterium bovis in farmed deer

Monitoring system

Sampling strategy

In 1994, a voluntary official control programme was implemented. In June 2003, the control programme became compulsory. In the programme, tuberculin tests are performed regularly and any herd found positive for bovine TB is depopulated. Furthermore, all animals are inspected at slaughter. In the voluntary programme, all animals >1 year that are found dead or euthanised are subjected to autopsy, whereas this applies to animals of all ages in the mandatory programme.

Sampling is also performed in case of clinical suspicion.

Frequency of the sampling

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

SAMPLING IN THE CONROL PROGRAMME

In brief, a herd obtains Bovine TB-free status (A-status) after three consecutive whole herd tuberculin tests of all deer older than one year, with negative results. Only herds with A-status may sell live deer and to maintain the A-status all female deer have to be tested after two years and then every third year, without reactors. Bovine TB-free status can also be obtained by slaughter of the whole herd and repopulation with deer from TB-free herds (A-status).

Type of specimen taken

Organs/ tissues: Samples from organs/tissues with suspected lesions and adjacent lymph nodes. Both fresh and formalin fixed samples.

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive tuberculin test, several lymph nodes are collected for histopathology, acid fast staining of direct smears and mycobacterial culture. Any organ with gross lesions is also sampled. Lymph nodes always collected for culture include retropharyngeal, submandibular, parotideal, medistinal, tracheobronchial, mesenterial, iliacal and inguinal lymph nodes. Lymph nodes are pooled for culture, wheras organs with pathological changes are cultured separately.

Case definition

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

Diagnostic/analytical methods used

Samples from necropsy/meat inspection are investigated by histology and direct smears. The result from these tests determines if culture is performed. 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 used on colony materials. If deemed necessary, re-culture is carried out at four weeks. In case mycobacteria in the *M. tuberculosis*-complex is isolated the strain is further subtyped.

Vaccination policy

Vaccination is not allowed.

Control program/mechanisms

The control program/strategies in place

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

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 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

All 635 deer herds in Sweden were affiliated in 2006. Since the beginning of the programme, 570 (90%) herds have been declared free from TB; 108 after three whole herd tuberculin tests, 372 after culling of the whole herd and subsequent meat inspection, and 90 herds were established with deer originating from TB free herds. Thus, 65 herds in the control programme are not yet declared free from TB. Compared with the previous year, 33 additional herds were declared free during 2006.

In the control programme, tuberculin tests were performed on 259 animals from 9 herds. One herd was tested twice.

16 deer were investigated by histology and direct smears after suspicion at meat inspection. All samples were negative.

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

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

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

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

Additional information

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

C. M. tuberculosis in animal - Zoo animals

Monitoring system

Sampling strategy

Sampling is performed in case of clinical suspicion, or if suspected lesions are detected at autopsy.

Type of specimen taken

Organs/ tissues: Samples from organs/tissues with suspected lesions and adjacent lymph nodes. Both fresh and formalin fixed samples. Also tracheal and trunk samples may be taken.

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive tuberculine test, several lymph nodes are collected for histopathology, acid fast staining of direct smears and mycobacterial culture. Any organ with gross lesions is also sampled. Lymph nodes always collected for culture include retropharyngeal, submandibular, parotideal, medistinal, tracheobronchial, mesenterial, iliacal

and inguinal lymph nodes. Lymph nodes are pooled for culture, 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 TB-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. Cultures are read once/week for eight weeks and microscopy of suspected colonies is performed. If deemed necessary, re-culture is carried out at four weeks. If growth of acid-fast rods is seen, a molecular probe for the *M. tuberculosis* complex is used on colony material. In case mycobacteria in the *M. tuberculosis*-complex are isolated the strain is further subtyped.

Vaccination policy

Vaccination is not allowed.

Other preventive measures than vaccination in place

Presently, trunk- or tracheal lavage for detection of mycobacteria in the *M. tuberculosis*-complex in

elephants, and other relevant zoo-animals, are performed at the two largest Zoos in Sweden, where TB has been diagnosed on a few occasions since 2001.

Control program/mechanisms

The control program/strategies in place

There is no specific control programme for Zoo animals.

Suggestions to the Community for the actions to be taken

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

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

In 2006, one out of two tested giraffes was positive for M. tuberculosis. The giraffe was from a zoo in the Eastern part of Sweden. A few other exotic animals were tested at this zoo, those are presented in the table "Tuberculosis in other animals".

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

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

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

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

The risk for Zoo visitors to become infected is regarded as very small due to the sporadic contact with the animals.

Additional information

In 2001, *M. tuberculosis* was isolated from a diseased riding elephant at a zoo in the eastern part of Sweden. The zoo was immediately put under official restrictions and tuberculin testing and/or bacteriological sampling was initiated in all contact animals and animal keepers. In total 5 elephants, including the index case, and one giraffe were euthanised due to positive culture. In 2003, the restrictions were lifted after cleaning and disinfection of all buildings and other housing of the infected animals. No human infection has been identified associated to these animal cases.

In Dec 2004, a female elephant at a Zoo in the western part of Sweden was positive for *M. Tuberculosis*. An epidemiological link was found between the two Zoos, and subtyping of the bacterial isoaltes confirmed this link.

In 2005, one giraff from a Zoo at the eastern part of Sweden was culture positive for *M. Tuberculosis*.

Table Tuberculosis in other animals

| | Source of information | Sampling unit | Units tested | Total units positive for Mycobacterium spp. | M. bovis | M. tuberculosis | Mycobacterium spp., unspecified |
|------------------------------------|-----------------------|---------------|--------------|---|----------|-----------------|---------------------------------|
| Sheep | SVA, SJV | animal | 3 | 0 | | | |
| Pigs | SVA, SJV | animal | 19 | 0 | | | |
| Zoo animals, all (1) | SVA, SJV | animal | 1 | 0 | | | |
| Cattle (bovine animals) (2) | SVA, SJV | animal | 9 | 0 | | | |
| Solipeds, domestic | | | | | | | |
| horses | SVA, SJV | animal | 1 | 0 | | | |
| Dogs (3) | SVA, SJV | animal | 7 | 0 | | | |
| Cats | SVA, SJV | animal | 4 | 0 | | | |
| Mouflons | SVA, SJV | animal | 2 | 0 | | | |
| Alpacas | | | | | | | |
| zoo animals | SVA, SJV | animal | 1 | 0 | | | |
| Antelopes | | | | | | | |
| zoo animal (4) | SVA, SJV | animal | 1 | 0 | | | |
| Marine mammals | | | | | | | |
| zoo animals (5) | SVA, SJV | animal | 1 | 0 | | | |
| Giraffes | | | | | | | |
| zoo animal (6) | SVA, SJV | animal | 2 | 1 | | 1 | |
| Deer | | | | | | | |
| farmed (7) | SVA, SJV | animal | 16 | 0 | | | |

(1) : penguin

(2) : culture n=1

(3) : culture n=3

(4) : culture n=1

(5) : culture n=1, dolphin

(6) : The positive individual was preliminary identified in 2005, but cultured in 2006

(7) : culture n=1

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

| Region | Total number of existing bovine | | Officially free herds | | Infected herds | | Routine tuberculin testing | | Number of tuberculin tests carried out before the introduction into the herds (Annex A(I)(2)(C) third indent (1) of Directive 64/432/EEC) | Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological examinations | Number of animals detected positive in bacteriological examination |
|---------|---------------------------------|---------|-----------------------|-----|-----------------|---|---|--------------------------|---|--|--|
| | Herds | Animals | Number of herds | % | Number of herds | % | Interval between routine tuberculin tests (*) | Number of animals tested | | | |
| SVERIGE | 26179 | 1604933 | 26179 | 100 | 0 | 0 | | | 1 | | 0 |
| Total | 26179 | 1604933 | 26179 | 100 | 0 | 0 | | 0 | 1 | | 0 |

Footnote

Note that numbers of herds and animals are from 2005. Additional 8 cattle were subjected only to histopathology investigation, all were negative.

(*) Legend:

In column "Interval between routine tuberculin tests" use the following numeric codes: (0) no routine tests; (1) tests once a year; (2) tests each two years; (3) tests each three years concerning 24 month-old animals; (4) tests each 4 years; (5) others (please give details).

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 | 635 | 22361 | 570 | 89,764 | 0 | 0 | | | 1 | 0 | |
| Total | 635 | 22361 | 570 | 89,764 | 0 | 0 | 0 | 0 | 1 | 0 | |

Footnote

*570 herds are free, the remaining 65 are not classified as infected. If a herd would be infected, all animals are euthanised. *Tuberculin testing: There is a stepwise procedure for a herd to be declared free. For detailed information, see text "Mycobacterium bovins in farmed deer" *Additional 15 animals were subjected only to histopathological examination.

(*) Legend:

In column "Interval between routine tuberculin tests" use the following numeric codes: (0) no routine tests; (1) tests once a year; (2) tests each two years; (3) tests each three years concerning 24 month-old animals; (4) tests each 4 years; (5) others (please give details).

2.6. BRUCELLOSIS

2.6.1. General evaluation of the national situation

A. Brucellosis general evaluation

History of the disease and/or infection in the country

The last case of bovine brucellosis in Sweden was reported in 1957. Brucellosis has not been diagnosed in other animal species. Sweden was declared officially brucellosis free (OBF) in cattle 1995 and in goats and sheep (OBmF) 1994, and fulfils the requirements on control measures in OBF and OBmF member states.

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

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

The national situation remains stable. This is shown in the yearly serological surveillance in cattle, pigs, sheep and goats. Since the start of the surveillance (mid 1990s), no positive sample has been detected.

Each year there are usually a few clinical suspicions of brucella infection in animals, for example abortions or genital infections, all of which have been negative in serological/bacteriological analyses.

The situation in humans remains stable.

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

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

and ObmF.

2.6.2. Brucella in foodstuffs

2.6.3. Brucella in animals

A. Brucella abortus in bovine animals

Status as officially free of bovine brucellosis during the reporting year

The entire country free

Sweden is declared officially brucellosis free (OBF) in cattle since 1994, Decision 2003/467/EC last amended by Decicion 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

All clinically suspected cases have to be confirmed serologically and bacteriologically. Cattle are investigated serologically at breeding stations and before import or export. On a national initiative, serological surveys are regularly performed in cattle, in bulk milk and/or individual serum samples. The industry (Swedish Dairy Association) collect serum and bulk milk samples in their various control programmes. Of those samples, 1000 serum and 2000 bulk milk samples, respectively, are systematically collected for serological screening of *Brucella abortus*.

Frequency of the sampling

The serological screening is performed anually. Individual animals are sampled at breeding stations and at import/export. Herds are also sampled when there is a suspicion of brucellosis.

Type of specimen taken

Other: serum and/or milk

Methods of sampling (description of sampling techniques)

Milk samples and sera are collected from dairy herds. The milk samples are pooled (5-50 individuals) before analysis. From beef herds, sera is only collected from cattle >2 years old. At least 0.5 ml sera is analysed.

Case definition

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

Diagnostic/analytical methods used

The diagnostic test used is an indirect ELISA. For confirmation the complement fixation test and sometimes other tests, such as the tube agglutination test or the Rose Bengal test, are used.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

In the screening programme, serum samples from 1 000 cattle and bulk milk samples from 2000 dairy herds were analysed by use of an indirect ELISA. All samples were negative.

Additionally, 778 breeding animals, or animals for export, were tested and all were negative.

In three abortions of calves brucellosis could not be ruled out and culture were performed. However, none was positive.

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

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

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

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

Additional information

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

Several other animal species were tested before, mainly breeding or at import/export (see table "Brucellosis in other animals").

B. *Brucella melitensis* in sheep

Status as officially free of ovine brucellosis during the reporting year

The entire country free

Sweden is declared officially brucellosis free and in goats and sheep (OBmF) since 1994 (Decision 94/972/EC). The current surveillance standards are given in EU legislation, Directive 91/68/EEC.

Monitoring system

Sampling strategy

In sheep and goats, surveillance is based on serological surveys according to EU-legislation. The samples from the sheep are collected within the voluntary control programme for Maedi-Visna. The number of samples each year represent approximately 5% of the sheep population.

In addition to this, all clinically suspected cases have to be examined serologically and bacteriologically. Samples are also collected at import/export.

Frequency of the sampling

Annual testing of a sample of sheep. Herds are also sampled when there is a suspicion of brucellosis. Test are performed at import/export.

Type of specimen taken

Blood

Case definition

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

Diagnostic/analytical methods used

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

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

In total, 9597 individual serum samples from sheep were analysed and all were negative.

27 animals for import/export tested negative.

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

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

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

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

Additional information

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

C. *Brucella melitensis* in goats

Status as officially free of caprine brucellosis during the reporting year

The entire country free

Sweden is declared officially brucellosis free in goats and sheep (OBmF) since 1994 (94/972/EC). Current surveillance standards are given in EU legislation, Directive 91/68/EEC.

Monitoring system

Sampling strategy

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

Frequency of the sampling

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

Type of specimen taken

Blood

Case definition

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

Diagnostic/analytical methods used

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

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

In total, 427 individual sera from goats were analysed for antibodies against *B. melitensis*. All were negative.

Additional 9 goats tested negative at breeding or at export/import.

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

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

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

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

Additional information

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

D. *Brucella* spp. in animal - Pigs

Monitoring system

Sampling strategy

The declaration of freedom from brucellosis in Swedish pigs is based on annual testing of a random sample of the pig population. The samples are collected within the yearly screening of Aujeszky's disease.

Frequency of the sampling

Annual testing in the serological screening. Animals are also tested at breeding stations and at import/export. Herds are sampled if there is a suspicion of brucellosis.

Type of specimen taken

Blood

Methods of sampling (description of sampling techniques)

The samples size is at least 0.5 ml sera.

Case definition

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

Diagnostic/analytical methods used

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

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

In total, 3000 individual serum samples from pigs were analysed for antibodies against *Brucella suis*. All samples were negative. Additional 231 sera from wild boars were screened and all were negative.

Apart from this, 1801 breeding animals or animals aimed for export/import tested negative.

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

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

Since 1995, *Brucella* has been screened for in approximately 3000 samples from pigs every year. Out of all these samples, none have been confirmed positive.

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

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

Additional information

Table Brucellosis in other animals

| | Source of information | Sampling unit | Units tested | Total units positive for Brucella spp. | B. melitensis | B. abortus | B. suis | Brucella spp., unspecified |
|---|-----------------------|---------------|--------------|--|---------------|------------|---------|----------------------------|
| Pigs (1) | SVA | animal | 1801 | 0 | | | | |
| - at farm - animal sample - blood - Surveillance - official controls (other than control and eradication programmes) - official sampling - objective sampling | SVA | animal | 3000 | 0 | | | | |
| Wild boars (2) | SVA | animal | 231 | 0 | | | | |
| Dogs | | | | | | | | |
| pet animals (3) | SVA | animal | 135 | 0 | | | | |
| Solipeds, domestic | | | | | | | | |
| horses | SVA | animal | 1 | 0 | | | | |
| Camels (4) | SVA | animal | 19 | 0 | | | | |
| Reindeers (5) | SVA | animal | 112 | 0 | | | | |
| Moose (6) | SVA | animal | 8 | 0 | | | | |
| Deer (7) | SVA | animal | 41 | 0 | | | | |
| Antelopes (8) | SVA | animal | 5 | 0 | | | | |
| Alpacas (9) | SVA | animal | 8 | 0 | | | | |
| Lamas (10) | SVA | animal | 4 | 0 | | | | |
| Cattle (bovine animals) (11) | SVA | animal | 778 | 0 | | | | |
| Goats (12) | SVA | animal | 11 | 0 | | | | |
| Sheep (13) | SVA | animal | 27 | 0 | | | | |
| Capricorns (14) | SVA | animal | 6 | 0 | | | | |
| Other ruminants | SVA | animal | 1 | 0 | | | | |

- (1) : breeding animals and animals for export
(2) : screening
(3) : breeding, import/export and clinical suspicions
(4) : export/import
(5) : export
(6) : export
(7) : export/import (21 fallow deer and 20 red deer)
(8) : export/import
(9) : export/import
(10) : export/import
(11) : breeding animals, animals for export/import
(12) : export/import
(13) : export/import

(14) : export/import

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

| Region | Total number of existing bovine | | Officially free herds | | Infected herds | | Surveillance | | | | | | Investigations of suspect cases | | | | | | | | | | | |
|---------|---------------------------------|---------|-----------------------|-----|-----------------|---|-------------------------------|--------------------------|---------------------------------|----------------------------------|-----------------------------------|--------------------------|---|--|---|---|---------------------------|--|--|---|---|---|---|---|
| | Herds | Animals | Number of herds | % | Number of herds | % | Serological tests | | | Examination of bulk milk samples | | | Information about abortions | | | Epidemiological investigation | | | | | | | | |
| | | | | | | | Number of bovine herds tested | Number of animals tested | Number of infected herds tested | Number of bovine herds tested | Number of animals or pools tested | Number of infected herds | Number of notified abortions whatever cause | Number of isolations of Brucella infection | Number of abortions due to Brucella abortus | Number of animals tested with serological (blood tests) | Number of suspended herds | Number of positive animals (Serologically) | Number of animals examined microbiologically | Number of animals positive microbio logically | | | | |
| SVERIGE | 26179 | 1604933 | 26179 | 100 | 0 | 0 | 0 | 1000 | 0 | 2000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 26179 | 1604933 | 26179 | 100 | 0 | 0 | 1000 | 0 | 2000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Footnote

Note that figures for number of herds and animals are from 2005. Breeding animals and animals tested at import/export are not presented here as they were not sampled as "investigation of suspected cases".

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

| Region | Total number of existing ovine / caprine | | Officially free herds | | Infected herds | | Surveillance | | | Investigations of suspect cases | | | | |
|---------|--|---------|-----------------------|-----|-------------------|---|------------------------|--------------------------|--------------------------|---|--|---|---|---------------------------|
| | Herds | Animals | Number of herds | % | Number of animals | % | Number of herds tested | Number of animals tested | Number of infected herds | Number of animals tested with serological blood tests | Number of animals positive serologically | Number of animals examined microbologically | Number of animals positive microbologically | Number of suspended herds |
| SVERIGE | 7653 | 476793 | 7653 | 100 | 0 | 0 | 0 | 10024 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 7653 | 476793 | 7653 | 100 | 0 | 0 | 0 | 10024 | 0 | 0 | 0 | 0 | 0 | 0 |

Footnote

Note that number of animals and number of herds are from 2005 and include only sheep. Breeding animals and animals tested at import/export are not presented here as they were not sampled as "investigation of suspected cases".

2.7. YERSINIOSIS

2.7.1. General evaluation of the national situation

A. Yersinia enterocolitica general evaluation

History of the disease and/or infection in the country

Yersinia infection is not notifiable in animals, therefore there is little epidemiological data on the occurrence of the disease in animals.

In the beginning of the 1990s there were about 1000 annual human cases. Since then, there has been a decrease in the number of cases, which might be attributed to improved hygiene at slaughter and/or decreased sampling in patients. During the last five years, around 550-800 cases per year have been reported.

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

Approximately 70% of human yersinia infections are of domestic origin. Of these, children below the age of six years predominate.

In 2005, for the first time in many years, less cases were reported than during the year before. In 2006 the trend was still pointing downwards.

The majority of the cases were as usual in the age group under ten years and a small majority was men.

In general, it is expected that meat from pigs are a common source of infection in humans.

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

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

Recent actions taken to control the zoonoses

2.7.2. Yersinia in foodstuffs

A. Yersinia spp. in food

Monitoring system

Sampling strategy

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

Diagnostic/analytical methods used

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

Measures in case of the positive findings or single cases

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

Results of the investigation

In 2006 the local authorities reported altogether 34 samples of various foods analysed for *Yersinia* in various categories of foods. No sample was positive for *Yersinia*.

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 spp. | Y. enterocolitica | Yersinia spp., unspecified | Y. enterocolitica - O:3 | Y. enterocolitica - O:9 | Y. enterocolitica - unspecified |
|--|-----------------------|---------------|---------------|--------------|--|-------------------|----------------------------|-------------------------|-------------------------|---------------------------------|
| | | | | | | | | | | |

Footnote

Yersinia analyses were reported from 16 samples of ready -to -eat foods, 8 samples from red meat, 1 from fish products , 1 from molluscs, 1 from soups, 1 from cereals , 3 from fruits and vegetables and 3 from herbs and spices. No Yersiniapositive samples were reported. The information is not complete and therefore not reported in the table.

2.7.3. Yersinia in animals

A. Yersinia enterocolitica in pigs

Control program/mechanisms

The control program/strategies in place

There is no surveillance of Yersinia spp. in animals.

Notification system in place

Findings of Yersinia are not notifiable in animals.

Table Yersinia in animals

| | Source of information | Sampling unit | Units tested | Total units positive for Yersinia spp. | Y. enterocolitica | Yersinia spp., unspecified | Y. enterocolitica - O:9 | Y. enterocolitica - O:3 | Y. enterocolitica - unspecified |
|--|-----------------------|---------------|--------------|--|-------------------|----------------------------|-------------------------|-------------------------|---------------------------------|
| | | | | | | | | | |

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 free living or farmed wild boars and other wild life.

The last outbreak with human cases occurred in 1969.

Since the beginning of the 1990's just two sporadic cases have been reported, one in 1997 and one in 2004. The last case had consumed cold smoked pork abroad.

The Directive 2075/2005 was not implemented in Sweden during 2006.

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

Trichinosis in farmed animals is, and has been, extremely rare for many years. The prevalence of *Trichinella* spp in wildlife that might be eaten (wild boars) is low to very low, while it is higher in carnivorous wildlife such as foxes, lynxes, wolves and bears.

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

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

2.8.2. Trichinella in animals

A. Trichinella in pigs

Number of officially recognised Trichinella-free holdings

Sweden has not implemented a system of trichinella free holdings during 2006.

Monitoring system

Sampling strategy

General

Sweden did not implement a system of trichinella free holdings, or regions with negligible Trichinella risk, during 2006.

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

Frequency of the sampling

General

Every slaughtered pig is sampled.

Type of specimen taken

General

Diaphragm muscle

Methods of sampling (description of sampling techniques)

General

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

VILKA Å R DET???

Case definition

General

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

Diagnostic/analytical methods used

General

Artificial digestion method of collective samples.

Measures in case of the positive findings or single cases

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

Notification system in place

Trichinosis is compulsory notifiable in animals.

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

All slaughtered pigs (domestic pigs and wild boars) were negative for *Trichinella* spp.

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

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

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

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

Additional information

In 2006, 2/202 foxes, 3/70 lynx and 2/9 wolves were positive for trichinella. All investigated bears were negative.

B. Trichinella in horses

Monitoring system

Sampling strategy

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

Frequency of the sampling

Every slaughtered horse (soliped) is sampled.

Type of specimen taken

Samples for musculus masseter or the tongue is analysed.

Methods of sampling (description of sampling techniques)

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

Case definition

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

Diagnostic/analytical methods used

Artificial digestion method of collective samples.

Results of the investigation including the origin of the positive animals

All slaughtered horses were negative for *Trichinella* spp.

Measures in case of the positive findings or single cases

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

Notification system in place

Trichinosis is compulsory notifiable.

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.

Table Trichinella in animals

| | Source of information | Sampling unit | Units tested | Total units positive for Trichinella spp. | T. spiralis | Trichinella spp., unspecified |
|---------------------------|-----------------------|---------------|--------------|---|-------------|-------------------------------|
| Pigs (1) | SVA | animal | 3033740 | 0 | | |
| Solipeds, domestic | | --- | | | | |
| horses (3) | SVA | animal | 3009 | 0 | | |
| Wild boars | | | | | | |
| wild (2) | SVA | animal | 11226 | 0 | | |
| Foxes | SVA | animal | 202 | 2 | | 2 |
| Bears (4) | SVA | animal | 108 | 0 | | |
| Lynx | SVA | animal | 70 | 3 | | 3 |
| Wolves | SVA | animal | 9 | 2 | | 2 |
| Other animals | SVA | animal | 29 | 0 | | |

- (1) : all slaughtered animals
- (2) : all slaughtered animals, wild and farmed wild boars
- (3) : all slaughtered animals
- (4) : all slaughtered animals

2.9. ECHINOCOCCOSIS

2.9.1. General evaluation of the national situation

A. Echinococcus spp. general evaluation

History of the disease and/or infection in the country

The last diagnosed cases of *E. granulosus* in animals was in 1997 (one reindeer) and 2000 (one moose). *E. multilocularis* has never been diagnosed in the country.

Notification of echinococcosis in humans was initiated in 1994 and since then 3-14 cases have been reported annually, all assumed to have been infected abroad.

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

The situation in Sweden remains stable, but as *E. multilocularis* spreads within Europe, a high awareness and risk mitigating measures are important. In 2006, a risk assessment of introducing *E. multilocularis* into Sweden from EU and the effect of 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 and the risk of domestic infection is at present negligible. 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 antihelmintic is implemented and complied with.

Recent actions taken to control the zoonoses

Since 1994 all dogs that are brought in from countries other than Finland and Norway must be

treated with praziquantel as a preventive measure.

Suggestions to the Community for the actions to be taken

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

2.9.2. Echinococcus in animals

A. E. granulosus in animal

Monitoring system

Sampling strategy

All food producing animals are macroscopically examined at slaughter. If there is a suspicion of echinococcosis, samples are investigated microscopically.

Samples from foxes are collected as part of annual investigations of around 300 foxes. Single necropsied, mainly wild wolves, may also be examined.

Type of specimen taken

Other: Feces and gut tissue from foxes and cyst material from intermediate hosts.

Methods of sampling (description of sampling techniques)

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

Case definition

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

Diagnostic/analytical methods used

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

Control program/mechanisms

The control program/strategies in place

In order to prevent the introduction of *E. multilocularis*, dogs that are brought in from countries other than Finland and Norway must be treated with praziquantel. This treatment also prevents additional introduction of *E. granulosus*.

Measures in case of the positive findings or single cases

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

Notification system in place

Echinococcosis is a notifiable disease in all animals.

Results of the investigation

In 2006, neither *E. granulosus* or *E. multilocularis* was found at inspection of all slaughtered animals. 300 foxes were sampled and all were negative.

Additional 4 wolves that were subjected to necroscopy tested negative.

All slaughtered animal were investigated macroscopically, and microscopically if deemed necessary. All were negative.

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

Sporadic cases of *E. granulosus* infection have occurred in imported horses that most probably were infected abroad. In reindeer, *E. granulosus* infection was prevalent in northern Sweden during the 1970s when around 2% of the reindeer were found infected at slaughter. Based on these findings, the routines at meat inspection of reindeer were revised and organs not approved for consumption were

destroyed. During 1986-96 there was no case diagnosed in reindeer, followed by 3 cases in 1996-97. From elks, there have been two positive findings of *E. granulosus*, one in the early 1980s in the southern part of Sweden and one in 2000 in the central part of the country.

Since 2001 there has been an annual investigation of 300-400 foxes in order to detect *E. multilocularis* and *E. granulosus*. None of the investigated animals have tested positive.

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

The risk of obtaining domestic echinococcosis is negligible.

B. E. multilocularis in animal

Monitoring system

Sampling strategy

All food producing animals are macroscopically examined at slaughter. If there is a suspicion of echinococcosis, samples are investigated microscopically.

Samples from foxes are collected as part of annual investigations of around 200-400 foxes.

In addition, *E. multilocularis* will be look for when, mainly, wild wolves are examined post mortem.

Type of specimen taken

Other:

Methods of sampling (description of sampling techniques)

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

Case definition

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

Diagnostic/analytical methods used

Other: In food producing animals surveillance is based on slaughter inspections, whereas the Copro-Elisa-test and sedimentation is used in foxes.

Control program/mechanisms

The control program/strategies in place

In order to prevent the introduction of *E. multilocularis*, dogs that are brought in from countries other than Finland and Norway must be treated with praziquantel.

Suggestions to the Community for the actions to be taken

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

Measures in case of the positive findings or single cases

If an animal is found infected with *Echinococcus* spp. the offal will be destroyed. If *E. multilocularis* is found in Swedish animals, there would be a need of increased public awareness on this matter and an education campaign on the risk of exposure from wildlife would be started.

Notification system in place

Echinococcosis is a notifiable disease in all animals.

Results of the investigation

In 2006, neither *E. granulosus* or *E. multilocularis* was found in slaughtered animals. 300 foxes were sampled and all tested negative.

Additional 4 wolves that were subjected to necropsy tested negative.

All slaughtered animals were investigated macroscopically, and microscopically if deemed necessary. All 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.

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

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

The risk of obtaining domestic echinococcosis is negligible.

Table Echinococcus in animals

| | Source of information | Sampling unit | Units tested | Total units positive for Echinococcus spp. | E. granulosus | E. multilocularis | Echinococcus spp., unspecified |
|------------------------------------|-----------------------|---------------|--------------|--|---------------|-------------------|--------------------------------|
| Cattle (bovine animals) (1) | SVA, SJV | animal | | 0 | | | |
| Sheep (2) | SVA, SJV | animal | | 0 | | | |
| Goats (3) | SVA, SJV | animal | | 0 | | | |
| Pigs (4) | SVA, SJV | animal | | 0 | | | |
| Solipeds, domestic (5) | SVA, SJV | animal | | 0 | | | |
| Reindeers (6) | SVA, SJV | animal | | 0 | | | |
| Foxes (7) | SVA | animal | 300 | 0 | | | |
| Wolves | | | | | | | |
| wild | SVA | animal | 4 | 0 | | | |

- (1) : macroscopic investigation of all slaughtered animals
- (2) : macroscopic investigation of all slaughtered animals
- (3) : macroscopic investigation of all slaughtered animals
- (4) : macroscopic investigation of all slaughtered animals
- (5) : macroscopic investigation of all slaughtered animals
- (6) : macroscopic investigation of all slaughtered animals
- (7) : annual screening

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.

2.10.2. Toxoplasma in animals

A. T. gondii in animal

Monitoring system

Sampling strategy

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

Notification system in place

Toxoplasmosis is not notifiable in animals.

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

Results for toxoplasma investigations were previously reported when a majority of the samples were analysed at the SVA. Nowadays, it is not known how large proportion of samples being analysed at other laboratories and, therefore, results for toxoplasmosis has 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 most important in immunosuppressed persons and in pregnant women.

Table Toxoplasma in animals

| | Source of information | Sampling unit | Units tested | Total units positive for Toxoplasma gondii |
|--|-----------------------|---------------|--------------|--|
|--|-----------------------|---------------|--------------|--|

2.11. RABIES

2.11.1. General evaluation of the national situation

A. Rabies general evaluation

History of the disease and/or infection in the country

The Swedish animal population has been free from rabies since 1886.

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

The national situation is stable. However, there are concerns about the risk of introducing rabies through the increased number of dogs that are brought into the country illegally.

Recent actions taken to control the zoonoses

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

2.11.2. Lyssavirus (rabies) in animals

A. Rabies in dogs

Monitoring system

Sampling strategy

The surveillance of rabies in Sweden is passive. Animals that are brought into the country illegally are tested for rabies, if they are euthanised. Also, there is a passive surveillance of bats and other wildlife sent in to the SVA.

Frequency of the sampling

Sampling is performed when there is a suspicion of rabies.

Type of specimen taken

Organs/ tissues: imprints from brain tissue

Methods of sampling (description of sampling techniques)

Specimens from brain tissue are analysed as soon as possible after collection.

Case definition

A case is defined as an animal from which rabies virus has been detected.

Diagnostic/analytical methods used

Other: fluorescent antibody test (FAT) performed on smears from hippocampus or medulla oblongata, and mouse inoculation test as a complementary test

Vaccination policy

Vaccination of animals is allowed but usually only traveling dogs and cats are vaccinated. Dogs and cats that are brought into the country has to be tested for levels of protective antibodies following vaccination.

Control program/mechanisms

The control program/strategies in place

Recent actions taken to control the zoonoses

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

Suggestions to the Community for the actions to be taken

One suggestion is to have import restrictions on dogs from areas where rabies virus strains are adapted to dogs.

Measures in case of the positive findings or single cases

If rabies were diagnosed, measures to eradicate the disease would be taken in accordance with the Swedish Act of Epizootics.

Notification system in place

Rabies is notifiable on clinical suspicion

Results of the investigation

Four dogs were investigated and all were negative.

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

Rabies has not occurred in Sweden since 1886. Dogs and cats from EU, EFTA countries and certain third countries (EU998/2003) can be brought into Sweden after rabies vaccination and antibody titre control, whereas dogs and cats from other countries have to be kept in quarantine for four months. Presently there is a great concern about increased number of illegally imported dogs into Sweden.

Additional information

Other animal species that were tested in 2006 were: 26 bats, 4 cats, 2 minks and 1 cattle, fox and squirrel, respectively. All were negative.

Veterinarians and the public are advised to send bats are found dead to the SVA for rabies investigation, and hunters are encouraged to notify SVA about wildlife that behave in a way that rabies might be suspected.

In 1987-89 and 1999, surveys were performed where sick (n=75) or dead bats (n=200) were investigated for rabies, all were negative. Between 1998 and 2005, 322 bats were investigated and all were negative.

Table Rabies in animals

| | Source of information | Sampling unit | Units tested | Total units positive for Lyssavirus (rabies) | unspecified Lyssavirus | European Bat Lyssavirus - unspecified | classical rabies virus (genotype 1) |
|--------------------------------|-----------------------|---------------|--------------|--|------------------------|---------------------------------------|-------------------------------------|
| Cattle (bovine animals) | SVA | animal | 1 | 0 | | | |
| Dogs | SVA | animal | 4 | 0 | | | |
| Cats | SVA | animal | 4 | 0 | | | |
| Bats | | | | | | | |
| wild | SVA | animal | 26 | 0 | | | |
| Foxes | | | | | | | |
| wild | SVA | animal | 1 | 0 | | | |
| Minks | SVA | animal | 2 | 0 | | | |
| Squirrels | SVA | animal | 1 | 0 | | | |

2.12. Q-FEVER

2.12.1. General evaluation of the national situation

2.12.2. Coxiella (Q-fever) in animals

Table Coxiella burnetii (Q fever) in animals

| | Source of information | Sampling unit | Units tested | Total units positive for Coxiella burnetii |
|--|-----------------------|---------------|--------------|--|
| | | | | |

3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE

3.1. ENTEROCOCCUS, NON-PATHOGENIC

3.1.1. General evaluation of the national situation

3.1.2. Antimicrobial resistance in Enterococcus, non-pathogenic isolates

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

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial resistance in enterococci from healthy animal is regularly monitored in the Swedish Veterinary Antimicrobial Resistance Monitoring programme (SVARM).

In 2006, isolates from dairy cows were tested.

Type of specimen taken

Intestinal content (caecum or colon) from dairy cows were sampled. Each animal is from a unique dairy herd.

Methods of sampling (description of sampling techniques)

In all 461 samples were collected from 11 abattoirs. The abattoirs accounted for 84% of the total volume of dairy cows slaughtered in Sweden in 2005. The number of samples collected at each abattoir was proportional to the slaughter volume of the abattoir.

Procedures for the selection of isolates for antimicrobial testing

All isolates (13 *E. faecalis* and 98 *E. faecium*) obtained from culture of the 470 samples were tested for antimicrobial susceptibility. Each isolate is from a unique dairy herd.

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

For samples from cows, 0.5 g colon content was diluted in 4.5 mL saline. From the dilution, 0.1 mL was spread onto Slanetz-Bartley (SlaBa) agar. The plates were incubated for 48 h at 37°C. One colony, randomly chosen, was sub-cultured on bile-esculin agar and blood agar (37°C, 24 h). Colonies with a 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- α -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, 2002) using VetMIC panels produced at the Dept. of Antibiotics, SVA. As quality control, *Enterococcus faecalis* ATCC 29212 was included.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

For antimicrobials tested and range of tested concentrations see Table 1. Breakpoints used for antimicrobial susceptibility testing of *Enterococcus* spp. in Animals .

Preventive measures in place

No preventive measures are in place regarding enterococci from healthy animals.

Control program/mechanisms

The control program/strategies in place

No control program is in place.

Recent actions taken to control the zoonoses

No measures are taken in case of antimicrobial resistance in commensal enterococci.

Results of the investigation

Antimicrobial resistance in enterococci from dairy cows was rare.

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

The situation is most favourable regarding antimicrobial resistance in commensal enterococci from dairy cows. This is in agreement with a previous study in 2000 in yearling cattle. Also the situation among isolates from slaughter pigs and broilers previously studied in SVARM is favourable.

Table Antimicrobial susceptibility testing of E. faecium in Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring - quantitative data [Dilution method]

| Number of resistant isolates (n) and number of isolates with the concentration ($\mu\text{l/ml}$) or zone (mm) of inhibition equal to | | | | | | | | | | | | | | | | | | | | | |
|---|----|-------------|------|------|------|-----|----|----|----|----|----|----|----|-----|-----|-----|------|------|-------|--------|---------|
| E. faecium | | | | | | | | | | | | | | | | | | | | | |
| Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | | yes | | | | | | | | | | | | | | | | | | | |
| Number of isolates available in the laboratory | | 98 | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | N | ≤ 0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest |
| Tetracyclines | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclin | 98 | | | | 61 | 34 | | | | | | 3 | | | | | | | | 0.5 | 64 |
| Amphenicols | | | | | | | | | | | | | | | | | | | | | |
| Chloramphenicol | 98 | 0 | | | | | 1 | 24 | 71 | 2 | | | | | | | | | | 0.5 | 64 |
| Aminoglycosides | | | | | | | | | | | | | | | | | | | | | |
| Streptomycin | 98 | 0 | | | | | | | 3 | 34 | 61 | | | | | | | | | 8 | 1024 |
| Gentamicin | 98 | 0 | | | | | 3 | 33 | 56 | 6 | | | | | | | | | | 2 | 256 |
| Kanamycin | 98 | 0 | | | | | | | | 4 | 36 | 28 | 7 | 3 | | | | | | 16 | 2048 |
| Macrolides | | | | | | | | | | | | | | | | | | | | | |
| Erythromycin | 98 | 7 | | | | 29 | 24 | 13 | 25 | 7 | | | | | | | | | | 0.5 | 64 |
| Glycopeptides (Cyclic peptides, Polypeptides) | | | | | | | | | | | | | | | | | | | | | |
| Bacitracin | 98 | 1 | | | | | 1 | 1 | 3 | 16 | 65 | 11 | 1 | | | | | | | 1 | 128 |
| Vancomycin | 98 | 0 | | | | | 74 | 10 | 14 | | | | | | | | | | | 1 | 128 |
| Ionophores | | | | | | | | | | | | | | | | | | | | | |
| Narasin | 98 | 0 | | | 1 | 36 | 54 | 7 | | | | | | | | | | | | 0.12 | 16 |
| Oxazolidinones | | | | | | | | | | | | | | | | | | | | | |
| Linezolid | 98 | 0 | | | | | 2 | 77 | 19 | | | | | | | | | | | 0.5 | 16 |
| Penicillins | | | | | | | | | | | | | | | | | | | | | |
| Ampicillin | 98 | 0 | | | 10 | 30 | 45 | 13 | | | | | | | | | | | | 0.25 | 32 |
| Streptogramins | | | | | | | | | | | | | | | | | | | | | |
| Virginiamycin | 98 | 0 | | | | 25 | 16 | 18 | 38 | 1 | | | | | | | | | | 0.5 | 64 |

Table Antimicrobial susceptibility testing of E. faecium - qualitative data

| n = Number of resistant isolates | | |
|---|----------|----------|
| E. faecium | | |
| Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring | | |
| Isolates out of a monitoring programme | yes | |
| Number of isolates available in the laboratory | 98 | |
| Antimicrobials: | | |
| Antimicrobials: | N | n |
| Tetracyclines | | |
| Tetracyclin | 98 | 3 |
| Amphenicols | | |
| Chloramphenicol | 98 | 0 |
| Aminoglycosides | | |
| Streptomycin | 98 | 0 |
| Gentamicin | 98 | 0 |
| Kanamycin | 98 | 0 |
| Macrolides | | |
| Erythromycin | 98 | 7 |
| Glycopeptides (Cyclic peptides, Polypeptides) | | |
| Bacitracin | 98 | 1 |
| Vancomycin | 98 | 0 |
| Ionophores | | |
| Narasin | 98 | 0 |
| Oxazolidines | | |
| Linezolid | 98 | 0 |
| Penicillins | | |
| Ampicillin | 98 | 0 |
| Streptogramins | | |
| Virginiamycin | 98 | 1 |
| Fully sensitive | 98 | 87 |
| Resistant to 1 antimicrobial | 98 | 10 |
| Resistant to 2 antimicrobials | 98 | 1 |

Footnote

For virginiamycin the EUCAST breakpoint >4 was used. This could not be indicated in the Breakpoint table.

Table Antimicrobial susceptibility testing of E. faecalis - qualitative data

| n = Number of resistant isolates | | |
|---|----------|----------|
| E. faecalis | | |
| Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring | | |
| Isolates out of a monitoring programme | yes | |
| Number of isolates available in the laboratory | 13 | |
| Antimicrobials: | | |
| | N | n |
| Tetracyclines | | |
| Tetracyclin | 13 | 2 |
| Amphenicols | | |
| Chloramphenicol | 13 | 0 |
| Aminoglycosides | | |
| Streptomycin | 13 | 0 |
| Gentamicin | 13 | 0 |
| Kanamycin | 13 | 0 |
| Macrolides | | |
| Erythromycin | 13 | 0 |
| Glycopeptides (Cyclic peptides, Polypeptides) | | |
| Bacitracin | 13 | 0 |
| Vancomycin | 13 | 0 |
| Ionophores | | |
| Narasin | 13 | 1 |
| Oxazolidines | | |
| Linezolid | 13 | 0 |
| Penicillins | | |
| Ampicillin | 13 | 0 |
| Streptogramins | | |
| Virginiamycin | 13 | 0 |
| Fully sensitive | 13 | 10 |
| Resistant to 1 antimicrobial | 13 | 3 |

Table Antimicrobial susceptibility testing of E. faecalis in Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring - quantitative data [Dilution method]

| Number of resistant isolates (n) and number of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to | | | | | | | | | | | | | | | | | | | | | |
|--|----|--------|------|------|------|-----|---|----|---|---|----|----|----|-----|-----|-----|------|------|-------|--------|---------|
| E. faecalis | | | | | | | | | | | | | | | | | | | | | |
| Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | | yes | | | | | | | | | | | | | | | | | | | |
| Number of isolates available in the laboratory | | 13 | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | N | <=0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest |
| Tetracyclines | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclin | 13 | 2 | | | | 10 | 1 | | | | | 1 | 1 | | | | | | | 0.5 | 64 |
| Amphenicols | | | | | | | | | | | | | | | | | | | | | |
| Chloramphenicol | 13 | 0 | | | | | | 4 | 9 | | | | | | | | | | | 0.5 | 64 |
| Aminoglycosides | | | | | | | | | | | | | | | | | | | | | |
| Streptomycin | 13 | 0 | | | | | | | | | 2 | 10 | 1 | | | | | | | 8 | 1024 |
| Gentamicin | 13 | 0 | | | | | | 2 | 3 | 8 | | | | | | | | | | 2 | 256 |
| Kanamycin | 13 | 0 | | | | | | | | | 1 | 11 | 1 | | | | | | | 16 | 2048 |
| Macrolides | | | | | | | | | | | | | | | | | | | | | |
| Erythromycin | 13 | 0 | | | | 4 | 3 | 3 | 3 | | | | | | | | | | | 0.5 | 64 |
| Glycopeptides (Cyclic peptides, Polypeptides) | | | | | | | | | | | | | | | | | | | | | |
| Bacitracin | 13 | 0 | | | | | | 1 | | 5 | 6 | 1 | | | | | | | | 1 | 128 |
| Vancomycin | 13 | 0 | | | | | 5 | 4 | 4 | | | | | | | | | | | 1 | 128 |
| Ionophores | | | | | | | | | | | | | | | | | | | | | |
| Narasin | 13 | 1 | | | 1 | 5 | 4 | 2 | | 1 | | | | | | | | | | 0.12 | 16 |
| Oxazolindines | | | | | | | | | | | | | | | | | | | | | |
| Linezolid | 13 | 0 | | | | | | 11 | 2 | | | | | | | | | | | 0.5 | 16 |
| Penicillins | | | | | | | | | | | | | | | | | | | | | |
| Ampicillin | 13 | 0 | | | 3 | 8 | 2 | | | | | | | | | | | | | 0.25 | 32 |
| Streptogramins | | | | | | | | | | | | | | | | | | | | | |
| Virginiamycin | 13 | 0 | | | | | | 2 | 3 | 7 | 1 | | | | | | | | | 0.5 | 64 |

Table Breakpoints for antibiotic resistance of Enterococcus, non-pathogenic in Animals

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| |
|-------|
| NCCLS |
|-------|

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

Footnote

The EUCAST breakpoints for virginiamycin, narasin and streptomycin differs between *E. faecalis* and *E. faecium*. It was not possible to indicate this in the table. Therefore the breakpoint for *E. faecalis* is given.

3.2. ESCHERICHIA COLI, NON-PATHOGENIC

3.2.1. General evaluation of the national situation

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

A. Antimicrobial resistance of E. coli in animal - Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring

Sampling strategy used in monitoring

Frequency of the sampling

Antimicrobial resistance in E. coli from healthy animal is regularly monitored in the Swedish Veterinary Antimicrobial Resistance Monitoring programme (SVARM). In 2006, isolates from dairy cows were tested.

Type of specimen taken

Intestinal content (caecum or colon) from dairy cows were sampled. Each animal is from a unique dairy herd.

Methods of sampling (description of sampling techniques)

In all 365 samples were collected from 11 abattoirs. The abattoirs accounted for 84% of the total volume of dairy cows slaughtered in Sweden in 2005. The number of samples collected at each abattoir was proportional to the slaughter volume of the abattoir.

Procedures for the selection of isolates for antimicrobial testing

All isolates (314) obtained from culture of the 365 samples were tested for antimicrobial susceptibility. Each isolate is from a unique dairy herd.

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 ceacal content was diluted in 4.5 mL phosphate buffered saline (PBS, pH 7.2). After thorough mixing, 0.1 mL of this suspension was spread on MacConkey agar. After incubation overnight at 37°C, one lactose positive colony with morphology typical for E. coli was sub-cultured on horse-blood agar (5% v/v), after which the isolate was tested for production of tryptofanase (indole) and b-glucuronidase (p-nitrophenyl-b-D- glucopyranosiduronic acid, PGUA). Only lactose-positive isolates with typical morphology and positive reactions in both tests were selected for susceptibility tests.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Antimicrobial susceptibility was tested using dilution methods in cation adjusted Mueller-Hinton broth (CAMBH). The tests were performed following the standards for microdilution of the National Committee of Clinical Laboratory Standards (NCCLS, 2002) using VetMIC panels produced at the Dept. of Antibiotics, SVA. As quality control, Escherichia coli ATCC 25922 was included.

Breakpoints used in testing

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

Preventive measures in place

No preventive measures are in place regarding E. coli from healthy animals.

Control program/mechanisms

The control program/strategies in place

No control program is in place.

Measures in case of the positive findings or single cases

No measures are taken in case of antimicrobial resistance in commensal E. coli.

Notification system in place

No notification system is in place in case of antimicrobial resistance in commensal E. coli.

Results of the investigation

Antimicrobial resistance in commensal E. coli from dairy cows was extremely rare.

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

The situation is most favourable regarding antimicrobial resistance in commensal E. coli from dairy cows. This is in agreement with a previous study in 2000 in yearling cattle. Also the situation among isolates from slaughter pigs and broilers previously studied in SVARM is favourable.

Table Antimicrobial susceptibility testing of E. coli in animals

| n = Number of resistant isolates | | | | | | | | |
|--|-------------------------|----------|----------|----------|----------------------|----------|----------|----------|
| | E. coli | | | | | | | |
| | Cattle (bovine animals) | | Pigs | | Gallus gallus (fowl) | | Turkeys | |
| Isolates out of a monitoring programme | yes | | | | | | | |
| Number of isolates available in the laboratory | 314 | | | | | | | |
| Antimicrobials: | N | n | N | n | N | n | N | n |
| Tetracyclines | | | | | | | | |
| Tetracyclin | 314 | 5 | | | | | | |
| Amphenicols | | | | | | | | |
| Chloramphenicol | 314 | 0 | | | | | | |
| Florfenicol | 314 | 0 | | | | | | |
| Cephalosporins | | | | | | | | |
| Cefotaxim | 314 | 0 | | | | | | |
| Ceftiofur | 314 | 0 | | | | | | |
| Fluoroquinolones | | | | | | | | |
| Ciprofloxacin | 314 | 2 | | | | | | |
| Quinolones | | | | | | | | |
| Nalidixic acid | 314 | 2 | | | | | | |
| Sulfonamides | | | | | | | | |
| Sulfonamide | 314 | 5 | | | | | | |
| Trimethoprim | 314 | 1 | | | | | | |
| Aminoglycosides | | | | | | | | |
| Streptomycin | 314 | 6 | | | | | | |
| Gentamicin | 314 | 3 | | | | | | |
| Kanamycin | 314 | 1 | | | | | | |
| Penicillins | | | | | | | | |
| Ampicillin | 314 | 0 | | | | | | |
| Fully sensitive | 314 | 301 | | | | | | |
| Resistant to 1 antimicrobial | 314 | 8 | | | | | | |
| Resistant to 2 antimicrobials | 314 | 1 | | | | | | |
| Resistant to 3 antimicrobials | 314 | 3 | | | | | | |
| Resistant to 4 antimicrobials | 314 | 1 | | | | | | |
| Resistant to >4 antimicrobials | 314 | 0 | | | | | | |

Footnote

In calculations of multiresistance, nalidixic acid and ciprofloxacin were regarded as one substance. "Bovine animals" in this table are adult dairy cows

Table Antimicrobial susceptibility testing of E. coli in Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring - quantitative data [Dilution method]

| Number of resistant isolates (n) and number of isolates with the concentration ($\mu\text{l/ml}$) or zone (mm) of inhibition equal to | | | | | | | | | | | | | | | | | | | | | |
|---|-------------|------|------|------|-----|-----|-----|-----|-----|-----|----|----|-----|-----|-----|------|------|-------|--------|---------|--|
| E. coli | | | | | | | | | | | | | | | | | | | | | |
| Cattle (bovine animals) - dairy cows - at slaughterhouse - animal sample - Monitoring | | | | | | | | | | | | | | | | | | | | | |
| Isolates out of a monitoring programme | yes | | | | | | | | | | | | | | | | | | | | |
| | 314 | | | | | | | | | | | | | | | | | | | | |
| Number of isolates available in the laboratory | | | | | | | | | | | | | | | | | | | | | |
| Antimicrobials: | | | | | | | | | | | | | | | | | | | | | |
| N | ≤ 0.03 | 0.06 | 0.12 | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 | 2048 | >2048 | lowest | highest | |
| Tetracyclines | | | | | | | | | | | | | | | | | | | | | |
| Tetracyclin | 314 | | | 1 | 206 | 100 | 2 | | | | 1 | 1 | 3 | | | | | | 0.5 | 64 | |
| Amphenicols | | | | | | | | | | | | | | | | | | | | | |
| Chloramphenicol | 314 | | | | | 39 | 236 | 39 | | | | | | | | | | | 1 | 128 | |
| Florfenicol | 314 | | | | | | 162 | 152 | | | | | | | | | | | 4 | 32 | |
| Cephalosporins | | | | | | | | | | | | | | | | | | | | | |
| 3rd generation cephalosporins | 0 | | | | | | | | | | | | | | | | | | | | |
| Cefotaxim | 314 | | 210 | 100 | 4 | | | | | | | | | | | | | | 0.06 | 2 | |
| Ceftiofur | 314 | | | 21 | 122 | 163 | 8 | | | | | | | | | | | | 0.12 | 16 | |
| Fluoroquinolones | | | | | | | | | | | | | | | | | | | | | |
| Ciprofloxacin | 314 | 2 | 231 | 81 | | 1 | | | | | | | | | | | | | 0.03 | 1 | |
| Enrofloxacin | 0 | | | | | | | | | | | | | | | | | | | | |
| Quinolones | | | | | | | | | | | | | | | | | | | | | |
| Nalidixic acid | 314 | 2 | | | | 12 | 61 | 224 | 15 | | | 1 | 1 | | | | | | 1 | 128 | |
| Sulfonamides | | | | | | | | | | | | | | | | | | | | | |
| Sulfonamide | 314 | 5 | | | | | | | | 249 | 58 | 2 | | | | | 5 | | 16 | 2048 | |
| Trimethoprim | 314 | 1 | | | 145 | 160 | 7 | 1 | | | | 1 | | | | | | | 0.25 | 32 | |
| Aminoglycosides | | | | | | | | | | | | | | | | | | | | | |
| Streptomycin | 314 | 6 | | | | | | 47 | 241 | 20 | 1 | 2 | 2 | | 1 | | | | 2 | 256 | |
| Gentamicin | 314 | 3 | | | 67 | 217 | 27 | 3 | | | | | | | | | | | 0.5 | 64 | |
| Neomycin | 0 | | | | | | | | | | | | | | | | | | | | |
| Kanamycin | 124 | 1 | | | | | 12 | 100 | 11 | 1 | | | | | | | | | 2 | 16 | |
| Penicillins | | | | | | | | | | | | | | | | | | | | | |
| Ampicillin | 314 | 0 | | | 1 | 12 | 54 | 161 | 65 | 21 | | | | | | | | | 0.25 | 32 | |



Table Breakpoints used for antimicrobial susceptibility testing in Animals

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| |
|-------|
| NCCLS |
|-------|

| Escherichia coli, non-pathogenic | Standard for breakpoint | Breakpoint concentration (microg/ml) | | | Range tested concentration (microg/ml) | | Disk content microg | Breakpoint Zone diameter (mm) | | |
|------------------------------------|-------------------------|--------------------------------------|--------------|-------------|--|---------|---------------------|-------------------------------|--------------|--------------|
| | | Susceptible <= | Intermediate | Resistant > | lowest | highest | | Susceptible >= | Intermediate | Resistant <= |
| Amphenicols | | | | | | | | | | |
| Chloramphenicol | EUCAST | 16 | | 16 | 1 | 128 | | | | |
| Florfenicol | EUCAST | 16 | | 16 | 4 | 32 | | | | |
| Tetracyclines | | | | | | | | | | |
| Tetracyclin | EUCAST | 8 | | 8 | 0.5 | 64 | | | | |
| Fluoroquinolones | | | | | | | | | | |
| Ciprofloxacin | SVARM | 0.06 | | 0.06 | 0.03 | 1 | | | | |
| Enrofloxacin | | | | | | | | | | |
| Quinolones | | | | | | | | | | |
| Nalidixic acid | EUCAST | 16 | | 16 | 1 | 128 | | | | |
| Trimethoprim | EUCAST | 2 | | 2 | 0.25 | 32 | | | | |
| Sulfonamides | | | | | | | | | | |
| Sulfonamide | NCCLS | 256 | | 256 | 16 | 2048 | | | | |
| Aminoglycosides | | | | | | | | | | |
| Streptomycin | EUCAST | 16 | | 16 | 2 | 256 | | | | |
| Gentamicin | EUCAST | 2 | | 2 | 0.5 | 64 | | | | |
| Neomycin | | | | | | | | | | |
| Kanamycin | EUCAST | 8 | | 8 | 2 | 16 | | | | |
| Trimethoprim + sulfonamides | | | | | | | | | | |
| Cephalosporins | | | | | | | | | | |
| Cefotaxim | EUCAST | 0.25 | | 0.25 | 0.06 | 2 | | | | |
| Ceftiofur | EUCAST | 1 | | 1 | 0.12 | 16 | | | | |
| 3rd generation cephalosporins | | | | | | | | | | |
| Penicillins | | | | | | | | | | |
| Ampicillin | EUCAST | 8 | | 8 | 0.25 | 32 | | | | |

Table Breakpoints used for antimicrobial susceptibility testing in Food

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| Escherichia coli, non-pathogenic | Standard for breakpoint | Breakpoint concentration (microg/ml) | | | Range tested concentration (microg/ml) | | Disk content microg | Breakpoint Zone diameter (mm) | | |
|------------------------------------|-------------------------|--------------------------------------|--------------|----------------|--|---------|------------------------|-------------------------------|--------------|-----------------|
| | | Susceptible <= | Intermediate | Resistant > | lowest | highest | | Susceptible >= | Intermediate | Resistant <= |
| Amphenicols | | | | | | | | | | |
| Chloramphenicol | | | | | | | | | | |
| Florfenicol | | | | | | | | | | |
| Tetracyclines | | | | | | | | | | |
| Tetracyclin | | | | | | | | | | |
| Fluoroquinolones | | | | | | | | | | |
| Ciprofloxacin | | | | | | | | | | |
| Enrofloxacin | | | | | | | | | | |
| Quinolones | | | | | | | | | | |
| Nalidixic acid | | | | | | | | | | |
| Trimethoprim | | | | | | | | | | |
| Sulfonamides | | | | | | | | | | |
| Sulfonamide | | | | | | | | | | |
| Aminoglycosides | | | | | | | | | | |
| Streptomycin | | | | | | | | | | |
| Gentamicin | | | | | | | | | | |
| Neomycin | | | | | | | | | | |
| Kanamycin | | | | | | | | | | |
| Trimethoprim + sulfonamides | | | | | | | | | | |
| Cephalosporins | | | | | | | | | | |
| Cefotaxim | | | | | | | | | | |
| Ceftiofur | | | | | | | | | | |
| 3rd generation cephalosporins | | | | | | | | | | |
| Penicillins | | | | | | | | | | |
| Ampicillin | | | | | | | | | | |

Table Breakpoints used for antimicrobial susceptibility testing in Feedingstuff

Test Method Used

| |
|----------------|
| Disc diffusion |
| Agar dilution |
| Broth dilution |
| E-test |

Standards used for testing

| Escherichia coli, non-pathogenic | Standard for breakpoint | Breakpoint concentration (microg/ml) | | | Range tested concentration (microg/ml) | | Disk content microg | Breakpoint Zone diameter (mm) | | |
|------------------------------------|-------------------------|--------------------------------------|--------------|----------------|--|---------|------------------------|-------------------------------|--------------|-----------------|
| | | Susceptible <= | Intermediate | Resistant > | lowest | highest | | Susceptible >= | Intermediate | Resistant <= |
| Amphenicols | | | | | | | | | | |
| Chloramphenicol | | | | | | | | | | |
| Florfenicol | | | | | | | | | | |
| Tetracyclines | | | | | | | | | | |
| Tetracyclin | | | | | | | | | | |
| Fluoroquinolones | | | | | | | | | | |
| Ciprofloxacin | | | | | | | | | | |
| Enrofloxacin | | | | | | | | | | |
| Quinolones | | | | | | | | | | |
| Nalidixic acid | | | | | | | | | | |
| Trimethoprim | | | | | | | | | | |
| Sulfonamides | | | | | | | | | | |
| Sulfonamide | | | | | | | | | | |
| Aminoglycosides | | | | | | | | | | |
| Streptomycin | | | | | | | | | | |
| Gentamicin | | | | | | | | | | |
| Neomycin | | | | | | | | | | |
| Kanamycin | | | | | | | | | | |
| Trimethoprim + sulfonamides | | | | | | | | | | |
| Cephalosporins | | | | | | | | | | |
| Cefotaxim | | | | | | | | | | |
| Ceftiofur | | | | | | | | | | |
| 3rd generation cephalosporins | | | | | | | | | | |
| Penicillins | | | | | | | | | | |
| Ampicillin | | | | | | | | | | |

4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS

4.1. HISTAMINE

4.1.1. General evaluation of the national situation

4.1.2. Histamine in foodstuffs

Table Histamine in food

| | Source of information | Sampling unit | Sample weight | Units tested | Total units in non-conformity | <= 100 mg/kg | >100 - <= 200 mg/kg | >200 - <= 400 mg/kg | > 400 mg/kg |
|--|-----------------------|---------------|---------------|--------------|-------------------------------|--------------|---------------------|---------------------|-------------|
| | | | | | | | | | |

4.2. ENTEROBACTER SAKAZAKII

4.2.1. General evaluation of the national situation

4.2.2. Enterobacter sakazakii in foodstuffs

Table Enterobacter sakazakii in food

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for Enterobacter sakazakii |
|--|-----------------------|---------------|---------------|--------------|---|
|--|-----------------------|---------------|---------------|--------------|---|

4.3. STAPHYLOCOCCAL ENTEROTOXINS

4.3.1. General evaluation of the national situation

4.3.2. Staphylococcal enterotoxins in foodstuffs

Table Staphylococcal enterotoxins in food

| | Source of information | Sampling unit | Sample weight | Units tested | Total units positive for Staphylococcal enterotoxins |
|--|-----------------------|---------------|---------------|--------------|--|
| | | | | | |

5. FOODBORNE OUTBREAKS

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

A. Foodborne outbreaks

System in place for identification, 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.

Table Foodborne outbreaks in humans

| 1 | 2 | 3 | 4 | 5 | | 6 | 7 | | 8 | | 9 | 10 |
|-----------|----|---|-----|------------------|--------------------|---|-------------------------------|----------------|------|--|--------------------------------------|--|
| | | | | General outbreak | Household outbreak | | Total Number of persons | ill (in total) | died | in hospital | | |
| Unknown | 18 | | 126 | | 1 | | meals | x | | epidemiology | restaurant/household | deficiencies in food handling |
| Histamine | 1 | | 2 | 0 | | | tuna fish | x | | symptoms, type of fish | household | storage temperature too high |
| Histamine | 1 | | 20 | 0 | | | escolar | x | | symptoms, type of fish | restaurant | storage temperature too high |
| Unknown | 1 | | 3 | | | | cake | x | | epidemiology | vending bus | deficiencies in cleaning of tools in kitchen |
| Unknown | 8 | | 52 | | | | buffé | x | | epidemiology | restaurant, catering (3) | deficiencies in food handling |
| Histamine | 1 | | 2 | 0 | | | tuna fish | x | | symptoms, type of fish | restaurant | storage temperature too high |
| Histamine | 1 | | 2 | 0 | | | escolar | | x | laboratory confirmed in food, symptoms | household | storage temperature too high |
| Unknown | 7 | | 17 | | | | pizza | x | | epidemiology/suspect | pizzeria/household | deficiencies in food handling |
| Unknown | 2 | | 24 | | | | cold sauce | x | | epidemiology | restaurant | deficiencies in food preparation |
| Unknown | 4 | | 20 | | | | savoury | x | | epidemiology | large-scale household | Deficiencies in food handling |
| Unknown | 1 | | 4 | | | | chicken meat balls | x | | epidemiology, bad smell and taste | household (industry made meat balls) | |
| Unknown | 1 | | 2 | | | | peeled paranuts from Amazonas | x | | epidemiology | household | deficiencies during production |
| Unknown | 1 | | 3 | | | | fruit salad | x | | suspected | restaurant | |
| Unknown | 1 | | 4 | | | | fish soup | x | | epidemiology | restaurant/household | |

| | | | | | | | | | | | |
|--|----|-----|---|--|----------------------------|---|---|--|---|-------------------------|--|
| Unknown | 1 | 3 | | | fried chicken | x | | | epidemiology | Chinese restaurant | deficiencies in cleaning and preparation of food |
| Wax esters (from fish) (1) | 1 | 2 | 0 | | butterfish/escolar | x | | | symptoms, type of fish | restaurant | deficiencies in preparation of food |
| Unknown | 4 | 21 | | | mixed salad | x | | | epidemiology | restaurant | deficiencies in cleaning and food handling |
| Unknown | 23 | 92 | | | unknown | | | | | | |
| Wax esters (from fish) | 1 | 2 | 0 | | butterfish/escolar | x | | | symptoms, type of fish | restaurant | deficiencies in preparation of food |
| Unknown | 8 | 20 | 1 | | kebab, hamburger | x | | | epidemiology, ill person in kitchen | hamburger bar, pizzeria | Deficiencies in food handling |
| Salmonella - S. Virchow (2) | 1 | 130 | 0 | | sprouts | x | | | epidemiology | Indian restaurant | food at room temp too long time |
| Salmonella - S. Give | 1 | 53 | 0 | | unknown | | | | lab confirmed in patients | unknown | |
| Salmonella - S. Paratyphi B var. Java | 1 | 17 | 0 | | unknown | | | | lab confirmed in patients | unknown | |
| Salmonella - S. Kapemba | 1 | 32 | 0 | | pork roast | x | | | epidemiology, laboratory confirmation of patients and personnel | restaurant | deficiencies in cleaning and heating of food |
| Bacillus - B. cereus | 1 | 5 | | | pasta | | x | | lab confirmed food | vending car | def in food prep |
| Salmonella - S. Bareilly | 1 | 130 | 0 | | sprouts | x | | | epidemiology | Indian restaurant | food at room temp too long time |
| Staphylococcus - S. aureus | 1 | 5 | | | Christmas buffe | x | | | epidemiology, symptoms | restaurant | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) | 1 | 20 | 0 | | sandwich | x | | | epidemiology, lab confirmed in patients | restaurant | deficiencies in food handling |
| Clostridium - C. perfringens | 1 | 20 | 0 | | meal | x | | | epidemiology | restaurant | |
| Staphylococcus - S. aureus | 1 | 2 | | | hot chicken sandwich | x | | | | cafe | deficiencies in food handling |
| Staphylococcus - S. aureus | 1 | 3 | 0 | | meal | x | | | epidemiology, symptoms | restaurant | deficiencies in food handling |
| Staphylococcus - S. aureus | 1 | 2 | 0 | | chicken | | x | | lab confirmed in food, symptoms | Japanese restaurant | deficiencies in food handling |
| Staphylococcus - S. aureus | 1 | 3 | 0 | | grilled chicken | | x | | lab confirmed in food, symptoms | household | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) | 1 | 8 | 0 | | Chinese frozen raspberries | x | | | Calicivirus isolated from an earlier batch | household | deficiencies during production |

| | | | | | | | | | | |
|---|---|--|----|---|----------------------------|---|---|---|-------------------------|--|
| Food borne viruses - calicivirus (including norovirus) | 1 | | 7 | 0 | meal | x | | epidemiology, patients and personnel lab confirmed | restaurant | infected by kitchen personnel |
| Food borne viruses - calicivirus (including norovirus) | 1 | | 77 | 0 | salad | x | | epidemiology, lab confirmed in patients | household | deficiencies during production |
| Food borne viruses - calicivirus (including norovirus) | 1 | | 90 | 0 | meals | x | 1 | epidemiology, lab confirmed in patients | institution for elderly | deficiencies in food handling |
| Staphylococcus - S. aureus | 1 | | 2 | 0 | beef fillet | | | lab confirmed in food, symptoms | restaurant | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) | 1 | | 9 | 0 | Frozen Chinese raspberries | | | epidemiology, lab confirmed in patients and food | household | deficiencies during production |
| Food borne viruses - calicivirus (including norovirus) | 1 | | 8 | 0 | cake with cream | x | | epidemiology, lab confirmed in patients | household | deficiencies in food handling |
| Salmonella - S. Muenchen (3) | 1 | | 32 | 0 | pork roast | x | | epidemiology, laboratory confirmation of patients and personnel | restaurant | deficiencies in cleaning and heating of food |
| Salmonella - S. Stanley | 1 | | 13 | 0 | lime leaves | | | x epidemiology, laboratory confirmed in leaves and patients | household | deficiencies in preparation of food |
| Food borne viruses - calicivirus (including norovirus) | 1 | | 54 | 0 | unknown | | | lab confirmed in patients | unknown | |
| Food borne viruses - calicivirus (including norovirus) | 1 | | 10 | 0 | savoury | x | | lab confirmed in patients and persons who handled food | household | infected by kitchen personnel |
| Staphylococcus - S. aureus | 1 | | 6 | 0 | shellfish | | | x lab confirmed in food, symptoms, epidemiology | restaurant | deficiencies in food handling |
| Staphylococcus - S. aureus | 1 | | 2 | 0 | pizza | x | | epidemiology, symptoms | household | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) | 1 | | 25 | 0 | unknown | | | lab confirmed in patients | unknown | |
| Food borne viruses - calicivirus (including norovirus) | 1 | | 15 | 0 | sandwich | x | | epidemiology, lab confirmed in patients | household | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | | 10 | 0 | raspberries | x | | epidemiology | household | deficiencies during production |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | | 9 | 0 | meal | x | | epidemiology, lab confirmed in patients | large-scale household | deficiencies in food handling |

| Salmonella - S. Typhimurium - DT 104 | 1 | 32 | 0 | pork roast | x | epidemiology, laboratory confirmation of patients and personnel | restaurant | deficiencies in cleaning and heating of food |
|---|---|----|---|-----------------------------|---|---|--------------|--|
| Escherichia coli, pathogenic - Verotoxigenic E. coli (VTEC) - VTEC O157 | 1 | 10 | 0 | vegetables | x | epidemiology, lab confirmed in patients | kindergarten | |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 4 | 39 | 0 | unknown | | | | |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 2 | 5 | 0 | mixed salads | x | epidemiology | restaurant | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 9 | 0 | oysters | x | epidemiology, lab confirmed in patients | restaurant | deficiencies during production |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 37 | 0 | meal | x | epidemiology, lab confirmed in patients | restaurant | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 40 | 0 | catering buffées | x | epidemiology, lab confirmed in patients | household | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 24 | 0 | buffé | x | epidemiology, lab confirmed in patients | restaurant | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 55 | 1 | cake with cream | x | epidemiology, lab confirmed in patients | household | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 12 | 0 | meal | x | epidemiology, lab confirmed in patients | household | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 35 | 0 | mousse with raspberry sauce | x | epidemiology, lab confirmed in patients | household | deficiencies during production |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 11 | 0 | chicken salad | x | epidemiology | household | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 12 | 0 | raspberries | x | epidemiology, lab confirmed in patients | household | deficiencies during production |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus) | 1 | 2 | 0 | raspberries | x | epidemiology, lab confirmed in patients | school | deficiencies during production |

| | | | | | | | | | | | |
|---|---|--|----|---|--|---------|---|--|---|------------|-------------------------------|
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like Virus) | 1 | | 10 | 0 | | meals | x | | epidemiology, lab confirmed in patients | restaurant | deficiencies in food handling |
| Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like Virus) | 1 | | 21 | 0 | | meal | x | | epidemiology, lab confirmed in patients | restaurant | deficiencies in food handling |
| Salmonella - S. Enteritidis - Not typable | 1 | | 15 | 0 | | almonds | x | | epidemiology | household | def during production |

(1) : Illness caused by wax esters and histamine

(2) : A total of 130 persons diseased in the outbreak caused by serotypes S. Bareilly and S. Virchow.

(3) : The outbreak was caused by three serotypes: S. Typhimurium DT104, S. Muenchen and S. Kapemba