Sweden

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

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

IN 2014
PREFACE

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

The report contains information on trends and sources of zoonoses and zoonotic agents in Sweden during the year 2014.

The information covers the occurrence of these diseases and agents in animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and indicator 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 Union 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 European Union 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 European Union Summary Reports on zoonoses and antimicrobial resistance that are published each year by EFSA.

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1 ANIMAL POPULATIONS

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

1.1.1 Information on susceptible animal population

Sources of information

Most information about numbers of animals or herds is derived from the Yearbook of Agricultural Statistics with numbers from June 2014. During 2010, there were changes in the criteria for inclusion of herds in the Yearbook of Agricultural Statistics. Some information about the number of slaughtered animals has also been collected by the National Food Administration.

Dates the figures relate to and the content of the figures

Most data relates to 2014.

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 total number of horses were estimated to be 362,700 in 2010 and the number of locations to 77,800. The number of horses per 100 inhabitants is 39 for the whole country and 3/4 of all of the horses are located in city areas and rural areas adjacent to cities. The number of dairy cows and heifers has been decreasing over long period of time in Sweden. In June 2014 there were about 29% less animals than in 1995. Since 2010 the number of animals has decrease with about 3800 animals. The last years the number of dairy cows and heifers has been about the same. The number of dairy holdings has decreased with 274 holdings between 2013 and 2014. However, herd size has increased from about 74 to 79 dairy cows and heifers per holding in Sweden and since 1995 the average herd size has increased from 27 animals per holding. For calves (under 1 year), between 2013 and 2014, there was a decrease in the number of animals. In 2013 there were about 467,000 calves in 16606 holdings and in 2014 there were 472,013 calves in 15706 holdings. The herd size has increased by 16% since 2010. For meat production animals there has been a decrease in the number of animals between 2013 and 2014, but since 2010 there has been a decrease in the number of animals and also in the number of holdings. In 2014 there were 186260 animals in 10663 holding compared to 18810 animals in 2013. Between 1995 and 2014 the herd size for meat production animals has increased by 90% in Sweden there has been an approximately 40% decrease of pigs in total since 1995. Also the number of holdings has had a down going trend. Between 2012 and 2013, on the other hand, there was a slight increase of number of animals but the numbers are decreasing again between 2013 and 2014. The average herd size in 2014 were 1,074 pigs per holding. This is a decrease in Sweden since 2013 and it is a decrease by about 9% since 2010. In 2014 Sweden had about 85,000 fattening pigs, an increase since previous year with about 10,000 animals. The number of holdings also increased, with 18 holdings. The average herd size, with 791 fattening pigs per holding is a slight decrease since 2013 but has increased by 405% since 1995. Compared with 2010 there were in 2014 an increase of 19% animals per holding. With a small increase between 2012 and 2013. The number of breeding animals is now decreasing again and the number of holdings are still increasing. Between June 2013 and 2014 the number of animals decreased by 3% and the number of holding increased with 19 holdings. The number of breeding animals were in 1995 about 31 animals/holding and where in 2014 about 105 animals per holding. Since the beginning of the 21st century the numbers of sheep and lambs increased during the years. But this up going trend was changed in 2011 and between 2012 and 2013 there was a decrease in the number of sheep and sheep holdings. Between 2013 and 2014 the number of animals and holdings started to slightly to increase again. The number of lambs in 2014 increased with 30205 animals and sheep increased with 1783 animals. The total amount of sheep has increased by 27% since 1995. The number of holdings has increased with 82 holdings between 2013 and 2014 and with 294 holdings since 2010. In June 2014 there were estimated to be 65,493,79 laying hens at farms. This is about 7% more animals than in 1995. The number of holdings with laying hens has decreased by 9% since 1995. In 1995 there was an average flock size of 642 animals per flock, in 2010 the flock size was 1637 and in 2014 it was 1689 animals. The number of broiler holdings increased by 7% from 2013 and 2014 and the number of animal decreased from about 7,958,400 animals in 2013 to about 7,911,000 animals in 2014.

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

Most farms are located in the south and central parts of Sweden and animal husbandry is the dominant line of production. In the north of Sweden there are mostly small farms.
2 DISEASE STATUS

2.1 TUBERCULOSIS, MYCOBACTERIAL DISEASES

2.1.1 General evaluation of the national situation

2.1.1.1 Mycobacterium - 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 stopped 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 60 years in Sweden. M. bovis was diagnosed in farmed deer in 1991. A trace-back investigation revealed that the infection was introduced by imported deer in 1987. In 1994, a voluntary control programme was introduced that became mandatory in 2003. In total, 13 herds have tested positive and all have been depopulated. The programme is near completion and the vast majority of deer herds are officially free. No case of TB has been detected in farmed deer since 1997. In humans, less than 10 cases of M. bovis are notified annually in Sweden. Most of these are found 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 of the country. The animals were euthanised and a thorough investigation was performed (See M. Tuberculosis in Zoo animals). No human infection has been associated to this outbreak.

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

The national situation remains favourable.

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

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

Additional information

During 2012 a decision was taken to abolish the intra-dermal test in alpacas because of demonstrated low sensitivity in this species. The test has been replaced with serological test. During 2014, eleven alpacas were tested before export with negative final results.

2.1.2 Mycobacterium in animals

2.1.2.1 M. bovis in animal - Deer - farmed

Monitoring system

Sampling strategy

In 1994, a voluntary control programme was implemented. In June 2003, the control programme became compulsory. In the programme, until October 2012, tuberculin tests or whole herd slaughter were performed in all herds to obtain free status and any herd found positive for TB was depopulated. Furthermore, all deer were inspected at slaughter. All animals \( \geq 1 \) year that were found dead or euthanised were subjected to necropsy. Sampling was also performed in case of clinical suspicion. Since October 2012, the programme has turned into a new phase. Tuberculin tests is no longer performed in TB-free herds, but inspection at slaughter and necropsy of animals found dead or euthanised is still required, as is sampling in case of clinical suspicion. The small number of herds that are not TB-free today practice slaughtering of 20% of the herd yearly with meat inspections and necropsies for 15 years to obtain free status.
Frequency of the sampling

Sampling is performed after any suspicion of TB, for example if TB is suspected after meat inspection of slaughtered animals, if there is a clinical suspicion, or if there is a positive tuberculin test. SAMPLING IN THE CONTROL PROGRAMME Until October 2012: In brief, a herd obtained 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 were allowed to sell live deer and to maintain the ‘A’ status all female deer had to be tested after three years without reactors. A secondary whole herd test was performed after another 5 years. Herds with ‘A’ status must have all animals ear-tagged and individually identified. Bovine TB free status could also be obtained by slaughter of the whole herd and repopulation with deer from TB free herds (’A’ status). For sampling after October 2012, see above under heading Sampling strategy.

Type of specimen taken

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

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive tuberculin test, several lymph nodes are collected for histopathology, acid-fast staining of direct smears and mycobacterial culture. Any organ with gross lesions is also sampled. Lymph nodes are pooled for culture, whereas organs or lymphnodes 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 or meat inspection are investigated by histology and direct smears. The results from these tests determine if culture is performed. Apart from this, samples from animals that were positive in the tuberculin test are always cultured. Culture is performed according to the method SVA 4120, on solid media (Lowenstein Jensen and Stonebrink). Cultures are checked for growth once per week for twelve weeks for suspected colonies. 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 are isolated the strain is further subtyped.

Vaccination policy

Vaccination is not allowed.

Control program/mechanisms

The control program/strategies in place

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

Recent actions taken to control the zoonoses

The control programme has changed so that herds having tested negative four times do not need to continue testing. However, it is still required to 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 (e.g. clinical- or post mortem suspicion).
Results of the investigation

The total number of registered holdings for farmed deer was approximately 600. However, a large proportion of these do not keep deer after obtaining TB free status. The numbers of herds that were considered active, i.e. kept deer and had obtained TB free status were 314. Nine herds were not tested. These herds are exempted from regular testing and instead practice slaughtering of 20% of the herd yearly with meat inspections and necropsies for 15 years to obtain a free status. No TB was detected in any tested deer herds in 2014.

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

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

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

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

Additional information

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

2.1.2.2 M. tuberculosis in animal - Zoo animals, all

Monitoring system

Sampling strategy

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

Type of specimen taken

Samples from organs/tissues with suspected lesions and adjacent lymph nodes. Both fresh and formalin fixed samples. Also tracheal and trunk samples may be taken. In some zoos, serological monitoring is performed in certain animal species.

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive tuberculin test, 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 are pooled for culture, whereas organs or lymphnodes with pathological changes are cultured separately. In some cases of low suspicion, where culling of the animal is not immediately necessary, tracheal or trunk (for elephants) samples are taken.

Case definition

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

Diagnostic/analytical methods used

Samples from necropsy or meat inspection are investigated by histology and direct smears. The results from these tests determine if culture is performed. Apart from this, samples from animals that were positive in the tuberculin test are always cultured. Culture is performed according to the method SVA 4120, on solid media (Lowenstein Jensen and Stonebrink). Cultures are checked for growth once per week for twelve weeks for suspected colonies. 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 are isolated the strain is further subtyped.
Vaccination policy

Vaccination is not allowed.

Other preventive measures than vaccination in place

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

Control program/mechanisms

The control program/strategies in place

There is no specific control programme for Zoo animals.

Suggestions to the European Union for the actions to be taken

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

Measures in case of the positive findings or single cases

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

Notification system in place

Infection with M.bovis, M.tuberculosis, or other mycobacteria in the M.tuberculosis-complex, is compulsory notifiable in all animal species on the basis of suspicion (e.g. clinical- or post mortem suspicion).

Results of the investigation

No case of Tb was detected in zoo animals in 2014.

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

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

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

The zoo animals that were positive for M. tuberculosis in previous years have most likely carried the infection subclinically for long periods. It cannot be ruled out that there is a risk for animal care takers to contract TB from these animals. The risk for zoo visitors to become infected is regarded as very small due to the low level of contact with the animals.

Additional information

In 2001, M. tuberculosis was isolated from a diseased riding elephant at a zoo in the eastern part of Sweden. The zoo was immediately put under official restrictions and tuberculin testing and/ or bacteriological sampling was initiated in all contact animals and animal keepers. In total 5 elephants, including the index case, and one giraffe were euthanised due to positive culture. In 2003, the restrictions were lifted after cleaning and disinfection of all buildings and other housing of the infected animals. No human infection has been identified associated to these animal cases. In Dec 2004, a female elephant at a zoo in the western part of Sweden was positive for M. Tuberculosis. An epidemiological link was found between the two zoos, and subtyping of the bacterial isolates confirmed this link. In 2005, one giraffe from a zoo at the eastern part of Sweden was culture positive for M. Tuberculosis.

2.1.2.3 M. bovis in animal - Cattle (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. Sweden fulfils the requirements for control measures in OTF member states (Council Directive 64/432/EEC, Annex A).

Monitoring system

Sampling strategy

Monitoring is performed by meat inspections at slaughter of food producing animals. The inspection is performed by staff employed by the National Food Administration. If TB is suspected, samples are collected and analysed at the National Veterinary Institute (SVA). Furthermore, tuberculin tests are performed at semen collection centres and at export/import of animals as required according to EU-legislation (Council Directive 64/432/EEC). Sampling is also performed in case of clinical suspicion.

Frequency of the sampling

All cattle are inspected at slaughter and samples are taken when suspected lesions are detected. Samples are also collected at necropsy from clinical suspicions or from animals with a positive tuberculin test.

Type of specimen taken

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

Methods of sampling (description of sampling techniques)

If TB is suspected after a positive tuberculin test, several lymph nodes are collected for histopathology, acid-fast staining of direct smears and mycobacterial culture. Any organ with gross lesions is also sampled. Lymph nodes are pooled for culture, whereas organs or lymphnodes 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 necropsy or meat inspection are investigated by histology and direct smears. The results from these tests determine if culture is performed. Apart from this, samples from animals that were positive in the tuberculin test are always cultured. Culture is performed according to the method SVA 4120, on solid media (Lowenstein Jensen and Stonebrink). Cultures are checked for growth once per week for twelve weeks for suspected colonies. 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 are 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 European Union 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 is diagnosed in a food producing animal eradication measures are implemented, including depopulation of the whole herd, in accordance with the Swedish Act of Epizootics.

Notification system in place

Infection with M. bovis, M. tuberculosis, or other mycobacteria in the M. tuberculosis-complex, is compulsory notifiable in all animal species on the basis of suspicion (e.g. clinical- or post mortem suspicion).

Results of the investigation

In total, two cattle were investigated for M. bovis in 2014. The reason for investigation was clinical suspicion. No Mycobacterium bovis was detected in bovine animals during 2014.

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

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

Additional information

Animals other than cattle: Apart from the tested cattle mentioned above, other animals were also tested for M. bovis in 2014 including: one sheep, 40 pigs, one calf and one horse that were investigated following suspicion at meat inspection. All were negative for TB but bacteria from the Mycobacterium avium/intracellulare-complex were isolated in thirty of the pigs.

2.2 BRUCELLOSIS

2.2.1 General evaluation of the national situation

2.2.1.1 Brucella - general evaluation

History of the disease and/or infection in the country

The last case of bovine brucellosis in Sweden was reported in 1957, no case of brucellosis has ever been diagnosed in any other food producing animal species. Sweden was declared officially brucellosis free in goats and sheep (OBmF) in 1994, in cattle (OBF) in 1995. Sweden fulfills the requirements on control measures in OBF and OBmF for EU 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 illustrated by the annual serological surveillance in the sheep and goat and regularly in the cattle and pig populations. The swedish brucellosis status is also monitored with targeted surveillance performed on aborted fetuses from cattle, sheep, goats and pigs. Since the start of the serological surveillance in the mid 1990s, no positive sample has been detected. In a typical year there are a few clinical suspicions of Brucella infection in animals, mainly presenting as abortions or genital infections, all of which have been negative on further serological and/or bacteriological analyses. The situation regarding human cases of brucellosis 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 free from OBF and ObmF.

2.2.2 Brucella in animals
2.2.2.1 Brucella spp., unspecified in animal - Pigs

Monitoring system

Sampling strategy

Sweden has a very stable epidemiological situation for brucellosis in pigs with no cases ever detected in the species despite frequent sampling. Other food producing animal species have also been free since 1957 (last case of bovine brucellosis). In order to monitor the situation, active as well as passive surveillance is carried out. Active surveillance for Brucella suis has been carried out yearly since 1995 with approximately 3 000 serum samples collected in coordination with the control programme for PRRS. Beginning 2009 and onwards serum samples will be tested every second year. Moreover, active surveillance is performed in the form of post mortem examinations of aborted foetuses, animals are tested before export or import and all clinical suspicions are investigated and tested.

Frequency of the sampling

Serological surveillance for Brucella suis in pigs is conducted every second year, and therefore this sampling was not performed in 2014. In total, 31 foetuses were examined and cultured at post mortem within the enhanced passive surveillance of aborted foetuses. Pigs were also tested at breeding centres and for import or export reasons.

Type of specimen taken

Blood samples for serology and organ samples for culture.

Methods of sampling (description of sampling techniques)

Serum is collected from the jugular vein of live pigs. If applicable, organ samples for culture are collected at post mortem examinations.

Case definition

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

Diagnostic/analytical methods used

The Rose Bengal plate test (RBT) or complement fixation test is used. If relevant material is available (e.g. aborted foetuses), culture is performed.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

All samples tested for Brucella suis, including cultures from 31 aborted foetuses, serum samples from breeding animals, and animals tested for import or export, were negative. In summary, no herd or animal tested positive for Brucella suis in 2014.
National evaluation of the recent situation, the trends and sources of infection

Brucellosis has never been diagnosed in Sweden in food producing animals in Sweden other than bovines (last case in 1957). As Sweden has been free from porcine brucellosis for many decades, the risk of contracting Brucella from Swedish domestic pigs is considered negligible.

Additional information

From 1995 until 2008, approximately 3 000 serum samples/year from pigs have been tested for antibodies against Brucella suis. From 2009 onwards active serological surveillance is conducted every two years. The sampling was not performed in 2014. No samples have been confirmed positive for Brucella suis. In addition to the surveillance of Brucella suis in domestic pigs there is also an active surveillance of Brucella suis in wild boar. During 2014, serum samples from 401 wild boars were tested and found negative for Brucella suis. Imported dogs or dogs mated abroad are seen as a risk factor for introduction of Brucella canis into Sweden. An unknown number of stray dogs from countries where Brucella canis is endemic enter Sweden every year. In 2013, an outbreak of Brucella canis was detected in a kennel of Miniature Schnauzers. Three dogs out of 25 tested positive using bacterial culture and serology. One of the infected dogs was imported from Spain. In 2014 one imported Russian mix-breed dog with discospondylitis was positive for Brucellosis. The serological diagnosis could not be confirmed with bacterial culture, probably due to treatment with antibiotics. Another dog in the same household was tested negative. It is important to be aware of the risk this group of dogs represents, for Brucella infection as well as for other diseases.

2.2.2.2 B. abortus in animal - Cattle (bovine animals)

Status as officially free of bovine brucellosis during the reporting year

The entire country free

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

Free regions

The entire country of Sweden is free from brucellosis.

Monitoring system

Sampling strategy

The surveillance for Brucella abortus is multi layered:* Passive surveillance executed by clinicians and official veterinarians in accordance with the Swedish Epizootic Act requiring all suspected cases of brucellosis in food producing animals to be reported and subsequently investigated.* Active surveillance via a control programme including bulk milk samples from dairy herds and serum samples from beef cattle obtained at slaughter.* Enhanced passive surveillance via post mortem examination and culture of aborted foetuses.* Additional serological testing of cattle prior to import and export and at breeding centers.

Frequency of the sampling

The control programme with active serological surveillance is conducted every third year and will be performed next time in 2016. The control programme is coordinated with the control programmes for Bovine virus diarrhea (BVD) and enzootic bovine leucosis (EBL). Samples for Brucella abortus have been obtained from the larger pool of samples retrieved in the other control programmes by convenience sampling (in other words not strictly random), evenly distributed throughout the sampling period. During 2014 no active surveillance was performed but 32 foetuses were examined within the enhanced passive surveillance of aborted foetuses and one additional foetus was examined due to clinical suspicion. In addition, animals were tested at breeding centers and for import or export reasons.

Type of specimen taken

Serum samples were taken for serology and organ samples for culture of the bacteria.

Methods of sampling (description of sampling techniques)

In the active surveillance control programme bulk milk samples are collected from dairy cows. From beef cattle, serum samples are collected at slaughter. Clinical suspicions are investigated with examinations and relevant sampling in the herd. If applicable, organ samples for culture are collected at post mortem examination.
Case definition

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

Diagnostic/analytical methods used

The diagnostic test used for analyzing serum- and milk samples is an indirect ELISA (SVANOVIR Brucella-Ab I-ELISA, Svanova, Biotech, Uppsala, Sweden). For confirmation, the complement fixation test was used. If relevant material is available, (e.g. aborted foetuses), culture is performed.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

During 2014 the control programme was not performed. All samples tested within the passive surveillance were negative.

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

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

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 Brucella from domestic cattle in Sweden is considered negligible.

Additional information

Testing for Brucella abortus in Swedish cattle has been performed regularly since 1988. From 1997 and onwards, approximately 3000 samples (bulk milk and/or serum samples) have been tested each year for antibodies against Brucella abortus. This sampling is, since 2010, conducted every third year and thus was performed last time in 2013. None have been confirmed positive. In addition several other animal species have been tested, mainly before breeding or at import/export with no positive results during 2014.

2.2.2.3 B. melitensis in animal - Goats

Status as officially free of caprine brucellosis during the reporting year

The entire country free

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

**Monitoring system**

**Sampling strategy**

Surveillance for brucellosis in sheep and goats is based on serological surveys according to EU-legislation Directive 91/68/EEC. Serum samples from goats are collected within the control programme for Caprine Arthrit Encephalitis (CAE). The subset for Brucella screening were obtained from the larger sample by convenience sampling (in other words not strictly random). Furthermore, animals are tested before export or import and all clinically suspected cases are investigated and tested.

**Frequency of the sampling**

Serological sampling is done annually, in 2014 a total of 71 serum samples from 21 goat herds were analyzed for Brucella melitensis. Moreover, 2 caprine foetuses were examined within the enhanced passive surveillance of aborted foetuses. In addition, goats are tested at import or export.

**Type of specimen taken**

Blood samples for serology and organ samples for culture.

**Methods of sampling (description of sampling techniques)**

Serum is collected from the jugular vein of live goats. If applicable, organ samples for culture are collected at post mortem examination.

**Case definition**

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

**Diagnostic/analytical methods used**

The buffered antigen test (Rose Bengal), and for confirmation a complement fixation test, is used. If relevant material is available, (eg aborted foetuses) culture is performed.

**Vaccination policy**

Vaccination is not permitted.

**Measures in case of the positive findings or single cases**

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

**Notification system in place**

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

**Results of the investigation**

During 2014, there were no clinical suspicion in goats. All samples within the active control programme were negative. In summary, no herd or any individual animal was diagnosed with Brucella melitensis infection during 2014.

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

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

Additional information

Since 1995, Brucella melitensis screening has been performed in approximately 7000 sheep/year, as well as a small number of goats. None have been confirmed positive.

2.2.2.4 B. melitensis in animal - Sheep

Status as officially free of ovine brucellosis during the reporting year

The entire country free

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

Free regions

The entire country of Sweden is free.

Monitoring system

Sampling strategy

Surveillance for brucellosis in sheep and goats is based on serological surveys according to EU-legislation Directive 91/68/EEC. The samples from the sheep are collected within the control program for Maedi-Visna. The number of sheep sampled each year has been approximately 7 000 until 2012 but was lower in 2013 and 2014. In addition, surveillance is performed in the form of post mortem examinations of aborted foetuses. Animals are also tested before export or import and all clinically suspected cases are investigated and tested.

Frequency of the sampling

Serological sampling is done annually, in 2014 a total of 2925 serum samples from sheep from 747 holdings were analyzed for Brucella melitensis. Moreover, 28 ovine foetuses were examined within the enhanced passive surveillance of aborted foetuses. Animals were also tested at breeding centres and for import or export reasons.

Type of specimen taken

Blood samples for serology and organ samples for culture.

Methods of sampling (description of sampling techniques)

Serum is collected from the jugular vein of live sheep. If applicable, organ samples for culture are collected at post mortem examination.

Case definition

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

Diagnostic/analytical methods used
A buffered antigen test (Rose Bengal) was used and confirmation was done by a complement fixation test. If relevant material is available (e.g. aborted fetuses) culture is performed.

Vaccination policy

Vaccination is not permitted.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

During 2014, a clinically suspect case was reported from one sheep herd. In addition to this a sample from an animal in another sheep herd taken prior to export was serologically positive for Brucella ovis. There were no clinical signs of brucellosis in this herd. In both cases samples from testicle and epididymis were taken for bacteriological culture. All samples were negative. In summary, no herd or any individual animal was diagnosed with Brucella melitensis infection during 2014.

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

Brucellosis has never been diagnosed in food producing animals other than bovines in Sweden. The last bovine case was 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 Brucella from domestic sheep in Sweden is considered negligible.

Additional information

Since 1995, screening for Brucella melitensis has been completed from approximately 7 000 sheep/year as well as a small number of goats. Sample size is calculated on a yearly basis to reach a probability of freedom of 99 % at the end of the year. In 2014 the sample size needed was 3760 (4 samples per herd from 940 herds per year). No sample has been confirmed positive.
3 INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

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

3.1 SALMONELLOSIS

3.1.1 General evaluation of the national situation

3.1.1.1 Salmonella - general evaluation

History of the disease and/or infection in the country

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

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

The national situation has been very favorable. The number of infected broiler flocks, swine and cattle herds decreased in the late 1980's. Since 2012, an outbreak of Salmonella Dublin has been ongoing in cattle herds in the county of Skåne. The source of this infection has not been elucidated. During 2013 and 2014, Salmonella was not detected in any pig herds. This is consistent with the low incidence of Salmonella in pigs in previous years. However, the dramatic decrease in the number of pig herds in Sweden during the last few years may also play a role in the low incidence. For human outbreaks, the trend has been changing from large meat outbreaks towards smaller outbreaks with vegetable sources.

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

Travel and imported food are considered most important sources of Salmonella infections. An increased awareness regarding the risk of Salmonella in nontraditional sources such as leafy green vegetables is needed as these products are commonly not cooked or heated prior to eating as compared to meat products. Leafy green vegetables are quite frequently found to be contaminated with Salmonella. Routine subtyping by MLVA of isolates of S. Typhimurium from humans and comparison with isolates from animals, food, feed and the environment has proved to be a useful tool to detect clusters and outbreaks. PFGE is another useful molecular tool to identify sources in outbreaks and to connect cases to outbreaks, both with historical cases and with present cases.

Recent actions taken to control the zoonoses

The Swedish Salmonella control programme has been in place for decades. It is extensive and the continuous work has resulted in a very favourable Salmonella situation in domestic animals. However, the programme is costly and could be modernised. The Swedish Board of Agriculture, the National Food Agency, the Swedish Institute for Communicable Disease Control, the National Board of Health and Welfare and the National Veterinary Institute have now prepared a new common national strategy for the control and monitoring of Salmonella for the entire chain from feed to humans. The strategy includes goals and proposals for important actions to achieve goals, including how the control programme should be made more cost effective. In 2014, Salmonella was not detected in any of the samples taken at the abattoirs or cutting plants. However, in 2014, a new laboratory was elected for performing Salmonella analyses of the control programme (lymph nodes, carcass swabs and meat trimmings). This laboratory is accredited for Salmonella, but had only a limited experience of Salmonella and no experience of these matrices. The NRL for Salmonella inspected the laboratory and found that the analytical methods and laboratory routines needed improvements. The NFA and NRL pointed out measures the laboratory needed to take to improve its performance. These measures were in progress at the end of the year 2014.

3.1.2 Salmonella in foodstuffs

3.1.2.1 Salmonella spp. in food - Meat from bovine animals
Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Sampling strategies are described in the Swedish Salmonella control program (95/50/EC). The programs are supervised by the Swedish Board of Agriculture and the National Food Administration. All sampling for the Salmonella programme is performed or supervised by the competent authority. Within the programme swabs are systematically collected from cattle at slaughter, ensuring that the samples are representative of the population of slaughtered cattle at each abattoir. Sampling of carcass swabs in the programme is described here, whereas sampling of lymph nodes is described under "Salmonella spp. in bovine animals - Monitoring system - Sampling strategy ". At each abattoir, a sufficient number of samples of carcass swabs is collected. At larger slaughterhouses, sampling is performed daily. The sampling at larger slaughterhouses is calculated to detect a prevalence of at least 5% Salmonella infected animals with 95% Confidence Interval (CI) in the annual slaughter. Samples are collected evenly distributed over the day and if slaughter is performed on separate lines, each line will be sampled separately. From smaller abattoirs, enough samples to detect a prevalence of 1% Salmonella infected animals with 90% CI will be taken. Sampling is spread out over the slaughter days to avoid periodical sampling. Cutting plants: Samples are taken from crushed meat on equipment etc. or from trimmings. Sampling is designed to detect a prevalence of 5% Salmonella (95% CI).

At meat processing plant

Sampling is according to each plants in-house control and decisions by the local or regional competent authority.

At retail

Sampling is according to each retail's in-house control and decisions by the local competent authorities.

Frequency of the sampling

At slaughterhouse and cutting plant

Carcass swabs: at larger abattoirs: daily, small abattoirs: spread out evenly over the year. NFA sets annually by special decision the number of samples to be taken at each slaughterhouse. 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. See also LivsFS 2005:21 4-7 available at www.slv.se.

At meat processing plant

According to each in-house control plan and decisions by the local or regional competent authority.

At retail

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

Type of specimen taken

At slaughterhouse and cutting plant

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

At meat processing plant

Varies according to in-house control plan and decisions by the local or regional competent authority.

At retail
Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

Carcass swabs: The upper inner part of the hind legs including the pelvic entrance will be tested. A total of 30 cm x 20-25 cm will be swabbed. The cut surface area of the abdomen and the chest including approximately 5 cm of the skin surface will be tested. Approx. 70-80 cm x 8-10 cm will be swabbed. In total approx 1400 cm² will be swabbed. Two sterile swabs moistened with PBS are used. The swabs from one carcass will be placed in a plastic bag. Samples are kept refrigerated until they are sent to the laboratory. One drop off pre-enrichment broth from each of 10 animals at most is pooled in RV broth and examined according to NMKL. Each pre-enrichment broth is stored at 4°C until results are ready. In case of a positive result each broth will be analyzed separately. Crushed meat: 5 subsamples of 5 g are pooled to 25 g and analyzed according to NMKL. However a minor part of the samples taken at cutting plant were analysed with another method.

At meat processing plant

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

Definition of positive finding

At slaughterhouse and cutting plant

A confirmed positive sample.

At meat processing plant

A confirmed positive sample.

At retail

A confirmed positive sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

NMKL 71 or for a minor part of the samples from cutting plants VIDAS SLM is also used.

At meat processing plant

NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2005

At retail

NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2005

Preventive measures in place

The salmonella control program. See also 30 a, 30 b LiVSFS 2005:20

Control program/mechanisms
The control program/strategies in place

National Salmonella Control Program (Comm. Decision 95/50). See also "Salmonella spp. in bovine animals - Control program/mechanisms - The control program/strategies in place"

Recent actions taken to control the zoonoses

See Salmonella General evaluation

Suggestions to the European Union for the actions to be taken

See Salmonella General evaluation

Measures in case of the positive findings or single cases

All positive findings are followed by corrective actions directed against (if possible) product and process.

Notification system in place

Any positive finding has to be reported to the competent authority. See also 37-38 Food decree (2006:813) and 17 LIVSFS 2005:21

Results of the investigation

Salmonella prevalence in animal products of Swedish origin is low. 3475 carcass swabs from pigs were analyzed. Salmonella was detected in two carcass swabs. From cutting plants 5593 samples from both cattle and pigs were collected, all were negative. Reporting from samples at cutting plants does not differentiate between pork and beef.

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

Salmonella prevalence in animal products of Swedish origin is low. See also "Salmonella spp. in bovine meat and products thereof - National evaluation of the recent situation, the trends and sources of infection"

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

As the prevalence of Salmonella in Swedish red and white meat, and eggs is low, the risk of contracting Salmonella from domestically produced food is very small.

Additional information

Between 1996 and 2013, 59584 lymph nodes from cattle have been sampled. Of those, 58 (0.1%) were positive for Salmonella. Furthermore, 62264 swabs have been analyzed and of those 14 (0.02%) have been positive.

3.1.2.2 Salmonella spp. in food - Meat from broilers (Gallus gallus)

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant
Sampling strategies are described in the Swedish Salmonella control programme (95/50/EC). The programme is supervised by the Swedish Board of Agriculture and the National Food Administration. All sampling for the Salmonella programme is performed or supervised by the competent authority. Within the programme, neck skin samples are collected at slaughter. Samples from neck skin include all poultry, not only broilers. The sampling at larger slaughterhouses is calculated to detect a prevalence of at least 5% with 95% confidence interval. A systematic sampling is performed and samples are collected daily. The sampling at smaller slaughterhouses is calculated to detect a prevalence of 5% Salmonella with 95% confidence interval. Samples are evenly spread over the slaughtering days. Cutting plants: Samples are taken from crushed meat on equipment etc. Samples from crushed meat include all poultry, not only broilers. 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

Sampling is according to each plant's in-house control and decisions by the local or regional competent authority.

At retail

Sampling is according to each retail's in-house control and decisions by the local competent authorities.

Frequency of the sampling

At slaughterhouse and cutting plant

Neck skins: at larger abattoirs: daily, small abattoirs: spread out evenly over the year. NFA sets annually by special decision the number of samples to be taken at each slaughterhouse. 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. See also LIVSFS 2005:21 8-9 available at www.slv.se.

At meat processing plant

According to each in-house control plan and decisions by the local or regional competent authority.

At retail

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

Type of specimen taken

At slaughterhouse and cutting plant

Neck skin: Approx. 20 gram/carcass. Cutting plants: crushed meat

At meat processing plant

Varies according to in-house control plan and decisions by the local or regional competent authority.

At retail

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

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant
At slaughterhouse: From each carcass at least 2 pieces, each about 10g, approx. 3 x 3 cm, of neck skin is cut off. At the lab each neck skin sample is divided into two equal parts. One part is pooled. The other part is separately stored until the examination is completed. 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 analysed according to NMKL.

At meat processing plant

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

Definition of positive finding

At slaughterhouse and cutting plant

A confirmed positive sample.

At meat processing plant

A confirmed positive sample.

At retail

A confirmed positive sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

NMKL 71 or for a minor part of the samples from cutting plants VIDAS SLM is also used.

At meat processing plant

NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2005

At retail

NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2005

Preventive measures in place

The salmonella control program. See also 30 a, 30 b LIVSFS 2005:20

Control program/mechanisms

The control program/strategies in place

National Salmonella Control Program (Comm. Decision 95/50). See also “Salmonella spp. in Gallus Gallus - broiler flocks - Control program/mechanisms - The control program/strategies in place - Broiler flocks”

Recent actions taken to control the zoonoses

See Salmonella General evaluation
Suggestions to the European Union for the actions to be taken

See Salmonella General evaluation

Measures in case of the positive findings or single cases

All positive findings are followed by corrective actions directed against (if possible) product and process.

Notification system in place

Any positive finding has to be reported to the competent authority. See also 37-38 Food decree (2006:813) and 17 LIVSFS 2005:21

Results of the investigation

Salmonella prevalence in animal products of Swedish origin is low. In the surveillance program 4900 neckskins were analysed in 2013 - no positive sample was found. In cutting plants 934 samples were taken - no positive sample was found. These figures include also other poultry than broiler. For more detailed information please see the tables.

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

Salmonella prevalence in animal products of Swedish origin is low. See also "Salmonella spp. in Gallus Gallus - broiler flocks - National evaluation of the recent situation, the trends and sources of infection"

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

As the prevalence of Salmonella in Swedish red and white meat, and eggs is low, the risk of contracting salmonella from domestically produced food is very small.

Additional information

In the surveillance described in the Salmonella control programme, approximately 5000 neck skin samples from the slaughter houses are analysed yearly. Between 1995 and 2013, 86291 neck skin samples were collected and of those, 19 (0.02%) were positive. These figures include also other poultry than broiler.

3.1.2.3 Salmonella spp. in food - Meat from pig

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Sampling strategies are described in the Swedish Salmonella control program (95/50/EC). The programs are supervised by the Swedish Board of Agriculture and the National Food Administration. All sampling for the Salmonella programme is performed or supervised by the competent authority. Within the programme swabs are systematically collected from fattening and adult pigs at slaughter, ensuring that the samples are representative of the population of slaughtered pigs at each abattoir. Sampling of carcass swabs in the programme is described here, whereas sampling of lymph nodes is described under "Salmonella spp. in pigs - Monitoring system - Sampling strategy - Breeding herds". At each abattoir, a sufficient number of samples of carcass swabs is collected. At larger slaughterhouses, sampling is performed daily. The sampling at larger slaughterhouses is calculated to detect a prevalence of at least 5% Salmonella infected animals with 95% Confidence Interval (CI) in the annual slaughter. Samples are collected evenly distributed over the day and if slaughter is performed on separate lines, each line will be sampled separately. From smaller abattoirs, enough samples to detect a prevalence of 1% Salmonella infected animals with 90% CI will be taken. Sampling is spread out over the slaughter days to avoid periodical sampling. Cutting plants: Samples are taken from crushed meat on equipment etc. or from trimmings. Sampling is designed to detect a prevalence of 5% salmonella (95% CI).

At meat processing plant

Sampling is according to each plants in-house control and decisions by the local or regional competent authority.
At retail
Sampling is according to each retail's in-house control and decisions by the local competent authorities.

Frequency of the sampling

At slaughterhouse and cutting plant
Carcass swabs: at larger abattoirs: daily, small abattoirs: spread out evenly over the year NFA sets annually by special decision the number of samples to be taken at each slaughterhouse. 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. See also LIVSFS 2005:21 4-7 available at www.slv.se.

At meat processing plant
According to each in-house control plan and decisions by the local or regional competent authority.

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

Type of specimen taken

At slaughterhouse and cutting plant
Carcass swabs: Approx. 1400 square cm/carcass is swabbed. Cutting plants: crushed meat

At meat processing plant
Varies according to in-house control plan and decisions by the local or regional competent authority.

At retail
Varies according to in-house control plan and decisions by the local competent authority.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant
Carcass swabs: The upper inner part of the hind legs including the pelvic entrance will be tested. A total of 30 cm x 20-25 cm will be swabbed. The cut surface area of the abdomen and the chest including approximately 5 cm of the skin surface will be tested. Approx. 70-80 cm x 8-10 cm will be swabbed. In total approx 1400 cm² will be swabbed. Two sterile swabs moistened with PBS are used. The swabs from one carcass will be placed in a plastic bag. Samples are kept refrigerated until they are sent to the laboratory. One drop off pre-enrichment broth from each of 10 animals at most is pooled in RV broth and examined according to NMKL. Each pre-enrichment broth is stored at 4°C until results are ready. In case of a positive result each broth will be analyzed separately. Crushed meat: 5 subsamples of 5 g are pooled to 25 g and analyzed according to NMKL. However a minor part of the samples taken at cutting plant were analysed with another method.

At meat processing plant
According to in-house control plans and decisions by the competent authority.

Definition of positive finding
At slaughterhouse and cutting plant

A confirmed positive sample.

At meat processing plant

A confirmed positive sample.

At retail

A confirmed positive sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

NMKL 71 or for a minor part of the samples from cutting plants VIDAS SLM is also used.

At meat processing plant

NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2005

At retail

NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2005

Preventive measures in place

The salmonella control program. See also 30 a, 30 b LIVSFS 2005:20

Control program/mechanisms

The control program/strategies in place

National Salmonella Control Program (Comm. Decision 95/50). See also "Salmonella spp. in pigs - Control program/mechanisms - The control program/strategies in place - Breeding herds"

Recent actions taken to control the zoonoses

See Salmonella General evaluation - Recent actions taken to control the zoonoses

Suggestions to the European Union for the actions to be taken

See Salmonella General evaluation

Measures in case of the positive findings or single cases

All positive findings are followed by corrective actions directed against (if possible) product and process.

Notification system in place

Any positive finding has to be reported to the competent authority. See also 37-38 Food decree (2006:813) and 17 LIVSFS 2005:21
Results of the investigation

Salmonella prevalence in animal products of Swedish origin is low. 5379 carcass swabs from pigs (2447 from breeding pigs and 2932 from fattening pigs) were analyzed. Salmonella was detected in one carcass swab. From cutting plants 5593 samples from both cattle and pigs were collected, all were negative. Reporting from samples at cutting plants does not differentiate between pork and beef.

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

Salmonella prevalence in animal products of Swedish origin is low. See also "Salmonella spp. in pigs - National evaluation of the recent situation, the trends and sources of infection"

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

As the prevalence of Salmonella in Swedish red and white meat, and eggs is low, the risk of contracting salmonella from domestically produced food is very small.

Additional information

In 1995-2013, 103106 swabs have been analysed and of those 12 (0.01%) have been positive.

3.1.2.4 Salmonella spp. in food - Meat from turkey

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 small. See also "Salmonella spp. in turkey-...".

At meat processing plant

See Salmonella in broiler meat

At retail

See Salmonella in broiler meat

Frequency of the sampling

At slaughterhouse and cutting plant

See Salmonella in broiler meat

Type of specimen taken

Methods of sampling (description of sampling techniques)

Definition of positive finding
Diagnostic/analytical methods used

Preventive measures in place
See Salmonella in broiler meat

Control program/mechanisms
The control program/strategies in place
See Salmonella in broiler meat

Recent actions taken to control the zoonoses
See Salmonella in broiler meat

Suggestions to the European Union for the actions to be taken
See Salmonella in broiler meat

Measures in case of the positive findings or single cases
See Salmonella in broiler meat

Notification system in place
See Salmonella in broiler meat

Results of the investigation
See Salmonella in broiler meat

National evaluation of the recent situation, the trends and sources of infection
See Salmonella in broiler meat

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

Additional information
See Salmonella in broiler meat

3.1.2.5 Salmonella spp. in food - Eggs

Monitoring system
Sampling strategy
There is no official control programme for packing centers or for eggs at retail. Egg packing centers have in-house control programmes that sometimes includes sampling for Salmonella. Egg product producing businesses also usually include salmonella in their in-house sampling plan. See also "Salmonella spp. in Gallus Gallus - flocks of laying hens - Monitoring system - Sampling strategy - Laying hens flocks"

Frequency of the sampling

Eggs at egg packing centres (foodstuff based approach)

There is no official control programme for packing centers or for eggs at retail. Egg packing centers have in-house control programmes that sometimes includes sampling for Salmonella. Egg product producing businesses also usually include salmonella in their in-house sampling plan. See also "Salmonella spp. in Gallus Gallus - flocks of laying hens - Monitoring system - Sampling strategy - Laying hens flocks"

Eggs at retail

There is no official control programme for packing centers or for eggs at retail. Egg packing centers have in-house control programmes that sometimes includes sampling for Salmonella. Egg product producing businesses also usually include salmonella in their in-house sampling plan. See also "Salmonella spp. in Gallus Gallus - flocks of laying hens - Monitoring system - Sampling strategy - Laying hens flocks"

Raw material for egg products (at production plant)

There is no official control programme for packing centers or for eggs at retail. Egg packing centers have in-house control programmes that sometimes includes sampling for Salmonella. Egg product producing businesses also usually include salmonella in their in-house sampling plan. See also "Salmonella spp. in Gallus Gallus - flocks of laying hens - Monitoring system - Sampling strategy - Laying hens flocks"

Egg products (at production plant and at retail)

There is no official control programme for packing centers or for eggs at retail. Egg packing centers have in-house control programmes that sometimes includes sampling for Salmonella. Egg product producing businesses also usually include salmonella in their in-house sampling plan. See also "Salmonella spp. in Gallus Gallus - flocks of laying hens - Monitoring system - Sampling strategy - Laying hens flocks"

Type of specimen taken

Methods of sampling (description of sampling techniques)

Definition of positive finding

Eggs at egg packing centres (foodstuff based approach)

A confirmed positive sample.

Eggs at retail

A confirmed positive sample.

Raw material for egg products (at production plant)

A confirmed positive sample.

Egg products (at production plant and at retail)

A confirmed positive sample.
Diagnostic/analytical methods used

- Eggs at egg packing centres (foodstuff based approach)
  NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2005

- Eggs at retail
  NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2006

- Raw material for egg products (at production plant)
  NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2007

- Egg products (at production plant and at retail)
  NMKL 71, ISO 6579 or any other method fulfilling the requirements according to COMMISSION REGULATION (EC) No 1688/2008

Preventive measures in place

See Salmonella in Gallus gallus layers

Control program/mechanisms

The control program/strategies in place

See "Salmonella spp. in eggs and egg products - Monitoring system - Sampling strategy"

Recent actions taken to control the zoonoses

See Salmonella General evaluation

Suggestions to the European Union for the actions to be taken

See Salmonella General evaluation

Measures in case of the positive findings

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

Notification system in place

Any positive finding has to be reported to the competent authority. See also 37-38 Food decree (2006:813) and 17 LIVSFS 2005:21

Results of the investigation

No positive findings in 2013

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

The national situation is good. Salmonella in eggs and egg products is not considered to be a problem.
Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)

Findings in foodstuffs and in humans is seldom related to consumption of contaminated eggs and eggproducts produced in Sweden.

Additional information

No additional information

3.1.3 Salmonella in animals

3.1.3.1 Salmonella spp. in animal

Monitoring system

Sampling strategy

Described here is Salmonella in animal species (such as horses, pets and wild life) that are not covered by the Salmonella control programme. Sampling at farms/holdings or of individual animals is performed whenever there is a clinical suspicion or for trace-back analysis. Sampling may also be performed at necropsy. Wildlife sent to the SVA for necropsy are tested for Salmonella.

Type of specimen taken

Animals at farm

Organ samples at necropsy. When sampling at farms, faecal samples, sock samples or dust samples can be taken as well as other environmental samples.

Methods of sampling (description of sampling techniques)

Animals at farm

See Salmonella - bovine.

Animals at slaughter (herd based approach)

See Salmonella - bovine.

Diagnostic/analytical methods used

Measures in case of the positive findings or single cases

If Salmonella is detected in food-producing animals (including horses), the herd, the stables and or the paddocks at risk are put under restrictions and the animals are followed up. If Salmonella is detected in companion animals advice is given to the owners and proper actions are taken in order to eliminate the infection and prevent spread of Salmonella.

Notification system in place

Salmonella compulsory notifiable disease.

Results of the investigation
In 2014, Salmonella was detected in 121 cats. Most of these were reported from January to May. All the 32 serotyped cat isolates belonged to Typhimurium. An outbreak of Salmonella among hedgehogs on the isle of Gotland in 2013 led to an intensified screening of Salmonella among hedgehogs in 2014. This resulted in findings of Enteritidis in 16 hedgehogs. In addition, Salmonella Typhimurium was detected in two hedgehogs from mainland Sweden. Also, Salmonella was detected in two dogs, one horse, 14 wild birds and eleven other wild mammals than hedgehogs.

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

A five strategy plan was prepared and published in co-operation with five central authorities (Public Health Agency, National Board of Health and Welfare, National Food Agency, Swedish Board of Agriculture and National Veterinary Institute).

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

Salmonella is endemic in Swedish passerine birds. Human cases have been associated with feeding of passerine birds. Findings of Salmonella in pet reptiles pose a risk for transmission of Salmonella to humans.

Additional information

Since 2003, there have been yearly outbreaks of Salmonella typhimurium in cats during late winter/early spring. The number of reported cats has varied between 30 to 150. Phage type 40 has been the dominant type among the samples that were phagetyped.

3.1.3.2 Salmonella spp. in animal - Cattle (bovine animals)

Monitoring system

Sampling strategy

Sampling strategies are described in the Swedish Salmonella control programme (95/50/EC). The programme is supervised by the Swedish Board of Agriculture and the National Food Administration. All sampling for the Salmonella programme is supervised by official veterinarians at the competent authority. Sampling can be divided into routine sampling and targeted sampling. Routine sampling: Within the programme, lymph nodes are systematically collected from cattle at slaughter to ensure that the samples are representative of the population of slaughtered cattle at each abattoir. Sampling of lymph nodes in the programme is described here, whereas sampling of carcass swabs is described under “Salmonella spp. in bovine meat and meat products”. At each abattoir, a sufficient number of samples of lymph nodes from the ileocaecal region are collected. At larger abattoirs, sampling is performed daily. The sample size is calculated to detect a prevalence of least 5% Salmonella-infected animals with a 95% Confidence Interval (CI) in the number of animals slaughtered annually. At these abattoirs, samples are collected evenly distributed over the day and if slaughter is performed on separate lines, each line will be sampled separately. From smaller abattoirs, enough samples to detect a prevalence of 1% Salmonella-infected animals with 90% CI will be taken. Sampling is spread out over the slaughter days to avoid periodical sampling. Animals that are bought to a farm under certain defined criteria are also sampled. Targeted sampling: Sampling at farms is performed whenever there is a clinical suspicion. Calves up to six months are sampled at necropsy, other animals are sampled when considered necessary.

Frequency of the sampling

Animals at farm

1) lymph nodes: Larger abattoirs: daily, Smaller abattoirs: spread out evenly over the year, 2) sampling at suspicion/outbreak

Animals at slaughter (herd based approach)

see lymph nodes at “Animals at farms”

Type of specimen taken

Animals at farm

Faeces, sock and dust samples Milk or blood samples

Animals at slaughter (herd based approach)
Methods of sampling (description of sampling techniques)

Animals at farm

FECAL 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 50 g (10 g 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 is pooled from no more than 5 animals. If Salmonella is isolated from a pooled sample, each of the individually stored samples can be examined separately.

ENVIRONMENTAL SAMPLES: Sock samples are taken from the barn: from the manure channels and drains and boxes with animals. The sampler walks around with small steps and uses one pair of socks for every part of the system. In stables with boxes socks are used while collecting faecal samples in the boxes. A pair of socks is taken per 50 animals. A milk sample is taken from the tank milk.

LYMPH NODES AT SLAUGHTER: The lymph nodes are aseptically removed and put in a plastic bag. The samples are kept refrigerated until sent to the laboratory. At the laboratory all lymph nodes from one sample are divided into two equal parts. One half is placed in a mortar and the other part is kept at 4°C. In the mortar lymph nodes from 10 animals at most are pooled and homogenized. If Salmonella is isolated from a pooled sample of lymph nodes each of the individually stored samples will be separately analysed.

Animals at slaughter (herd based approach)

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

Case definition

Animals at farm

If Salmonella is isolated from a bovine animal or from the environmental samples, the whole herd is considered infected. The herd is the epidemiological unit. If only a positive serological response is obtained the herd is not considered infected but the finding leads to repeated sampling.

Animals at slaughter (herd based approach)

see "Animals at farm"

Diagnostic/analytical methods used

Animals at farm

Bacteriological method: ISO 6579:2002

Animals at slaughter (herd based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Vaccination is not used.

Other preventive measures than vaccination in place

Control of Salmonella in feed and in feed production (HACCP based approach) is integrated in the control programme. Since 2002, a voluntary hygiene programme has been run by the industry aiming at decreasing the risk of Salmonella. The programme is supervised by the Swedish Board of Agriculture. In this programme, certain rules of hygiene and standardized preventive measures have to be implemented. Holdings affiliated to the programme get higher compensation in case of Salmonella. The majority of all breeding holdings and many of the large dairy herds are affiliated to the programme. In addition, affiliated holdings can apply for a commercial Salmonella insurance.
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 nationwide, thus it covers all herds in Sweden, also those that may export. The Salmonella control programme is officially supervised and includes:

1. Compulsory notification of all findings of Salmonella in all animals, food, feed (environmental sampling included) and humans as well as suspicions of Salmonella, regardless of serotype.
2. Compulsory action if Salmonella is isolated, see “Measures in case of positive findings”.
3. Examination for Salmonella in animals slaughtered under special conditions (e.g. diseased animals or when Salmonella is suspected).
4. Control programme at abattoir and clinical surveillance in herds.

Measures in case of the positive findings or single cases

1. Salmonella isolates have to be sent to the SVA for typing and testing of antimicrobial resistance.
2. When Salmonella is confirmed on a farm, the holding is put under restrictive measures and an epidemiological investigation is always performed and a plan to eradicate Salmonella from the holding is designed. Animal movements to and from the holding are forbidden. In cattle, a combination of stamping out of groups of animals and hygienic measures controlled by repeated sampling is usually employed. Hygienic measures can include reducing the number of animals, control of animal, feed and manure movements on the farm and reduction of Salmonella in the environment by cleaning and disinfection.
3. No Salmonella positive animals should enter the cleaned and disinfected parts of the stable. Negatively tested animals, when considered at low risk of being infected, may be slaughtered under certain conditions with extra hygienic measures and sampling of each carcass. The restrictions are lifted when the cleaning and disinfection have been completed and Salmonella cannot be detected from two whole-herd samplings for culture, performed four weeks apart. Trace-back and trace-forward investigations are also performed. Also, the feed supplier is investigated.
4. If Salmonella is isolated from a lymph node the farm of origin is always sampled except for cases when Salmonella is only isolated from the pooled sample but cannot be traced to an individual animal.
5. If Salmonella is isolated from other animals, humans or feed and connections can be made to cattle, investigation is always performed.

Notification system in place

All findings and suspicions of Salmonella are compulsory notifiable.

Results of the investigation

In summary, Salmonella was detected in nine new herds in 2014: 2 herds were detected by post mortem examination of a diseased calf. 3 herds were detected in a bulk milk screening performed in an area of the Skåne county, where a prolonged Salmonella outbreak has been occurring since 2012. 3 herds were detected by trace-back investigations from a Salmonella positive herd. 1 herd was detected by sampling before sale. In addition, Salmonella was isolated from eight farms put under restrictions before 2014. Salmonella was also isolated from three cases in the necropsy but these findings did not lead to findings in the herd. Salmonella was not isolated from any of 3756 mesenterial lymph nodes from cattle at slaughter.

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

During the 1980's the number of Salmonella-infected cattle farms declined rapidly. Since the end of the 1990's the number of farms with new infections varied from 4 to 13 per year. In 2014, Salmonella was not detected in any of the samples taken at the abattoirs or cutting plants. However, in 2014, a new laboratory was elected for performing Salmonella analyses of the control programme (lymph nodes, carcass swabs and meat trimmings). This laboratory is accredited for Salmonella, but had only a limited experience of Salmonella and no experience of these sample types. The NRL for Salmonella inspected the laboratory and found that the analytical methods and laboratory routines needed improvements. The NRL and NRL pointed out measures the laboratory needed to take to improve its performance. These measures were in progress at the end of the year 2014. The Swedish Salmonella control programme has been in place for decades. It is extensive and the continuous work has resulted in a very favourable Salmonella situation in domestic animals. However, the programme is costly and could be modernised. The Swedish Board of Agriculture, the National Food Agency, the Swedish Institute for Communicable Disease Control, the National Board of Health and Welfare and the National Veterinary Institute have prepared a new common national strategy for the control and monitoring of Salmonella for the entire foodchain from feed to humans. The strategy includes goals and proposals for important actions to achieve goals, including how the control programme should be made more cost effective.

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 the number of Swedish cattle infected with Salmonella has been low. However, Salmonella in cattle might be increasing. Salmonella on farms contaminates the environment which causes a risk to humans and other animal species. Also, human sewage might contaminate water sources and thus lead to infections in animal herds and further infect humans.

Additional information

Prevalence of Salmonella in cattle might be increasing. As Salmonella often causes clinical disease in cattle, a control programme based on testing of clinically healthy cattle at slaughter reveals only some infected herds.
3.1.3.3 Salmonella spp. in animal - Gallus gallus (fowl) - broilers

Monitoring system

Sampling strategy

Broiler flocks

Sampling strategies are described in the Swedish control programme, approved by the Commission in 1995 (95/50/EU), in the Commission regulation (646/2007) and in the national regulations on control of Salmonella (SJVFS 2004:2 and SJVFS 2007:19). The Salmonella control programme is supervised by Swedish Board of Agriculture and National Food Administration. All holdings with an annual production of more than 500 birds are sampled. In practice, all broiler flocks are sampled before slaughter. Sampling is supervised by the competent authority. An official veterinarian visits all broiler holdings once a year. During the visit the official veterinarian takes samples and supervises sampling performed by the food business operator (FBO) and that all results are appropriately documented. Other samplings are performed by the FBO. The aim of the sampling is to detect a prevalence of Salmonella of at least 5% (CI 95%).

Frequency of the sampling

Broiler flocks: Day-old chicks

Day-old chicks are not routinely sampled.

Broiler flocks: Rearing period

No routine sampling of broiler flocks during the rearing period except before slaughter.

Broiler flocks: Before slaughter at farm

2 weeks prior to slaughter

Broiler flocks: At slaughter (flock based approach)

Every batch is sampled

Type of specimen taken

Broiler flocks: Day-old chicks

Meconium

Broiler flocks: Rearing period

Socks/ boot swabs

Broiler flocks: Before slaughter at farm

Socks/ boot swabs

Broiler flocks: At slaughter (flock based approach)

Neck skin
Methods of sampling (description of sampling techniques)

Broiler flocks: Day-old chicks

Day-old chicks of broilers are not routinely sampled.

Broiler flocks: Rearing period

Broilers are not routinely sampled during the rearing period.

Broiler flocks: Before slaughter at farm

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

Broiler flocks: At slaughter (flock based approach)

See: Salmonella in broiler meat

Case definition

Broiler flocks: Day-old chicks

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

Broiler flocks: Rearing period

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

Broiler flocks: Before slaughter at farm

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

Broiler flocks: At slaughter (flock based approach)

See Salmonella in broiler meat.

Diagnostic/analytical methods used

Broiler flocks: Day-old chicks


Broiler flocks: Rearing period


Broiler flocks: Before slaughter at farm

Vaccination policy

Broiler flocks

Vaccination is not in use.

Other preventive measures than vaccination in place

Broiler flocks

A preventive voluntary programme with the aim of reducing the risk of acquiring Salmonella has been in place for more than 40 years. The programme includes all-in all-out production, hygienic measures and certain standards for poultry houses, such as hygienic barriers between the clean and unclean part. Purchase of animals is only allowed from holdings affiliated to the voluntary programme. Only heat-treated feed is allowed. The poultry houses must be cleaned and disinfected before introduction of a new flock. The broiler producer has to make an application to be accepted into the voluntary programme. An official veterinarian controls the housing regularly. The producers affiliated to the voluntary program are allowed higher compensation in case of Salmonella. All broiler producers belonging to the Swedish Poultry Association are affiliated to the voluntary programme (approximately 99% of the slaughtered broilers).

Control program/mechanisms

The control program/strategies in place

Broiler flocks

All broiler flocks are sampled 2 weeks before slaughter. A voluntary control programme is in place (see Other preventive measures than vaccination).

Recent actions taken to control the zoonoses

See the text on Salmonella -general evaluation.

Suggestions to the European Union for the actions to be taken

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

Measures in case of the positive findings or single cases

Broiler flocks: Day-old chicks

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

Broiler flocks: Rearing period

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

Broiler flocks: Before slaughter at farm
If Salmonella is detected all the birds are euthanized and destroyed irrespective of the serotype. The holding is cleaned and disinfected and put under restriction. An investigation in order to trace the source of infection is conducted. Restrictions are not lifted until environmental samples from within the house are taken and analyzed with negative results. A new flock can be introduced into the holding after no Salmonella can be detected in the broiler house.

Broiler flocks: At slaughter (flock based approach)

See Salmonella in broiler meat.

Notification system in place

When Salmonella is isolated the laboratory has to notify the Swedish Board of Agriculture and the County Administration (of the holding) irrespective of the serotype. The County Administration informs meat inspection veterinarian and others who need the information at this stage. The isolate is sent to the National Veterinary Institute (SVA) for confirmation, typing and resistance testing. SVA reports the results of the analysis to the sending laboratory, Swedish Board of Agriculture, the food business operator and County Administration. In addition, the laboratory must report to the County Administration on the results of tests of all poultry flocks situated in the county. This reporting is performed on a quarterly basis. The County Administration summarizes the results each year and sends this summary to the Swedish Board of Agriculture. It is compulsory to notify any finding of Salmonella. However, the summary reports done by the county administrations cover only laying hens. In practice, information on the samplings of poultry flocks is gathered by the SVA by contacting the laboratories, the Swedish Poultry Meat Association, the Swedish Egg Association and the abattoirs not affiliated to the Swedish Poultry Meat Association.

Results of the investigation

Salmonella Typhimurium was detected in two broiler flocks.

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

Between 1996-2005 the Salmonella situation was stable with 1-4 infected flocks detected per year. In 2008, three poultry flocks were directly associated with human cases (one broiler flock, one flock of layer hens and one turkey flock). In 2009, goslings purchased from one holding with breeding geese were a source of Salmonella typhimurium infection in 10 poultry flocks of different species. This holding also had fattening geese and turkeys and a history of Salmonella infection in recent years with clinical salmonellosis in children. In 2010, an outbreak affecting 17 flocks occurred early in the year.

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

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

3.1.3.4 Salmonella spp. in animal - Pigs

Monitoring system

Sampling strategy

Breeding herds

Sampling strategies are described in the Swedish Salmonella control program (95/50/EC). The programs are supervised by the Swedish Board of Agriculture and the National Food Administration. All sampling for the Salmonella programme is performed or supervised by the competent authority and by official veterinarians. Sampling is divided into routine sampling and targeted sampling. Routine sampling consists of faecal samples from herds, lymph nodes and carcass swabs at slaughter. Targeted sampling consists of faecal, environmental and feed samples from herds. ROUTINE SAMPLING Routine sampling Within the programme lymph nodes from the ileo-caecal region are systematically collected from fattening and adult pigs at slaughter, ensuring that the samples are representative of the population of slaughtered pigs at each abattoir. Sampling of lymph nodes in the programme is described here, whereas sampling of carcass swabs is described under “Salmonella spp. in pig meat and meat products”. At each abattoir, a sufficient number of samples of lymph nodes from the ileocaecal region is collected. At larger slaughterhouses, sampling is performed daily. The sampling at larger slaughterhouses is calculated to detect a prevalence of at least 5% Salmonella infected animals with 95% Confidence Interval (CI) in the annual slaughter. Samples are collected evenly distributed over the day and if slaughter is performed on separate lines, each line will be sampled separately. From smaller abattoirs, enough samples to detect a prevalence of 1% Salmonella infected animals with 90% CI will be taken. Sampling is spread out over the slaughter days to avoid periodical sampling. Breeding and gilt-producing herds are sampled once a year and sow-pools twice a year. All imported animals are sampled. TARGETED SAMPLING Sampling at farms and abattoirs is performed whenever there is a clinical suspicion.
Multiplying herds

see "breeding herds"

Fattening herds

see "breeding herds"

Frequency of the sampling

Breeding herds

1. Lymph nodes at larger abattoirs: daily, small abattoirs: spread out evenly over the year 2. Sampling at suspicion/outbreak 3. Faecal samples once a year 4. All imported animals

Multiplying herds

1. Lymph nodes at larger abattoirs: daily, small abattoirs: spread out evenly over the year 2. Sampling at suspicion/outbreak 3. Sow pools twice a year 4. All imported animals

Fattening herds at farm

1. Lymph nodes at larger abattoirs: daily, small abattoirs: spread out evenly over the year 2. Sampling on suspicion/outbreak

Fattening herds at slaughterhouse (herd based approach)

The sampling unit is the pig, not the herd

Type of specimen taken

Breeding herds

Lymph nodes and faeces or sock samples

Multiplying herds

Lymph nodes and faeces or sock samples

Fattening herds at farm

Lymph nodes and faeces or sock samples

Methods of sampling (description of sampling techniques)

Breeding herds
* Faecal sampling:  1. Sampling procedure in clinical suspicion: For individual sampling, at least 10 g faeces from each animal is collected. From pens with growers/finisher pigs pooled faecal samples of at least 50g (10g from each of at least 5 animals/pen) is collected. For sampling at suspicion or in outbreak investigations faecal samples are only pooled for fattening pigs and not for adult pigs.  2. Sampling procedure in routine sampling: Faecal samples are taken from 50 sows. Faeces from five animals are pooled to one sample.  3. Bacteriological examination: All samples should be analysed within 24-48 h of collection. From individual samples, 5 g faeces is examined while the remaining part is stored at +4°C until examination is completed. Material from at most 5 animals is 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: 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 a maximum of 10 animals are pooled and homogenized. If Salmonella is isolated from a pooled sample of lymph nodes each of the individually stored samples will be analysed separately.

Multiplying herds

See "breeding herds"

Fattening herds at farm

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

Fattening herds at slaughterhouse (herd based approach)

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

**Case definition**

**Breeding herds**

If Salmonella is isolated from a pig in the herd sampling, 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: ISO 6579:2002

**Multiplying herds**

Bacteriological method: ISO 6579:2002

**Fattening herds at farm**
Bacteriological method: ISO 6579:2002

Fattening herds at slaughterhouse (herd based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Breeding herds

Vaccination is not used in Sweden.

Fattening herds

See under "breeding herd"

Other preventive measures than vaccination in place

Breeding herds

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

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 nationwide, thus it covers all herds in Sweden, also those that may deliver their animals abroad. The Salmonella control programme is officially supervised and includes: a) Compulsory notification of all findings of Salmonella in all animals, food, feed (including environmental sampling) and humans, as well as suspicion of Salmonella, regardless of serotype b) Compulsory action if Salmonella is isolated see "Measures in case of positive findings" c) Examination for Salmonella in animals slaughtered under special conditions (e.g. diseased animals or when Salmonella is suspected) d) Control programme at abattoirs 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 the farm level.

Multiplying herds

See under "breeding herd"

Fattening herds

See under "breeding herd"

Recent actions taken to control the zoonoses

In 2014, a new laboratory was elected for performing Salmonella analysis of the control programme. This laboratory is accredited for Salmonella but had only a limited experience.

Suggestions to the European Union for the actions to be taken
Control of Salmonella at both herd and slaughter level is important.

Measures in case of the positive findings or single cases

1. Salmonella isolates have to be sent to the SVA for typing and testing of antimicrobial resistance. 2. When Salmonella is confirmed on a farm, the holding is put under restrictive measures and an epidemiological investigation is always performed and a plan to eradicate Salmonella from the holding is designed. Animal movements to and from the holding are forbidden. In swine, a combination of stamping out of groups of animals and hygienic measures controlled by repeated sampling is usually practiced. Hygienic measures can include reducing the number of animals, control of animal, feed and manure movements on the farm and reduction of Salmonella in the environment by cleaning and disinfection. No Salmonella positive animals should enter the cleaned and disinfected parts of the stable. Negatively tested animals, when considered at low risk of being infected, may be slaughtered under certain conditions with extra hygienic measures and sampling of each carcass. The restrictions are lifted when the cleaning and disinfection have been completed and Salmonella cannot be detected from two whole-herd samplings for culture performed four weeks apart. Trace-back and trace-forward investigations are also performed. Also, the feed supplier is investigated. 3. If Salmonella is isolated from a lymph node the farm of origin is always sampled except for cases when Salmonella is only isolated from the pooled sample but cannot be traced to an individual animal. 4. If Salmonella is isolated from other animals, humans or feed and connections can be made to swine, investigation is always performed.

Notification system in place

All findings and suspicions of Salmonella are compulsory notifiable.

Results of the investigation

In 2014, Salmonella was not detected in any pig herds. Salmonella was not detected from any of the 2,329 lymph node samples taken from adult pigs or from the 2,871 lymph node samples of fattening pigs. Salmonella was not isolated from any of the 40 breeding or gilt-producing herds that were sampled.

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

The situation in Sweden has been favorable. From the beginning of the 80's there were, in general, less than 5 infected pig-herds per year. Control of feed and infected herds is extremely important in order to prevent Salmonella infections. The growing herd sizes and the structural changes pose a great challenge for biosecurity and sanitation. In 2014, Salmonella was neither detected in pig herds nor in the samples taken at abattoirs. However, in 2014, a new laboratory was elected for performing Salmonella analyses of the control programme (lymph nodes, carcass swabs and meat trimmings). This laboratory is accredited for Salmonella, but had only a limited experience of Salmonella and no experience of these matrices. The NRL for Salmonella inspected the laboratory and found that the laboratory was underperforming. The NFA and NRL pointed out measures the laboratory needed to take to improve its performance. These measures were in progress at the end of the year 2014. Thus, the results of the control programme of 2014 are not reliable. The Swedish Salmonella control programme has been in place for decades. It is extensive and the continuous work has resulted in a very favourable Salmonella situation in domestic animals. However, the programme is costly and could be modernised. The Swedish Board of Agriculture, the National Food Agency, the Swedish Institute for Communicable Disease Control, the National Board of Health and Welfare and the National Veterinary Institute have now prepared a new common national strategy for the control and monitoring of Salmonella in the entire foodchain from feed to humans. The strategy includes goals and proposals for important actions to achieve goals, including how the control programme should be made more cost effective. See also "Salmonella spp. in pig meat and products".

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

Since 1996 the percentage of swedish pigs infected with Salmonella has varied from 0(2014) to 0,38% (2007). However, the number of swedish pigs infected with Salmonella is still low.

Additional information

Apart from sampling of animals in the mandatory Salmonella programme at the herd and slaughter level, there is extensive sampling at feed mills at critical control points to ensure production of feed virtually free from Salmonella contamination. Swine herds can participate in a voluntary control programme which gives a higher biosecurity.

3.1.3.5 Salmonella spp. in animal - Gallus gallus (fowl) - laying hens

Monitoring system

Sampling strategy

Laying hens flocks
Sampling strategies are described in the Swedish control programme, approved by the Commission in 1995 (95/50/EU), in the Commission regulation (1168/2006) and in the national regulations on control of Salmonella (SJVFS 2004:2 and SJVFS 2007:19). The Salmonella control programme is supervised by Swedish Board of Agriculture and National Food Administration. All holdings selling eggs for consumption are sampled. Sampling is supervised by the competent authority. An official veterinarian visits every holding once a year. During the visit the official veterinarian takes samples and controls sampling performed by the food business operator (FBO) and that all results are documented. Other samplings are performed by the FBO. The aim of the sampling is to detect a prevalence of Salmonella of at least 5% (CI 95%).

Frequency of the sampling

Laying hens: Day-old chicks

No routine sampling of day-old chicks.

Laying hens: Rearing period

During the rearing period laying hens are sampled 2 weeks prior to moving.

Laying hens: Production period

Laying hens are sampled every 15 weeks with start of the age of 22-26 weeks.

Laying hens: Before slaughter at farm

Laying hens are sampled 2 weeks prior to slaughter.

Laying hens: At slaughter

See: Salmonella in broiler meat

Eggs at packing centre (flock based approach)

No routine sampling at packing centres.

Type of specimen taken

Laying hens: Day-old chicks

Meconium

Laying hens: Rearing period

Socks/ boot swabs

Laying hens: Production period

Socks/ boot swabs

Laying hens: Before slaughter at farm

Socks/ boot swabs

Laying hens: At slaughter
Neck skin

Eggs at packing centre (flock based approach)

No routine sampling of eggs.

Methods of sampling (description of sampling techniques)

Laying hens: Day-old chicks

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

Laying hens: Rearing period

Holdings with more than 200 hens are sampled.

Laying hens: Production period

All holdings selling eggs for consumption are sampled.

Laying hens: Before slaughter at farm

All flocks are sampled two weeks before slaughter. Two alternatives for sampling: 1. Two pairs of sock samples are taken from the area where the birds are rearing. This sample is pooled to form one sample. 2. Two fecal samples of 75 g are collected from the flock and pooled into one sample.

Laying hens: At slaughter

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

Eggs at packing centre (flock based approach)

No routine samples are taken at egg packing centers.

Case definition

Laying hens: Day-old chicks

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

Laying hens: Rearing period

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

Laying hens: Production period

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

Laying hens: Before slaughter at farm

If Salmonella is isolated from a sample the whole flock is considered infected with Salmonella.
Laying hens: At slaughter

See the chapter of Salmonella in broiler meat.

Diagnostic/analytical methods used

Laying hens: Day-old chicks


Laying hens: Rearing period


Laying hens: Production period


Laying hens: Before slaughter at farm


Laying hens: At slaughter

Bacteriological method: NMKL No 71:1999

Eggs at packing centre (flock based approach)

No routine sampling.

Vaccination policy

Laying hens flocks

Laying hens are not vaccinated against Salmonella in Sweden.

Other preventive measures than vaccination in place

Laying hens flocks

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

Control program/mechanisms

The control program/strategies in place

Laying hens flocks
A HACCP-based Salmonella control in feed and in feed production is integrated in the control programme. All serotypes of Salmonella are covered in the whole control programme. Sampling is performed as described earlier. Additional samplings can be undertaken when there is a suspicion such as trace-back of an infected flock or human cases.

Recent actions taken to control the zoonoses

See Salmonella -general evaluation.

Suggestions to the European Union for the actions to be taken

Actions towards all serotypes of Salmonella should be taken. A HACCP-based control of feed and feed production.

Measures in case of the positive findings or single cases

Laying hens flocks

If Salmonella is detected all the birds are euthanized and destroyed irrespective of the serotype. The holding is cleaned and disinfected and put under restrictive measures. An investigation in order to trace the source of infection is conducted. Restrictions are not lifted until environmental samples from within the house are taken and analysed with negative results. A new flock can be introduced into the holding after no Salmonella can be detected in the broiler house.

Notification system in place

When Salmonella is isolated, the laboratory has to notify the Swedish Board of Agriculture and the County Administration (of the holding) irrespective of the serotype. The County Administration informs others who need the information at this stage. The isolate is sent to the National Veterinary Institute (SVA) for confirmation, typing and resistance testing. SVA reports the results of the analysis to the sending laboratory, Swedish Board of Agriculture, the food business operator and County Administration. In addition, the laboratory must report to the County Administration on the results of tests of all poultry flocks situated in the county. This reporting is performed on a quarterly basis. The County Administration summarizes the results each year and sends this summary to the Swedish Board of Agriculture. Any finding of Salmonella is compulsory notifiable. However, the summary reports done by the county administrations cover only laying hens. In practice, information on the samplings of poultry flocks is gathered by the SVA by contacting the laboratories, the Swedish Poultry Meat Association, the Swedish Egg Association and the abattoirs not affiliated to the Swedish Poultry Meat Association.

Results of the investigation

In 2014, Salmonella was detected in two layer flocks: serovars Typhimurium and Mbandaka, respectively.

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

Prevalence of Salmonella in Swedish food-producing animals is low. See text on Salmonella in Gallus gallus broilers.

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

See text on Salmonella in Gallus gallus broilers.

3.1.3.6 Salmonella spp. in animal - Gallus gallus (fowl) - breeding flocks, unspecified

Monitoring system

Sampling strategy

Breeding flocks (separate elite, grand parent and parent flocks when necessary)
Sampling strategies are described in the Swedish control programme, approved by the Commission in 1995 (95/50/EU), in the Commission regulations and in the national regulations on control of Salmonella (SJVFS 2004:2 and SJVFS 2007:19). All holdings with more than 250 breeders are sampled. Sampling of breeders is supervised by the competent authority. An official veterinarian visits all breeding holdings with rearing birds once a year and breeding holdings with production animals three times a year. During the visit the official veterinarian takes samples and supervises sampling performed by the food business operator (FBO) and confirms that results are documented. Other samples are taken by the FBO. The aim of the sampling is to detect a prevalence of Salmonella of at least 5% (CI 95%). There are no elite breeding flocks in Sweden.

Frequency of the sampling

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

Every flock is sampled.

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

Every flock is sampled at the age of 4 weeks and 2 weeks before moving.

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

Flocks are sampled every second week.

Type of specimen taken

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

Meconium

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

Socks/ boot swabs

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

Socks/ boot swabs

Methods of sampling (description of sampling techniques)

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

Breeding flocks are sampled at hatcheries by taking meconium from day-old birds. Approximately 250 bird samples are pooled into one sample for analysis.

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

Breeding flocks are sampled three times during the rearing period: as day-old chicks, at 4 weeks and 2 weeks prior to removal. Except for day-old chicks two pairs of bootswabs are taken from the area where birds are reared. Two pairs are pooled to one sample.

Breeding flocks: Production period

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

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

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

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

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

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

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

Diagnostic/analytical methods used

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


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


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


Vaccination policy

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

Vaccination is not in use in Sweden.

Other preventive measures than vaccination in place

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

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

Control program/mechanisms

The control program/strategies in place

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

See the text on other preventive measures.
Suggestions to the European Union for the actions to be taken

A HACCP-based control of feed should be integrated in the Salmonella control programs. All serotypes should be included in the target.

Measures in case of the positive findings or single cases

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

If Salmonella is detected all the birds are euthanized and destroyed irrespective of the serotype. The holding is cleaned and disinfected and put under restriction. An investigation in order to trace the source of the infection is conducted. Restrictions are not lifted until environmental samples from within the house are taken and analysed with negative results. A new flock can be introduced into the holding after no Salmonella can be detected in the holding.

Notification system in place

Any finding of Salmonella is compulsory notifiable. See the text on notification system of Gallus gallus broiler flocks.

Results of the investigation

In 2014, Salmonella was not detected in any grand parent flocks of Gallus gallus. Salmonella Poona was isolated from one sample from a parent flock for meat production. No Salmonella was detected from the consecutive samples taken from the flock. The possibility of a low grade infection could not be ruled out. Therefore the flock was euthanized.

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

See Salmonella in Gallus gallus broiler flocks

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

See Salmonella in Gallus gallus broiler flocks

3.1.3.7 Salmonella spp. in Ducks - breeding flocks and meat production flocks

Monitoring system

Sampling strategy

Breeding flocks

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC), in the Zoonosis Directive (2003/99/EG) and in the Swedish regulation on control of Salmonella in poultry (SJ VFS 2007:19). The Salmonella control programme is supervised by the Swedish Board of Agriculture and the National Food Administration. Official veterinarians are responsible for sampling in holdings. Samples are either taken by the official veterinarian or sampling is delegated to the food business operators. The control consists of clinical surveillance and sampling. The clinical surveillance includes general surveillance and surveillance related to the control programme. Veterinarians takes samples once a year during rearing and three times a year under production. The other samples are taken by the food business operator. The aim is to detect a prevalence of Salmonella of at least 5% with a confidence interval of 95% on flock level each time sampling is done. Breeders and hatchery: Sampling of breeding flocks is carried out according to Regulation SJ VFS 2007:19. Sampling is mandatory at holdings with more than 250 breeding ducks. There are no Elite and Grand Parent ducks in Sweden. The breeding stock is imported as parents.

Meat production flocks

Mandatory sampling if >500 ducks are raised for slaughter per year. In practice, every flock is sampled 2 weeks prior to slaughter. If thinning is practiced an additional sampling has to be done 10 days before slaughter. Once a year, this sampling is done by an official veterinarian, usually the veterinarian responsible at the abattoir where the ducks are slaughtered.
Frequency of the sampling

Breeding flocks: Day-old chicks
Every flock is sampled

Breeding flocks: Rearing period
at the age of 4 weeks and 2 weeks before moving

Breeding flocks: Production period
Every second week

Meat production flocks: Day-old chicks
No routine sampling of day-old ducks.

Meat production flocks: Rearing period
See "before slaughter at farm"

Meat production flocks: Before slaughter at farm
Sampling at 1-2 weeks before slaughter.

Meat production flocks: At slaughter (flock based approach)
see Salmonella in broiler meat and meat products

Type of specimen taken

Breeding flocks: Day-old chicks
Meconium

Breeding flocks: Rearing period
Socks/ boot swabs

Breeding flocks: Production period
Socks/ boot swabs

Meat production flocks: Day-old chicks
Meconium

Meat production flocks: Before slaughter at farm
socks or faeces
Meat production flocks: At slaughter (flock based approach)

neck skins, see Salmonella in broiler meat and products thereof

Methods of sampling (description of sampling techniques)

Breeding flocks: Day-old chicks

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

Breeding flocks: Rearing period

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

Breeding flocks: Production period

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

Meat production flocks: Day-old chicks

See Breeding ducks: day-old chicks

Meat production flocks: Rearing period

See meat production flocks: Before slaughter at farm

Meat production flocks: Before slaughter at farm

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

Meat production flocks: At slaughter (flock based approach)

see "Salmonella in broiler meat and products thereof"

Case definition

Breeding flocks: Day-old chicks

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

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. The flock is considered infected if Salmonella is isolated from the flock samples taken.

Diagnostic/analytical methods used

Breeding flocks: Day-old chicks


Breeding flocks: Rearing period


Breeding flocks: Production period


Meat production flocks: Day-old chicks


Meat production flocks: Rearing period


Meat production flocks: Before slaughter at farm


Meat production flocks: At slaughter (flock based approach)

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Vaccination policy

Breeding flocks

Vaccination is not in use.

Meat production flocks
Other preventive measures than vaccination in place

Breeding flocks

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

Meat production flocks

Controlled feed, Salmonella free ducklings.

Control program/mechanisms

The control program/strategies in place

Breeding flocks

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

Meat production flocks

These are raised outdoors. Following rules may be applied at some holdings: 1. Rules for feed production and transport 2. Salmonella free newly hatched ducklings from the hatcheries 3. 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

Salmonella is a compulsory notifiable. See the text of the notification system in Salmonella in broiler flocks.

Results of the investigation

In 2014, Salmonella was not isolated from any flocks of ducks.

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

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

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

See Salmonella-geese

3.1.3.8 Salmonella spp. in Geese - breeding flocks and meat production flocks
Monitoring system

Sampling strategy

Breeding flocks

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC), in the Zoonosis Directive (2003/99/EG) and in the Swedish regulation on control of Salmonella in poultry (SJVFS 2007:19). The Salmonella control programme is supervised by the Swedish Board of Agriculture and the National Food Administration. Official veterinarians are responsible for sampling in holdings and at hatcheries. The control constitutes of clinical surveillance and sampling. The clinical surveillance includes general surveillance and surveillance related to the control programme where an official veterinarian visits breeding farms three times during egg production and otherwise once a year. The aim is to detect a prevalence of salmonella of at least 5% with a confidence interval of 95% on flock level each time sampling is done. Breeders and hatchery: Sampling of breeding flocks is carried out according to Regulation SJVFS 2007:19. Sampling is mandatory at holdings with more than 250 breeding geese. The Swedish goose production is very small. There are no elite and grand parent geese in Sweden. The parent stock is imported as day-old chicks.

Type of specimen taken

Imported feed material of animal origin

see "Salmonella spp in feed"

Frequency of the sampling

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

Every flock is sampled

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

At 4 weeks and 2 weeks prior to moving

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

Every 2nd week

Meat production flocks: Day-old chicks

No routine sampling of day-old ducklings.

Meat production flocks: Rearing period

No routine sampling during the rearing period.

Meat production flocks: Before slaughter at farm

1-2 weeks before slaughter

Meat production flocks: At slaughter (flock based approach)

see Salmonella in broiler meat and products thereof

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

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

Socks/ boot swabs

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

Socks/ boot swabs

Meat production flocks: Day-old chicks

Meconium

Meat production flocks: Rearing period

No routine sampling except for before slaughter.

Meat production flocks: Before slaughter at farm

Socks or faeces

Meat production flocks: At slaughter (flock based approach)

Sampling of neck skins, see Salmonella in poultry meat.

Methods of sampling (description of sampling techniques)

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

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

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

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

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

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

Meat production flocks: Day-old chicks

See "Breeding flocks: Day-old chicks"

Meat production flocks: Rearing period

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

Meat production flocks: Before slaughter at farm
Sampling is mandatory at holdings with >500 geese slaughtered yearly. In practice, all geese are tested before slaughter. Two paired sock samples are taken and pooled into one sample two weeks before slaughter. Instead of sock samples it is also possible to take 2 faecal samples of 75 g and pool them into one sample. An official veterinarian takes samples once a year, the other samples are taken by the food business operator.

Meat production flocks: At slaughter (flock based approach)

See "Salmonella in broiler meat and products thereof" 

Case definition

Breeding flocks: Day-old chicks

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

Breeding flocks: Rearing period

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

Breeding flocks: Production period

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

Meat production flocks: Day-old chicks

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

Meat production flocks: Rearing period

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

Meat production flocks: Before slaughter at farm

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

Meat production flocks: At slaughter (flock based approach)

A positive neck skin sample at slaughter results in restriction on the holding of origin and additional official testing at the holding. If Salmonella is isolated from a sample, the flock is considered infected.

Diagnostic/analytical methods used

Breeding flocks: Day-old chicks


Breeding flocks: Rearing period


Breeding flocks: Production period

Vaccination policy

Breeding flocks

Vaccination against Salmonella is not in use.

Meat production flocks

Vaccination against Salmonella is not in use.

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 geeslings.

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 goose 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

Meat production flocks have access to outdoor space. Following rules are applied at some establishments: a) Rules for feed production and transport, b) Salmonella free newly hatched goslings are delivered from the hatcheries, c) precaution to stop spread of Salmonella from an infected flock. At some holdings no preventive measures are applied.
Recent actions taken to control the zoonoses

See Salmonella - general evaluation.

Measures in case of the positive findings or single cases

Breeding flocks

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

Meat Production flocks

See "Breeding flocks"

Notification system in place

Any finding of Salmonella is compulsory notifiable. See the text of the notification system in Salmonella in broiler flocks.

Results of the investigation

In 2014, Salmonella Typhimurium was detected in two goose flocks.

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

Since 1996, the situation has remained stable with no to a few infected flocks per year. The Swedish goose-meat production is very small but the few holdings struggle with Salmonella.

3.1.3.9 Salmonella spp. in Turkeys - breeding flocks and meat production flocks

Monitoring system

Sampling strategy

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

Sampling strategies are outlined in the Swedish Salmonella control programme, approved by the EU in 1995 (95/50/EC), in the Zoonosis Directive (2003/99/EG), Commission regulations (584/2008) and in the Swedish regulation on control of Salmonella in poultry (SjVFS 2007:19). The Salmonella control programme is supervised by the Swedish Board of Agriculture and the National Food Administration. All sampling for the Salmonella programme is supervised by the competent authority. The control includes clinical surveillance and sampling. The clinical surveillance includes general surveillance and surveillance related to the control programme where an official veterinarian visits turkey farms once a year. The official veterinarian takes samples for Salmonella once a year and three times during the production period, the other samples are taken by the food business operator. The aim is to detect a prevalence of Salmonella of at least 5% with a confidence interval of 95% on flock level each time sampling is done. Breeders and hatchery: Sampling is mandatory at holdings with more than 250 breeding turkeys. There are no elite and grand parent turkeys in Sweden. The breeding stock is imported as parents.

Meat production flocks

Mandatory sampling if >500 turkeys are raised for slaughter per year. In practice, all flocks are tested for Salmonella prior to slaughter. Every flock is sampled 2 weeks prior to slaughter. If thinning is practised an additional sampling has to be done 10 days before slaughter. Once a year this sampling is done by an official veterinarian.

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

Every flock is sampled.

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

At 4 weeks and 2 weeks prior to moving

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

Every second week

Meat production flocks: Rearing period

No routine sampling during the rearing period.

Meat production flocks: Before slaughter at farm

1-2 weeks before slaughter

Meat production flocks: At slaughter (flock based approach)

See Salmonella in broiler meat and products thereof

Type of specimen taken

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

Meconium

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

Sock samples

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

Sock samples

Meat production flocks: Day-old chicks

See Breeding flocks

Meat production flocks: Rearing period

See Meat production flocks: Before slaughter at farm

Meat production flocks: Before slaughter at farm

Sock samples

Meat production flocks: At slaughter (flock based approach)

Neck skin; see Salmonella in broiler meat and products thereof
Methods of sampling (description of sampling techniques)

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

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

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

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

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

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

Meat production flocks: Day-old chicks

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

Meat production flocks: Rearing period

Meat production flocks are only sampled 2 weeks before slaughter.

Meat production flocks: Before slaughter at farm

Two paired sock samples are taken and pooled into one sample two weeks before slaughter. An official veterinarian takes samples once a year, the other samples are taken by the food business operator.

Case definition

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

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

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

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

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

Meat production flocks: Day-old chicks

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

Meat production flocks: Rearing period

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

Meat production flocks: Before slaughter at farm

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

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 flock is considered infected.

Diagnostic/analytical methods used

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


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


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


Meat production flocks: Day-old chicks


Meat production flocks: Rearing period


Meat production flocks: Before slaughter at farm


Meat production flocks: At slaughter (flock based approach)

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Vaccination policy

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

Vaccination is not used.

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 against Salmonella. These rules are implemented by the prophylactic voluntary salmonella control programme and includes:

1. Rules for feed production and transportation
2. Hygienic rules to protect the birds from Salmonella infection from their surroundings
3. Salmonella free newly hatched turkey chicks are delivered from the hatcheries
4. Precautions to stop the spread of Salmonella from an infected flock
5. All-in all-out management in all categories of poultry production.

Meat production flocks

Strict hygiene rules are enforced through the whole production chain as preventive measures against Salmonella. These rules are implemented by the prophylactic voluntary Salmonella control programme and includes:

1. Rules for feed production and transportation
2. Hygienic rules to protect the birds from Salmonella infection from their surroundings
3. Salmonella free newly hatched turkey chicks are delivered from the hatcheries
4. Precautions to stop the spread of salmonella from an infected flock
5. All-in all-out management in all categories of poultry production. Not all meat production flocks are affiliated to the voluntary control programme.

Control program/mechanisms

The control program/strategies in place

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

Sampling strategies are described in the Swedish control programme, approved by the Commission in 1995 (95/50/EU), in the Commission regulations and in the national regulations on control of Salmonella (SJ/VFS 2004:2 and SJ/VFS 2007:19). All holdings having more than 250 breeders are sampled. Sampling of breeders is supervised by the competent authority. An official veterinarian visits all breeding holdings with rearing birds once a year and breeding holdings with production animals three times a year. During the visit the official veterinarian takes samples and controls sampling performed by the food business operator (FBO) and that all results are documented. Other samples are taken by the FBO. The aim of the sampling is to detect a prevalence of Salmonella of at least 5% (CI 95%). There are no elite or grand parent breeding flocks of turkeys in Sweden. The parent stock is imported as day-old chicks.

Meat production flocks

See "Breeding flocks"

Recent actions taken to control the zoonoses

See Salmonella - general evaluation.

Suggestions to the European Union for the actions to be taken

A HACCP-based control of feed should be integrated in the Salmonella control programmes. All serotypes should be included in the target.

Measures in case of the positive findings or single cases

If Salmonella is detected all the birds are euthanized and destroyed irrespective of the serotype. The holding is cleaned and disinfected and put under restrictive measures. An investigation in order to trace the source of infection is conducted. Restrictions are not lifted until environmental samples from within the house are taken and analysed with negative results. A new flock can be introduced into the holding after no Salmonella can be detected in the holding.

Notification system in place

Any finding of Salmonella is compulsory notifiable. See the text of the notification system in Salmonella in broiler flocks.

Results of the investigation

In 2014, Salmonella was not detected in any turkey flocks.

National evaluation of the recent situation, the trends and sources of infection
The Swedish turkey production is small. Since 1996, none to a few infected flocks have been detected every year.

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

In 2007-2009 Salmonella isolated from turkey flocks was associated with infections in humans.

Additional information

See Salmonella - general evaluation.

3.1.4 Salmonella in feedingstuffs

3.1.4.1 Salmonella spp. in feed

Monitoring system

Sampling strategy

The aim of the surveillance is to investigate the Salmonella status of ingredients as well as the environmental hygiene of the premises, especially the production lines, and also to take corrective actions when positive samples are detected. Feedmills and feed-material suppliers are included in the surveillance which is based on HACCP-principles following a risk analysis. Feed materials that are categorized as a risk for Salmonella contamination have to be tested negative, according to a sampling plan that is designed to detect a Salmonella contamination of 5% of the batch with 95% probability, before being used in feed processing. Feed samples collected by the feed operator and also officials are investigated when outbreaks occur in food-producing animals.

Frequency of the sampling

Domestic feed material of plant origin

Products in their natural state, the frequency of official controls are carried out according to a sampling plan. In premises where products derived from industrial processing are produced, the frequency of sampling follows a sampling plan based on a risk assessment. The samples are taken in the processing line/environment as dust samples/scrapings.

Domestic feed material of animal origin

Products in their natural state, fresh or preserved, the frequency of official controls are carried out according to a sampling plan. In premises where products derived from industrial processing are produced, the frequency of sampling follows a sampling plan based on a risk assessment. The samples are taken in the processing line/environment as dust samples/scrapings.

Imported feed material of plant origin

According to national legislation, feed materials are categorized according to the risk for Salmonella contamination, and those consignments of feed ingredients found to have a risk have to be tested negative for Salmonella before they can be used for feed production, see also “Methods of sampling”.

Imported feed material of animal origin

According to national legislation, feed materials (e.g. fish meal) are categorized according to risk for Salmonella contamination, and those consignments of feed ingredients found to have a risk have to be tested negative for Salmonella before they can be used for feed production, see also “Methods of sampling”. Official sampling of pet food and dog chews are carried out according to a sampling plan. Consignments of pet food and dog chews coming from a third country are sampled according to a sampling plan at the border inspection. The sampling plan is based on a risk assessment.

Process control in feed mills
Once a week.

Compound feedingstuffs

The strategy is to monitor ingredients as well as the environment of the premises, especially the production lines are not contaminated with Salmonella. No sampling is normally carried out on the compound feed except for official controls according to a sampling plan. Compound feedingstuffs that are traded into Sweden destined for feeding of cattle, pigs, poultry or reindeer have to be tested for Salmonella in accordance with the same testing principles as other feed material.

Type of specimen taken

Domestic feed material of plant origin

At the premises where products are derived from industrial processing, samples are taken on the processing line/environment as dust samples/scrapings.

Domestic feed material of animal origin

At the premises where products are derived from industrial processing samples are taken on the processing line/environment as dust samples/scrapings.

Imported feed material of plant origin

A large number of samples are collected and pooled into analytical samples in accordance with a statistical model. The sampling plan for feed materials is designed to detect a Salmonella contamination of 5% of the batch with a 95% probability, see also "Methods of sampling".

Imported feed material of animal origin

A large number of samples are collected and pooled into analytical samples in accordance with a statistical model. The sampling plan for feed materials, e.g. fish meal, is designed to detect a Salmonella contamination of 5% of the batch with a 95% probability, see also "Methods of sampling". Sampling of pet food and dog chews are carried out according to a sampling plan.

Process control in feed mills

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

Compound feedingstuffs

No sampling is normally carried out on the compound feed except official controls according to a sampling plan. For compound feedingstuffs that are traded into Sweden destined for feeding of cattle, pigs, poultry or reindeer a large number of subsamples are collected and pooled into analytical samples in accordance with a statistical model. The sampling plan is designed to detect a Salmonella contamination in 5% of the batch with 95% probability.

Methods of sampling (description of sampling techniques)

Domestic feed material of plant origin

In premises where products are derived from industrial processing the samples are taken using aseptic technique in the processing line/environment as dust samples/scrapings. Official sampling (according to Regulation (EC) No 882/2004) is normally carried out on the feed material in the flow. If this is not possible, the samples are taken from the storage of the feed material. Several subsamples are collected and pooled into analytical samples to make it representative for the batch. Official sampling of the production line and in the environment in the premises is carried out at places where there is a theoretical risk for Salmonella growth.

Domestic feed material of animal origin
In premises where products are derived from industrial processing the samples are taken using aseptic technique in the processing line/environment as dust samples/scrapings. Official sampling (according to Regulation (EC) No 882/2004) is normally carried out on the feed material in the flow. If this is not possible the samples are taken from the storage of the feed material. Several subsamples are collected and pooled into analytical samples to make it representative for the batch. Official sampling of the production line and in the environment in the premises is carried out at places where there is a theoretical risk for Salmonella growth.

Imported feed material of plant origin

The surveillance of feed ingredients is based on a sampling procedure which takes into consideration an uneven distribution of Salmonella contamination and is designed to detect contamination in 5% of the batch with 95% probability. The size of the analytical sample is 25 g, each consisting of 10 pooled subsamples of 2.5 gram. The number of analysed samples depends on the imported feed material and the size of the consignment (according to national legislation). Besides the surveillance above, official controls according to Regulation (EC) No 882/2004 are also carried out.

Imported feed material of animal origin

The surveillance of feed ingredients (e.g. fish meal) is based on a sampling procedure which takes into consideration an uneven distribution of Salmonella contamination and is designed to detect a contamination in 5% of the batch with 95% probability. The size of the analytical sample is 25 g, each consisting of 10 pooled subsamples of 2.5 g. The number of analysed samples depends on the imported feed material and the size of the consignment (according to national legislation). Besides the surveillance above, official controls according to Regulation (EC) No 882/2004 are also carried out.

Process control in feed mills

According to national legislation the following five control points in the processing line in feed mills that manufacture compound-feed for food-producing animals are sampled with an aseptic technique: 1. Top of bin for final feed (compound feed). 2. Room for pellet coolers. 3. Top of pellet cooler. 4. Dust from the aspiration system (filter). 5. Intake pit/bottom part of elevator for feed materials. At these critical control points dust samples or scrapings are collected. When poultry feed is produced, a minimum of one environmental sample has to be taken at each of the above five control points on a weekly basis and checked for the absence of salmonella. When only non-poultry feed is produced the corresponding requirement is limited to control points 1 and 5. These samples are taken by the operator and all samples have to be sent to the National Veterinary Institute (SVA) for analysis and to control that the number of samples is in accordance with the legislation. However, most operators normally take additional environmental samples. Besides the surveillance above, an official sampling of the production line and in the environment in the feed mills are also carried out.

Compound feedingstuffs

For compound feedingstuffs that are traded into Sweden destined for feeding of cattle, pigs, poultry or reindeer, the surveillance is based on a sampling procedure which takes into consideration an uneven distribution of Salmonella contamination and is designed to detect a contamination in 5% of the batch with 95% probability. The size of the analytical sample is 25 g, each consisting of 10 pooled subsamples of 2.5 g. The number of analysed samples depends on the size of the consignment (according to national legislation). Official sampling (according to Regulation (EC) No 882/2004) is normally carried out on the compound feed in the flow. If this is not possible, the samples are taken from the storage of the compound feed. Several subsamples are collected and pooled into analytical samples to make it representative for the batch.

Definition of positive finding

Domestic feed material of plant origin

All findings of Salmonella spp.

Domestic feed material of animal origin

All findings of Salmonella spp.

Imported feed material of plant origin

All findings of Salmonella spp.

Imported feed material of animal origin
All findings of Salmonella spp.

Process control in feed mills

All findings of Salmonella spp.

Compound feedingstuffs

All findings of Salmonella spp.

Diagnostic/analytical methods used

Domestic feed material of plant origin


Domestic feed material of animal origin


Imported feed material of plant origin


Imported feed material of animal origin


Process control in feed mills


Compound feedingstuffs


Preventive measures in place

The HACCP-based process control system in the feed establishment, where the main hazards are identified in the processing line. The main risk factors that are identified are the raw materials, and for that reason many producers carry out audits at their suppliers.

Control program/mechanisms

The control program стратегies in place

In the control programme for feed, the focus is on control of ingredients, the heat treatment process and preventive measures to eliminate post-process recontamination of heat treated feed. The purpose is to ensure the absence of Salmonella in the production lines and the feed mill environment.

Suggestions to the European Union for the actions to be taken

A risk-based Salmonella control programme covering all steps from feed raw material to food should be established.
Measures in case of the positive findings

Domestic feed material of plant origin

Salmonella positive findings in feed material in their natural state, fresh or preserved are usually treated with organic acids, such as formic acid. After acid treatment the feed material has to be tested negative for Salmonella before using it in feed production. Feed materials that have been treated with acid are only allowed to be used in feed that is supposed to be heat treated. In premises where products are derived from industrial processing and there has been a positive Salmonella test, a larger sampling schedule is undertaken in the production line. If Salmonella is found the contaminated part of the production line is thoroughly cleaned and disinfected. Environmental sampling must show negative results before production is resumed.

Domestic feed material of animal origin

Domestic feed material of animal origin containing Salmonella has to be withdrawn from the market and handled according to Regulation (EC) No 178/2002. Contaminated parts in the premises at the raw material producer have to be thoroughly cleaned and disinfected.

Imported feed material of plant origin

Consignments found to be Salmonella contaminated are subjected to a decontamination procedure by using organic acids followed by re-testing for the presence of Salmonella. Feed materials that have been treated with acid are only allowed to be used in feed that will be heat treated. Contaminated parts in the premises have to be thoroughly cleaned and disinfected.

Imported feed material of animal origin

Imported feed material of animal origin containing Salmonella has to be withdrawn from the market and handled according to Regulation (EC) No 178/2002. Contaminated parts in the premises have to be thoroughly cleaned and disinfected.

Process control in feed mills

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

Compound feedingstuffs

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

Notification system in place

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

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

In the feed sector, data from 2014 showed that *S*. Typhimurium was the most frequently isolated serotype in the weekly surveillance of feed mills. This serotype was detected in 8 samples, mostly from one major feed mill. This feed mill was struggling with a contamination of *S*. Typhimurium in the vicinity of the production line and solved this problem for a couple of years ago. Still, they occasionally detect *S*. Typhimurium in the feed mill environment.

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

Feed is considered the most important source of Salmonella for animals and the most important risk factor in feed production, is feed materials. According to previous experience, feed materials of animal origin as well as some of vegetable origin are considered hazardous. However, due to restrictions on the use of feed materials of animal origin, certain feed materials of vegetable origin are presently the most important risk factor. If the risk of Salmonella contaminated feed materials is minimized it is possible to reduce the cases in animals and humans. However, an epidemiological link between findings in feed and animals and humans is difficult to verify.
3.2 CAMPYLOBACTERIOSIS

3.2.1 General evaluation of the national situation

3.2.1.1 Thermophilic Campylobacter spp., unspecified - general evaluation

History of the disease and/or infection in the country

Broiler production: From 1991 to June 2001, a voluntary Campylobacter programme was run. During this period the prevalence varied between 9 and 16%. The programme was extended in 2001 to be part of a programme of poultry health. During 2001-2005 cloacal swabs or caecal samples and neck skin samples were collected at slaughter. In the beginning of that programme, the flock prevalence was 20%. It is likely that the higher prevalence compared with before 2001 was due to changes in the sampling strategy and a more sensitive analytical method. Since 2001 there has been a decreasing trend of positive slaughter groups from 20 to 8.8% in 2013. In 2013, the lowest number of Campylobacter positive flocks was detected since the starting of the programme in 2001. Humans: The number of reported cases during the last decade has varied between approximately 6000 and 8600. Approximately 1800-3400 (30-40%) have been reported as being 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, like in the other EU countries. As 30 to 40% of the cases in Sweden are of domestic origin, it is important to identify ways to reduce the incidence and implement these measures. Reducing Campylobacter prevalence at farm level decreases the risk of human infection. Applying strict biosecurity measures has decreased the number of Campylobacter positive broiler slaughter batches in Sweden. Still, approximately 10% of producers deliver Campylobacter positive slaughter batches accounting for 55% of the Campylobacter load of domestic poultry. Thus, more efficient measures to control colonization of broiler flocks is needed. Since flies have been associated with spread of the infection, a fly control programme has been introduced in some broiler houses. Also, several other control measures to reduce flock prevalence are under investigation.

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 shown other risk factors for domestic campylobacteriosis, such as consumption of unpasteurized milk, participating in barbecue gatherings and contact with dogs. Several waterborne outbreaks have also been reported in Sweden.

Recent actions taken to control the zoonoses

In order to decrease human incidence of campylobacteriosis a national 5-year strategy plan for Campylobacter has been published as a co-operation between the Swedish Board of Agriculture, National Food Agency, Swedish Institute for Communicable Disease Control, the National Board of Health and Welfare and the National Veterinary Institute.

Suggestions to the European Union for the actions to be taken

One important action is to implement a harmonized monitoring programme in poultry. The work that has started in this area should proceed. With increasing trade within the EU, Campylobacter appears to be a community problem, requiring a harmonized solution at the EU-level. A performance objective for Campylobacter in broiler meat should be discussed in the EU. The emphasis should not only be on poultry but also on other sources of Campylobacter. Community-wide projects should be encouraged.

3.2.2 Campylobacter in foodstuffs

3.2.2.1 Thermophilic Campylobacter spp., unspecified in food - Meat from broilers (Gallus gallus)

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant
Infrequent sampling by competent authorities. See also "Thermophilic Campylobacter in Gallus gallus - Monitoring system - Sampling strategy".

At meat processing plant

Sampling is according to each plant's in-house control and decisions by the local or regional competent authority.

At retail

Sampling is according to each retail's in-house control and decisions by the local competent authorities.

Frequency of the sampling

At slaughterhouse and cutting plant

Infrequent sampling by competent authorities. See also "Thermophilic Campylobacter in Gallus gallus - Monitoring system - Frequency of the sampling - At slaughter".

At meat processing plant

According to each in-house control plan and decisions by the local or regional competent authority.

At retail

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

Type of specimen taken

At slaughterhouse and cutting plant

No information available from sampling by the competent authorities. See also "Thermophilic Campylobacter in Gallus gallus - Monitoring system - Type of specimen taken - At slaughter".

At meat processing plant

No information available from sampling by the competent authorities.

At retail

Varies most samples are in the category Other processed food products and prepared dishes - Other processed food products and prepared dishes.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

According to in-house control plans and decisions by the competent authority. See also "Thermophilic Campylobacter in Gallus gallus - Monitoring system - Type of specimen taken - At slaughter".

At meat processing plant

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

Campylobacter identified in the sample.

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

ISO 10272:2006

At meat processing plant

ISO 10272:2006

At retail

NMKL 119 - M and Vidas Camp

Preventive measures in place

Good manufacturing practice

Control program/mechanisms

The control program/strategies in place

See "Thermophilic Campylobacter in Gallus gallus - Control program/mechanisms - The control program/strategies in place"

Recent actions taken to control the zoonoses

See Campylobacter in Gallus gallus

Notification system in place

Findings in food are not notifiable.

Results of the investigation

See "Thermophilic Campylobacter in Gallus gallus - Control program/mechanisms - The control program/strategies in place"

National evaluation of the recent situation, the trends and sources of infection
3.2.3 Campylobacter in animals

3.2.3.1 Thermophilic Campylobacter spp., unspecified in animal - Gallus gallus (fowl)

Monitoring system

Sampling strategy

The Swedish Campylobacter monitoring programme covers 99% of slaughtered broilers. All flocks in the programme are sampled at slaughter. The programme includes six abattoirs, all members of Swedish Poultry Meat Association. The programme is financed by the Swedish Board of Agriculture and the Poultry Meat Association. In 2011, a survey was performed on broilers slaughtered at small scale abattoirs using the same sampling strategy as described above.

Frequency of the sampling

At slaughter

Every flock is sampled

Type of specimen taken

At slaughter

Caecum samples

Methods of sampling (description of sampling techniques)

Rearing period

Samples are not taken during rearing period.

At slaughter

From every flock, the caecum of ten birds is taken and pooled to form one composite sample.

Case definition

At slaughter

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

Diagnostic/analytical methods used

At slaughter

Vaccination policy

Chickens are not vaccinated against Campylobacter.

Other preventive measures than vaccination in place

Preventive measures at primary production are hygiene barriers, cleaning and disinfection after slaughter of each flock and leaving the house empty for a defined period before introducing a new flock. Specific advice to each producer is also given by the Swedish Poultry Meat Association. The majority of the slaughter companies pay a premium for Campylobacter free broilers, as a bonus to encourage efforts to reduce the introduction of Campylobacter to broiler flocks.

Control program/mechanisms

The control program/strategies in place:

Broiler flocks are sampled at slaughter. The programme is voluntary and financed by the Swedish Poultry Meat Association and the Swedish Board of Agriculture. The Poultry Meat Association covers the entire production chain, from feed manufacturers, breeding companies, hatcheries, slaughter houses, and processing plants. Members of the association produce approximately 99% of all broilers slaughtered in Sweden. The members are obliged to only use approved feed and to participate in stipulated animal health programs, such as Salmonella, welfare and classification program.

Recent actions taken to control the zoonoses:

Since flies have been associated with spread of the infection, a fly control programme has been introduced in some broiler houses.

Suggestions to the European Union for the actions to be taken:

As chickens are considered an important or the main source of human campylobacteriosis a monitoring programme for Gallus gallus should be established in order to decrease the risk of human infection.

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 environment where the broilers have been kept from colonization.

Notification system in place:

Detection of Campylobacter in Gallus gallus is notifiable.

Results of the investigation:

In 2014, thermophilic Campylobacter spp. were detected in 363 (11.5%) of the 3162 broiler flocks at slaughter. A seasonal variation of Campylobacter in broilers was observed with the least findings in winter and most in the summertime. In November-December 2014, however, Campylobacter were detected in a larger proportion of flocks compared with the same period previous years.

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

From 2000 to 2005, the prevalence of Campylobacter in broiler flocks decreased from approximately 20% to 12-13%. In 2013, the percentage of Campylobacter positive broiler flocks was 8.8% which is the lowest ever reported (Figure[@Figure-2]). Reasons for this decrease are not clear but might be related to improved hygienic barriers and/or unusually dry weather conditions in the summer 2013. In 2014, however, the prevalence in broiler flocks was 11.5%, which is an increase compared to the previous two years. In 2014, thinning was more commonly practiced which might have increased the prevalence. The broiler producers can be divided into three groups on the basis of the delivery of Campylobacter positive slaughter batches. Approximately 50% of the producers seldom or sporadically deliver Campylobacter positive slaughter batches, 38% of the producers have seasonal problems with the pathogen and the remaining group of producers (12-13%) have been found to often deliver Campylobacter positive slaughter batches. The group that frequently delivers Campylobacter positive slaughter batches accounts for 40% of the Campylobacter load. Campylobacter seems to be more prevalent in small scale flocks which might result from less stringent biosecurity measures.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)
Consumption of poultry meat is regarded an important source of domestically acquired Campylobacter infection in humans, even if there are other sources of importance. The number of notified cases of campylobacteriosis usually increases during the summer, and this also happened in 2014. However, in 2014 there was an unusual peak in December. During the same period, Campylobacter were detected in a larger proportion of flocks than usually during this time of the year, but it is unclear if this affected the human incidence. Investigation on the potential association is in progress.

3.3 LISTERIOSIS

3.3.1 General evaluation of the national situation

3.3.1.1 Listeria - general evaluation

History of the disease and/or infection in the country

In Sweden, during the last ten years approximately 40-60 human cases have been reported annually. Outbreaks have been associated with vacuum-packaged fish (1995-1996) and with cheese made from raw goat milk (2001). During the later years, an increasing trend for cases of listeriosis has been noted both in Sweden and internationally. In 2013, the highest number of cases ever was reported (93 cases). Listeriosis is a notifiable disease in humans and animals. Annually, 20-40 cases are reported in animals, mainly in ruminants.

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

In 2014, 125 cases of listeriosis were reported (incidence 1.28 cases per 100,000 inhabitants). This is the highest number ever reported and an increase with 34% from the year before (93 cases). A majority of the cases reported in 2014 were elderly people over 70 years. The age groups above 80 years were the most common with 40% of the cases. Five pregnant women and one infant were reported with listeriosis in 2014. This was an unusual high number when normally 1-2 pregnant women and/or infants are reported every year. Of the reported cases 53% were women. Between July 2013 and October 2014 a large national outbreak was ongoing. A total of 50 cases shared the same serotype, IIa, with identical PFGE pattern and investigations showed that cold cut meat was the suspected source of infection. During the outbreak isolates with the same PFGE pattern were identified in several products of cold cut meat from one food producer. Despite the fact that the contaminated production line was closed, cases were still reported and the source of infection could never be fully identified. Though the majority of the outbreak cases (67%) were older people over 70 years of age, four pregnant women were infected. A second national outbreak was identified during 2014 and between May and September 17 cases were infected with an identical serotype IIa strain. The PFGE pattern differed from the previous mentioned outbreak strain. As in the larger outbreak, the majority of the cases (76%) were older people over 70 years of age. Though investigations pointed towards vacuum-packaged smoked and/or marinated salmon, the source of infection could never be identified. Several food products were analyzed but were found negative for Listeria. No pregnant women were infected in the outbreak which could indicate a more well-known risk product as the source of infection. The situation seems to be stable in animals.

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

Foodborne transmission is thought to be most important. Cold cuts, gravad and cold-smoked fish products packaged in vacuum or in modified atmosphere are considered to be an important source of L. monocytogenes.

Recent actions taken to control the zoonoses

In 2010, a national survey was run as a cooperation between the National Food Agency and the local authorities. In addition, Sweden participated in an EU-wide baseline survey targeting the same three categories of ‘ready to eat’ foods as the national survey, (i) packaged heat-treated meat products, (ii) soft and semi -soft cheeses and (iii) packaged gravad and smoked fish. During the same time period all the human isolates recovered from listeriosis cases were subtyped. With a common goal to reduce the incidence od listeriosis in humans a national five-year strategy plan has been prepared and published as part of a collaboration project between the Swedish Board of Agriculture, the National Food Agency, the Swedish Institute for Communicable Disease Control, the National Board of Health and Welfare and the National Veterinary Institute.

Suggestions to the European Union for the actions to be taken

Continuous surveillance of L. monocytogenes in humans, food and the food processing environment will be essential for understanding the sources for human infection and giving tools to prevent infections.

3.3.2 Listeria in foodstuffs
3.3.2.1 Listeria in food

Monitoring system

Sampling strategy

Sampling is performed by local authorities on a random basis. No official control program exists. Official sampling usually takes place at retail level but can also be at production units.

Frequency of the sampling

At retail

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

Type of specimen taken

At retail

See sampling strategy

Methods of sampling (description of sampling techniques)

At the production plant

See sampling strategy

Definition of positive finding

At retail

A sample positive for L. monocytogenes

Diagnostic/analytical methods used

At retail

VIDAS LMX, VIDAS LMO II, RAPID’L mono, BioRad and BAX PCR (Qualicon) and different NMKL nr 136are reported as metod used for Listeria however there is often no indication of where the sample was taken

Preventive measures in place

See Listeriosis in general

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.
Recent actions taken to control the zoonoses

A national strategy plan has been published in co-operation with National Food Agency, Public Health Agency, Swedish Board of Agriculture, National Board of Health and Welfare and National Veterinary Institute with common priorities and recommended measures.

Suggestions to the European Union for the actions to be taken

See Listeriosis in general

Notification system in place

Findings in food are notifiable to the competent authority

Results of the investigation

For results reported in 2013 see the prevalence tables for food

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

See "Listeriosis general evaluation - National evaluation of the recent situation, the trends and sources of infection"

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

Food is the main source of human listeriosis cases.

Additional information

See Listeriosis in general

3.3.3 Listeria in animals

3.3.3.1 Listeria in animal

Monitoring system

Sampling strategy

There is no active surveillance system. Notifications are based on clinical cases and laboratory analyses.

Frequency of the sampling

When there is a suspected case.

Type of specimen taken

Organ or faecal samples

Case definition

A case may be defined by isolation of L. monocytogenes from animal samples. In cases of meningitis or meningoencephalitis a diagnosis can also be performed using histology.
Diagnostic/analytical methods used

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

Vaccination policy

Vaccination is not used in Sweden.

Other preventive measures than vaccination in place

Feed hygiene

Control program/mechanisms

Recent actions taken to control the zoonoses

See Listeriosis - general evaluation.

Suggestions to the European Union for the actions to be taken

See Listeriosis - general evaluation.

Measures in case of the positive findings or single cases

In a verified case of listeriosis, the Swedish Board of Agriculture decides, on a case-by-case basis, whether to investigate the herd to identify the source of infection.

Notification system in place

Listeriosis is notifiable in all animal species.

Results of the investigation

In 2014, listeriosis was reported in 25 sheep, eight cattle, one horse and in one cat.

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. Since 1999, the number of cases have increased by 33-51 per year.

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

As Listeria monocytogenes is present in the environment, a risk of contracting domestic listeriosis through animals and environment does exist. However, human listeriosis is considered to be primarily foodborne.

3.4 E. COLI INFECTIONS

3.4.1 General evaluation of the national situation
3.4.1.1 Escherichia coli, pathogenic - general evaluation

History of the disease and/or infection in the country

Only sporadic cases of VTEC infections were reported in Sweden until 1995 when 114 human cases of infection caused by VTEC O157:H7 were detected. In 1996, VTEC O157 was isolated in Swedish cattle for the first time and human E. coli O157 infection was traced back to presence of VTEC O157 in a cattle herd. In the autumn of 2002, an outbreak of VTEC O157:H7 in the county of Skåne affecting 30 patients was caused by consumption of cold smoked fermented sausage. The largest recorded Swedish outbreak occurred in the summer of 2005 when 135 cases, including 11 (8%) with haemorrhagic uraemic syndrome (HUS), were infected with O157:H7 after eating contaminated fresh lettuce irrigated with water positive for verocytotoxin 2. Common strains between human cases and cattle faeces from a farm upstream from the source of irrigation water confirmed the source of infection. Control measures that lead to the termination of the outbreak were then implemented. Around 250-500 cases (3-6 cases per 100 000 inhabitants) of EHEC are reported in Sweden annually, of which around 50% are domestically acquired. Most of the domestic cases are reported during the period from July to September. In 2014, five Swedish governmental agencies published a national strategy document containing a plan to reduce the risk of domestic EHEC cases. The document is based on knowledge compilation by the agencies and identifies what actions the authorities believe to be important and should therefore be prioritized in order to reduce the risk of domestic infection with VTEC in humans.

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

In 2014, 473 human cases were reported, corresponding to an overall incidence of 4.9 cases per 100000 inhabitants. Around 60 percent of the cases were domestic (290 cases) which is the second highest number of domestic cases since 2005. The domestic incidence 2014 was 3 cases per 100000 inhabitants and the increasing trend since 2010 in domestic incidence is continued in 2014.

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

In case of human infections, trace back investigations are performed. If the infection is traced back to a farm with animals, special recommendations are given to the farmer about improved hygiene.

Recent actions taken to control the zoonoses

In 2014, five Swedish governmental agencies published a national strategy document containing a plan to reduce the risk of domestic EHEC cases.

3.4.2 Escherichia coli, pathogenic in animals

3.4.2.1 Verotoxigenic E. coli (VTEC) in animal - Cattle (bovine animals)

Monitoring system

Sampling strategy

TRACE BACK OF HUMAN INFECTION: If a County Medical Officer in a Swedish county suspects that a human VTEC infection has been associated with a farm, the County Veterinary Officer will be informed, who will make a request to the Swedish Board of Agriculture for sampling of animals at the relevant farm. Sampling is targeted mainly to young stock, as they are more likely to shed these bacteria. Samples are collected by a veterinarian. Environmental sampling consists of overshoe, composite pat and dust samples. PREVALENCE STUDIES: Prevalence studies will be conducted approximately every 3rd year. The last study was conducted 2010/11. In these surveys, around 2000 faecal samples were collected randomly throughout the year from cattle at slaughter. Samples were collected under the supervision of veterinarians at the abattoirs.

Frequency of the sampling

Animals at farm

Trace back of human VTEC infection.

Animals at slaughter (herd based approach)
Type of specimen taken

Animals at farm

Faeces and/or environmental samples.

Animals at slaughter (herd based approach)

Study (animal based): faeces, ear samplesTrace 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 a total of 25 g. For individual faecal samples, approximately 30 g of faeces is collected. Environmental sampling consisting of overshoe, composite pat and dust sampling are also used.

Animals at slaughter (herd based approach)

TRACE BACK OF HUMAN INFECTION: A 30 cm x 20-25 cm area or a total of approximately 700 cm² of the carcass is swabbed.SINGLE STUDY (ANIMAL BASED APPROACH): After slaughter, 30 g of faeces were collected from the rectum with disposable plastic gloves and placed in plastic cups. Also, the outer 1/3 of the ear was removed after slaughter. Samples collected in the study were analysed individually.

Case definition

Animals at farm

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

Animals at slaughter (herd based approach)

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

Diagnostic/analytical methods used

Animals at farm

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

Animals at slaughter (herd based approach)

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

Vaccination policy

Vaccination is not used.
Other preventive measures than vaccination in place

In 2014, five Swedish governmental agencies published a national strategy document containing a plan to reduce the risk of domestic EHEC cases. The document is based on knowledge compilation by the agencies and identifies what actions the authorities believe to be important and should therefore be prioritized in order to reduce the risk of domestic infection with VTEC in humans.

Control program/mechanisms

The control program/strategies in place

No control programme for VTEC is in place.

Recent actions taken to control the zoonoses

In 2014, five Swedish governmental agencies published a national strategy document containing a plan to reduce the risk of domestic EHEC cases. The document is based on knowledge compilation by the agencies and identifies what actions the authorities believe to be important and should therefore be prioritized in order to reduce the risk of domestic infection with VTEC in humans.

Suggestions to the European Union for the actions to be taken

Harmonized monitoring programmes for VTEC in cattle in the EU.

Measures in case of the positive findings or single cases

Guidelines on how to handle VTEC in cattle when associated with human VTEC infection. Hygiene recommendations should be instituted at the farm. Faecal samples are collected repeatedly in the epidemiological unit (usually the herd) from a representative numbers of animals of different age.

Notification system in place

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

Results of the investigation

During 2014, ten cattle farms were investigated as suspected sources for human infection. An epidemiological association was established for three farms, one with VTEC O157, one with VTEC O121 and one with VTEC O145.

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

In 1996, VTEC O157 was isolated in swedish cattle for the first time and human E. coli O157 infection was traced back to presence of VTEC O157 in a cattle herd. Restrictions were initiated at the herd and surveillance was initiated. In 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 - 2012, between 1 and 14 farms, primarily cattle farms, have been investigated annually as suspected sources of human infection. Of these, 1 - 4 farms per year have been confirmed as sources of infection. VTEC O157 is the most common serotype, but other serotypes have also been found (VTEC O8, O26, O121 and O103). In cattle, surveys during 1997-2002 showed a prevalence of approximately 1%. In the study done in 2005-2006, VTEC O157 was detected in 3.4% of faecal samples. Because of changes to the detection methods, the results of the different prevalence surveys cannot be directly compared. Therefore it is difficult to determine whether the observed increase in animal prevalence from one to three percent is true or merely an effect of an improved detection method. In the abattoir survey conducted in 2008-2009 VTEC O157 was detected in 36/1993 faecal (1.8%) and 41/500 ear samples (8.2%). In the abattoir survey conducted during 2011-2012, VTEC O157 was detected in 73 of 2376 faecal samples (3.1%). Clade 8 was detected in 15 of the 73 positive samples. In these studies, VTEC O157:H7 has predominantly been isolated from cattle in southern Sweden but rarely from the northern two thirds of the country. The collected samples during 2011-2012 were also analysed for VTEC O26 and VTEC O103. VTEC O26 were detected in 8 of 1308 faecal samples (0.6%) and in 15 of 336 faecal samples (4.5%). VTEC O103 were detected in three of 1000 faecal samples (0.3%) and in three of 500 ear samples (0.6%). Measures to decrease the animal prevalence are being investigated.

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 such as unpasteurised milk. Two outbreaks caused by domestic food have been recorded. The first included 28 cases reported in 2002. The source of infection was locally produced sausage. The second occurred in 2005 and included 135 reported cases. The source of this infection was locally produced salad irrigated by contaminated water from a nearby canal. Both outbreaks were reported in areas of high cattle density.
Additional information

In 1998 a survey was conducted at the slaughterhouse level in non-bovines. The results showed that 0.8% (4/474) lambs and 0.9% (1/109) sheep and 0.08% (2/2446) pigs were positive for VTEC O157. Between 1996 and 2003, the industry (Swedish Meats) analysed between 334 and 968 carcass swabs per year at abattoirs. Sporadic positive samples were found during those four years. In another study, VTEC O157 was detected in 9% of the Swedish dairy herds. Of these, 23% were situated in the county of Halland in Western Sweden. VTEC O157 was detected in 9 (1.8%) of 492 faecal and 2 (1.9%) of 105 ear samples from sheep in a survey performed in 2007-2008.

3.5 YERSINIOSIS

3.5.1 General evaluation of the national situation

3.5.1.1 Yersinia - general evaluation

History of the disease and/or infection in the country

Yersinia infection is notifiable in humans but not in animals or food. There is no active surveillance in animals or food. In the beginning of the 1990's approximately 1000 human cases were reported annually. Since 2004, when a total of 594 persons were reported, there has been a decrease in cases.

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

Yersiniosis in humans is considered foodborne. Outbreaks are rare and most infections seem to be sporadic. Approximately 70% of the infected cases are considered to be of domestic origin. Case-control studies suggest consumption of pork products is a risk factor. Yersiniosis is still one of the most commonly reported zoonoses in Sweden, although the number of annual notifications has decreased from 1000 cases to less than 300. This decrease has occurred without any active measures in the food chain. We do not know whether the number of human samples tested has decreased. In Sweden, a study of the presence of Yersinia in wild boar captured in 2010-2011 found that 20.5% and 19.3% of 88 tested animals carried Y. enterocolitica and Y. pseudotuberculosis, respectively.

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

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

Recent actions taken to control the zoonoses

In order to decrease human incidence of yersiniosis a national 5-year strategy plan for human pathogenic Y. enterocolitica has been prepared and was published in 2013 as a co-operation between the Swedish Board of Agriculture, National Food Agency, Swedish Institute for Communicable Disease Control, the National Board of Health and Welfare and the National Veterinary Institute. In the plan actions are recommended to decrease the incidence in humans as well as knowledge gaps have been identified.

3.5.2 Yersinia in animals

3.5.2.1 Yersinia in animal - Pigs

Monitoring system

Sampling strategy

Animals at farm
No routine monitoring is in place. In the fall of 2014, a national survey was performed on the prevalence of patogenic Y. enterocolitica in herds with slaughter pigs. A sample of 105 pig herds was selected using random sampling. The sampling frame was all the finishing pig herds slaughtering more than 1300 pigs per year. The number of samples was calculated according to following estimates: 40% of herds positive for Y. enterocolitica (CI 95%), within-herd prevalence 50%. Test sensitivity was estimated as 80%. From each of these herds, four pen-level faecal samples were collected by a herd veterinarian. Isolates of Y. enterocolitica were stored and future work will characterize them by bio-typing and molecular typing to determine the risk to humans.

Case definition

Animals at farm

Herd with 1-4 positive faecal samples was considered as positive for Y. enterocolitica.

Diagnostic/analytical methods used

Animals at farm

Five gram of faeces was enriched in 1:10 PMB buffer for one week at 4C. Ten l was further inoculated onto a selective agar plate (CAY) and incubated at 25C for 2 d.

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.

Results of the investigation

Y. enterocolitica was identified from 32 of the 105 sampled farms. In 10 farms either 3 or 4 of the sampled pens were positive for Y. enterocolitica, in 22 farms 1 or 2 pens were positive.

Additional information

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

3.6 TRICHINELLOSIS

3.6.1 General evaluation of the national situation

3.6.1.1 Trichinella - general evaluation

History of the disease and/or infection in the country
In domestic pigs, trichinellosis has not been reported since 1994. Trichinella is endemic in Swedish wildlife. Sporadic cases are annually reported in sylvatic or farmed wild boars. The last domestic outbreak with human cases occurred in 1969. Since the beginning of the 1990's three sporadic cases have been reported, in 1997, in 2004 and in 2007. The two last cases had consumed cold smoked pork abroad or imported cold smoked pork sausage. During 2013, one possible domestic case of Trichinella was reported in Sweden. The clinical symptoms indicated that the case had trichinellosis but diagnostic tests have been inconclusive. Further diagnostic tests are ongoing to confirm the trichinellosis status of this potential case. The person had consumed or handled meat from Swedish wild boar which was not tested for Trichinella. During 2014, one person was infected with T. spiralis after consumption of infected pork in Poland. Six persons had eaten a hotpot prepared from pork. Another two of the six persons who reside in Poland were infected. The meat was analyzed in Poland and found positive. The Directive 2075/2005 has been implemented in Sweden, with the exception of Trichinella free regions.

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

Trichinellosis in farmed animals is, and has been, extremely rare for many years. The prevalence of Trichinella spp in wildlife that might be eaten (wild boars, bears, etc.) is low to very low, while it is higher in carnivorous wildlife such as foxes, lynxes, wolves and wolverines.

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

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

### 3.6.2 Trichinella in animals

#### 3.6.2.1 Trichinella spp., unspecified in animal - Solipeds, domestic - horses

**Monitoring system**

**Sampling strategy**

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

**Frequency of the sampling**

Every slaughtered horse is sampled.

**Type of specimen taken**

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

**Methods of sampling (description of sampling techniques)**

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

**Case definition**

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

**Diagnostic/analytical methods used**

Artificial digestion method of collective samples (magnetic stirrer method as detailed in Annex 1 to 2075/2005).

**Measures in case of the positive findings or single cases**

If an animal is found with Trichinella, the carcass will be destroyed. The competent Authority will also investigate the source and possible spread of infection.
Notification system in place

Trichinellosis is notifiable under the Communicable Diseases Act.

Results of the investigation including the origin of the positive animals

All slaughtered horses were negative for Trichinella spp.

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

Trichinellosis 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 trichinellosis from horses slaughtered in Sweden is negligible.

3.6.2.2 Trichinella in animal - Pigs

Monitoring system

Sampling strategy

General

Sweden has not yet implemented a system of Trichinella free holdings, or defined regions with a negligible risk for Trichinella. All domestic pigs that were slaughtered before July 2nd 2014 were tested for Trichinella. From July and onwards production sites that are officially applying controlled housing conditions were obliged to test all carcasses of breeding sows and boars sent for slaughter each year according to the regulation (EC) No 2075/2005. Production sites without controlled housing conditions should test all their slaughtered domestic pigs. In conclusion, fattening pigs originating from holdings officially recognized as applying controlled housing conditions were not obliged to test for Trichinella in the latter half of the year.

Frequency of the sampling

General

Until 2014 every slaughtered pig was sampled. From July 2014 and onwards production sites that are officially applying controlled housing conditions were obliged to test all carcasses of breeding sows and boars sent for slaughter each year according to the regulation (EC) No 2075/2005. Production sites without controlled housing conditions should test all their slaughtered domestic pigs.

Type of specimen taken

General

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

Methods of sampling (description of sampling techniques)

General

Methods used are in accordance to Directive 2075/2005.
Case definition

General

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

Diagnostic/analytical methods used

General

Artificial digestion method of collective samples (magnetic stirrer method as detailed in Annex 1 to 2075/2005).

Number of officially recognised Trichinella-free holdings

Sweden has not yet implemented a system of Trichinella free holdings.

Notification system in place

Trichinellosis is notifiable in animals.

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.

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

All slaughtered pigs were negative for Trichinella spp.

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

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

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

The risk of obtaining trichinellosis from Swedish farmed pigs is negligible.

Additional information

In 2014, 1 bear, 3 wolverines, 4 lynxes, 2 wolves, 1 raccoon dog and 6 wild boars were positive for Trichinella.

3.7 ECHINOCOCCOSIS

3.7.1 General evaluation of the national situation

3.7.1.1 Echinococcus - general evaluation

History of the disease and/or infection in the country
E. multilocularis and E. granulosus: Surveillance for echinococcosis in humans in Sweden is based on passive surveillance. As patients eventually will seek medical care, this is considered sufficient for detecting clinical cases of alveolar echinococcosis (AE) caused by E. multilocularis and also cystic echinococcosis (CE) caused by E. granulosus. Symptoms in the early stages of the disease do not differentiate echinococcosis from other diseases and as a result there can be a delay in reporting cases. If cases are not diagnosed at all there can be an underreporting of cases. Echinococcosis has been notifiable for both clinicians and laboratories since 2004. Before 2004 and since 1994, surveillance relied on voluntary reporting by the laboratories. CE is not reported separately from AE in the official statistics however, discrimination between the two forms of the disease is performed by laboratory tests, by the clinical picture, by medical imaging techniques or by the epidemiology. Information on the number of cases infected with the two different species is then given separately in the text. Before 2012, E. multilocularis had never been reported in humans in Sweden. Since echinococcosis became notifiable (2004), up to and including 2011, Sweden has reported 131 human cases of CE. All cases have been diagnosed in immigrants from countries where the disease is considered endemic and are therefore considered as imported cases. E. multilocularis: between 2001 and 2010, 300-400 foxes have been shot annually, sampled and investigated within the frame of a screening programme for EM and EG. Carcasses of wildlife, including wolves and raccoon dogs are sampled sporadically at necropsy. In 2011, E. multilocularis was detected for the first time in Sweden. Due to this positive finding in a fox, an extended surveillance programme was implemented in 2011 and 2985 hunter shot foxes from different parts of the country were examined. In addition, 119 faecal samples from hunting dogs collected in the region of the first positive finding were analyzed. In the same area 236 rodents were trapped and autopsied. Three out of 2985 foxes were found positive: one in Västra Götaland, one in Södermanland and one in Dalarna County. All dogs and rodents were negative for E. multilocularis. In order to get more information of the distribution of the parasite in a known infected area, fox scats were collected within a radius of 25 km surrounding the known site of an EM-positive fox in Södermanland County. The results of this study may also be used as a baseline if repeated surveys are performed in the future to evaluate any changes in prevalence. Samples were collected during 2011 and analyzed in 2012. Six out of 790 (0.8%) fecal samples from foxes were found positive. General information have been given to the public and in order to prevent the further introduction of E. multilocularis, dogs brought in from countries other than Finland, Ireland, Malta, Norway or UK are recommended to be treated with praziquantel.

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

See E. multilocularis and E. granulosus

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

See E. multilocularis and E. granulosus. With the ongoing Emiro research project and FoMA Zoonos monitoring program at the Swedish University of Agricultural Sciences (SLU) initiated in 2012, intensive sampling of rodents and fox scats were performed in four restricted areas (20 X 20 km), two areas in Södermanland (Katrineholm) and Västra Götaland County where E. multilocularis had previously been identified and in two areas where no cases of E. multilocularis have been found in Södermanlands (Gnesta/Nykping) and Smland County (Vxi). The aim of the project is to increase the knowledge of the epidemiology of this parasite in Sweden.

Recent actions taken to control the zoonoses

See E. multilocularis and E. granulosus

Suggestions to the European Union for the actions to be taken

See E. multilocularis and E. granulosus

3.7.2 Echinococcus in animals

3.7.2.1 E. granulosus in animal

Monitoring system

Sampling strategy

All livestock, including reindeer, are macroscopically examined at slaughter. Upon suspicion of echinococcosis, samples are investigated microscopically. All free-living wolves submitted to necropsy at the National Veterinary Institute were tested. Faecal samples from carcasses of wildlife including wolves and raccoon dogs are sampled sporadically at necropsy.

Type of specimen taken

Canids: intestinal contents/faecal samples. Livestock: suspected lesions at meat inspection
Methods of sampling (description of sampling techniques)

Livestock: At routine meat inspection at abattoirs: On suspicion, cyst material is collected from livestock. Canids: fecal samples or intestinal contents from carcasses is collected.

Case definition

For the definitive host, a case is defined as an animal in which the parasite has been diagnosed morphologically followed by PCR confirmation or DNA from eggs/worms can be diagnosed by PCR. For the intermediate host, an E. granulosus case is defined as an animal with suspected macroscopic (visual) changes in organs and a positive PCR analysis.

Diagnostic/analytical methods used

Faeces is examined by PCR. Intestines are examined by SCT followed by PCR. Organs are examined by macroscopic (visual) and microscopic examination and PCR.

Control program/mechanisms

The control program/strategies in place

Dogs brought in from countries other than Finland, Norway, UK, Ireland and Malta are recommended to be treated with praziquantel. Apart from offal from free-ranging wildlife and animals slaughtered for own consumption, feeding of offal to dogs and fur producing animals are only allowed after special permission from the Board of Agriculture

Measures in case of the positive findings or single cases

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

Notification system in place

Echinococcosis is a notifiable on species level in all animals.

Results of the investigation

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

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

Sporadic cases of E. granulosus infection have occurred in imported horses that most probably were infected abroad, presumably in England and Ireland. In reindeer, E. granulosus infection was prevalent in northern Sweden during the 1970s when around 2% of the reindeer were found infected at slaughter. Based on these findings, the routines at meat inspection of reindeer were revised and organs not approved for consumption were destroyed. During 1986-96 there was no case diagnosed in reindeer, followed by three cases in 1996-97. There have been two positive findings of E. granulosus from elk, one in the early 1980's in the southern part of Sweden and one in 2000 in the central part of the country.

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

The risk of obtaining E. granulosis is negligible.

3.7.2.2 E. multilocularis in animal

Monitoring system

Sampling strategy
A second national screening was initiated in 2012 and continued in 2013 and 2014, aiming at sampling about 4000 fecal samples from foxes. A systematic stratified random sampling was performed with an increased sampling intensity in the southern parts of Sweden. To obtain parasites for further subtyping, hunters were requested to submit 30 foxes from each known infected area. Sampling was initiated in 2012 and continued during 2013 and 2014. During 2014, fecal samples were collected at autopsy from 17 Raccoon dogs (Nyctereutes procyonoides) and 29 wolves (Canis lupus) and faecal samples were submitted to the National Veterinary Institute from four dogs, one wolverin (Gulo gulo) and one fox and tested with the MC-PCR. In addition, at autopsy one otter (Lutra lutra) was analysed for E. multilocularis. These samples were not included in any monitoring project.

Type of specimen taken


Case definition

For the definitive host, a case is defined as either an animal in which the parasite has been diagnosed morphologically followed by PCR confirmation or faeces/intestinal contents with is positive by a semi automated magnetic capture probe based DNA extraction and real-time PCR (MC-PCR). For the intermediate host, an E. multilocularis case is defined as an animal with suspected macroscopic (visual) changes in organs followed by PCR confirmation.

Diagnostic/analytical methods used

Faeces/intestinal contents is examined by MC-PCR. Intestines may be examined with the segmental sedimentation and counting technique (SSCT) or sedimentation and counting technique (SCT) followed by PCR. Suspected lesions in organs are examined macroscopically (visual) and microscopically followed by PCR.

Control program/mechanisms

The control program/strategies in place

Previously, dogs brought from countries other than Finland, Ireland, Malta, Norway and UK were required to be treated with praziquantel as a preventive measure. In accordance with an EU-regulation this was substituted by a voluntary recommendation in 2012. There is a need of increased public awareness on the recommendation to deworm dogs entering the country after visiting areas where E. multilocularis is common. There is also a need to clarify the prevalence and potential spread of the parasite in Sweden and to clarify the epidemiology including the role of intermediate hosts that are involved in its life cycle.

Suggestions to the European Union for the actions to be taken

Continuous treatment of dogs and cats prior to entering countries free from or having very low prevalence of E. multilocularis from countries where the prevalence of the parasite is high is necessary. More knowledge is needed on risk factors for humans to become infected with EM to be able to issue recommendations for preventing human infections. More knowledge is also needed on the epidemiology of the parasite to understand the emergence of EM in Europe and increase the possibilities of control and eradication of the disease. For countries that are free from or has a very low prevalence of echinococcosis, the infection should be notifiable in animals. More knowledge is also needed on the epidemiology of the parasite to understand the emergence of EM in Europe and increase the possibilities of control and eradication of the disease.

Measures in case of the positive findings or single cases

In case of new positive findings information to the public will be given. However, if the prevalence increases this practice may be re-evaluated.

Notification system in place

Echinococcosis is a notifiable on species level in all animals.

Results of the investigation
The second national screening, initiated in 2012, was finalised in 2014. In all, during 2012-2014 a total of 2,779 fox scat samples were analysed and three positive fox scats were identified, one from Gnesta and one from Katrineholm (Södermanland County) and one from Västra Götaland County. Further analysis, taking the stratified sampling into account is under way. Results from the sampling of foxes in infected areas will be given when the sampling is finalized. Intestinal/fecal samples from 17 Raccoon dogs, 29 wolves, four dogs, one wolverin and one fox as well as organs from one otter were all negative. Humans: No case of alveolar echinococcosis was diagnosed in humans in Sweden in 2014.

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

Extended investigations during 2011 have shown that prevalence is very low (approximately 0.1% in foxes). However, the parasite is spread in the country and eradication is not considered feasible. Within the Emiro project and FoMA Zoonos monitoring program, the parasite was found in a new area (Växjö, in Kronobergs County). Thereby a total of five infected areas has been identified in Sweden. Furthermore, within the Emiro project, the parasite was founds for the first time in an intermediate host, voles, in 2014. The voles were caught in Södermanlands county (Gnesta / Nyköping) in 2013 (n=1) and in 2014 (n=3). Although it is not known how EM was introduced in Sweden, infected dogs introduced to the country without proper deworming is a probable way. This is in line with results of the Swedish risk assessment conducted in 2006. However, it can not be excluded that the parasite has been present for a long time, however at a prevalence below the design prevalence of the surveillance done.

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

Currently, the risk for humans of obtaining domestic echinococcosis is very small. The importance of food and drinking water for the transmission of human AE could not be assessed and the risk reducing effect of washing vegetables and berries is not documented. No specific restrictions were issued about interaction with pets and no specific recommendations were issued about EM and food. However, consumers were informed that good hygienic practices when handling food also apply with regard to *E. multilocularis*. To consumers who do not accept any risk, information was given that boiling of food is the only effective way to inactivate the parasite during food preparation. To hunters and other persons coming into close contact with foxes, recommendations on hygienic practices were given.

### 3.8 RABIES

#### 3.8.1 General evaluation of the national situation

#### 3.8.1.1 Lyssavirus (rabies) - general evaluation

**History of the disease and/or infection in the country**

Sweden has been free from classical rabies since 1886. During the last decades, two persons have been hospitalized for rabies in Sweden. In 1974, a Swedish man fell ill after having been infected in India and in 2000 a woman fell ill after a visit in Thailand. Both patients had most probably been infected by rabid dogs.

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

Since Sweden has been free from classical rabies, the risk of acquiring the disease from Swedish animals is negligible. Illegally imported dogs from endemic countries are probably the greatest threat to the rabies free status of Sweden. Illegal importation of pets, mostly dogs, has increased since 2004. During 2014 the National Veterinary Institute (SVA) made a new risk assessment on rabies. The results suggest that the probability of introducing rabies with illegally imported pets is very low, but not negligible. European Bat Lyssavirus (EBLV) has not been isolated from bats in Sweden but antibodies to EBLV have been detected in specimen of Daubentons bats, which indicates that the virus is circulating.

**Recent actions taken to control the zoonoses**

Between 1998 and 2012, an enhanced passive bat rabies surveillance program has been in place where dead bats have been examined for the presence of rabies virus. In addition, active surveillance on bat rabies was started in 2008 and ended in 2013.

#### 3.8.2 Lyssavirus (rabies) in animals

#### 3.8.2.1 European Bat Lyssavirus - unspecified in animal - Bats - wild
Monitoring system

Sampling strategy

During 2014 there has been no programme for enhanced passive surveillance in bats. Nevertheless, some dead or wounded and euthanized bats were sent to the National Veterinary Institute (SVA) for rabies examination.

Type of specimen taken

Dead bats

Methods of sampling (description of sampling techniques)

Dead or euthanized wounded bats sent by general public.

Case definition

Bat positive by detection of rabies antigen or nucleic acid or isolation of virus.

Diagnostic/analytical methods used

The diagnostic method used was based on the detection of antigens in brain tissue by use of a fluorescent antibody test, FAT. If the specimen was in poor condition due to decomposition, a PCR was performed as well.

Vaccination policy

Bats are not vaccinated against EBLV.

Control program/mechanisms

Recent actions taken to control the zoonoses

Dead bats sent to the National Veterinary Institute (SVA) have been examined for the presence of rabies virus.

Results of the investigation

Four dead or wounded and euthanized bats were investigated for rabies. All samples were negative.

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

In recent years, specimens of Daubentons bats have been especially investigated for EBLV and the results with seropositivity suggest that EBLV is present in Sweden. Daubentons bat (Myotis daubentonii), associated with EBLV-2 infections, is common and may be found from the south up to the county of Ngermanland in the north. Six other Myotis species may also be found in Sweden. The Serotine Bat (Eptesicus serotinus), associated with findings of EBLV-1 in Europe, is found in certain habitats in the south of Sweden. The Northern Bat (Eptesicus Nilsonii), which is related to the Serotine Bat, is the most common bat in Sweden, and may be found all over the country. There are 19 different species of bats in Sweden, all insectivorous belonging to the family of Vespertilionidae.

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

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

3.8.2.2 Lyssavirus (rabies) in animal - Dogs

Monitoring system
Sampling strategy

Surveillance of rabies is passive.

Frequency of the sampling

Sampling is performed when there is a suspicion of rabies. In addition, illegally imported dogs without clinical signs of rabies from high-risk countries that are euthanized are examined for rabies.

Type of specimen taken

Imprints from brain tissue

Methods of sampling (description of sampling techniques)

Specimens from brain tissue are analyzed as soon as possible after collection.

Case definition

A case is defined as an animal from which rabies virus has been detected.

Diagnostic/analytical methods used

Fluorescent antibody test (FAT) performed on smears from hippocampus or medulla oblongata, and PCR as well as mouse inoculation test as complementary tests.

Vaccination policy

Vaccination of animals is allowed but usually only traveling dogs and cats are vaccinated. To prevent the introduction of rabies, dogs and cats have to be vaccinated for rabies before entering Sweden. In addition, depending on the country of origin, antibody titer testing has to be performed. The rules are set in SJVFS 2014:47 and in EU regulation 576/2013.

Control program/mechanisms

The control program/strategies in place

To prevent the introduction of rabies, dogs and cats have to be vaccinated for rabies before entering Sweden. In addition, depending on the country of origin, antibody titer testing has to be performed. The rules are set in SJVFS 2014:47 and in EU regulation 576/2013.

Suggestions to the European Union for the actions to be taken

Import restrictions on dogs from areas, where rabies is endemic, should be motivated.

Measures in case of the positive findings or single cases

Rabies is included in the Swedish Act of Epizootic diseases (SFS 1999:657 with amendments). If rabies is suspected or confirmed measures will be taken to combat the disease and to prevent further spread.

Notification system in place

Rabies is notifiable on clinical suspicion.

Results of the investigation
In 2014, four dogs were examined for rabies due to clinical suspicion and 31 illegally imported dogs were euthanized and examined for rabies after a decision by the Board of Agriculture.

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

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

**Additional information**

In 2014, one red fox were tested for rabies due to clinical suspicions with negative results. One cat, illegally imported, were euthanized and examined for rabies after a decision by the Board of Agriculture. None of the illegally imported animals had presented clinical signs associated with rabies.

### 3.9 Q-FEVER

#### 3.9.1 General evaluation of the national situation

**3.9.1.1 Coxiella (Q-fever) - general evaluation**

**History of the disease and/or infection in the country**

Animals: Coxiella burnetii was detected in the domestic animal population in Sweden in the early 1990's. The first isolate was from a sheep placenta in a herd on the isle of Gotland. In 1993, a survey on swedish sheep and cattle showed a low seroprevalence (0.3% in sheep (n=1001) and 1.3% in cattle (n=784). In 2008/2009, a national survey on dairy cattle herds was performed showing that 8% of the herds were antibody positive in bulk milk. There were large regional differences, with highest prevalence on the isles of Gotland and land (59 and 35%, respectively). In 2010, national surveys in dairy goats and sheep showed a very low prevalence of antibodies; for sheep measured in pooled serum samples 0.6% (n=518 sheep herds) and for goats measured in bulk milk 1.7% (n=58 herds). In addition, the goat samples were also analyzed for detection of the agent. C. burnetii was not detected in bulk milk from any of the investigated dairy goat herds. In 2010/2011 a regional bulk milk survey was carried out on the isle of Gotland, with repeated sampling occasions. The results from 2008/2009 confirmed that this region has a high prevalence of cattle herds exposed to the agent. The serological survey conducted in sheep in 2010 was followed up in 2011 by a survey based on vaginal swab sampling at lambing for detection of the agent by RT-PCR. The agent was not detected in any of the samples, confirming that C.burnetii is a rare pathogen in this population. A survey was carried out for investigating the C. burnetii status of Swedish moose during 2008-2010. The result suggests that C. burnetii is not prevalent in this wild ruminant species.Humans: In humans, only two domestic cases were reported in the 1980's and 90's. During the same period, a serological survey in humans identified 28% of sheep farmers and 13% of veterinarians to be antibody positive, indicating a larger extent of the exposure. However, a prospective study on cases of endocarditis showed that only one of 329 patients had antibodies to C. burnetii indicating that the chronic Q-fever endocarditis is rare. Since Q-fever became notifiable in humans in 2004, one to three cases have been reported annually until 2008, when an increase was observed. Only one case was classified as of domestic origin during the period 2004-2009. In 2010, the epidemiological situation changed as eight of the totally 11 reported cases claimed having been infected in Sweden. All these domestic cases were linked to a farm in southern Sweden, which was included in a national survey on dairy herds and where the bulk milk from the cows was shown to be antibody positive for C. burnetii. In 2014, two cases of Q fever, both male and both infected in Spain, were reported.

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

During 2014 there was no active surveillance performed for Q-fever. No clinically affected herds were reported. No domestic human case was reported. The national situation remains stable.

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

The number of notified domestic cases in humans is very low and little is known about the significance of animals as a source. However, the findings from the serosurveys in humans in the early 90's indicate that professional exposure to domestic ruminants may be a risk factor for infection. The number of human cases is therefore likely to be underestimated.

**Recent actions taken to control the zoonoses**

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

It would be valuable if Q-fever was made notifiable in both humans and animals in all member states. It would be advisable to encourage member states to perform surveys at the national level in the animal and human populations.

3.9.2 Coxiella (Q-fever) in animals

3.9.2.1 C. burnetii in animal - Cattle (bovine animals) - dairy cows

Monitoring system

Diagnostic/analytical methods used

For antibody detection: CHEKIT Q Fever Antibody ELISA Test For detection of the agent: RT-PCR (in-house protocol)

Notification system in place

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

3.10 CYSTICERCOSIS, TAENIOSIS

3.10.1 Cysticerci in animals

3.10.1.1 Cysticerci spp., unspecified in animal

Monitoring system

Sampling strategy

Cattle and swine are inspected at slaughter for lesions caused by Cysticerci.

Frequency of the sampling

All slaughtered animals.

Type of specimen taken

Cattle: incisions of mandibular, retropharyngeal, and parotideal lymph nodes and M. masseter Swine: incision of the heart

Methods of sampling (description of sampling techniques)

Removal of suspected cystercerci at the abattoir for parasitological investigation.

Case definition

Confirmed finding of Cysticercus bovis (Taenia saginata) or unarmed taenid larva (absence of rostellar hooks).
Diagnostic/analytical methods used

Morphology by microscopy or in case of a calcified lesion, histological examination and a probable diagnosis.

Vaccination policy

Vaccination is not used.

Control program/mechanisms

Suggestions to the European Union for the actions to be taken

Meat inspection for cysticerci should be risk-based and only necessary incisions should be performed. Current analytical methods are not sensitive enough to detect infected carcasses and the lesions can only be detected when inspecting the heart or breast muscles. Therefore, incisions for surveillance of cysticerci should be omitted from the routine monitoring, although this might lead to detection of slightly fewer cases.

Measures in case of the positive findings or single cases

Carcasses with mild lesions are frozen, carcasses with massive lesions condemned. Laboratory-confirmed cases are notified to the Swedish Board of Agriculture.

Notification system in place

Cysticercus in animals is a notifiable disease. Cysticercus in humans is not notifiable.

Results of the investigation

In 2014, Cysticercus was detected in one cattle carcass. Cysticercus was not detected in swine.

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

Very few infected animals are detected during meat inspection. In 2008, 10 cattle were detected and in 2009 four cattle were detected with mild infections. The carcasses were frozen. Cysticercus has not been detected in swine for years. No significant increase in cases is expected in the near future.

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

The risk of human infection is low as infected animals are rarely detected with the currently used methods. Also, human incidence is low and the symptoms are mild and treatable. Cooking meat before consumption, as well as good water hygiene protect from the infection.

3.11 FRANCISELLA

3.11.1 Francisella in animals

3.11.1.1 F. tularensis in animal

Monitoring system

Sampling strategy
No active surveillance is performed in animals. Monitoring is based on voluntary submission of animals found dead, euthanized or hunted.

Frequency of the sampling

See above.

Type of specimen taken

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

Case definition

Animal that test positive for F. tularensis.

Diagnostic/analytical methods used

The detection is based on direct immunofluorescence and immunohistochemistry of the sample as well as on PCR.

Vaccination policy

Vaccination is not in use.

Notification system in place

Tularaemia is notifiable in animals (and in humans).

Results of the investigation

F. tularensis was detected from two hares.

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

Tularaemia has been endemic in northern and central Sweden at least since 1931 with marked variation in the number of cases per year. Years with high numbers of cases are often followed by periods when the disease is virtually absent. There is no obvious explanation for these fluctuations. The reservoir for the bacterium between outbreaks has not been identified. During the last decade, the epidemiology of tularaemia has changed and the number of reported cases in humans and animals infected south of the previous endemic region has increased. In animals, outbreaks of tularaemia have been associated with rises in the rodent and hare populations, but this association has not been detected in Sweden. It is possible that the European brown hare has become an important carrier of F. tularensis in many areas, but its epidemiological role remains unclear.

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

Tularaemia is one of the most reported zoonotic infections in humans in Sweden. The yearly numbers of notified cases range from a few cases to more than 2700 cases in 1967. In 2012, 590 human cases were reported, which is the highest number since 2003 and a 69% increase from 2011. The substantial increase could be explained by the accumulation of cases in northern Sweden, which will be further described below. In 2014, 150 human cases of tularaemia were reported. This was a slight increase in comparison to the year before with 114 cases, but seen in a longer perspective the incidence was still relatively low. There are in general quite large natural fluctuations in the number of tularaemia cases observed between years and in different regions, which are probably due to several factors combined like the number of reservoirs and mosquitoes as well as the weather conditions. The reservoir for F. tularensis is not yet known. In Sweden, surveys in dead animals are used for monitoring tularaemia. It is possible that the European brown hare has become an important carrier of F. tularensis in many areas, but its epidemiological role remains unclear.
4 ANTIMICROBIAL RESISTANCE INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

4.1 SALMONELLOSIS

4.1.1 Salmonella in animals

4.1.1.1 Antimicrobial resistance in Salmonella Cattle (bovine animals)

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 are included 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".

Methods of sampling (description of sampling techniques)

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

Procedures for the selection of isolates for antimicrobial testing

Salmonellosis in animals is a notifiable disease in Sweden and one isolate from each notified incident must be confirmed at SVA. Data on antimicrobial resistance presented in the zoonosis report include one isolate of each serovar, and when appropriate from each phage-type. These isolates are from cattle, pigs and poultry in incidents notified during 2014 and in incidents previously notified and still under restrictions in 2014. Isolates are also included that were obtained in 2014 in the Salmonella surveillance programme from samples collected at slaughter (carcass swabs, neck skins and lymph nodes).

Methods used for collecting data

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

Laboratory methodology used for identification of the microbial isolates

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

Laboratory used for detection for resistance

Antimicrobials included in monitoring

For antimicrobials and ranges tested see XML-file on isolate based reporting.

Cut-off values used in testing

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

See "Salmonella spp. in bovine animals".

Control program/mechanisms

The control program/strategies in place

See "Salmonella spp. in bovine animals".

Recent actions taken to control the zoonoses

See "Salmonella spp. in bovine animals".

Suggestions to the European Union for the actions to be taken

No specific suggestions

Measures in case of the positive findings or single cases

See "Salmonella spp. in bovine animals".

Notification system in place

See "Salmonella spp. in bovine animals".

Results of the investigation

Five of the 21 incidents in cattle in 2014 involved multiresistant S. Typhimurium.

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

The overall situation of antimicrobial resistance in Salmonella in cattle is favourable. There are few incidents each year and multiresistant clones are rarely involved.

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

Salmonella from Swedish animals is a rare source for human infections

Additional information

No specific information

4.1.1.2 Antimicrobial resistance in Salmonella 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".

Methods of sampling (description of sampling techniques)

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

Procedures for the selection of isolates for antimicrobial testing

Salmonellosis in animals is a notifiable disease in Sweden and one isolate from each notified incident must be confirmed at SVA. Data on antimicrobial resistance presented in the Zoonosis report include one isolate of each serovar, and when appropriate from each phage-type. These isolates come from cattle, pigs and poultry in incidents notified during 2014 and in incidents previously notified and still under restrictions 2014. Also included are isolates obtained 2014 in the Salmonella surveillance programme from samples collected at slaughter (carcass swabs, neck skins and lymph nodes).

Methods used for collecting data

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

Laboratory methodology used for identification of the microbial isolates

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

Laboratory used for detection for resistance

Antimicrobials included in monitoring

For antimicrobials and ranges tested see XML-file on isolate based reporting.

Cut-off values used in testing

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

Preventive measures in place

See "Salmonella spp. in pigs".

Control program/mechanisms

The control program/strategies in place

See "Salmonella spp. in pigs".

Recent actions taken to control the zoonoses

See "Salmonella spp. in pigs".

Suggestions to the European Union for the actions to be taken

No specific suggestions

Measures in case of the positive findings or single cases

See "Salmonella spp. in pigs".
Notification system in place

See "Salmonella spp. in pigs".

Results of the investigation

No incident of Salmonella was reported in pigs in 2014.

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

The overall situation of antimicrobial resistance in Salmonella in pigs is favourable. There are few incidents each year and multiresistant clones are rarely involved.

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

Salmonella from swedish animals is a rare source for human infections

Additional information

No specific information

4.1.1.3 Antimicrobial resistance in Salmonella Poultry, unspecified

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.

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 poultry".

Laboratory used for detection for resistance
Antimicrobials included in monitoring

For antimicrobials and ranges tested see XML-file on isolate based reporting.

Cut-off values used in testing

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

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".

Suggestions to the European Union for the actions to be taken

No specific suggestions

Measures in case of the positive findings or single cases

See "Salmonella spp. in poultry".

Notification system in place

See "Salmonella spp. in poultry".

Results of the investigation

None of the 7 incidents of Salmonella in poultry in 2014 involved resistant strains.

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

The overall situation of antimicrobial resistance in Salmonella in poultry is favourable.

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

Salmonella from Swedish animals is a rare source for human infections

Additional information

No specific information

4.2 CAMPYLOBACTERIOSIS

Sweden - 2014
4.2.1 Campylobacter in animals

4.2.1.1 Antimicrobial resistance in Campylobacter jejuni and coli in Poultry, unspecified

Sampling strategy used in monitoring

Frequency of the sampling

See Thermophilic Campylobacter in Gallus gallus

Laboratory methodology used for identification of the microbial isolates

Isolation is performed at the National Veterinary Institute. Samples were cultured according to ISO/DIS 10272-1:2014 for detection of thermophilic Campylobacter spp. by direct cultivation on mCCDA and incubation at 42C. Identification was based on colony morphology, microscopic appearance including motility and the following phenotypic characteristics: production of oxidase, catalase and hippurate hydrolysis reaction. With these tests, hippurate-positive *C. jejuni* were identified.

Type of specimen taken

Caecal content or meat at retail

Methods of sampling (description of sampling techniques)

For caecal content See Thermophilic Campylobacter in Gallus gallus in zoonosis report.

Procedures for the selection of isolates for antimicrobial testing

Of the isolates from caecal content obtained, 102 were randomly selected for susceptibility testing.

Methods used for collecting data

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

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Ciprofloxacin, nalidixic acid, erythromycin, tetracycline, gentamicin, streptomycin.

Cut-off values used in testing

EUCAST ECCOFFs were used

Preventive measures in place

No specific preventive measures are in place

Control program/mechanisms
The control program/strategies in place
See Zoonosis report

Recent actions taken to control the zoonoses
See Zoonosis report

Suggestions to the European Union for the actions to be taken
No specific suggestions

Measures in case of the positive findings or single cases
No specific measures are taken

Notification system in place
No notification system is in place

Results of the investigation
In 2014, 102 isolates from broilers were tested. Resistance to erythromycin was not found and Resistance to streptomycin, gentamicin and tetracycline was rare. Resistance to quinolones, including ciprofloxacin and nalidixic acid, was more common, 4% and 8 % respectively.

National evaluation of the recent situation, the trends and sources of infection
In 2010 and 2012 quinolone resistance in Campylobacter from broilers was 17-21 % but is much lower in 2014, 4-8 %.

Relevance of the findings in animals to findings in foodstuffs and to human cases (as a source of infection)
No comments

Additional information
No comments

4.3 ESCHERICHIA COLI, NON-PATHOGENIC

4.3.1 Escherichia coli, non-pathogenic in animals

4.3.1.1 Antimicrobial resistance in E.coli, non-pathogenic, unspecified

Sampling strategy used in monitoring

Frequency of the sampling
Antimicrobial resistance in indicator bacteria (E. coli and enterococci) from healthy animals and food is regularly monitored in the Swedish Veterinary Antimicrobial Resistance Monitoring programme (Svarm).
Type of specimen taken

Intestinal contents or faeces and fresh meat.

Methods of sampling (description of sampling techniques)

2014 intestinal contents (colon) from healthy broilers and turkeys were sampled at slaughter. Each sample is from a unique slaughter-batch.

Procedures for the selection of isolates for antimicrobial testing

From each sample cultured, one isolate of the relevant bacterial species was randomly selected for antimicrobial susceptibility testing.

Methods used for collecting data

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

**Laboratory methodology used for identification of the microbial isolates**

Isolation was performed at the National Veterinary Institute. Intestinal contents: Approximately 0.5 g of colon contents were diluted in 4.5 ml of saline. After thorough mixing, 0.1 ml of this suspension was spread on MacConkey and incubated overnight at 37°C. Furthermore, 1 g of caecum content was diluted in 9 ml MacConkey broth with cefotaxime (1 mg/L) and incubated at 37°C overnight. From the MacConkey broth 100 L was spread on MacConkey agar with cefotaxime (1 mg/L) and incubated overnight at 37°C. One lactose positive colony with morphology typical of E. coli was sub-cultured onto horse-blood agar (5% v/v), after which the isolate was tested for production of tryptophanase (indole). Only lactose and indol positive isolates with typical morphology were selected for susceptibility tests. Colonies growing on MacConkey agar with cefotaxime were sub-cultured on horse-blood agar (5% v/v) and further tested for ESBL detection.

**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 (CLSI, 2013). For E. coli Sensititre panels produced by Trek Diagnostics LTD were used. Antimicrobials tested are those advised by EFSA.

Cut-off values used in testing

Epidemiological cut-off values issued by EUCAST are used.

**Preventive measures in place**

No preventive measures are in place.

**Control program/mechanisms**

The control program/strategies in place

No control program is in place.

Recent actions taken to control the zoonoses

None.

Suggestions to the European Union for the actions to be taken
Measures in case of the positive findings or single cases

Escherichia coli with confirmed transferable resistance to carbapenems are notifiable to the authorities.

Notification system in place

None.

Results of the investigation

In 2014, isolates of E. coli were obtained from calves and turkeys.

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

The situation is favourable regarding antimicrobial resistance in commensal bacteria. Levels of resistance in E. coli from animals and meat are low when compared to resistance levels from other countries.

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

No comments.

Additional information

No comments.

4.4 ENTEROCOCCUS, NON-PATHOGENIC

4.4.1 Enterococcus, non-pathogenic in animals

4.4.1.1 Antimicrobial resistance in Enterococcus spp., unspecified

Sampling strategy used in monitoring

Frequency of the sampling

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

Type of specimen taken

Intestinal contents (caecal content).

Methods of sampling (description of sampling techniques)

Intestinal contents from healthy animals are sampled at slaughter. Each sample is from a unique farm (pigs, cattle) or slaughterbatch (poultry).

Procedures for the selection of isolates for antimicrobial testing
From each sample cultured one isolate of the relevant bacterial species is randomly selected for antimicrobial susceptibility testing.

Methods used for collecting data

Results of antimicrobial susceptibility testing and information on the origin of isolates are stored in a database. For summary statistics, the relevant data are extracted from the database.

Laboratory methodology used for identification of the microbial isolates

Isolation was performed at the National Veterinary Institute. Intestinal contents: Approximately 0.5 g of colon contents were diluted in 4.5 ml saline. After thorough mixing, 0.1 ml of this suspension was spread on Slanetz-Bartley (SlaBa) agar and incubated at 37°C for 48 h. Five colonies, randomly chosen, were sub-cultured on bile-esculin agar and blood agar (37°C, 24 h). Colonies with morphology consistent with enterococci, and with a positive reaction on bile-esculin agar were submitted to speciation by MALDI-TOF MS. If available, one isolate of E. faecium and one isolate of E. faecalis from each sample are tested for antimicrobial susceptibility.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

Antimicrobial susceptibility is tested using dilution methods in cation adjusted Mueller-Hinton broth (CAMBH). The tests are performed following the standards for microdilution of the National Committee of Clinical Laboratory Standards (CLSI, 2013) using VetMIC panels produced at SVA. Antimicrobials tested are those previously advised by EFSA.

Cut-off values used in testing

Epidemiological cut-off values issued by EUCAST were used.

Preventive measures in place

No preventive measures are in place.

Control program/mechanisms

The control program/strategies in place

No control program is in place.

Recent actions taken to control the zoonoses

None

Suggestions to the European Union for the actions to be taken

None

Measures in case of the positive findings or single cases

None

Notification system in place

None

Results of the investigation

Sweden - 2014
In 2014, isolates of Enterococcus faecalis and E. faecium were obtained from broilers.

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

The situation is favourable regarding antimicrobial resistance in commensal bacteria. Levels of resistance in Enterococci from animals and meat are low compared to resistance levels in other countries.

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

No comments

**Additional information**

No comments

### 4.5 STAPHYLOCOCCUS AUREUS METI CILLIN RESISTANT (MRSA) INFECTION

#### 4.5.1 Staphylococcus in animals

#### 4.5.1.1 Antimicrobial resistance in S. aureus, meticillin resistant (MRSA) Pigs

**Sampling strategy used in monitoring**

- **Frequency of the sampling**

  A point prevalence survey was performed in September December 2014.

- **Type of specimen taken**

  Swabs from skin behind ears.

**Methods of sampling (description of sampling techniques)**

All Swedish 39 nucleus and multiplying herds present in Sweden were subjected to sampling in 2014. Weaned pigs in the age 5-12 weeks were sampled, 6 pigs per box, 15 boxes per herd. Sampling was done by scrubbing the skin behind one ear with a sterile compress. The same compress was used to all 6 pigs in the same box, constituting a pooled sample.

**Procedures for the selection of isolates for antimicrobial testing**

Not relevant

**Methods used for collecting data**

Not relevant

**Laboratory methodology used for identification of the microbial isolates**

Samples were analysed in accordance with the method in the EU baseline study, in a two step selective enrichment, followed by plating on selective media and blood agar plates.
Laboratory used for detection for resistance

Antimicrobials included in monitoring

Not relevant

Cut-off values used in testing

Not relevant

Preventive measures in place

Infection control measures are advised and it is recommended that imported breeding animals and semen are tested for MRSA.

Control program/mechanisms

The control program/strategies in place

No official control program is in place but it is recommended that imported breeding animals and semen are tested for MRSA. This is also performed on a voluntary basis.

Recent actions taken to control the zoonoses

Not relevant.

Suggestions to the European Union for the actions to be taken

Not relevant.

Measures in case of the positive findings or single cases

In companion animals and horses there is legislation on how animals with MRSA should be handled. The procedure includes contact isolation of animals with clinical MRSA-infections. The legislation does however not apply for farm animals and in case of findings of MRSA in such animals the Board of Agriculture will decide on actions to be taken.

Notification system in place

MRSA in animals is notifiable to the Board of agriculture.

Results of the investigation

MRSA was not found in any sample.

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

There are reasons to believe that the MRSA situation in the Swedish pig population still is favourable. The low number of notified human cases of MRSA CC398 supports this opinion.

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

Not relevant.

Additional information

Sweden - 2014
Not relevant.
5 INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS

5.1 STAPHYLOCOCCAL ENTEROTOXINS

5.1.1 General evaluation of the national situation

5.1.1.1 Staphylococcal enterotoxins - general evaluation

Additional information

No additional information

5.1.2 Staphylococcal enterotoxins in foodstuffs

5.1.2.1 Staphylococcal enterotoxins in food - All foodstuffs

Monitoring system

Sampling strategy

Sampling is mainly performed by local competent authorities and the most frequent reason for sampling is investigation of food poisoning.

Definition of positive finding

Detection of staphylococcal enterotoxin

Diagnostic/analytical methods used

Vidas

Results of the investigation

There were 65 samples reported for staphylococcal enterotoxin and 2 of these were positive
### Table Susceptible animal population

<table>
<thead>
<tr>
<th>Animal species</th>
<th>Category of animals</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>holding (heads)</td>
<td>animal</td>
</tr>
<tr>
<td>Cattle (bovine animals)</td>
<td>Cattle (bovine animals) - calves (under 1 year) (not specified)</td>
<td>15,706</td>
</tr>
<tr>
<td></td>
<td>Cattle (bovine animals) - dairy cows and heifers</td>
<td>4,394</td>
</tr>
<tr>
<td></td>
<td>Cattle (bovine animals) - meat production animals (not specified)</td>
<td>10,663</td>
</tr>
<tr>
<td></td>
<td>Cattle (bovine animals) (not specified)</td>
<td>18,210</td>
</tr>
<tr>
<td>Deer</td>
<td>Deer - farmed - fallow deer</td>
<td>19,922</td>
</tr>
<tr>
<td></td>
<td>Deer - farmed - red deer</td>
<td>6,590</td>
</tr>
<tr>
<td></td>
<td>Deer - farmed (not specified)</td>
<td>314</td>
</tr>
<tr>
<td>Ducks</td>
<td>Ducks - meat production flocks - before slaughter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ducks (not specified)</td>
<td></td>
</tr>
<tr>
<td>Gallus gallus (fowl)</td>
<td>Gallus gallus (fowl) - broilers (not specified)</td>
<td>260</td>
</tr>
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<td></td>
<td>Gallus gallus (fowl) - laying hens - adult</td>
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<td></td>
<td>Gallus gallus (fowl) - laying hens (not specified)</td>
<td>3,878</td>
</tr>
<tr>
<td>Geese</td>
<td>Geese - meat production flocks - before slaughter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Geese (not specified)</td>
<td></td>
</tr>
<tr>
<td>Goats</td>
<td>Goats - animals over 1 year</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goats - animals under 1 year</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goats (not specified)</td>
<td>1,396</td>
</tr>
<tr>
<td>Pigs</td>
<td>Pigs - breeding animals (not specified)</td>
<td>1,388</td>
</tr>
<tr>
<td></td>
<td>Pigs - fattening pigs (not specified)</td>
<td>1,083</td>
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<tr>
<td></td>
<td>Pigs (not specified)</td>
<td>1,282</td>
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<tr>
<td>Reindeers</td>
<td>Reindeers - semi-domesticated</td>
<td>1,004</td>
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<tr>
<td>Sheep</td>
<td>Sheep - animals over 1 year</td>
<td>8,912</td>
</tr>
<tr>
<td></td>
<td>Sheep - animals under 1 year (lambs)</td>
<td>7,346</td>
</tr>
<tr>
<td></td>
<td>Sheep (not specified)</td>
<td>8,951</td>
</tr>
<tr>
<td>Solipeds, domestic</td>
<td>Solipeds, domestic (not specified)</td>
<td>77,800</td>
</tr>
<tr>
<td>Turkeys</td>
<td>Turkeys - meat production flocks (not specified)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turkeys (not specified)</td>
<td></td>
</tr>
<tr>
<td>Wild boars</td>
<td>Wild boars - farmed</td>
<td></td>
</tr>
</tbody>
</table>
### DISEASE STATUS TABLES

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

<table>
<thead>
<tr>
<th>Region</th>
<th>Total number of herds</th>
<th>Number of infected herds</th>
<th>Number of herds with status officially free</th>
<th>Number of animals positive in microbiological testing under investigations of suspect cases</th>
<th>Number of animals tested by microbiology under investigations of suspect cases</th>
<th>Number of seropositive animals under investigations of suspect cases</th>
<th>Number of suspended herds under investigations of suspect cases</th>
<th>Number of animals serologically tested under investigation of suspect cases</th>
<th>Number of herds tested under surveillance</th>
<th>Number of animals tested under surveillance</th>
<th>Number of animals serologically tested under surveillance</th>
<th>Total number of animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sverige</td>
<td>10,347</td>
<td>0</td>
<td>10,347</td>
<td>0</td>
<td>32</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2,996</td>
<td>768</td>
<td>600,352</td>
</tr>
</tbody>
</table>
### Table Bovine brucellosis in countries and regions that do not receive Community co-financing for eradication programme

| Region | Total number of herds | Number of infected herds | Number of herds with status officially free | Number of animals positive in microbiological testing under investigations of suspect cases | Number of animals positive to BST under investigations of suspect cases | Number of seropositive animals under investigations of suspect cases | Number of animals serologically tested under investigations of suspect cases | Number of abortions due to Brucella abortus | Number of isolations of Brucella infections | Number of notified abortions whatever cause | Number of infected herds tested under surveillance by bulk milk | Number of animals or pools tested under surveillance by bulk milk | Number of herds tested under surveillance by bulk milk | Number of infected herds tested under surveillance | Number of animals tested under surveillance | Number of herds tested under surveillance | Total number of animals |
|--------|-----------------------|--------------------------|---------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|------------------------------------------------|
| Sverige | 18,210                | 0                        | 18,210                                      | 33                                                                                       | 0                                                                  | 0                                                                      | 0                                                                                     | 0                                             | 0                                             | 0                                             | 32                                              | 0                                              | 0                                              | 0                                              | 0                                              | 1,493,119                                      |
**DI SEASE STATUS TABLES**

### Table Tuberculosis in farmed dear

<table>
<thead>
<tr>
<th>Region</th>
<th>Total number of herds</th>
<th>Number of infected herds</th>
<th>Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological examinations</th>
<th>Number of tuberculin tests carried out before the introduction into the herds</th>
<th>Number of animals tested with tuberculin routine testing</th>
<th>Interval between routine tuberculin tests</th>
<th>Total number of animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sverige</td>
<td>314</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>(1)</td>
<td>26,512</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Region</th>
<th>Total number of herds</th>
<th>Number of infected herds</th>
<th>Number of herds with status officially free</th>
<th>Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological examinations</th>
<th>Number of tuberculin tests carried out before the introduction into the herds</th>
<th>Number of animals tested with tuberculin routine testing</th>
<th>Interval between routine tuberculin tests</th>
<th>Total number of animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sverige</td>
<td>18,210</td>
<td>0</td>
<td>18,210</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>(1)</td>
<td>1,493,119</td>
</tr>
</tbody>
</table>
## PREVALENCE TABLES

### Table BRUCELLA in animal

<table>
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<th>Total units positive</th>
<th>Zoonoses</th>
<th>N of units positive</th>
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### Table CAMPYLOBACTER in animal

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<td>Campylobacter - Thermophilic Campylobacter spp., unspecified</td>
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Table COXIELLA (Q-FEVER) in animal

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<th>Sampling unit</th>
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<th>Total units positive</th>
<th>N of clinical affected herds</th>
<th>Zoonoses</th>
<th>N of units positive</th>
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## Table CYSTICERCI in animal

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<th>Sampling unit</th>
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<th>Total units positive</th>
<th>Zoonoses</th>
<th>N of units positive</th>
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<tbody>
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<td>organ/tissue</td>
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<td>Dogs - pet animals</td>
<td>Veterinary clinics</td>
<td>Sweden</td>
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<td>Sweden</td>
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<td>Goats - Slaughterhouse</td>
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<td>organ/tissue</td>
<td>Surveillance</td>
<td>Official sampling</td>
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<td>Otter - wild</td>
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<td>Sweden</td>
<td>animal sample</td>
<td>organ/tissue</td>
<td>Surveillance</td>
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<td>Raccoon dogs - wild</td>
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<td>Sweden</td>
<td>animal sample</td>
<td>faeces</td>
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<td>Reindeers - semi-domesticated</td>
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<td>Sweden</td>
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<td>organ/tissue</td>
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<td>animal sample</td>
<td>organ/tissue</td>
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<td>faeces</td>
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<td>Wolves - wild</td>
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<td>Sweden</td>
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<td>Monitoring</td>
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### Table ESCHERICHIA COLI, PATHOGENIC in animal

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<th>Total units positive</th>
<th>Zoonoses</th>
<th>N of units positive</th>
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### Table FRANCI SELL A in animal

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<td>1 detection</td>
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<td>Sample type</td>
<td>Sampling context</td>
<td>Sampler</td>
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<td>Surveillance</td>
<td>Official sampling</td>
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Sweden - 2014
Table LYSSAVIRUS (RABIES) in animal

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<th>Matrix - Sampling stage - Sampling origin - Sample type - Sampling context - Sampler - Sampling strategy</th>
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<th>Total units tested</th>
<th>Total units positive</th>
<th>Zoonoses</th>
<th>N of units positive</th>
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<td>Bats - wild - Natural habitat - Sweden - animal sample - brain - Surveillance - Official sampling - Suspect sampling</td>
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<td>Sampling unit</td>
<td>Total units tested</td>
<td>Total units positive</td>
<td>Zoonoses</td>
<td>N of units positive</td>
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### Table SALMONELLA in animal

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<th>N of flocks under control programme</th>
<th>Target verification</th>
<th>Total units tested</th>
<th>Total units positive</th>
<th>Zoonoses</th>
<th>N of units positive</th>
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### Additional Table:

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### Table:

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<th>Target verification</th>
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Sweden - 2014
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### Table YERSINIA in animal

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<th>Total units tested</th>
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**Sweden - 2014**
## Foodborne Outbreaks: summarized data

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<th>Outbreak strength</th>
<th>Strong</th>
<th>Weak</th>
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<tbody>
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<td>N outbreaks</td>
<td>N human cases</td>
<td>N hospitalized</td>
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<td>Outbreak strenght</td>
<td>Strong</td>
<td>Weak</td>
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<tr>
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<td>N human cases</td>
<td>N hospitalized</td>
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<td>Nature of evidence</td>
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<td>Dessert cake and Sandwich cake</td>
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<td>Dessert cake</td>
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<td>Food vehicle</td>
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<td>Unknown</td>
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<td>Unknown</td>
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<td>Restaurant or Cafe or Pub or Bar or Hotel or Catering service</td>
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<tr>
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<td>FBO nat. code</td>
<td>Outbreak type</td>
<td>Food vehicle More food vehicle info</td>
<td>Nature of evidence</td>
</tr>
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<td>------------------------------------</td>
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<td>Tap water, including well water</td>
<td>Descriptive epidemiologic evidence</td>
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Table Antimicrobial susceptibility testing of Campylobacter - C. jejuni in Gallus gallus (fowl) - broilers (not specified)

Sampling Stage: Slaughterhouse  Sampling Type: animal sample - caecum  Sampling Context: Monitoring - active
Sampler: Official sampling  Sampling Strategy: Objective sampling  Programme Code: AMR MON
Analytical Method: Micromethod dilution (in microtiter plate) (not specified)
Country of Origin: Sweden

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<th>Aminoglycosides - Gentamicin</th>
<th>Aminoglycosides - Streptomycin</th>
<th>Fluoroquinolones - Ciprofloxacin</th>
<th>Macrolides - Erythromycin</th>
<th>Quinolones - Nalidixic acid</th>
<th>Tetracyclines - Tetracycline</th>
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<tr>
<td>MIC</td>
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<td>&lt;=0.25</td>
<td>0.25</td>
<td>&lt;=0.5</td>
<td>0.5</td>
<td>&gt;=0.5</td>
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## Antimicrobial Susceptibility Testing of Salmonella - S. 4,5:-:1,5 in Birds - wild (not specified)

### Sampling Information
- **Sampling Stage:** Natural habitat
- **Sampling Type:** Animal sample (not specified)
- **Sampling Context:** Monitoring - passive
- **Sampler:** Official sampling
- **Sampling Strategy:** Suspect sampling
- **Programme Code:** OTHER AMR MON

### Analytical Method
- Micromethod dilution (in microtiter plate) (not specified)

### Country of Origin
- Sweden

### AM Substances and MIC Values

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### MIC Range
- **ECOFF**
  - Lowest limit: 0.12
  - Highest limit: 256

### N of Tested Isolates
- 0.06: 1
- 0.12: 1
- <0.25: 1
- <0.5: 1
- 0.5: 1
- <1: 1
- <2: 1
- <4: 1
- <8: 1
- <16: 1

### N of Resistant Isolates
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- 0.12: 0
- <0.25: 0
- <0.5: 0
- 0.5: 0
- <1: 0
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- <4: 0
- <8: 0
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## Table: Antimicrobial susceptibility testing of Salmonella - S. Derby in Dogs - pet animals

**Sampling Stage:** Veterinary clinics  
**Sampling Type:** animal sample - faeces  
**Sampling Context:** Clinical investigations  
**Sampler:** Official sampling  
**Sampling Strategy:** Suspect sampling  
**Programme Code:** OTHER AMR MON

**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)

**Country of Origin:** Sweden

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<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
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### Notes:
- **ECOFF** values for each antibiotic are listed along the top row.
- **MIC** values are listed along the left column.
- The table indicates the number of resistant isolates for each MIC range.
- The sampling strategy is suspect sampling, indicating that the samples were selected based on suspicion of resistance.

**Sweden - 2014**
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Table Antimicrobial susceptibility testing of Salmonella - S. Duesseldorf in Wolves - wild

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# Antimicrobial Susceptibility Testing of Salmonella - S. enterica subsp. diarizonae in Otter - wild

### Sampling Details
- **Sampling Stage**: Natural habitat
- **Sampling Type**: Animal sample (not specified)
- **Sampling Context**: Monitoring - passive
- **Sampler**: Official sampling
- **Sampling Strategy**: Suspect sampling
- **Programme Code**: OTHER AMR MON
- **Analytical Method**: Micromethod dilution (in microtiter plate) (not specified)

### Country of Origin: Sweden

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Sweden - 2014
### Antimicrobial Susceptibility Testing of Salmonella - S. enterica subsp. diarizonae in Moose - wild

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Table Antimicrobial susceptibility testing of Salmonella - S. enterica subsp. enterica in Solipeds, domestic - horses

Sampling Stage: Veterinary clinics  Sampling Type: animal sample - faeces  Sampling Context: Clinical investigations
Sampler: Official sampling  Sampling Strategy: Suspect sampling  Programme Code: OTHER AMR MON

Analytical Method: Micromethod dilution (in microtiter plate) (not specified)

Country of Origin: Sweden

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<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
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Table Antimicrobial susceptibility testing of Salmonella - S. Enteritidis in Hedgehogs - wild

Sampling Stage: Natural habitat  
Sampling Type: animal sample (not specified)  
Sampling Context: Monitoring - passive  
Sampler: Official sampling  
Sampling Strategy: Suspect sampling  
Programme Code: OTHER AMR MON  
Analytical Method: Micromethod dilution (in microtiter plate) (not specified)  
Country of Origin: Sweden

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### Antimicrobial susceptibility testing of Salmonella - S. Infantis in Cattle (bovine animals) - unspecified

**Sampling Stage:** Farm (not specified)  
**Sampling Type:** animal sample - faeces  
**Sampling Context:** Control and eradication programmes  
**Sampler:** Official sampling  
**Sampling Strategy:** Suspect sampling  
**Programme Code:** OTHER AMR MON

**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)

**Country of Origin:** Sweden

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Sampling Stage: Farm (not specified)  
Sampling Type: environmental sample - boot swabs  
Sampling Context: Control and eradication programmes  
Sampler: Official and industry sampling  
Sampling Strategy: Census  
Analytical Method: Micromethod dilution (in microtiter plate) (not specified)  
Country of Origin: Sweden
### Table: Antimicrobial Susceptibility Testing of Salmonella - S. Mbandaka in Cattle (bovine animals) - unspecified

**Sampling Stage:** Farm (not specified)  
**Sampling Type:** Animal sample - faeces  
**Sampling Context:** Control and eradication programmes  
**Sampler:** Official sampling  
**Sampling Strategy:** Suspect sampling  
**Programme Code:** OTHER AMR MON

**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)

**Country of Origin:** Sweden

| AM substance | Aminoglycosides - Gentamicin | Aminoglycosides - Kanamycin | Aminoglycosides - Streptomycin | Aminoglycosides - Chloramphenicol | Amphenicols - Florfenicol | Cephalosporins - Cefotaxime | Cephalosporins - Ceftazidime | Fluoroquinolones - Ciprofloxacin | Penicillins - Ampicillin | Polymyxins - Colistin | Quinolones - Nalidixic acid | Sulfonamides - Sulfamethoxazole | Tetracyclines - Tetracycline | Trimethoprim |
|--------------|-----------------------------|-----------------------------|---------------------------------|-----------------------------------|--------------------------|-----------------------------|-----------------------------|--------------------------|--------------------------|------------------------|--------------------------|--------------------------|--------------------------|
| MIC          | 0.03                         | 0.12                        | 0.25                            | 0.5                               | <=1                      | 4                           | 1                           | 4                        | 1                        | 1                      | 1                       | 1                        | 1                        |
| Low limit    | 2                            | 16                          | 16                              | 16                                | 0.5                      | 2                           | 0.06                        | 8                        | 2                        | 16                     | 256                     | 8                        | 16                      |
| High limit   | 16                           | 16                          | 256                             | 64                                | 32                       | 2                           | 16                          | 1                        | 128                      | 4                       | 128                    | 1024                    | 128                     |
| N of tested isolates | 1          | 1                           | 1                               | 1                                 | 1                        | 1                           | 1                           | 1                        | 1                        | 1                      | 1                       | 1                        | 1                        |
| N of resistant isolates | 0          | 0                           | 0                               | 0                                 | 0                        | 0                           | 0                           | 0                        | 0                        | 0                      | 0                       | 0                        | 0                        |

Sweden - 2014
<table>
<thead>
<tr>
<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
<th>Aminoglycosides - Kanamycin</th>
<th>Aminoglycosides - Streptomycin</th>
<th>Aminoglycosides - Chloramphenicol</th>
<th>Amphenicols - Florfenicol</th>
<th>Cephalosporins - Cefotaxime</th>
<th>Cephalosporins - Ceftazidime</th>
<th>Fluoroquinolones - Ciprofloxacin</th>
<th>Penicillins - Ampicillin</th>
<th>Polymyxins - Colistin</th>
<th>Quinolones - Nalidixic acid</th>
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<td>16</td>
<td>16</td>
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<td>Lowest limit</td>
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<td>0.008</td>
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<td>16</td>
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<td>4</td>
<td>128</td>
<td>1024</td>
<td>128</td>
<td>16</td>
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</table>

| N of tested isolates | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| N of resistant isolates | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

MIC

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</tbody>
</table>

Sweden - 2014
### Table: Antimicrobial susceptibility testing of Salmonella - S. Poona in Gallus gallus (fowl) - parent breeding flocks for broiler production line (not specified)

**Sampling Stage:** Farm (not specified)  
**Sampling Type:** environmental sample - boot swabs  
**Sampling Context:** Control and eradication programmes  
**Sampler:** Official and industry sampling  
**Sampling Strategy:** Census  
**Programme Code:** AMR MON

**Country of Origin:** Sweden

<table>
<thead>
<tr>
<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
<th>Aminoglycosides - Kanamycin</th>
<th>Aminoglycosides - Streptomycin</th>
<th>Chloramphenicol</th>
<th>Amphenicols - Florfenicol</th>
<th>Cephalosporins - Cefotaxime</th>
<th>Cephalosporins - Ceftazidime</th>
<th>Fluoroquinolones - Ciprofloxacin</th>
<th>Penicillins - Ampicillin</th>
<th>Polymyxins - Colistin</th>
<th>Quinolones - Nalidixic acid</th>
<th>Sulfonamides - Sulfamethoxazole</th>
<th>Tetracyclines - Tetracycline</th>
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</tr>
<tr>
<td>N of resistant isolates</td>
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<td>0</td>
<td>0</td>
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</table>

Sweden - 2014
Table Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Rodents - wild

Sampling Stage: Natural habitat  
Sampling Type: animal sample (not specified)  
Sampling Context: Monitoring - passive  
Sampler: Official sampling  
Sampling Strategy: Suspect sampling  
Programme Code: OTHER AMR MON  
Analytical Method: Micromethod dilution (in microtiter plate) (not specified)  
Country of Origin: Sweden

<table>
<thead>
<tr>
<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
<th>Aminoglycosides - Kanamycin</th>
<th>Aminoglycosides - Streptomycin</th>
<th>Aminoglycosides - Chloramphenicol</th>
<th>Amphenicols - Florfenicol</th>
<th>Cephalosporins - Cefotaxime</th>
<th>Cephalosporins - Ceftazidime</th>
<th>Fluoroquinolones - Ciprofloxacin</th>
<th>Penicillins - Ampicillin</th>
<th>Polymyxins - Colistin</th>
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</tr>
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<td>≤4</td>
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<td>≤128</td>
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Table Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Gallus gallus (fowl) - laying hens - adult

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<td>&lt;=8</td>
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<td>128</td>
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</tr>
</tbody>
</table>

Table Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Otter - wild

Sampling Stage: Natural habitat  
Sampling Type: animal sample (not specified)  
Sampling Context: Monitoring - passive  
Sampler: Official sampling  
Sampling Strategy: Suspect sampling  
Programme Code: OTHER AMR MON

Analytical Method: Micromethod dilution (in microtiter plate) (not specified)

Country of Origin: Sweden

<table>
<thead>
<tr>
<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
<th>Aminoglycosides - Kanamycin</th>
<th>Aminoglycosides - Streptomycin</th>
<th>Aminoglycosides - Chloramphenicol</th>
<th>Amphenicols - Florfenicol</th>
<th>Cephalosporins - Cefotaxime</th>
<th>Cephalosporins - Ceftizidime</th>
<th>Fluoroquinolones - Ciprofloxacin</th>
<th>Penicillins - Ampicillin</th>
<th>Polymyxins - Colistin</th>
<th>Quinolones - Nalidixic acid</th>
<th>Sulfonamides - Sulfamethoxazole</th>
<th>Tetracyclines - Tetracycline</th>
<th>Trimethoprim</th>
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<td>&lt;=0.25</td>
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Sweden - 2014
### Table: Antimicrobial Susceptibility Testing of Salmonella - S. Typhimurium in Bears - Wild

**Sampling Stage:** Natural habitat  
**Sampling Type:** Animal sample (not specified)  
**Sampling Context:** Monitoring - passive  
**Sampler:** Official sampling  
**Sampling Strategy:** Suspect sampling  
**Programme Code:** OTHER AMR MON  
**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)  
**Country of Origin:** Sweden

<table>
<thead>
<tr>
<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
<th>Aminoglycosides - Kanamycin</th>
<th>Aminoglycosides - Streptomycin</th>
<th>Amphenicols - Chloramphenicol</th>
<th>Amphenicols - Florfenicol</th>
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<th>Cephalosporins - Ceftazidime</th>
<th>Fluoroquinolones - Ciprofloxacin</th>
<th>Penicillins - Ampicillin</th>
<th>Polymyxins - Colistin</th>
<th>Quinolones - Nalidixic acid</th>
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</tbody>
</table>

- Table shows the antimicrobial susceptibility testing results of Salmonella - S. Typhimurium in bears.  
- The table includes various antimicrobial substances such as aminoglycosides, amphenicols, cephalosporins, fluoroquinolones, Penicillins, Polymyxins, and Trimethoprim.  
- The table provides the lowest limit and highest limit MIC values for each antimicrobial substance.  
- The table also includes the number of tested isolates and the number of resistant isolates for each MIC value.  

**Sweden - 2014**
<table>
<thead>
<tr>
<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
<th>Aminoglycosides - Kanamycin</th>
<th>Aminoglycosides - Streptomycin</th>
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<th>Polymyxins - Colistin</th>
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Table Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Geese - meat production flocks - before slaughter

Sampling Stage: Farm (not specified)
Sampling Type: environmental sample - boot swabs
Sampling Context: Control and eradication programmes
Sampler: Official and industry sampling
Sampling Strategy: Census
Programme Code: AMR MON

Analytical Method: Micromethod dilution (in microtiter plate) (not specified)

Country of Origin: Sweden
**Table Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Gallus gallus (fowl) - broilers (not specified)**

Sampling Stage: Farm (not specified)
Sampling Type: environmental sample - boot swabs
Sampling Context: Control and eradication programmes
Sampler: Official and industry sampling
Sampling Strategy: Census
Programme Code: AMR MON
Analytical Method: Micromethod dilution (in microtiter plate) (not specified)

Country of Origin: Sweden

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**Table Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Badgers - wild**

- **Sampling Stage:** Natural habitat
- **Sampling Type:** animal sample (not specified)
- **Sampling Context:** Monitoring - passive
- **Sampler:** Official sampling
- **Sampling Strategy:** Suspect sampling
- **Programme Code:** OTHER AMR MON
- **Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)

**Country of Origin:** Sweden

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Table: Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Cattle (bovine animals) - unspecified

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Sampling Stage: Farm (not specified)  
Sampling Type: animal sample - organ/tissue  
Sampling Context: Control and eradication programmes  
Sampler: Official sampling  
Sampling Strategy: Suspect sampling  
Programme Code: OTHER AMR MON  
Analytical Method: Micromethod dilution (in microtiter plate) (not specified)  
Country of Origin: Sweden
### Antimicrobial Susceptibility Testing of Salmonella - S. Typhimurium in Cattle (Bovine Animals) - Unspecified

**Sampling Stage:** Farm (not specified)  
**Sampling Type:** Animal sample - Faeces  
**Sampling Context:** Control and eradication programmes  
**Sampler:** Official sampling  
**Sampling Strategy:** Suspect sampling  
**Programme Code:** OTHER AMR MON  
**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)

**Country of Origin:** Sweden

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**Sweden - 2014**
## Table: Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Birds - wild (not specified)

**Sampling Stage:** Natural habitat  
**Sampling Type:** animal sample (not specified)  
**Sampling Context:** Monitoring - passive  
**Sampler:** Official sampling  
**Sampling Strategy:** Suspect sampling  
**Programme Code:** OTHER AMR MON  
**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)  
**Country of Origin:** Sweden

### AM substance
<table>
<thead>
<tr>
<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
<th>Aminoglycosides - Kanamycin</th>
<th>Aminoglycosides - Streptomycin</th>
<th>Aminoglycosides - Chloramphenicol</th>
<th>Amphenicols - Florfenicol</th>
<th>Cephalosporins - Cefotaxime</th>
<th>Cephalosporins - Ceftazidime</th>
<th>Fluoroquinolones - Ciprofloxacin</th>
<th>Penicillins - Ampicillin</th>
<th>Polymyxins - Colistin</th>
<th>Quinolones - Nalidixic acid</th>
<th>Sulfonamides - Sulfamethoxazole</th>
<th>Tetracyclines - Tetracycline</th>
<th>Trimethoprim</th>
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<tbody>
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<td>0.03</td>
<td>0.06</td>
<td>0.12</td>
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<td>N of resistant isolates</td>
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| ECOFF              | 2                            | 16                          | 16                            | 16                               | 16                        | 0.5                         | 2                            | 0.06                           | 8                      | 2               | 16                           | 256                         | 8                        | 2             |
| Lowest limit       | 0.12                         | 8                           | 2                             | 4                                | 0.016                     | 2                           | 0.25                         | 0.008                          | 0.5                   | 1               | 16                           | 1                           | 1                        | 8             |
| Highest limit      | 16                           | 16                          | 256                           | 64                               | 32                        | 2                           | 16                           | 1                              | 128                  | 4               | 128                           | 1024                        | 128                      | 16            |

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Sweden - 2014
### Table Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Hedgehogs - wild

**Sampling Stage:** Natural habitat  
**Sampling Type:** animal sample (not specified)  
**Sampling Context:** Monitoring - passive  
**Sampler:** Official sampling  
**Sampling Strategy:** Suspect sampling  
**Programme Code:** OTHER AMR MON  
**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)

**Country of Origin:** Sweden

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<tr>
<th>AM substance</th>
<th>Aminoglycosides - Gentamicin</th>
<th>Aminoglycosides - Kanamycin</th>
<th>Aminoglycosides - Streptomycin</th>
<th>Chloramphenicol</th>
<th>Amphenicols - Florfenicol</th>
<th>Cephalosporins - Cefotaxime</th>
<th>Cephalosporins - Ceftazidime</th>
<th>Fluoroquinolones - Ciprofloxacin</th>
<th>Penicillins - Ampicillin</th>
<th>Polymyxins - Colistin</th>
<th>Quinolones - Nalidixic acid</th>
<th>Sulfonamides - Sulfamethoxazole</th>
<th>Tetracyclines - Tetracycline</th>
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- **ECOFF**:
  - Gentamicin: 16
  - Kanamycin: 2
  - Streptomycin: 2
  - Chloramphenicol: 16
  - Florfenicol: 0.5
  - Cefotaxime: 2
  - Ceftazidime: 0.06
  - Ciprofloxacin: 8
  - Ampicillin: 2
  - Colistin: 16
  - Nalidixic acid: 256
  - Sulfamethoxazole: 8
  - Tetracycline: 2
  - Trimethoprim: 2
## Table: Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Lynx - wild

**Sampling Stage:** Natural habitat  
**Sampling Type:** animal sample (not specified)  
**Sampling Context:** Monitoring - passive  
**Sampler:** Official sampling  
**Sampling Strategy:** Suspect sampling  
**Programme Code:** OTHER AMR MON  
**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)

**Country of Origin:** Sweden

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Sweden - 2014
### Table Antimicrobial susceptibility testing of Salmonella - S. Typhimurium in Cats - pet animals

**Sampling Stage:** Veterinary clinics  
**Sampling Type:** animal sample - faeces  
**Sampling Context:** Clinical investigations  
**Sampler:** Official sampling  
**Sampling Strategy:** Suspect sampling  
**Programme Code:** OTHER AMR MON  
**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)

**Country of Origin:** Sweden

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Sweden - 2014
## Antimicrobial Resistance Tables for Indicator Escherichia Coli

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Table: Antimicrobial susceptibility testing of Escherichia coli, non-pathogenic - E.coli, non-pathogenic, unspecified in Gallus gallus (fowl) - broilers (not specified)

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Sampling Stage: Slaughterhouse
Sampling Type: Animal sample - caecum
Sampling Context: Monitoring
Sampler: Official sampling
Sampling Strategy: Objective sampling
Programme Code: AMR MON
Analytical Method: Micromethod dilution (in microtiter plate) (not specified)
Country of Origin: Sweden

Sweden - 2014
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**Sampling Type:** Animal Sample - Caecum  
**Sampling Strategy:** Incubation  
**Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)
Table: Antimicrobial susceptibility testing of Escherichia coli, non-pathogenic - E. coli, non-pathogenic, unspecified in Gallus gallus (fowl) - broilers (not specified)

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### OTHER ANTIMICROBIAL RESISTANCE TABLES

#### Table Antimicrobial susceptibility testing of Enterococcus, non-pathogenic - E. faecalis in Gallus gallus (fowl) - broilers (not specified)

- **Sampling Stage:** Slaughterhouse
- **Sampling Type:** animal sample - caecum
- **Sampling Context:** Monitoring
- **Sampler:** Official sampling
- **Sampling Strategy:** Objective sampling
- **Programme Code:** OTHER AMR MON
- **Analytical Method:** Micromethod dilution (in microtiter plate) (not specified)
- **Country of Origin:** Sweden

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<th>Aminoglycosides - Streptomycin</th>
<th>Amphenicols - Chloramphenicol</th>
<th>Glycopeptides (Cyclic peptides, Polypeptides) - Bacitracin</th>
<th>Glycopeptides (Cyclic peptides, Polypeptides) - Vancomycin</th>
<th>Ionophores - Narasin</th>
<th>Macrolides - Erythromycin</th>
<th>Oxazolidines - Linezolid</th>
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Table Antimicrobial susceptibility testing of Enterococcus, non-pathogenic - E. faecium in Gallus gallus (fowl) - broilers (not specified)

Sampling Stage: Slaughterhouse  
Sampling Type: animal sample - caecum  
Sampling Context: Monitoring  
Sampler: Official sampling  
Sampling Strategy: Objective sampling  
Programme Code: OTHER AMR MON  
Analytical Method: Micromethod dilution (in microtiter plate) (not specified)  
Country of Origin: Sweden

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Swedish - 2014