ZOONOSES MONITORING

NORWAY

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

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

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

IN 2007

INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Country: **Norway**
Reporting Year: **2007**
Institutions and laboratories involved in reporting and monitoring:

Laboratory name	Description	Contribution
Norwegian Food Safety Authority	The Norwegian Food Safety Authority (NFSA) is the competent authority for the purpose of Directive 2003/ 99/ EC of the European Parliament and of the Council.	Contributing with data and text.
National Veterinary Institute	The National Veterinary Institute (NVI) is a governmental agency funded by the Ministry of Agriculture and Food, Ministry of Fisheries and Coastal Affairs and the Norwegian Research Council. The primary function is supply of independent research based advisory support to the governing authorities regarding animal health, fish health and food safety.	Contributing with data and text. The reporting officer is employed at the Zoonosis Centre at NVI.
National Institute of Nutrition and Seafood Research	The National Institute of Nutrition and Seafood Research (NIFES) is a research institute with administrative tasks. The institute is linked directly to the Ministry of Fisheries and Coastal Affairs and act as an advisor to the Ministry in matters concerning the "fjord to fork" production chain of seafood (both wild and farmed). NIFES also provides independent and research based advisory support to other governmental bodies and to the Norwegian fisheries and aquaculture industries.	Contributing with data and text.

Norwegian Institute of Public Health	The Norwegian Institute of Public Health (NIPH) is the national governmental centre for communicable disease prevention and control. The institute performs research and surveillance of communicable diseases in man and advices governmental and municipal authorities and the public on the prevention of communicable diseases, outbreaks and antimicrobial resistance. The institute also has responsibilities concerning chronic disease epidemiology, environmental medicine and forensic toxicology.	Contributing with data and text.

PREFACE

This report is submitted to the European Commission in accordance with Article 9 of Council Directive 2003/ 99/ EC[1]. The information has also been forwarded to the European Food Safety Authority (EFSA).
The report contains information on trends and sources of zoonoses and zoonotic agents in Norway during the year 2007. The information covers the occurrence of these diseases and agents in humans, animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and commensal bacteria as well as information on epidemiological investigations of foodborne outbreaks. Complementary data on susceptible animal populations in the country is also given.
The information given covers both zoonoses that are important for the public health in the whole European Community as well as zoonoses, which are relevant on the basis of the national epidemiological situation.
The report describes the monitoring systems in place and the prevention and control strategies applied in the country. For some zoonoses this monitoring is based on legal requirements laid down by the Community Legislation, while for the other zoonoses national approaches are applied.
The report presents the results of the examinations carried out in the reporting year. A national evaluation of the epidemiological situation, with special reference to trends and sources of zoonotic infections, is given. Whenever possible, the relevance of findings in foodstuffs and animals to zoonoses cases in humans is evaluated.
The information covered by this report is used in the annual Community Summary Report on zoonoses that is published each year by EFSA.

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

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1. ANIMAL POPULATIONS

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

A. Information on susceptible animal population

Sources of information:

Data on herds and animals: Register of Production Subsidies.
Data on slaughtered animals: Register of Slaughtered Animals.

Dates the figures relate to and the content of the figures:

Data on herds and animals: As of 31 July 2007.
Data on slaughtered animals: Slaughtered in 2007.

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

Herd means an animal or group of animals kept on a holding as an epidemiological unit (article 2.3(a) of Regulation (EC) No 2160/ 2003). In Norway, there is generally only one herd of the same animal species per holding.
A flock (poultry) is defined as all poultry of the same health status kept on the same premises or in the same enclosure and constituting a single epidemiological unit; in the case of housed poultry, this includes all birds sharing the same airspace (article 2.3(b) of Regulation (EC) No 2160/ 2003).

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

For cattle, swine, sheep, goat and poultry (layers and broilers) there has been a downward trend in the number of herds/ holdings during the last decade. However, the number of animals per herd/ holding has increased for all species.

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

Cattle: Most of the cattle herds are dairy herds, the average herd size being 18.2 cows. There are also a number of specialized beef herds with an average number of suckling cows of 13.0. A few herds are combined dairy and beef herds. The cattle herds are distributed throughout Norway with the main part being in the western and middle parts of Norway.
Swine: The Norwegian swine population is relatively small with products destinated for the national market. A national breeding program is organized by the industry. Approximately 150 approved elite and multiplier breeding herds house 5% of the live sows in the population, while more than 95% of the sows purchased on the national market are raised in these herds. The swine population is denser in some counties and about 50% of the swine production is concentrated in four counties in the southern and middle part of Norway.
Sheep: The Norwegian sheep flocks are widely distributed over the country, with the largest population found in the south-west. The sheep population consists of combined meat and wool producing breeds, with various Norwegian breeds predominating.
Goat: The Norwegian goat population is principally composed of one Norwegian breed. The main

product is milk used for cheese production. The goat flocks are located in some mountainous regions in the southern part of the country, in the fjord districts of the western part, and in the northern counties.
Poultry: The Norwegian poultry production is strictly regulated and the population has a hierarchical structure. Egg and broiler meat production are the most important branches, but the production of turkey is increasing slightly. The Norwegian layer population consists of two strains (Lohmann white and Shaver white). The layer population is located throughout Norway. The commercial broiler production consists of two strains (Cobb and Ross). The broiler production is mainly located in five counties in the southern and middle part of Norway.

Additional information

The livestock production in Norway is targeted for the national market. Until 1999 there was a general ban on the import of live animals and animal products to Norway. Following the extention of the European Economic Area (EEA) Agreement 1 January 1999 regarding Veterinary and Phytosanitary matters, the general ban was lifted. However, imports of live animals remained limited. In 2007, 31 live cattle, four live sheep and five live goats were imported. The poultry industry imported day-old broiler parent flocks, mainly from Sweden, and day-old layer grandparent flocks, mainly from Germany.

Table Susceptible animal populations

* Only if different than current reporting year

Animal species	Category of animals	Number of herds or flocks	Year*	Number of slaughtered animals	Year*	Livestock numbers (live animals)	Year*	Number of holdings	Year*
Cattle (bovine animals)	dairy cows and heifers	12600				229700			
	mixed herds	1100				30800			
	meat production animals	4100				53100			
	in total	19300		319000		902000			
Deer	farmed - in total (1)	62		1400		2000			
Gallus gallus (fowl)	parent breeding flocks for egg production line	12							
	grandparent breeding flocks for egg production line	2							
	parent breeding flocks for meat production line (2)	140							
	laying hens (3)			907900		3412700		710	
	broilers	4100		54423900				550	
Goats	milk goats	490				41000			
	in total	1300		19500		71500			
Pigs	breeding animals	1700				59300			
	fattening pigs	2500				449000			
	in total	2800		1470100		815400			
Reindeers	farmed - in total			46800					
Sheep	animals over 1 year	15100				854000			
	in total	15400		1139700		2243400			
Turkeys	in total (4)					333800		46	

(1): Data on herds and livestock numbers are estimates from the Norwegian Red Deer Centre. Data on slaughtered animals are from the Norwegian Food Safety Authority
(2): Not including rearing flocks
(3): Only flocks >250 birds, except for slaughtered animals.
(4): Numbers includes small amounts of ducks and geese. Data includes only flocks >25 birds, except for slaughtered animals.

Footnote

Numbers >100 rounded to the nearest ten, numbers >1000 rounded to the nearest hundred.

2. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

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

2.1. SALMONELLOSIS

2.1.1. General evaluation of the national situation

A. General evaluation

History of the disease and/ or infection in the country

The situation regarding Salmonella in feedingstuffs, animals and food produced in Norway has for many years been very good. Approximately 75-80% of the cases of salmonellosis in humans are acquired abroad.

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

There is no alarming development in the number of salmonellosis cases in humans, neither regarding domestic nor imported cases. However, there seem to be have been a slightly increasing trend in domestic infections during the last decade.
For feedingstuffs and animals, the situation is very good and has been so for many years.
Regarding food, the food produced in Norway is virtually free from Salmonella. There is, however, an increased import of food, and this is a potential source for infections to humans as well as animals.

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

The Norwegian Salmonella Control Programmes have documented that so far live cattle, swine, and poultry in Norway as well as domestically produced food products of animal origin are virtually free from Salmonella. Each year, approximately 75-80% of reported cases of salmonellosis in humans have acquired the infection abroad. This illustrates that domestic food products of animal origin represent a small risk to the consumer in regard to Salmonella, an assumption that is supported by case-control studies.

2.1.2. Salmonellosis in humans

A. Salmonellosis in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.

Case definition

A case from which Salmonella other than S. Typhi and S. Paratyphi has been isolated or a clinical compatible case with either an epidemiological link to a culture confirmed case or serology indicating recent infection.

Diagnostic/ analytical methods used

Bacteriology (isolation of the agent from a clinical sample) followed by confirmation, including serotyping and sometimes genotyping, at the National Reference Laboratory.

Notification system in place

According to the Communicable Disease Act, human cases are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1975.

History of the disease and/ or infection in the country

The recorded incidence of salmonellosis in Norway has increased during the last three decades with a sharp rise in the early 1980s due to the emergence of S. Enteritidis. In the majority of cases of salmonellosis (approximately 80%), the patients have acquired the disease abroad. The number of reported cases of salmonellosis corresponds well with charter tourism to foreign countries; in years with an increased charter tourism, such as in the mid-1980s and in the period 1992-1998, the incidence of salmonellosis also increased, whereas in years with a lower charter tourism activity due to economical depression, such as in the period 1988-1991, the incidence of salmonellosis dropped. Since 1998, the incidence of salmonellosis has leveled off. However, an increase was noted during 2001, mostly due to a few large outbreaks.
Since 1984, S. Enteritidis has become the most common serovar reported, except in 1987 when it was surpassed by S. Typhimurium due to a domestic outbreak traced to contaminated chocolate bars. While S. Typhimurium predominated in earlier years, S. Enteritidis has increased substantially from a low level in 1975-1982 to a higher level from the mid-1990s. No increase of similar magnitude has been observed for any other serovar.
The proportion of imported cases of S. Enteritidis infections is particularly high (approximately 90% among patients with known place of acquisition) as this pathogen is not established in the Norwegian poultry production. Among domestic cases, S. Typhimurium is the most common serovar. This serovar, although not established among food animals in Norway, does occur in the Norwegian environment such as in wild birds and hedgehogs.

Results of the investigation

In 2007, a total of 1649 cases of salmonellosis were reported (incidence rate 35.2 per 100 000), of which 391 (24%) were infected in Norway. Altogether 719 (44%) of the cases were due to S. Enteritidis, of which 84 (11%) were infected in Norway, while 339 (21%) of the cases were due to S. Typhimurium, of which 176 (52%) were infected in Norway. The outbreaks are described in the chapter on foodborne outbreaks.

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

The overall situation seem to be relatively stable, however there has been a small increasing trend in domestic infections during the last decade. In 2006 and 2007, nearly 400 cases were reported, which is the highest recorded since 1987.
There were only 16 cases with multiresistant S. Typhimurium DT104 infection in 2007, of which only seven where acquired in Norway. This is a decrease from previous years.
Domestic outbreaks of salmonellosis recorded in recent years illustrate that many kinds of foods may be involved in outbreaks, also those of non-animal origin, including imported foods.

Relevance as zoonotic disease

The Norwegian Salmonella Control Programmes have documented that so far live cattle, swine, and poultry in Norway as well as domestically produced food products of animal origin are virtually free from Salmonella. Each year, approximately 75-80% of reported cases of salmonellosis in humans have acquired the infection abroad. This illustrates that domestic food products of animal origin represent a small risk to the consumer in regard to Salmonella, an assumption that is supported by case-control studies.
However, data show that S. Typhimurium occurs endemically in the environment representing a risk for spread through wild animals and untreated water. In defined areas, where an endemic situation in the hedgehog and passerine bird populations has been established, annually minor outbreaks and sporadic cases occur.

Additional information

Patients whose work represents a risk for spread of the disease, e.g., in food production and health care, are advised to stay away from such work while they are having symptoms. It is recommended that for these patients three consecutive faecal samples examined after the symptoms have disappeared should be negative before resuming work.

2.1.3. Salmonella in foodstuffs

A. Salmonella spp. in eggs and egg products

Monitoring system

Sampling strategy

Eggs and egg products are monitored indirectly by monitoring of the layer population, see chapter on Salmonella spp. in Gallus gallus - breeding flocks for egg production and flocks of laying hens.
Additional testing of egg products is carried out by the food business operators as an integral part of their own check procedures.

B. Salmonella spp. in broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Broiler meat and products thereof are monitored indirectly by testing all broiler flocks before slaughter - see chapter on Salmonella spp. in Gallus gallus - breeding flocks for meat production and broiler flocks. Additional testing at the slaughterhouses or cutting plants is not required.
Occasionally, surveys are performed.

C. Salmonella spp. in turkey meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

Turkey meat and products thereof are monitored indirectly by testing all turkey flocks before slaughter - see chapter on Salmonella spp. in turkey - breeding flocks and meat production flocks. Additional testing at hte slaughterhouses or cutting plants is not required.
Occasionally, surveys are performed.

D. Salmonella spp. in pig meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Norwegian Salmonella Control Programme: Each year, a number of carcass swabs and lymph node samples are collected randomly from the pig population at slaughterhouse according to the slaughter volume. The sampling of carcass swabs is described in this chapter, the sampling of lymph nodes is described in the chapter on Salmonella in animals.
Samples of crushed meat are each year collected according to production capacity of cutting plants.

At meat processing plant

Samples are taken according to Council Directive 94/ 65/ EC.

Frequency of the sampling

At slaughterhouse and cutting plant

Other: At slaughterhouse: Detection of an annual prevalence of 0.1% by 95% confidence level. At cutting plant: According to production capacity: less than 2 tons; twice a year, 2-20 tons: once a month, greater than 20 tons: once a week.

At meat processing plant

Other: Samples are taken according to Council Directive 94/ 65/ EC.

Type of specimen taken

At slaughterhouse and cutting plant

Other: At slaughterhouse: Surface of carcass. At cutting plant: Crushed meat from equipment or trimmings.

At meat processing plant

Other: Samples are taken according to Council Directive 94/ 65/ EC.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

The upper inner part of the hind legs/ pelvic entrance and the cut surface area of the abdomen and chest are swabbed, covering an area of approximately 1400 cm2 of each carcass.

At meat processing plant

Each sample consists of 25 grams of meat.

Definition of positive finding

At slaughterhouse and cutting plant

A positive sample is a sample from which Salmonella has been isolated.

At meat processing plant

A positive sample is a sample from which Salmonella has been isolated.

Diagnostic/ analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL No 71:1999

At meat processing plant

Bacteriological method: NMKL No 71:1999

Control program/ mechanisms

The control program/ strategies in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Measures in case of the positive findings or single cases

Whenever Salmonella is detected in samples taken in the National Control Programmes, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread.
When Salmonella is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed, and investigation into the source of the contamination initiated if relevant. If Salmonella is detected in food controls at the Border Inspection Posts, the consignments will be either rejected or destroyed.

Notification system in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Results of the investigation

In 2007, a total of 3472 carcasses were swabbed, and five were positive for S. Typhimurium (all from the same slaughterhouse the same day).
One sample of crushed meat from pig was positive for S. Typhimurium.
The positive findings in carcass swabs and in crushed meat were found to be linked to the same problem, as was the findings of S. Typhimurium in two pig herds and in the baseline survey (see chapter on Salmonella spp. in pigs).
For details, see tables.

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

The Norwegian Salmonella Control Programmes document that domestically produced food products of animal origin are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.1%.

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

Red and white meat produced in Norway is virtually free from Salmonella, and the risk of contracting Salmonella from domestically produced animal products is small. A connection between meat or meat products of domestic origin and human infection has never been established.

E. Salmonella spp. in bovine meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Norwegian Salmonella Control Programme: Each year, a number of caracc swabs and lymph node samples are collected randomly from the cattle population at slaughterhouse according to the slaughter volume. The sampling of carcass swabs is described in this chapter, the sampling of lymph nodes is described in the chapter on Salmonella in animals.
Samples of crushed meat are each year collected according to production capacity of cutting plants.

At meat processing plant

Samples are taken according to Council Directive 94/ 65/ EC.

Frequency of the sampling

At slaughterhouse and cutting plant

Other: At slaughterhouse: Detection of an annual prevalence of 0.1% by 95% confidence level. At cutting plant: According to production capacity: less than 2 tons: twice a year, 2-20 tons: once a month, greater than 20 tons: once a week.

At meat processing plant

Other: Samples are taken according to Council Directive 94/ 65/ EC.

Type of specimen taken

At slaughterhouse and cutting plant

Other: At slaughterhouse: Surface of carcass. At cutting plant: Crushed meat from equipment or from trimmings.

At meat processing plant

Other: Samples are taken according to Council Directive 94/ 65/ EC.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

The upper inner part of the hind legs/ pelvic entrance and the cut surface area of the abdomen and chest are swabbed, covering an area of approximately 1400 cm2 of each carcass.

At meat processing plant

Each sample consists of 25 grams of meat.

Definition of positive finding

At slaughterhouse and cutting plant

A positive sample is a sample from which Salmonella has been isolated.

At meat processing plant

A positive sample is a sample from which Salmonella has been isolated.

Diagnostic/ analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL No 71:1999

At meat processing plant

Bacteriological method: NMKL No 71:1999

Control program/ mechanisms

The control program/ strategies in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Measures in case of the positive findings or single cases

Whenever Salmonella is detected in samples taken in the National Control Programmes, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread.
When Salmonella is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed, and investigation into the source of the contamination initiated if relevant. If Salmonella is detected in food controls at the Border Inspection Posts, the consignments will be either rejected or destroyed.

Notification system in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Results of the investigation

In 2007, a total of 2096 carcasses were swabbed, one was positive for S. Typhimurium.
One sample of crushed bovine meat taken at a meat production facility was positive for S. enterica subsp. enterica O:9, non motile.
For details, see tables.

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

The Norwegian Salmonella Control Programmes document that domestically produced food products of animal origin are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.1%.

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

Red and white meat produced in Norway is virtually free from Salmonella, and the risk of contracting Salmonella from meat and meat products of domestic origin is negligible.

F. Salmonella spp. in food - Meat from sheep

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant: The Norwegian Salmonella Control Programme: Each year, a number of carcass swabs are collected randomly from the sheep population at slaughterhouse according to the slaughter volume. Samples of crushed meat are each year collected according to production capacity of cutting plants.
At meat processing plant: Samples are taken according to Council Directive 94/ 65/ EC.

Frequency of the sampling

At slaughterhouse: Detection of an annual prevalence of 0.1% by 95% confidence level.
At cutting plant: According to production capacity: less than 2 tons; twice a year, 2-20 tons: once a month, greater than 20 tons: once a week.
At meat processing plant: Samples are taken according to Council Directive 94/ 65/ EC.

Type of specimen taken

Other: At slaughterhouse: Surface of carcass. At cutting plant: Crushed meat. At meat processing plant: Samples are taken according to Council Directive 94/ 65/ EC.

Methods of sampling (description of sampling techniques)

At slaughterhouse: The upper inner part of the hind legs/ pelvic entrance and the cut surface area of the abdomen and chest are swabbed, covering an area of approximately 1400 cm2 of each carcass.
At cutting plant: Each sample consists of 25 grams of meat (crushed meat, from the equipment or from trimmings).
At meat processing plant: Samples are taken according to Council Directive 94/ 65/ EC.

Definition of positive finding

A positive sample is a sample from which Salmonella has been isolated.

Diagnostic/ analytical methods used

Bacteriological method: NMKL No 71:1999

Control program/ mechanisms

The control program/ strategies in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Measures in case of the positive findings or single cases

Whenever Salmonella is detected in samples taken in the National Control Programmes, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread. However, in the sheep population in some regions, S. diarizonae is endemic. When this serovar is detected in live animals, less extensive measures are carried out.
When Salmonella is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed, and investigation into the source of the contamination initiated if relevant. If Salmonella is detected in food controls at the Border Inspection Posts, the consignments will be either rejected or destroyed.

Notification system in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Results of the investigation

In 2007, a total of 2496 carcasses were swabbed, and two were positive (S. diarizonae).
All samples of crushed sheep meat taken at meat production facilities were negative.
For details, see tables.

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

The Norwegian Salmonella Control Programmes document that domestically produced food products of animal origin are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.1%.

Table Salmonella in red meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. IIIb61:k:1,5,7	Other serotypes	S. Enteritidis	S. Typhimurium
Meat from pig									
carcass									
- at slaughterhouse - animal sample - carcass swabs - Surveillance (1)	NSCP	animal	Swabs	3472	5				5
Meat from bovine animals									
carcass									
- at slaughterhouse - animal sample - carcass swabs - Surveillance	NSCP	animal	Swabs	2096	1				1
Meat from sheep									
carcass									
- at slaughterhouse - animal sample - carcass swabs - Surveillance	NSCP	animal	Swabs	2496	2	2			
Meat, red meat (meat from bovines, pigs, goats, sheep, horses, donkeys, bison and water buffalos)									
- at cutting plant - Surveillance (Crushed meat) (2)	NSCP	single	25 g	1466	2		1		1

(1) : All five positive samples were from the same slaughter house the same day. These fndings were related to the positive findings in a cutting plant, the baseline survey (2006/ 668/ EC) and two pig herds positive for S. Typhimurium.
(2) : Crushed meat from cattle, sheep and pig. S. Typhimurium was isolated from crushed pig meat. S. enterica subsp. enterica O:9, non motile was isolated from crushed cattle meat. The finding in pig meat was related to the findings in the pig carcass swabs, in the baseline survey and in two pig herds.

Footnote

NCSP = Norwegian Salmonella Control Programme

Table Salmonella in other food

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Infantis	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Live bivalve molluscs	NIFES	single	25 g	380	1	1			
Fish									
raw									
- at processing plant (1)	NIFES	single	25 g	27	0				
- at processing plant - environmental sample	NIFES	single	Swabs	58	0				
(Wild catch) (2)	NIFES	single	25 g	18	0				

(1) : Farmed fish
(2) : Wild catch of pelagic fish sampled on fishing vessels

2.1.4. Salmonella in animals

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

Monitoring system

Sampling strategy

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

The Norwegian Salmonella Control Programme include all poultry breeding flocks. Sampling of breeding flocks of Gallus gallus is established pursuant to Article 5 of Regulation (EC) 2160/ 2003 and approved by the EFTA Surveillance Authority (ESA) (364/ 07/ COL). The Norwegian Food Safety Authority is responsible for the sampling.

Other strategies: Animals are tested in relation to clinical surveillance and import. Norway is also granted additional guaranties according to 2003/ 644/ EC.

Laying hens flocks

The Norwegian Salmonella Control Programme: All laying hen flocks are tested at the farm.
Other strategies: Animals are tested in relation to clinical surveillance and import. Additional guaranties according to 2004/ 235/ EC also applies to Norway.

Frequency of the sampling

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

Every flock is sampled

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

Other: At the age of 4 weeks and 2 weeks before transfer.

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

Every 2 weeks

Laying hens: Day-old chicks

Every flock is sampled

Laying hens: Rearing period

Other: 2 weeks before transfer.

Laying hens: Production period

Other: Every 15 weeks.

Laying hens: Before slaughter at farm

Every flock is sampled

Type of specimen taken

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

Internal linings of delivery boxes

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

Laying hens: Day-old chicks

Internal linings of delivery boxes

Laying hens: Rearing period

Other: Sock samples or faeces (cage birds)

Laying hens: Production period

Other: Sock samples or faeces (cage birds)

Laying hens: Before slaughter at farm

Other: Sock samples or faeces (cage birds)

Methods of sampling (description of sampling techniques)

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

Crate liners from 5 transport crates from one delivery (>1m2 in total) are sampled and pooled to one sample in the laboratory.

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

2 pairs of sock samples are pooled to one sample.

Breeding flocks: Production period

5 pairs of sock samples are pooled to two samples. Alternatively, if birds are kept in cages, two samples consisting of at least 150 g faeces each are analysed separately.

Laying hens: Day-old chicks

Crate liners from 5 transport crates from one delivery (>1m2 in total) are sampled and pooled to one sample in the laboratory.

Laying hens: Rearing period

2 pairs of sock samples are pooled to one sample. For cage birds: faecal samples > 150 g.

Laying hens: Production period

2 pairs of sock samples are pooled to one sample. For cage birds: faecal samples > 150 g.

Laying hens: Before slaughter at farm

2 pairs of sock samples are pooled to one sample. For cage birds: faecal samples > 150 g.

Case definition

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

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

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

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

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

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Laying hens: Day-old chicks

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Laying hens: Rearing period

A positive flock is a flock from which Salmonella (irrespective of serovar) has been

isolated from at least one sample.

Laying hens: Production period

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Laying hens: Before slaughter at farm

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Laying hens: At slaughter

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Diagnostic/ analytical methods used

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

Bacteriological method: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

Laying hens: Day-old chicks

Bacteriological method: ISO 6579:2002

Laying hens: Rearing period

Bacteriological method: ISO 6579:2002

Laying hens: Production period

Bacteriological method: ISO 6579:2002

Laying hens: Before slaughter at farm

Bacteriological method: ISO 6579:2002

Vaccination policy

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

Vaccination against Salmonella is prohibited in Norway.

Laying hens flocks

Vaccination against Salmonella is prohibited in Norway.

Control program/ mechanisms

The control program/ strategies in place

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

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Laying hens flocks

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Measures in case of the positive findings or single cases

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

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, relevante food business operators, sch as slaughterhouses, hatcheries, and egg collecting centres receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If Salmonella is detected, the whole animal holding will be destroyed or subjected to sanitation slaughter. Eggs from hatcheries where Salmonella has been detected will be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well.
Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

Laying hens flocks

See breeding flocks.

Notification system in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, has been notifiable since 1965.

Results of the investigation

In 2007, none of the Norwegian breeding flocks in the egg sector were positive except an imported grandparent flock that was discovered positive for S. Heidelberg when in quarantine. This flock was destroyed before the production of hatching eggs started.
None of the commercial layer flocks were positive. One hobby flock was positive for S. Gallinarum. For details, see table.

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

The favourable salmonella situation in Norwegian poultry is partly dependant upon an efficient control of breeding flocks. Due to extensive surveillance during many years, stringent measures in case of positive findings, and restricted import, poultry breeding flocks in Norway are virtually free from Salmonella. S. Enteritidis has never been detected in Norwegian breeding flocks or in laying hens.

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

Monitoring system

Sampling strategy

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

The Norwegian Salmonella Control Programmes include all poultry breeding flocks. Sampling of breeding flocks of Gallus gallus is established pursuant to Article 5 of Regulation (EC) 2160/ 2003 and approved by the EFTA Surveillance Authority (ESA) (364/ 07/ COL). The Norwegian Food Safety Authority is responsible for the sampling.

Other strategies: Animals are tested in relation to clinical surveillance and import.
Norway is also granted additional guaranties according to 2003/ 644/ EC.

Broiler flocks

The Norwegian Salmonella Control Programmes: All broiler flocks are tested before slaughter.
If poultry for slaughter are imported, additional guaranties according to 95/ 410/ EC applies.

Frequency of the sampling

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

Every flock is sampled

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

Other: At the age of 4 weeks and 2 weeks before transfer.

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

Every 2 weeks

Broiler flocks: Before slaughter at farm

Every flock is sampled

Type of specimen taken

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

Internal linings of delivery boxes

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

Broiler flocks: Before slaughter at farm

Socks/ boot swabs

Methods of sampling (description of sampling techniques)

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

Crate liners from 5 transport crates from one delivery (>1m2 in total) are sampled and pooled to one sample in the laboratory.

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

2 pairs of sock samples are pooled to one sample.

Breeding flocks: Production period

5 pairs of sock samples are pooled to two samples. Alternatively, if birds are kept in cages, two samples consisting of at least 150 g faeces each are analysed separately.

Broiler flocks: Before slaughter at farm

2 pairs of sock samples are pooled to one sample.

Case definition

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

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

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

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

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

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Broiler flocks: Day-old chicks

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Broiler flocks: Rearing period

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Broiler flocks: Before slaughter at farm

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Diagnostic/ analytical methods used

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

Bacteriological method: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

Broiler flocks: Rearing period

Bacteriological method: ISO 6579:2002

Broiler flocks: Before slaughter at farm

Bacteriological method: ISO 6579:2002

Vaccination policy

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

Vaccination against Salmonella is prohibited in Norway.

Broiler flocks

Vaccination against Salmonella is prohibited in Norway.

Control program/ mechanisms

The control program/ strategies in place

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

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Broiler flocks

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, is notifiable.

Measures in case of the positive findings or single cases

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

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, reelvant food business operators, such as slaughterhouses, hatcheries, and egg collecting centres receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If Salmonella is detected, the flock will be destroyed or subjected to sanitation slaughter. Eggs from hatcheries where Salmonella has been detected will be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well.
Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

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

See breeding flocks, day-old chicks.

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

See breeding flocks, day-old chicks.

Broiler flocks: Rearing period

See breeding flocks, day-old chicks.

Broiler flocks: Before slaughter at farm

See breeding flocks, day-old chicks.

Notification system in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, has been notifiable since 1965.

Results of the investigation

In 2007, one Norwegian breeding flock for meat production was positive for S. diarizonae (61:k:1,5,7).
One broiler flock was positive for S. Enteritidis. This was the first time S. Enteritidis was found in Norwegian poultry production, and the finding was followed up closely, but only one environmental sample at the same farm was found positive.
For details, see table.

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

The favourable salmonella situation in Norwegian poultry is partly dependant upon an efficient control of breeding flocks. Due to extensive surveillance during many years, stringent measures in case of positive findings, and restricted import, poultry breeding flocks in Norway are virtually free from Salmonella. S. Agona was found in a broiler parent flock in 2001. S. Enteritidis was from the first time detected in Norwegian poultry production in a broiler flock in 2007.

C. Salmonella spp. in pigs

Monitoring system

Sampling strategy

Breeding herds

The Norwegian Salmonella Control Programme: All elite breeding herds are tested.
Other strategies: Animals are tested in relation to clinical surveillance and import.

Multiplying herds

The Norwegian Salmonella Control Programme: Each year, a number of lymph node samples and carcass swabs are collected randomly from the sow population at

slaughterhouse according to the slaughter volume. The sampling of lymph nodes is described in this chapter, the sampling of carcass swabs is described in the chapter on Salmonella in foodstuffs.
Other strategies: Animals are tested in relation to clinical surveillance and import.

Fattening herds

The Norwegian Salmonella Control Programme: Each year, a number of lymph node samples and carcass swabs are collected randomly from the fattening pig population at slaughterhouse according to the slaughter volume. The sampling of lymph nodes is described in this chapter, the sampling of carcass swabs is described in the chapter on Salmonella in foodstuffs.
Other strategies: Animals are tested in relation to clinical surveillance and import.

Frequency of the sampling

Breeding herds

Once a year

Fattening herds at slaughterhouse (herd based approach)

Other: Detection of an animal prevalence level of 0.1% by 95% confidence

Type of specimen taken

Breeding herds

Faeces

Fattening herds at slaughterhouse (herd based approach)

Organs:Lymph nodes

Methods of sampling (description of sampling techniques)

Breeding herds

At lest 10 grams of faecal material is taken from single animals. From pens with growers/ finisher pigs, pooled faecal samples of at least 50 grams are taken. The samples are sent to the laboratory the same day.

Fattening herds at slaughterhouse (herd based approach)

From each carcass at least five ileo-caecal lymph nodes are aseptically removed and pooled in a plastic bag. All samples are kept refrigerated during the period of sampling and sent to the laboratory the same day.

Case definition

Breeding herds

A positive sample is a sample from which Salmonella has been isolated.

Multiplying herds

A positive sample is a sample from which Salmonella has been isolated.

Fattening herds at farm

A positive sample is a sample from which Salmonella has been isolated.

Fattening herds at slaughterhouse (herd based approach)

A positive sample is a sample from which Salmonella has been isolated.

Diagnostic/ analytical methods used

Breeding herds

Bacteriological method: NMKL No 71:1999

Multiplying herds

Bacteriological method: NMKL No 71:1999

Fattening herds at farm

Bacteriological method: NMKL No 71:1999

Fattening herds at slaughterhouse (herd based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Breeding herds

Vaccination against Salmonella is prohibited in Norway.

Multiplying herds

Vaccination against Salmonella is prohibited in Norway.

Fattening herds

Vaccination against Salmonella is prohibited in Norway.

Control program/ mechanisms

The control program/ strategies in place

Breeding herds

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, has been notifiable since 1965.

Multiplying herds

See "breeding herds".

Fattening herds

See "breeding herds".

Measures in case of the positive findings or single cases

Whenever Salmonella is detected, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding.
Infected animals must be isolated from other animals. Animals are not allowed to be sent to slaughter without permission from the Food Safety Authority and if sent to slaughter, the slaughterhouse must be notified so that sanitation slaughtering can be conducted.
Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. There will be intensified sampling, also on farms that have had contact with the infected holding. Restrictions will be lifted when all animals have been tested with a negative test result in two consecutive samplings with a minimum interval of 30 days. Following lifting of the restrictions, retesting will be conducted after approx. six months.

Notification system in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, has been notifiable since 1965.

Results of the investigation

In 2007, all of the lymph node samples from 3554 animals sampled in the Norwegian Salmonella Control Programme were negative.
None of the 122 tested breeding herds were positive.
In the baseline survey from October 2006 - September 2007, a total of 408 pigs were sampled, one was positive for S. Typhimurium.
In addition, three herds were found positive for Salmonella, all with S. Typhimurium. Two of these herds were connected to the positive findings in the baseline survey, the positive carcass swabs and the positive crushed meat sample (see chapter on Salmonella in pig meat). The third positive herd also had positive cattle, and on this farm, a hedgehog and a wild bird were also found positive for S. Typhimurium.

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

The Norwegian Salmonella Control Programmes document that Norwegian food producing animals are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.3%.

D. Salmonella spp. in bovine animals

Monitoring system

Sampling strategy

The Norwegian Salmonella Control Programme: Each year, a number of lymph node samples and carcass swabs are collected randomly from the cattle population at slaughterhouse according to the slaughter volume. The sampling of lymph nodes is described in this chapter, the sampling of carcass swabs is described in the chapter on Salmonella in foodstuffs.
Other strategies: Animals are tested in relation to clinical surveillance and import.

Frequency of the sampling

Animals at slaughter (herd based approach)

Other: Detection of an animal prevalence level of 0.1% by 95% confidence

Type of specimen taken

Animals at slaughter (herd based approach)

Organs:Lymph nodes

Methods of sampling (description of sampling techniques)

Animals at farm

If there are clinical problems with diarrhoea, faecal samples will be taken.

Animals at slaughter (herd based approach)

From each carcass at least five ileo-caecal lymph nodes are aseptically removed and pooled in a plastic bag. All samples are kept refrigerated during the period of sampling and sent to the laboratory the same day.

Case definition

Animals at farm

A positive sample is a sample from which Salmonella has been isolated.

Animals at slaughter (herd based approach)

A positive sample is a sample from which Salmonella has been isolated.

Diagnostic/ analytical methods used

Animals at farm

Bacteriological method: NMKL No 71:1999

Animals at slaughter (herd based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Vaccination against Salmonella is prohibited in Norway.

Control program/ mechanisms

The control program/ strategies in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, has been notifiable since 1965.

Measures in case of the positive findings or single cases

Whenever Salmonella is detected, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread. Also, slaughterhouses, dairies, and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding.
Infected animals must be isolated from other animals. Animals are not allowed to be sent to slaughter without permission from the Food Safety Authority and if sent to slaughter, the slaughterhouse must be notified so that sanitation slaughtering can be conducted. Milk from infected herds must be pasteurised.
Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. There will be intensified sampling, also on farms that have had contact with the infected holding. Restrictions will be lifted when all animals have been tested with a negative test result in two consecutive samplings with a minimum interval of 30 days. Following lifting of the restrictions, retesting will be conducted after approx. six months.

Notification system in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, has been notifiable since 1965.

Results of the investigation

In 2007, a total of 2218 animals were sampled in the Norwegian Salmonella Control Programme. One lymph node sample was positive for S. Paratyphi C.
In addition, a total of six herds were found positive for Salmonella, the majority of these had clinical problems. One herd was positive for S. Dublin, the rest were positive for S. Typhimurium. One of these herds was positive late 2006, and the sample being positive in 2007 was taken due to follow up of this herd. Another herd also had positive pigs, and on this farm, a hedgehog and a wild bird were also found positive for S. Typhimurium.

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

The Norwegian Salmonella Control Programmes document that Norwegian food producing animals are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.3%.

E. Salmonella spp. in animal

Monitoring system

Sampling strategy

Described here is Salmonella in other animal species than food producing animals, such as pets, zoo animals, reptiles and wild life.
Sampling is done in relation to clinical surveillance and import.

Case definition

Animals at farm

A positive animal is an animal from which Salmonella, irrespective of serovar, has been isolated.

Vaccination policy

Vaccination against Salmonella is prohibited in Norway.

Measures in case of the positive findings or single cases

Whenever Salmonella is detected, the competent authorities must be notified without delay. Unless the finding is in a wild animal, epidemiological investigations will be initiated in order to identify and eliminate the source of infection.

Notification system in place

Detection of Salmonella, irrespective of serovar, has been notifiable since 1965.

Results of the investigation

For details - see table. In addition to the results presented above and in the tables, animals may have been sampled due to clinical problems, follow up or various projects. None of these samples have been positive.

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

A substantial proportion of the S. Typhimurium infections in humans are indigenous. This serovar, although not established among food animals in Norway, does occur in Norwegian wild birds and hedgehogs, and these two sources have been described to be the source for almost half of all indigenous S. Typhimurium cases. These two sources probably also constitutes a risk for food producing animals. Also, reptiles kept as pets pose a risk for transmission to humans.

F. Salmonella spp. in animal - Poultry (Ducks, Geese and Turkeys (not Gallus gallus))

Monitoring system

Sampling strategy

The Norwegian Salmonella Control Programmes include all breeder flocks and all flocks for slaughter of ducks, geese and turkeys.
Other strategies: Animals are tested in relation to clinical surveillance and import.

Frequency of the sampling

Animals at farm

Other: See the description of the programme in Gallus gallus

Type of specimen taken

Animals at farm

Other: See the description of the programme in Gallus gallus

Methods of sampling (description of sampling techniques)

Animals at farm

See the description of the programme in Gallus gallus.

Animals at slaughter (herd based approach)

See the description of the programme in Gallus gallus.

Case definition

Animals at farm

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Animals at slaughter (herd based approach)

A positive flock is a flock from which Salmonella (irrespective of serovar) has been isolated from at least one sample.

Diagnostic/ analytical methods used

Animals at farm

Bacteriological method: ISO 6579:2002

Vaccination policy

Vaccination against Salmonella is prohibited in Norway.

Control program/ mechanisms

The control program/ strategies in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella,

irrespective of serovar, has been notifiable since 1965.

Measures in case of the positive findings or single cases

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If Salmonella is detected, the whole animal holding will be destroyed or subjected to sanitation slaughter. Eggs from hatcheries will be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well.
Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

Notification system in place

The Norwegian Salmonella Control Programme is mandatory. Detection of Salmonella, irrespective of serovar, has been notifiable since 1965.

Results of the investigation

In 2007, none of the Norwegian duck, geese or turkey breeder flocks were positive. None of the production flocks were positive.
In the turkey baseline survey from october 2006 - November 2007, a total of 77 turkey flocks were sampled. All were negative for Salmonella.
In addition to the Control Programme, samples have been taken in relation to clinical problems, follow up or various projects. None of these samples were positive for Salmonella. For details, see table.

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

The duck, geese and turkey population in Norway is small. A few times, positive commercial flocks have been found, the last time two turkey flocks in 2000 positive for S. Aberdeen and S. Typhimurium, respectively.

Table Salmonella in breeding flocks of Gallus gallus

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. IIIb61:k:1,5,7	S. Enteritidis	S. Typhimurium	S. Hadar	S. Infantis	S. Virchow	Salmonella spp., unspecified	S. Heidelberg
Gallus gallus (fowl)												
grandparent breeding flocks for egg production line												
during rearing period (1)	NSCP	flock	2	1								1
during production period	NSCP	flock	2	0								
parent breeding flocks for egg production line												
during rearing period	NSCP	flock	12	0								
during production period	NSCP	flock	12	0								
parent breeding flocks for meat production line												
during rearing period	NSCP	flock	87	0								
during production period	NSCP	flock	135	1	1							

(1) : The flock was imported and was detected positive while in the rearing stage in quarantine. The flock was destroyed before production of hatching eggs started.

Footnote

NSCP = Norwegian Salmonella Control Programme

Table Salmonella in other poultry

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Gallinarum	S. Heidelberg	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Gallus gallus (fowl)									
laying hens									
during rearing period	NSCP	holding	20	0					
during production period	NSCP	holding	676	0					
broilers	NSCP	flock	4419	1			1		
unspecified (1)	NVI	holding	58	3	1	1	1		
Ducks	NVI	holding	3	0					
breeding flocks	NSCP	flock	3	0					
meat production flocks	NSCP	flock	85	0					
Turkeys	NVI	holding	9	0					
breeding flocks	NSCP	flock	15	0					
meat production flocks	NSCP	flock	424	0					
baseline survey	NVI	flock	72	0					
breeding flocks, unspecified									
baseline survey	NVI	flock	5	0					
Poultry, unspecified	NSCP	single	1561	0					

(1) : A total of 226 samples from 58 holdings (mainly commercial, but also hobby flocks). A total of 9 samples were positive , coming from 3 holdings. The S. Enteritidis finding was an environmental sample from the same holding as the broiler flock positive for S. Enteritidis in the Norwegian Salmonella Control Programme.

Footnote

NSCP = Norwegian Salmonella Control Programme

Table Salmonella in other birds

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Pigeons	NVI	animal	7	0			
Quails	NVI	animal	1	0			
Ostriches	NVI	animal	1	0			
Birds							
pet animals (1)	NVI	animal	18	0			
wild (2)	NVI	animal	106	82		72	10

(1) : Mainly psittacine birds
(2) : The 10 positive birds listed under Salmonella spp. unspecified were birds with pathological findings typical of salmonellosis. However, cultivation was not performed on samples from these birds.

Table Salmonella in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. enterica subsp. salamae	S. Oranienburg	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. IIIb61:k:1,5,7	S. Dublin	S. Infantis	S. Saintpaul	S. Livingstone	S. Amsterdam	S. Muenchen	S. Montevideo	S. Paratyphi C	S. Minnesota
Cattle (bovine animals) (1)	NVI	holding	206	6				5			1								
- at slaughterhouse - animal sample - lymph nodes - Surveillance	NSCP	animal	2218	1														1	
Sheep (2)	NVI	holding	47	13					1	12									
Goats	NVI	animal	18	0															
Pigs (3)	NVI	holding	62	3				3											
breeding animals																			
- at slaughterhouse - animal sample - lymph nodes - Surveillance	NSCP	animal	1012	0															
- at farm - animal sample - faeces - Surveillance	NSCP	herd	122	0															
fattening pigs																			
- at slaughterhouse - animal sample - lymph nodes - Surveillance	NSCP	animal	2542	0															

baseline survey	NVI	animal	408	1				1											
Solipeds, domestic (4)	NVI	holding	52	6				6											
Alpacas	NVI	animal	19	0															
Lamas	NVI	animal	4	0															
Deer																			
farmed	NVI	animal	5	0															
Wild animals (5)	NVI	animal	22	2			1	1											
Dogs (6)	NVI	animal	170	11				6	1			1		2			1		1
Cats	NVI	animal	57	2				2											
Fur animals																			
farmed	NVI	animal	16	0															
Guinea pigs	NVI	animal	7	0															
Rabbits	NVI	animal	17	0															
Chinchillas	NVI	animal	4	0															
Zoo animals, all	NVI	animal	28	9	1	1							2		3	2			

(1) : From the 206 holdings, a total of 1050 samples were analysed (mainly animal samples, but also pen samples and environmental/ feed samples). A total of 84 samples from six holdings were positive. Many of the holdings were sampled due to follow up of positive findings. One of the holdings with S. Typhimurium (positive early 2007) was also reported positive late 2006. One other holding with S. Typhimurium also had positive pigs (and one hedgehog and one wild bird found on this farm were also positive for S. Typhimurium).
(2) : From the 47 holdings, a total of 171 animals were analysed. In the 13 positive holdings, a total of 28 animals were positive for Salmonella. The one animal positive for S. spp. unspecified was an animal from a herd with other animals positive for S. diarizonae, this paricular strain was not typed to serovar.
(3) : From the 62 holdings, a total of 938 samples were analysed (mainly animal samples, but also pen samples and environmental/ feed samples). A total of 34 samples from three holdings were positive. Two holdings were connected to the findings in the baseline survey, in crushed pig meat and in carcass swabs (see chapter on pig meat). The third holding also had cattle positive for S. Typhimurium (and one hedgehog and one wild bird found on the farm were also positive for S. Typhimurium).
(4) : From the 52 holdings/ stables, a total of 414 samples were analysed (mainly animal samples, but also pen samples and environment/ feed samples). A total of 37 samples from 6 stables/ holdings were positive. Several of the positive units had contact with each other.
(5) : The positive animals were both hedgehogs.
(6) : One dog had both Salmonella Minnesota and Salmonella sp.

Footnote

NSCP = Norwegian Salmonella Control Programme

2.1.5. Salmonella in feedingstuffs

A. Salmonella spp. in feed

History of the disease and/ or infection in the country

Norway has for many years performed an extensive surveillance of feedingstuffs and imposed stringent measures in case of positive findings. The import of animal feedingstuffs has also been restricted for many years. The result is that the feedingstuffs that Norwegian livestock are exposed to for many years have been virtually free from Salmonella.

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

Extensive surveillance systems for Salmonella in regard to feedingstuffs are established in accordance with Council Directives 76/ 371/ EEC, 97/ 78/ EEC, 89/ 662/ EEC, and 90/ 667/ EEC in order to prevent animals from being exposed to contaminated feed. Feedingstuffs for both terrestrial animals and fish are covered by surveillance programmes.
The surveillance programmes document a low prevalence of Salmonella in domestically produced animal compound feedingstuffs. However, data from process control, including environmental sampling, indicates that there are certain serovars that sometimes contaminate production facilities, especially those producing fish feed.

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

The favourable Salmonella situation in animals and humans in Norway is partly dependant upon the efficient control of animal feedingstuffs. The number of animals infected from feedingstuffs is probably very low, and this route of infection probably represent a negligible risk to humans.

Recent actions taken to control the zoonoses

Detection of Salmonella is notifiable. If Salmonella is detected in feedingstuffs, equipment, or production plants the authorities must be informed without delay. The establishment must take action according to a defined procedure to prevent the distribution of contaminated feed. Contaminated feed will be destroyed or heat-treated.
In general, complete feedingstuffs and protein concentrates (supplementary feedingstuffs) intended for poultry, pigs, and cattle that are distributed must be subject to heat treatment until a core temperature of at least 81 degrees Celsius is reached. The entire batch must be heat-treated, and the production has to be performed in a production line where all the other feedingstuffs are subject to heat treatment.
According to the regulations for production of feedingstuffs, feed mills are required to have an internal (process) control programme implemented. This includes a sampling scheme for Salmonella of minimum 3 samples per 14 days. Samples include raw materials and scrapings from control points.
The national production of meat and bone meal is subject to a continuous process control that includes analyses for Salmonella.
Establishments preparing feed for fur animals are required to analyse a minimum of one sample for Salmonella per month. Through an official surveillance programme (sampling according to Council Directive 76/ 371/ EEC) random samples of feedingstuffs for terrestrial animals are collected and analysed for the presence of Salmonella.

Imported feed materials of vegetable origin must be subjected to control for Salmonella before distribution or use. The number of samples depends on the size of the load and whether the feedingstuffs are classified as high-risk (soy beans, maize, cotton seed, etc.) or low-risk materials.
Imported feed of animal origin, predominantly pet feed, is controlled at one of the Border Inspection Posts according to Council Directives 97/ 78/ EEC and 89/ 662/ EEC. Dog treats made from hides that are imported from third countries must be accompanied with a certificate that documents that the lot has been controlled for Salmonella. At the Border Inspection Posts, sampling is done according to a specific scheme.
Establishments producing fish feed are required to establish and maintain an internal (process) control based on the HACCP-system according to the regulation for fish feed. A minimum of four samples per 14 days should be examined with respect to Salmonella. If Salmonella is detected, the Norwegian Food Safety Authority must be notified immediately. Through an official surveillance programme described in the regulation for feedingstuffs for fish, random samples of feedingstuffs for fish are collected at the establishments and analysed for the presence of Salmonella.
Feed materials, including fish meal, imported from third countries must be subjected to control for Salmonella according to a specified plan before distribution or use. A minimum of one sample per 50 tons must be tested for the presence of Salmonella.
Establishments producing fish meal or fish oil are required to establish and maintain an internal (process) control based on the HACCP-system according to the regulation for fish meal and fish oil. This control includes analyses for Salmonella. A minimum of one sample per 50 tons must be tested for the presence of Salmonella. In addition to the surveillance run by the government or the industry itself, feedingstuffs are also subjected to analyses for Salmonella in relation to epidemiological investigations and specific surveys and studies

Table Salmonella in feed material of animal origin

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Montevideo	S. Poona	S. Schwarzengrund
Feed material of marine animal origin											
fish meal											
- Surveillance - HACCP or own checks by industry	NFSA	batch	25 g	228	3				1	1	1
- Surveillance - official controls	NFSA	batch	25 g	36	0						
fish oil											
- Surveillance - HACCP or own checks by industry	NFSA	batch	25 g	4	0						
fish silage											
- Surveillance - HACCP or own checks by industry	NFSA	batch	25 g	44	0						
- Surveillance - official controls	NFSA	batch	25 g	1	0						

Table Salmonella in other feed matter (Part A)

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Schwarzengrund	S. Anatum	S. Oranienburg	S. Thompson	S. Lexington	S. Corvallis	S. Minnesota	S. Morehead	S. Rissen	S. Sandiego	S. Soerenga	S. Senftenberg
Feed material of cereal grain origin																				
barley derived	NFSA	batch	25 g	7	0															
wheat derived (1)	NFSA	batch	25 g	118	0															
maize (2)	NFSA	batch	25 g	662	19		4		6											
other cereal grain derived (3)	NFSA	batch	25 g	5	0															
Feed material of oil seed or fruit origin																				
rape seed derived (4)	NFSA	batch	25 g	34	0															
soya (bean) derived (5)	NFSA	batch	25 g	2665	1		1													
- at processing plant - environmental sample - Surveillance - HACCP or own checks by industry (Process control samples in a factory processing soy beans)	NFSA	single	25 g	1039	13			1												5

- at processing plant - imported - Surveillance - HACCP or own checks by industry (Samples taken on ships before transport to processing plant) (9)	NFSA	single	25 g	384	114	3	3	10		2	2	2	2	1	1	1	1	1	1	34
sunflower seed derived (6)	NFSA	batch	25 g	56	1		1													
other oil seeds derived (7)	NFSA	batch	25 g	4	0															
Other feed material																				
legume seeds and similar products	NFSA	batch	25 g	56	0															
tubers, roots and similar products (8)	NFSA	batch	25 g	4	0															

(1) : Including 13 samples taken as part of official surveillance
(2) : Including maize and maize derived. Also including 10 negative samples taken as part of official surveillance. The tre "Other serotypes" includes two S. diarizonae and one S. enterica monofasic variant.
(3) : Oat
(4) : Including two negative samples taken as part of official surveillance
(5) : Including 29 negative samples taken as part of official surveillance
(6) : Including eight samples taken as part of official surveillance
(7) : Faba beans
(8) : All samples taken as part of official surveillance
(9) : The 384 samples came from 16 ship loads.

Footnote

Unless otherwise stated in footnotes, the samples are taken as part of the industry's HACCP surveillance sampling.

Table Salmonella in other feed matter (Part B)

	S. Tennessee	S. Miami	S. Cubana	S. Adelaide	S. Saintpaul	Other serotypes	S. Altona	S. Cerro	S. Havana	S. Indiana	S. Infantis	S. Mbandaka	S. Agona
Feed material of cereal grain origin													
barley derived													
wheat derived (1)													
maize (2)						3	1	1	1	1	1	1	
other cereal grain derived (3)													
Feed material of oil seed or fruit origin													
rape seed derived (4)													
soya (bean) derived (5)													
- at processing plant - environmental sample - Surveillance - HACCP or own checks by industry (Process control samples in a factory processing soy beans)												6	1
- at processing plant - imported - Surveillance - HACCP or own checks by industry (Samples taken on ships before transport to processing plant) (9)	16	5	4	2	2			3	5		5	8	
sunflower seed derived (6)													

other oil seeds derived (7)													
Other feed material													
legume seeds and similar products													
tubers, roots and similar products (8)													

(1) : Including 13 samples taken as part of official surveillance
(2) : Including maize and maize derived. Also including 10 negative samples taken as part of official surveillance. The tre "Other serotypes" includes two S. diarizonae and one S. enterica monofasic variant.
(3) : Oat
(4) : Including two negative samples taken as part of official surveillance
(5) : Including 29 negative samples taken as part of official surveillance
(6) : Including eight samples taken as part of official surveillance
(7) : Faba beans
(8) : All samples taken as part of official surveillance
(9) : The 384 samples came from 16 ship loads.

Footnote

Unless otherwise stated in footnotes, the samples are taken as part of the industry's HACCP surveillance sampling.

Table Salmonella in compound feedingstuffs (Part A)

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Infantis	S. Typhimurium	S. Enteritidis	Salmonella spp., unspecified	S. Mbandaka	S. Schwarzengrund	S. Agona	S. Montevideo	S. Senftenberg	S. Liverpool	S. Havana	S. Coeln	S. Altona	S. Bredeney	S. Minnesota
Compound feedingstuffs for cattle																				
final product	NFSA	batch	25 g	14	0															
- Surveillance - HACCP or own checks by industry	NFSA	batch	25 g	5	0															
- Surveillance - official controls																				
Compound feedingstuffs for pigs																				
final product	NFSA	batch	25 g	3	0															
- Surveillance - HACCP or own checks by industry	NFSA	batch	25 g	79	0															
- Surveillance - official controls (1)																				
Compound feedingstuffs for poultry (non specified)																				
final product																				

- Surveillance - HACCP or own checks by industry	NFSA	batch	25 g	3	0															
- Surveillance - official controls	NFSA		25 g	190	0															
Pet food	NVI	single	25 g	104	3	2	1													
dog snacks (pig ears, chewing bones)	NFSA	single	25 g	13	0															
Compound feedingstuffs for fish																				
final product																				
- Surveillance - HACCP or own checks by industry	NFSA	batch	25 g	5893	13									13						
- Surveillance - official controls	NFSA	batch	25 g	226	0															
process control																				
- Surveillance - HACCP or own checks by industry	NFSA	single	25 g or swabs	1618	70				60	7			3							
Compound feedingstuffs, not specified																				
process control																				
- Surveillance - HACCP or own checks by industry (Feed for cattle, pigs and poultry)	NFSA	single	25 g	9658	31	1	2				7	10		1	2	2	2	1	1	1
- Surveillance - official controls (Feed for cattle, pigs and poultry)	NFSA	single	25 g	159	1	1														
final product																				
- Surveillance - HACCP or own checks by industry (Feed for cattle, pigs and poultry)	NFSA	batch	25 g	54	0															
Compound feedingstuffs for horses																				

- Surveillance - official controls	NFSA	batch	25 g	2	0															
Compound feedingstuffs for fur animal																				
- Surveillance - official controls	NFSA	batch	25 g	5	0															
process control																				
- Surveillance - official controls	NFSA	batch	25 g	1	0															

(1) : Including 6 samples of "wet feed"

Table Salmonella in compound feedingstuffs (Part B)

	S. Newport
Compound feedingstuffs for cattle	
final product	
- Surveillance - HACCP or own checks by industry	
- Surveillance - official controls	
Compound feedingstuffs for pigs	
final product	
- Surveillance - HACCP or own checks by industry	
- Surveillance - official controls (1)	
Compound feedingstuffs for poultry (non specified)	
final product	
- Surveillance - HACCP or own checks by industry	
- Surveillance - official controls	
Pet food	
dog snacks (pig ears, chewing bones)	
Compound feedingstuffs for fish	

final product	
- Surveillance - HACCP or own checks by industry	
- Surveillance - official controls	
process control	
- Surveillance - HACCP or own checks by industry	
Compound feedingstuffs, not specified	
process control	
- Surveillance - HACCP or own checks by industry (Feed for cattle, pigs and poultry)	1
- Surveillance - official controls (Feed for cattle, pigs and poultry)	
final product	
- Surveillance - HACCP or own checks by industry (Feed for cattle, pigs and poultry)	
Compound feedingstuffs for horses	
- Surveillance - official controls	
Compound feedingstuffs for fur animal	
- Surveillance - official controls	
process control	
- Surveillance - official controls	

(1) : Including 6 samples of "wet feed"

2.1.6. Salmonella serovars and phagetype distribution

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

Table Salmonella serovars in animals

Serovars		Zoo animals, all		Cats		Dogs		Sheep		Wild animals		Birds - wild		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry		Solipeds, domestic	
Sources of isolates (*)		M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C
Number of isolates in the laboratory	N=		9		2		12		27		2		72	2	83	21	3	6	3				37
Number of isolates serotyped	N=	0	9	0	2	0	12	0	27	0	2	0	72	2	83	21	3	6	3	0	0	0	37
Number of isolates per type																							
S. Amsterdam			3																				
S. Dublin															10								
S. Enteritidis											1							2					
S. Heidelberg																		3					
S. Infantis							1																
S. Livingstone							2																
S. Minnesota							1																
S. Montevideo							1																
S. Muenchen			2																				
S. Oranienburg			1																				
S. Paratyphi C														1									
S. Saintpaul			2																				
S. Typhimurium					2		6				1		72	1	73	21	3						37
S. IIIb61:k:1,5,7									27									1					
Salmonella spp.							1																
S. Gallinarum																			3				
S. enterica subsp. salamae			1																				

Footnote

(*) M : Monitoring, C : Clinical
Included in this table are all isolates found in a positive herd/ flock, and also isolates from environment found due to follow up sampling.
If a holding was discovered positive for Salmonella due to clinical problems, all positive follow up samples are also registred under the column "Clinical" even though the compulsory follow up of all positive findings is part of the Norwegian Salmonella Control Programmes.

Table Salmonella serovars in food

Serovars		Meat from sheep		Meat from bovine animals		Meat from pig		Meat from broilers (Gallus gallus)		Other poultry		Other products of animal origin		Live bivalve molluscs	
Sources of isolates (*)		M	C	M	C	M	C	M	C	M	C	M	C	M	C
Number of isolates in the laboratory	N=	2		2		6								1	
Number of isolates serotyped	N=	2	0	2	0	6	0	0	0	0	0	0	0	1	0
Number of isolates per type															
S. Infantis														1	
S. Typhimurium				1		6									
S. IIIb61:k:1,5,7		2													
Other serotypes (1)				1											

(1) : S. enterica subsp. enterica serovar O:9 non motile

Footnote

(*) M : Monitoring, C : Clinical

Table Salmonella serovars in feed

Serovars		Pet food		Compound feedingstuffs for fish - final product		Compound feedingstuffs for fish - process control		Compound feedingstuffs, not specified - process control (Feed for cattle, pigs and poultry)		Feed material of marine animal origin - fish meal		Feed material of cereal grain origin - maize		Feed material of oil seed or fruit origin - soya (bean) derived		Feed material of oil seed or fruit origin - sunflower seed derived	
Sources of isolates (*)		M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C
Number of isolates in the laboratory	N=	3		13		70		32		3		19		128		1	
Number of isolates serotyped	N=	3	0	13	0	70	0	32	0	3	0	19	0	128	0	1	0
Number of isolates per type																	
S. Adelaide														2			
S. Agona								10						1			
S. Altona								1				1					

S. Anatum													2			
S. Bredeney							1									
S. Cerro											1		3			
S. Coeln							2									
S. Corvallis													1			
S. Cubana													4			
S. Enteritidis													3			
S. Havana							2				1		5			
S. Indiana											1					
S. Infantis	2						2				1		5			
S. Lexington													2			
S. Liverpool							2									
S. Mbandaka					7						1		14			
S. Miami													5			
S. Minnesota							1						1			
S. Montevideo					3				1							
S. Morehead													1			
S. Newport							1									
S. Oranienburg													2			
S. Poona									1							
S. Rissen													1			
S. Saintpaul													2			
S. Sandiego													1			
S. Schwarzengrund							7		1		6					
S. Senftenberg			13				1						39			
S. Soerenga													1			
S. Tennessee													16			
S. Thompson													2			
S. Typhimurium	1						2				4		4		1	
Other serotypes											3					
Salmonella spp., unspecified					60								11			

Footnote

(*) M : Monitoring, C : Clinical

2.1.7. Antimicrobial resistance in Salmonella isolates

Antimicrobial resistance is the ability of certain microorganisms to survive or grow in the presence of a given concentration of antimicrobial agent that usually would kill or inhibit the microorganism species in question. Antimicrobial resistant Salmonella strains may be transferred from animals or foodstuffs to humans.

A. Antimicrobial resistance of Salmonella spp. in animal

Sampling strategy used in monitoring

Frequency of the sampling

All Salmonella found in production animals, irrespective if they are found in the Norwegian Salmonella Control Programmes or in connection with clinical problems, surveys or other investigations, are included in the resistance monitoring (only one isolate per herd). Salmonella isolated from other animals may be susceptibility tested as well. Exceptions from the rules described above are that not all S. diarizonae from sheep or S. Typhimurium from wild birds and wild animals or Salmonella from reptiles, wild animals or zoo animals are tested every year.
For description of the Norwegian Salmonella Control programmes, see the parts describing Salmonella in the various animal species.

Type of specimen taken

For description of the Norwegian Salmonella Control programmes, see the parts describing Salmonella in the various animal species. Other samples taken vary depending on the situation.

Methods of sampling (description of sampling techniques)

For description of the Norwegian Salmonella Control programmes, see the parts describing Salmonella in the various animal species. Other sampling methods vary depending on the situation.

Procedures for the selection of isolates for antimicrobial testing

Only one isolate per herd is selected for antimicrobial testing.

Methods used for collecting data

Salmonella is isolated at various laboratories and sent to the National Veterinary Institute in Oslo for the testing of antimicrobial susceptibility.

Laboratory methodology used for identification of the microbial isolates

Normally, ISO 6579:2002 or NMKL No 71:1999 are used for isolation of Salmonella. However, isolates may have been obtained by other methods as well.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) is used for the susceptibility testing of all isolates. The antimicrobials included are listed in the tables.

Breakpoints used in testing

For interpretation of results epidemiological cut-off values recommended by EFSA were applied.

Control program/ mechanisms

The control program/ strategies in place

The resistance testing of Salmonella isolated from animals is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals - NORM-VET.

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

	S. Dublin
	Cattle (bovine animals)
Isolates out of a monitoring programme	no
Number of isolates available in the laboratory	1

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	1	0					1															
Kanamycin	16	1	0							1													
Streptomycin	32	1	0									1											
Amphenicols																							
Chloramphenicol	16	1	0								1												
Florfenicol	16	1	0								1												
Cephalosporins																							
Cefotaxim	0.5	1	0		1																		
Ceftiofur	1	1	0						1														
Fluoroquinolones																							
Ciprofloxacin	0.064	1	0		1																		
Penicillins																							
Ampicillin	4	1	0						1														
Quinolones																							
Nalidixic acid	16	1	0									1											
Sulfonamides																							
Sulfamethoxazol	256	1	0											1									
Tetracyclines																							
Tetracyclin	8	1	0						1														
Trimethoprim	2	1	0					1															

Table Antimicrobial susceptibility testing in S. Dublin

n = Number of resistant isolates	S. Dublin	
	Cattle (bovine animals)	
Isolates out of a monitoring programme		no
Number of isolates available in the laboratory		1
Antimicrobials:	**N**	**n**
Aminoglycosides		
Gentamicin	1	0
Kanamycin	1	0
Streptomycin	1	0
Amphenicols		
Chloramphenicol	1	0
Florfenicol	1	0
Cephalosporins		
Cefotaxim	1	0
Ceftiofur	1	0
Fluoroquinolones		
Ciprofloxacin	1	0
Fully sensitive	1	1
Number of multiresistant isolates	1	0
Penicillins		
Ampicillin	1	0
Quinolones		
Nalidixic acid	1	0
Resistant to 1 antimicrobial	1	0
Resistant to 2 antimicrobials	1	0
Resistant to 3 antimicrobials	1	0
Resistant to 4 antimicrobials	1	0
Resistant to >4 antimicrobials	1	0
Sulfonamides		
Sulfamethoxazol	1	0
Tetracyclines		
Tetracyclin	1	0
Trimethoprim	1	0

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

	S. Enteritidis
	Gallus gallus (fowl) - broilers
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	1

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	1	0					1															
Kanamycin	16	1	0								1												
Streptomycin	32	1	0								1												
Amphenicols																							
Chloramphenicol	16	1	0								1												
Florfenicol	16	1	0								1												
Cephalosporins																							
Cefotaxim	0.5	1	0		1																		
Ceftiofur	1	1	0						1														
Fluoroquinolones																							
Ciprofloxacin	0.064	1	0		1																		
Penicillins																							
Ampicillin	4	1	0						1														
Quinolones																							
Nalidixic acid	16	1	0								1												
Sulfonamides																							
Sulfamethoxazol	256	1	0												1								
Tetracyclines																							
Tetracyclin	8	1	0						1														
Trimethoprim	2	1	0					1															

Table Antimicrobial susceptibility testing of S.Enteritidis in animals

n = Number of resistant isolates

S. Enteritidis

	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Turkeys		Gallus gallus (fowl) - laying hens		Gallus gallus (fowl) - broilers	
Isolates out of a monitoring programme											yes	
Number of isolates available in the laboratory											1	
Antimicrobials:	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**
Aminoglycosides												
Gentamicin											1	0
Kanamycin											1	0
Streptomycin											1	0
Amphenicols												
Chloramphenicol											1	0
Florfenicol											1	0
Cephalosporins												
Cefotaxim											1	0
Ceftiofur											1	0
Fluoroquinolones												
Ciprofloxacin											1	0
Fully sensitive											1	1
Quinolones												
Nalidixic acid											1	0
Resistant to 1 antimicrobial											1	0
Resistant to 2 antimicrobials											1	0
Resistant to 3 antimicrobials											1	0
Resistant to 4 antimicrobials											1	0
Resistant to >4 antimicrobials											1	0
Sulfonamides												
Sulfamethoxazol											1	0
Tetracyclines												
Tetracyclin											1	0

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

	S. Heidelberg
	Gallus gallus (fowl)
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	1

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	1	0					1															
Kanamycin	16	1	0								1												
Streptomycin	32	1	0									1											
Amphenicols																							
Chloramphenicol	16	1	0							1													
Florfenicol	16	1	0								1												
Cephalosporins																							
Cefotaxim	0.5	1	0		1																		
Ceftiofur	1	1	0					1															
Fluoroquinolones																							
Ciprofloxacin	0.064	1	0		1																		
Penicillins																							
Ampicillin	4	1	0						1														
Quinolones																							
Nalidixic acid	16	1	0								1												
Sulfonamides																							
Sulfamethoxazol	256	1	0										1										
Tetracyclines																							
Tetracyclin	8	1	0						1														
Trimethoprim	2	1	0				1																

Table Antimicrobial susceptibility testing in S. Heidelberg

n = Number of resistant isolates	S. Heidelberg	
	Gallus gallus (fowl)	
Isolates out of a monitoring programme		yes
Number of isolates available in the laboratory		1
Antimicrobials:	**N**	**n**
Aminoglycosides		
Gentamicin	1	0
Kanamycin	1	0
Streptomycin	1	0
Amphenicols		
Chloramphenicol	1	0
Florfenicol	1	0
Cephalosporins		
Cefotaxim	1	0
Ceftiofur	1	0
Fluoroquinolones		
Ciprofloxacin	1	0
Fully sensitive	1	1
Number of multiresistant isolates	1	0
Penicillins		
Ampicillin	1	0
Quinolones		
Nalidixic acid	1	0
Resistant to 1 antimicrobial	1	0
Resistant to 2 antimicrobials	1	0
Resistant to 3 antimicrobials	1	0
Resistant to 4 antimicrobials	1	0
Resistant to >4 antimicrobials	1	0
Sulfonamides		
Sulfamethoxazol	1	0
Tetracyclines		
Tetracyclin	1	0
Trimethoprim	1	0

Table Antimicrobial susceptibility testing in S. Infantis

n = Number of resistant isolates	S. Infantis	
	Dogs	
Isolates out of a monitoring programme		no
Number of isolates available in the laboratory		1
Antimicrobials:	**N**	**n**
Aminoglycosides		
Gentamicin	1	0
Kanamycin	1	0
Streptomycin	1	0
Amphenicols		
Chloramphenicol	1	0
Florfenicol	1	0
Cephalosporins		
Cefotaxim	1	0
Ceftiofur	1	0
Fluoroquinolones		
Ciprofloxacin	1	0
Fully sensitive	1	0
Number of multiresistant S. Typhimurium DT104		
with penta resistance	1	0
Number of multiresistant isolates	1	0
Penicillins		
Ampicillin	1	0
Quinolones		
Nalidixic acid	1	0
Resistant to 1 antimicrobial	1	0
Resistant to 2 antimicrobials	1	1
Resistant to 3 antimicrobials	1	0
Resistant to 4 antimicrobials	1	0
Resistant to >4 antimicrobials	1	0
Sulfonamides		
Sulfamethoxazol	1	1
Tetracyclines		
Tetracyclin	1	0
Trimethoprim	1	1

Table Antimicrobial susceptibility testing of S. Infantis in Dogs - quantitative data [Dilution method]

	S. Infantis
	Dogs
Isolates out of a monitoring programme	no
Number of isolates available in the laboratory	1

Antimicrobials:	**Break point**	**N**	**n**	**Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to**																			
				<=0.03	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	1	0					1															
Kanamycin	16	1	0								1												
Streptomycin	32	1	0										1										
Amphenicols																							
Chloramphenicol	16	1	0							1													
Florfenicol	16	1	0								1												
Cephalosporins																							
Cefotaxim	0.5	1	0			1																	
Ceftiofur	1	1	0						1														
Fluoroquinolones																							
Ciprofloxacin	0.064	1	0		1																		
Penicillins																							
Ampicillin	4	1	0					1															
Quinolones																							
Nalidixic acid	16	1	0								1												
Sulfonamides																							
Sulfamethoxazol	256	1	1																		1		
Tetracyclines																							
Tetracyclin	8	1	0						1														
Trimethoprim	2	1	1												1								

Table Antimicrobial susceptibility testing in S. Minnesota

n = Number of resistant isolates	S. Minnesota	
	Dogs	
Isolates out of a monitoring programme		no
Number of isolates available in the laboratory		1
Antimicrobials:	**N**	**n**
Aminoglycosides		
Gentamicin	1	0
Kanamycin	1	0
Streptomycin	1	0
Amphenicols		
Chloramphenicol	1	0
Florfenicol	1	0
Cephalosporins		
Cefotaxim	1	0
Ceftiofur	1	0
Fluoroquinolones		
Ciprofloxacin	1	0
Fully sensitive	1	1
Number of multiresistant S. Typhimurium DT104		
with penta resistance	1	0
Number of multiresistant isolates	1	0
Penicillins		
Ampicillin	1	0
Quinolones		
Nalidixic acid	1	0
Resistant to 1 antimicrobial	1	0
Resistant to 2 antimicrobials	1	0
Resistant to 3 antimicrobials	1	0
Resistant to 4 antimicrobials	1	0
Resistant to >4 antimicrobials	1	0
Sulfonamides		
Sulfamethoxazol	1	0
Tetracyclines		
Tetracyclin	1	0
Trimethoprim	1	0

Table Antimicrobial susceptibility testing of S. Minnesota in Dogs - quantitative data [Dilution method]

	S. Minnesota
	Dogs
Isolates out of a monitoring programme	no
Number of isolates available in the laboratory	1

Antimicrobials:	**Break point**	**N**	**n**	**Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to**																		
				<=0.03	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	1	0					1															
Kanamycin	16	1	0								1												
Streptomycin	32	1	0										1										
Amphenicols																							
Chloramphenicol	16	1	0									1											
Florfenicol	16	1	0									1											
Cephalosporins																							
Cefotaxim	0.5	1	0			1																	
Ceftiofur	1	1	0					1															
Fluoroquinolones																							
Ciprofloxacin	0.064	1	0		1																		
Penicillins																							
Ampicillin	4	1	0						1														
Quinolones																							
Nalidixic acid	16	1	0								1												
Sulfonamides																							
Sulfamethoxazol	256	1	0											1									
Tetracyclines																							
Tetracyclin	8	1	0						1														
Trimethoprim	2	1	0					1															

Table Antimicrobial susceptibility testing of S. Montevideo in Dogs - quantitative data [Dilution method]

	S. Montevideo
	Dogs
Isolates out of a monitoring programme	no
Number of isolates available in the laboratory	1

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	1	0						1														
Kanamycin	16	1	0								1												
Streptomycin	32	1	0									1											
Amphenicols																							
Chloramphenicol	16	1	0							1													
Florfenicol	16	1	0								1												
Cephalosporins																							
Cefotaxim	0.5	1	0		1																		
Ceftiofur	1	1	0					1															
Fluoroquinolones																							
Ciprofloxacin	0.064	1	0		1																		
Penicillins																							
Ampicillin	4	1	0					1															
Quinolones																							
Nalidixic acid	16	1	0								1												
Sulfonamides																							
Sulfamethoxazol	256	1	0										1										
Tetracyclines																							
Tetracyclin	8	1	0						1														
Trimethoprim	2	1	0				1																

Table Antimicrobial susceptibility testing in S. Montevideo

n = Number of resistant isolates	S. Montevideo	
	Dogs	
Isolates out of a monitoring programme		no
Number of isolates available in the laboratory		1
Antimicrobials:	**N**	**n**
Aminoglycosides		
Gentamicin	1	0
Kanamycin	1	0
Streptomycin	1	0
Amphenicols		
Chloramphenicol	1	0
Florfenicol	1	0
Cephalosporins		
Cefotaxim	1	0
Ceftiofur	1	0
Fluoroquinolones		
Ciprofloxacin	1	0
Fully sensitive	1	1
Number of multiresistant S. Typhimurium DT104		
with penta resistance	1	0
Number of multiresistant isolates	1	0
Penicillins		
Ampicillin	1	0
Quinolones		
Nalidixic acid	1	0
Resistant to 1 antimicrobial	1	0
Resistant to 2 antimicrobials	1	0
Resistant to 3 antimicrobials	1	0
Resistant to 4 antimicrobials	1	0
Resistant to >4 antimicrobials	1	0
Sulfonamides		
Sulfamethoxazol	1	0
Tetracyclines		
Tetracyclin	1	0
Trimethoprim	1	0

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

	S. Typhimurium
	Pigs
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	4

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	4	0					2	2														
Kanamycin	16	4	0								4												
Streptomycin	32	4	0									3	1										
Amphenicols																							
Chloramphenicol	16	4	0							1	3												
Florfenicol	16	4	0								4												
Cephalosporins																							
Cefotaxim	0.5	4	0		3	1																	
Ceftiofur	1	4	0					1	3														
Fluoroquinolones																							
Ciprofloxacin	0.064	4	0		4																		
Penicillins																							
Ampicillin	4	4	0					1	3														
Quinolones																							
Nalidixic acid	16	4	0								4												
Sulfonamides																							
Sulfamethoxazol	256	4	0										2	2									
Tetracyclines																							
Tetracyclin	8	4	0						4														
Trimethoprim	2	4	0				4																

Table Antimicrobial susceptibility testing of S. Typhimurium in All animals (4 horses, 3 dogs, 2 cats) - quantitative data [Dilution method]

	S. Typhimurium
	All animals (4 horses, 3 dogs, 2 cats)
Isolates out of a monitoring programme	no
Number of isolates available in the laboratory	9

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	9	0					8	1														
Kanamycin	16	9	0							2	7												
Streptomycin	32	9	1									4	4		1								
Amphenicols																							
Chloramphenicol	16	9	1							6	2					1							
Florfenicol	16	9	1								8			1									
Cephalosporins																							
Cefotaxim	0.5	9	0		4	5																	
Ceftiofur	1	9	0					1	8														
Fluoroquinolones																							
Ciprofloxacin	0.064	9	0		9																		
Penicillins																							
Ampicillin	4	9	1					2	6						1								
Quinolones																							
Nalidixic acid	16	9	0							1	8												
Sulfonamides																							
Sulfamethoxazol	256	9	1										3	5							1		
Tetracyclines																							
Tetracyclin	8	9	1						8				1										
Trimethoprim	2	9	0				8	1															

Table Antimicrobial susceptibility testing of S.Typhimurium in animals

n = Number of resistant isolates

S. Typhimurium

	Solipeds, domestic - horses		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Turkeys		Gallus gallus (fowl) - laying hens		Gallus gallus (fowl) - broilers		Dogs		Cats	
Isolates out of a monitoring programme	no		yes		yes										no		no	
Number of isolates available in the laboratory	4		5		4										3		2	
Antimicrobials:	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**
Aminoglycosides																		
Gentamicin	4	0	5	0	4	0									3	0	2	0
Kanamycin	4	0	5	0	4	0									3	0	2	0
Streptomycin	4	0	5	1	4	0									3	1	2	0
Amphenicols																		
Chloramphenicol	4	0	5	1	4	0									3	1	2	0
Florfenicol	4	0	5	1	4	0									3	1	2	0
Cephalosporins																		
Cefotaxim	4	0	5	0	4	0									3	0	2	0
Ceftiofur	4	0	5	0	4	0									3	0	2	0
Fluoroquinolones																		
Ciprofloxacin	4	0	5	0	4	0									3	0	2	0
Fully sensitive	4	4	5	4	4	4									3	2	2	2
Number of multiresistant S. Typhimurium DT104																		
with penta resistance	4	0	5	1	4	0									3	1	2	0
Number of multiresistant isolates	4	0	5		4	0									3	1	2	0
Penicillins																		
Ampicillin	4	0	5	1	4	0									3	1	2	0
Quinolones																		
Nalidixic acid	4	0	5	0	4	0									3	0	2	0

Resistant to 1 antimicrobial	4	0	5	0	4	0											3	0	2	0						
Resistant to 2 antimicrobials	4	0	5	0	4	0											3	0	2	0						
Resistant to 3 antimicrobials	4	0	5	0	4	0											3	0	2	0						
Resistant to 4 antimicrobials	4	0	5	0	4	0											3	0	2	0						
Resistant to >4 antimicrobials	4	0	5	1	4	0											3	1	2	0						
Sulfonamides																										
Sulfamethoxazol	4	0	5	1	4	0											3	1	2	0						
Tetracyclines																										
Tetracyclin	4	0	5	1	4	0											3	1	2	0						
Trimethoprim	4	0	5	0	4	0											3	0	2	0						

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

	S. Typhimurium
	Cattle (bovine animals)
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	5

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	5	0					4	1														
Kanamycin	16	5	0								5												
Streptomycin	32	5	1									4			1								
Amphenicols																							
Chloramphenicol	16	5	1								3	1					1						
Florfenicol	16	5	1								3	1			1								
Cephalosporins																							
Cefotaxim	0.5	5	0		4	1																	
Ceftiofur	1	5	0					2	3														
Fluoroquinolones																							
Ciprofloxacin	0.064	5	0		5																		
Penicillins																							
Ampicillin	4	5	1					2	2						1								
Quinolones																							
Nalidixic acid	16	5	0							1	3	1											
Sulfonamides																							
Sulfamethoxazol	256	5	1										1	2	1						1		
Tetracyclines																							
Tetracyclin	8	5	1						4				1										
Trimethoprim	2	5	0				2	3															

Table Antimicrobial susceptibility testing in S. Gallinarum

n = Number of resistant isolates	S. Gallinarum	
	Gallus gallus (fowl)	
Isolates out of a monitoring programme		no
Number of isolates available in the laboratory		1
Antimicrobials:	**N**	**n**
Aminoglycosides		
Gentamicin	1	0
Kanamycin	1	0
Streptomycin	1	0
Amphenicols		
Chloramphenicol	1	0
Florfenicol	1	0
Cephalosporins		
Cefotaxim	1	0
Ceftiofur	1	0
Fluoroquinolones		
Ciprofloxacin	1	0
Fully sensitive	1	1
Number of multiresistant isolates	1	0
Penicillins		
Ampicillin	1	0
Quinolones		
Nalidixic acid	1	0
Resistant to 1 antimicrobial	1	0
Resistant to 2 antimicrobials	1	0
Resistant to 3 antimicrobials	1	0
Resistant to 4 antimicrobials	1	0
Resistant to >4 antimicrobials	1	0
Sulfonamides		
Sulfamethoxazol	1	0
Tetracyclines		
Tetracyclin	1	0
Trimethoprim	1	0

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

	S. Gallinarum
	Gallus gallus (fowl)
Isolates out of a monitoring programme	no
Number of isolates available in the laboratory	1

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	1	0					1															
Kanamycin	16	1	0							1													
Streptomycin	32	1	0											1									
Amphenicols																							
Chloramphenicol	16	1	0								1												
Florfenicol	16	1	0								1												
Cephalosporins																							
Cefotaxim	0.5	1	0			1																	
Ceftiofur	1	1	0				1																
Fluoroquinolones																							
Ciprofloxacin	0.064	1	0	1																			
Penicillins																							
Ampicillin	4	1	0						1														
Quinolones																							
Nalidixic acid	16	1	0							1													
Sulfonamides																							
Sulfamethoxazol	256	1	0										1										
Tetracyclines																							
Tetracyclin	8	1	0						1														
Trimethoprim	2	1	0					1															

Table Breakpoints for antibiotic resistance testing in Animals

Test Method Used

Broth dilution

Standards used for testing

NCCLS

Salmonella	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Amphenicols										
Chloramphenicol	EFSA	16		16	1	128				
Florfenicol	E	16		16	4	32				
Tetracyclines										
Tetracyclin	EFSA	8		8	0.5	64				
Fluoroquinolones										
Ciprofloxacin	EFSA	0.064		0.064	0.008	1				
Enrofloxacin										
Quinolones										
Nalidixic acid	E	16		16	1	128				
Trimethoprim	EFSA	2		2	0.25	32				
Sulfonamides										
Sulfonamide										
Sulfamethoxazol	EFSA	256		256	16	2048				
Aminoglycosides										
Streptomycin	EFSA	32		32	2	256				
Gentamicin	EFSA	2		2	0.5	64				
Neomycin										
Kanamycin	E	16		16	2	16				
Trimethoprim + sulfonamides										
Cephalosporins										
Cefotaxim	EFSA	0.5		0.5	0.06	2				
Ceftiofur	E	1		1	0.12	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	EFSA	4		4	0.25	32				

Footnote

EFSA = Cut-off values given in Report from EFSA (EFSA Journal (2007), 96, 1-46).
E = epidemiological cut-off values based on MIC distribution.

Table Breakpoints for antibiotic resistance testing in Food

Test Method Used

Broth dilution

Standards used for testing

NCCLS

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

Footnote

EFSA = Cut-off values given in Report from EFSA (EFSA Journal (2007), 96, 1-46).
E = epidemiological cut-off values based on MIC distribution.

2.2. CAMPYLOBACTERIOSIS

2.2.1. General evaluation of the national situation

A. Thermophilic Campylobacter general evaluation

History of the disease and/ or infection in the country

Norwegian studies have shown that many species of wild birds, especially crows and seagulls, are frequent carriers of thermophilic Campylobacter spp. Thermophilic Campylobacter spp. have also been isolated from poultry, dogs, cats, pigs, sheep, cattle, and flies, and sporadically from wild mammals.
Before 2001, when the surveillance programme in broilers was implemented, the prevalence of thermophilic Campylobacter spp. in Norwegian broiler flocks had been studied twice. In 1990, 18% of the flocks tested were infected, whereas this proportion in 1997-1998 had decreased to 4%. This reduction was attributed to an increased focus on the importance of biosecurity. The Action Plan against Campylobacter in broilers that started in 2001 has shown that the yearly incidence of broiler flocks being positive for Campylobacter has been 6.3%, 4.9%, 3.3%, 3.6%, 4.9% and 5.7% in 2002, 2003, 2004, 2005, 2006 and 2007, respectively. The number of flocks going positive out on the market has been reduced from 127 in 2002 to 58 in 2007.
In 1998, campylobacteriosis for the first time surpassed salmonellosis as the most frequently reported bacterial cause of acute human gastroenteritis in Norway, and since then the reported incidence of campylobacteriosis has been above that of salmonellosis. Since the beginning of the 1990s and until it peaked in 2001, there was a major increase in the incidence of campylobacteriosis in Norway, both in domestic and imported cases. Usually, 50-60% of the cases are imported.

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

The reported human incidence has increased slightly in 2007 compared to 2006.
The prevalence in broiler flocks increased from 4.9% in 2006 to 5.7% in 2007. The majority of the positive flocks (75.5%) were detected before slaughter, and were therefore treated (i.e. frozen or heat treated) before they went on the market.
The use of untreated water is considered an important source of campylobacteriosis in Norway.

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

The poultry production and poultry consumption has increased during the last years. Even if the Norwegian action plan against Campylobacter in broilers have largely reduced the number of Campylobacter positive broiler carcasses entering the market, there are still positive broiler carcasses on the market. In addition, other food products may also be positive for Campylobacter. An important source of human campylobacteriosis in Norway is the use of untreated water, in private homes and cottages and during camping and hiking.

Recent actions taken to control the zoonoses

The implementation of the Norwegian action plan against Campylobacter in broilers in 2001 was a direct response from the authorities, scientific institutions and the industry to the major increase in

human campylobacteriosis that was seen during the late 1990s and up to 2001.

2.2.2. Campylobacteriosis in humans

A. Thermophilic Campylobacter in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.

Case definition

A case from which Campylobacter spp has been isolated or a clinical compatible case with an epidemiological link to a culture confirmed case.

Diagnostic/ analytical methods used

Bacteriology (isolation of Campylobacter species from faecal samples) followed by voluntary confirmation (species identification and biotyping) at the National Reference Laboratory. Due to the methods applied, C. lari and C. upsaliensis are probably underdiagnosed.

Notification system in place

According to the Communicable Disease Act, human cases are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1991.

History of the disease and/ or infection in the country

Since the beginning of the 1990s and until it peaked in 2001, there was a significant increase in the incidence of campylobacteriosis in Norway. From 1997 to 2001, the incidence increased by ~145%. In 1998, campylobacteriosis for the first time surpassed salmonellosis as the most frequently reported bacterial cause of acute gastroenteritis in Norway, and since then the reported incidence of campylobacteriosis has been above that of salmonellosis. Usually, 50-60% of the cases are imported. The increased incidences observed throughout the 1990s and until 2001 were due to a rising number of both domestic and imported cases. The number of cases, both domestic and imported declined in 2002 and was stable during the period from 2002 to 2004. In 2005, the number of cases increased again and the number of domestic and imported cases were for the first time almost the same. In 2006 the number of imported cases were stable and the number of domestic cases decreased compared to 2005.
Most cases are sporadic. A case-control study conducted in Norway during 1999-2000 identified consumption of untreated drinking water, consumption of poultry meat purchased fresh, consumption of barbecued meat, and professional contact with animals as significant risk factors in regard to campylobacteriosis. Daily contact with dogs/ cats was identified as a risk factor in case-control studies conducted during the early 1990s, but was not identified as a risk factor in the 1999-2000 study.
Studies indicate that the vast majority (~95%) of reported cases are due to C. jejuni, and that C. coli is the cause of most of the remaining cases.

Results of the investigation

In 2007, a total of 2834 cases (incidence rate 59.8 per 100 000) were reported of which 1438 (51%) were known to be imported. Altogether six outbreaks of campylobacteriosis were registered. No deaths due to campylobacteriosis were reported.

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

The number of reported cases has increased slightly in 2007 compared to 2006. A similar increase as seen in human campylobacteriosis cases during the recent years is not seen in the number of Campylobacter positive poultry products. Therefore there probably are other important sources to human campylobacteriosis apart from poultry in Norway, untreated drinking water probably being the most important one.

Relevance as zoonotic disease

Campylobacter is the most frequently reported cause of bacterial gastroenteritis in Norway. Every year, approx. half of the reported cases have acquired the infection in Norway.

Additional information

Patients whose work represents a risk for spread of the disease, e.g., in food production and health care, are advised to stay away from such work while they are having symptoms. It is recommended that for these patients two consecutive faecal samples examined after the symptoms have disappeared should be negative before returning to work.

2.2.3. Campylobacter in foodstuffs

A. Thermophilic Campylobacter in Broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

See chapter on Campylobacter in Gallus gallus.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

See chapter on Campylobacter in Gallus gallus.

Definition of positive finding

At slaughterhouse and cutting plant

See chapter on Campylobacter in Gallus gallus.

Diagnostic/ analytical methods used

At retail

Bacteriological method: NMKL no 119, 2007

Preventive measures in place

In the surveillance programme, the broiler flocks found positive before slaughter are subjected to freezing for at least 3 weeks, or to heat treatment.

Control program/ mechanisms

The control program/ strategies in place

The Norwegian action plan against Campylobacter in broilers is a surveillance programme agreed upon by the Norwegian Food Safety Authority, scientific institutions and the poultry industry.

Recent actions taken to control the zoonoses

The establishment of the Norwegian action plan against Campylobacter in broilers was a direct response to the major increase in the incidence of human campylobacteriosis during the 1990s.

Measures in case of the positive findings or single cases

See chapter on Campylobacter in Gallus gallus.

Notification system in place

All findings in the Norwegian action plan against Campylobacter in broilers are reported and published as summary reports.

Results of the investigation

The results from the Norwegian action plan against Campylobacter in broilers are presented in the chapter on Campylobacter in Gallus gallus.
A survey was performed in the period November 2006 to November 2007. A total of 375 broiler meat products (including minced meat consisting of broiler and turkey meat) were investigated, and a total of 32 samples (8.5%) were positive.

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

The Norwegian campylobacteriosis situation is a concern for the authorities. The establishment of the Norwegian action plan against Campylobacter sp. in broilers in 2001 was a response to the urgent situation. This action plan has since it was established and through 2007 prevented more than 13 million Campylobacter positive broiler carcasses from entering the market raw.

Table Campylobacter in poultry meat

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for thermophilic Campylobacter spp.	C. coli	C. lari	C. upsaliensis	C. jejuni	Thermophilic Campylobacter spp., unspecified
Meat from broilers (Gallus gallus)										
fresh										
- at processing plant	NVI	single	25 g	305	29		1		26	2
Meat from turkey										
fresh										
- at processing plant	NVI	single	25 g	121	7				7	
Meat from poultry, unspecified										
minced meat										
intended to be eaten cooked										
- at processing plant (1)	NVI	single	25 g	70	3				3	

(1) : Minced meat made of broiler and turkey meat.

Footnote

All samples of broiler and turkey meat and the minced meat were part of a survey taking place during November 2006 - November 2007.

2.2.4. Campylobacter in animals

A. Thermophilic Campylobacter in Gallus gallus

Monitoring system

Sampling strategy

A surveillance programme in broilers was implemented in May 2001 (part of the Norwegian action plan against Campylobacter in broilers).

Frequency of the sampling

Before slaughter at farm

Every flock is sampled

At slaughter

Other: Every slaughter batch is sampled

Type of specimen taken

Before slaughter at farm

Faeces

At slaughter

Organs:Caecum

Methods of sampling (description of sampling techniques)

Before slaughter at farm

10 swabs from fresh faecal droppings are taken by the owner maximum four days before slaughter. They are transported dry as one pooled sample to the laboratory.

At slaughter

10 caecae are sampled at the slaughter line. The 10 samples are pooled to one at the laboratory.

Case definition

Before slaughter at farm

A flock where Campylobacter spp. is found.

At slaughter

A slaughter batch where Campylobacter spp. is found.

Diagnostic/ analytical methods used

Before slaughter at farm

PCR Real Time PCR

At slaughter

Other: NMKL no 119:1990 with modification (no enrichment)

Vaccination policy

There is no vaccination against Campylobacter in Norway.

Other preventive measures than vaccination in place

Farms producing Campylobacter positive flocks are subject to follow-up visits from the advisors in the industry and veterinary supervisors from the Norwegian Food Safety Authority to assist in implementing measures preventing further flocks to be infected with Campylobacter.

Control program/ mechanisms

The control program/ strategies in place

The Norwegian action plan against Campylobacter in broilers is a surveillance programme agreed upon by the Norwegian Food Safety Authority, scientific institutions and the poultry industry. The surveillance programme is compulsory.

Recent actions taken to control the zoonoses

The establishment of the Norwegian action plan against Campylobacter in broilers was a direct response to the major increase in the incidence of human campylobacteriosis during the 1990s.

Measures in case of the positive findings or single cases

Carcasses from flocks that are positive for thermophilic Campylobacter sp. based upon the pre-slaughter sampling are either subjected to heat-treatment or frozen for a minimum of three weeks.
Farms having positive flocks are subject to follow up visits from the advisors in the industry or staff from the Norwegian Food Safety Authority to assist in implementing measures preventing further flocks to become infected with Campylobacter.
The poultry industry uses data from the surveillance programme as an incentive for improving the hygienic conditions on broiler farms.

Notification system in place

All positive flocks in the surveillance programme are reported to the authorities.

Results of the investigation

In 2007, a total of 4145 flocks were slaughtered in Norway and 237 flocks (5.7%) were positive for Campylobacter spp. either at farm before slaughter or at slaughter.
A total of 4109 of these flocks were sampled at farm before slaughter, and 179 of these flocks (4.4%) were positive, and thereby subject to heat treatment or freezing for at least 3 weeks. The floks were

slaughtered in 4268 slaughter batches, and 220 (5.2%) of these were positive at slaughter.

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

The poultry production has increased in Norway during the last years. There has been a reduction in the prevalence of flocks being positive for Campylobacter from 2002 to 2007. Until 2005 there was a declining trend. Since then, however, the prevalence has slowly increased again. The yearly prevalence from 2002 to 2007 has been 6.3%, 4,9%, 3.3%, 3.6%, 4.9% and 5.7%, respectively.

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

The overall occurrence of positive broiler flocks is low, but there is a large seasonal variation, the highest weekly incidence during the summer and autumn 2007 being 22%. Even though approximately 75% of these flocks are discovered before slaughter, and thereby subject to compulsory freezing or heat treatment, the number of Campylobacter positive broiler carcasses on the market during the summer can be considerable.

Table Campylobacter in animals

	Source of information	Sampling unit	Units tested	Total units positive for thermophilic Campylobacter spp.	C. jejuni	C. coli	C. lari	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Cattle (bovine animals)	NVI	animal	53	16	12	1	1		2
Gallus gallus (fowl)									
broilers									
- at farm	NACB	flock	4109	179					179
- at slaughterhouse	NACB	batch	4268	220	161	23	2		34
Turkeys	NVI	flock	107	10					10
Dogs	NVI	animal	115	27	4			21	2
Cats	NVI	animal	34	4	2			1	1

Footnote

NACB = Norwegian Action Plan against Campylobacter in Broilers.
All broiler flocks are tested maximum four days before slaughter and all slaughter batches are tested at slaughter. There is no data available on the Campylobacter species from broiler farms samples because the method used is a Real Time PCR method where no isolates are obtained.
NVI = National Veterinary Institute. Diagnostic samples from cattle, dogs and cats. The data on turkey are from a survey performed September 2006 - September 2007. The method used in the survey was a Real Time PCR method where no isolates were obtained.

2.2.5. Antimicrobial resistance in Campylobacter isolates

A. Antimicrobial resistance in Campylobacter jejuni and coli in poultry

Sampling strategy used in monitoring

Frequency of the sampling

As part of the Norwegian action plan against Campylobacter in broilers (see chapter on Termophilic Campylobacter in Gallus gallus), caecal samples were collected at slaughter plants. One isolate per positive farm was included for susceptibility testing.
In addition, isolates obtained from a research project lasting September 2006 - September 2007 regarding the occurrence of Campylobacter spp. in turkey flocks were included.

Type of specimen taken

See Thermophilic Campylobacter in Gallus gallus. The turkey flocks were sampled tha same way as flocks of Gallus gallus.

Methods of sampling (description of sampling techniques)

See Thermophilic Campylobacter in Gallus gallus. The turkey flocks were sampled tha same way as flocks of Gallus gallus.

Procedures for the selection of isolates for antimicrobial testing

One isolate of Campylobacter jejuni from each positive holding was selected for antimicrobial testing.

Methods used for collecting data

Strains were isolated at different laboratories, and sent to the National Veterinary Institute in Oslo for the testing of antimicrobial susceptibility.

Laboratory methodology used for identification of the microbial isolates

NMKL No 119 without enrichment.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) was used for the susceptibility testing of all isolates. The antimicrobials included are listed in the tables.

Breakpoints used in testing

For interpretation of results epidemiological cut-off values recommended by EFSA were used.

Control program/ mechanisms

The control program/ strategies in place

The resistance testing of Campylobacter jejuni isolated from broiler flocks is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals - NORM-VET.

B. Antimicrobial resistance in Campylobacter jejuni and coli in foodstuff derived from poultry

Sampling strategy used in monitoring

Frequency of the sampling

Isolates were obtained from a research project regarding the occurrence of Campylobacter spp. in broiler and turkey meat from November 2006 - November 2007.

Type of specimen taken

Meat products taken at processing plants.

Methods of sampling (description of sampling techniques)

The samples were taken evenly distributed throughout the year, and the product types were selected based on volume of the Norwegian production of these various types (fillets, whole carcass, minced meat, meat cuts).

Procedures for the selection of isolates for antimicrobial testing

One isolate of Campylobacter jejuni from each positive product was selected for antimicrobial testing.

Methods used for collecting data

Strains were isolated and tested for antimicrobial susceptibility at the National Veterinary Institute in Oslo.

Laboratory methodology used for identification of the microbial isolates

NMKL No 119.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) was used for the susceptibility testing of all isolates. The antimicrobials included are listed in the tables.

Breakpoints used in testing

For interpretation of results epidemiological cut-off values recommended by EFSA were applied.

Table Antimicrobial susceptibility testing of C. jejuni in Turkeys - quantitative data [Dilution method]

	C. jejuni
	Turkeys
Isolates out of a monitoring programme	no
Number of isolates available in the laboratory	14

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	1	14	0				1	12	1														
Streptomycin	2	14	0						10	4													
Fluoroquinolones																							
Ciprofloxacin	1	14	1			3	9	1					1										
Macrolides																							
Erythromycin	4	14	0					8	5	1													
Quinolones																							
Nalidixic acid	16	14	1								3	10				1							
Tetracyclines																							
Tetracyclin	2	14	1			10	3						1										

Table Antimicrobial susceptibility testing in C. jejuni

n = Number of resistant isolates	C. jejuni			
	Gallus gallus (fowl)		**Turkeys**	
Isolates out of a monitoring programme	yes		no	
Number of isolates available in the laboratory	99		14	
Antimicrobials:	**N**	**n**	**N**	**n**
Aminoglycosides				
Gentamicin	99	0	14	0
Streptomycin	99	2	14	0
Fluoroquinolones				
Ciprofloxacin	99	1	14	1
Fully sensitive	99	96	14	13
Macrolides				
Erythromycin	99	0	14	0
Quinolones				
Nalidixic acid	99	1	14	1
Resistant to 1 antimicrobial	99	1	14	0
Resistant to 2 antimicrobials	99	2	14	0
Resistant to 3 antimicrobials	99	0	14	1
Resistant to 4 antimicrobials	99	0	14	0
Resistant to >4 antimicrobials	99	0	14	0
Tetracyclines				
Tetracyclin	99	1	14	1

Table Antimicrobial susceptibility testing of C. jejuni in Gallus gallus (fowl) - quantitative data [Dilution method]

	C. jejuni
	Gallus gallus (fowl)
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	99

Antimicrobials:	**Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to**																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	1	99	0			1	13	81	4														
Streptomycin	2	99	2					8	66	23					1	1							
Fluoroquinolones																							
Ciprofloxacin	1	98	1		3	32	58	3	1				1										
Macrolides																							
Erythromycin	4	99	0					70	27	2													
Quinolones																							
Nalidixic acid	16	99	1							2	42	51	3			1							
Tetracyclines																							
Tetracyclin	2	99	1			82	16				1												

Table Antimicrobial susceptibility testing of C. jejuni in Meat from broilers (Gallus gallus) - quantitative data [Dilution method]

	C. jejuni
	Meat from broilers (Gallus gallus)
Isolates out of a monitoring programme	no
Number of isolates available in the laboratory	29

Antimicrobials:	**Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to**																							
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**	
Aminoglycosides																								
Gentamicin	1	29	0				5	22	2															
Streptomycin	2	29	0					3	23	3														
Fluoroquinolones																								
Ciprofloxacin	1	29	0			10	17	2																
Macrolides																								
Erythromycin	4	29	0					24	5															
Quinolones																								
Nalidixic acid	16	29	0								14	14	1											
Tetracyclines																								
Tetracyclin	2	29	0			28		1																

Table Antimicrobial susceptibility testing in C. jejuni

n = Number of resistant isolates		
	C. jejuni	
	Meat from broilers (Gallus gallus)	
Isolates out of a monitoring programme		no
Number of isolates available in the laboratory		29
Antimicrobials:	**N**	**n**
Aminoglycosides		
Gentamicin	29	0
Streptomycin	29	0
Fluoroquinolones		
Ciprofloxacin	29	0
Fully sensitive	29	29
Macrolides		
Erythromycin	29	0
Quinolones		
Nalidixic acid	29	0
Resistant to 1 antimicrobial	29	0
Resistant to 2 antimicrobials	29	0
Resistant to 3 antimicrobials	29	0
Resistant to 4 antimicrobials	29	0
Resistant to >4 antimicrobials	29	0
Tetracyclines		
Tetracyclin	29	0

Table Breakpoints used for antimicrobial susceptibility testing in Animals

Test Method Used

Broth dilution

Standards used for testing

NCCLS

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracyclines										
Tetracyclin	EFSA	2		2	0.125	32				
Fluoroquinolones										
Ciprofloxacin	EFSA	1		1	0.064	16				
Quinolones										
Nalidixic acid	E	16		16	0.5	128				
Aminoglycosides										
Streptomycin	EFSA	2		2	0.5	128				
Gentamicin	EFSA	1		1	0.25	8				
Macrolides										
Erythromycin	EFSA	4		4	0.5	128				
Penicillins										
Ampicillin										

Footnote

EFSA = Cut-off values given in Report from EFSA (EFSA Journal (2007), 96, 1-46).
E = epidemiological cut-off values based on MIC distribution.

Table Breakpoints used for antimicrobial susceptibility testing in Food

Test Method Used

Broth dilution

Standards used for testing

NCCLS

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracyclines										
Tetracyclin	EFSA	2		2	0.125	32				
Fluoroquinolones										
Ciprofloxacin	EFSA	1		1	0.064	16				
Quinolones										
Nalidixic acid	E	16		16	0.5	128				
Aminoglycosides										
Streptomycin	EFSA	2		2	0.5	128				
Gentamicin	EFSA	1		1	0.25	8				
Macrolides										
Erythromycin	EFSA	4		4	0.5	128				
Penicillins										
Ampicillin										

Footnote

EFSA = Cut-off values given in Report from EFSA (EFSA Journal (2007), 96, 1-46).
E = epidemiological cut-off values based on MIC distribution.

2.3. LISTERIOSIS

2.3.1. General evaluation of the national situation

A. Listeriosis general evaluation

History of the disease and/ or infection in the country

Listeriosis is endemic in Norway with sporadic clinical cases in humans and animals, especially among sheep.
Since 1982, the number of notified human cases has varied from 2-51. The incidence rate has varied from 0.05-1.07 per 100 000. Most of the cases are sporadic, occurring in elderly individuals or persons with other underlying diseases. A few congenital cases have been reported. An outbreak occurred in 1992 which involved six reported cases and was traced back to contaminated, vacuum packed cold cuts from a Norwegian meat producer. In 2005 a hospital outbreak occurred with 3 cases, probably linked to cold cuts (the same strain of L. monocytogenes as isolated from the patients was found on the slicing machine in the hospital kitchen). In 2007 another outbreak occurred (see chapter on outbreaks).
In a survey conducted in 1994, the prevalence of L. monocytogenes in samples of vacuum packed cold cuts and smoked salmon was 1.7% and 7.8%, respectively. The prevalence in smoked salmon was 3.4% in a survey conducted in 1996-1997. In 2002 4.3% of 703 samples of domestically produced fish and fish products, mainly unprocessed and smoked salmon, were positive for L. monocytogenes. In 2003, 8.6% of 990 samples of smoked salmon taken at retail level were positive for L. monocytogenes. The level of contamination was less than 10 CFU/ g in 53 samples, between 10 and 100 in 20 samples, between 100 and 1000 in 10 samples and more than 1000 CFU/ g in two samples. In a survey conducted in 1995 involving ready-to-eat poultry products, the prevalence of L. monocytogenes was 0.4%.
A survey of domestically produced raw milk products conducted in 1999 revealed that one out of 282 samples (0.4%) was positive for L. monocytogenes. A survey of raw bulk milk at Norwegian dairy farms, also conducted in 1999, did not detect any L. monocytogenes in 336 samples from cattle bulk milk, whereas four of 100 samples from goat bulk milk were positive for L. monocytogenes. This illustrates that products made of raw milk might be risk products with regard to L. monocytogenes.
Fermented trout is a traditional food product in Norway that is consumed without heat treatment. Studies have revealed that a large proportion of samples may contain L. monocytogenes, sometimes in high concentrations (up to 2000 CFU per gram). Guidelines issued by the Food Safety Authority recommend a maximum level of 1000 CFU per gram for this particular product. Information about risk products to consumers belonging to risk populations has been issued. A recent study has shown that it is possible to produce fermented trout without L. monocytogenes if hygienic precautionary measures, including temperature control and appropriate salt levels, are implemented throughout the process.

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

Listeriosis is endemic in Norway with sporadic clinical cases in animals, especially among sheep. However, listeriosis is not a common disease in humans in Norway. Most cases are sporadic and seen in the elderly or in patients with underlying disease.
Processed ready-to-eat products have been identified as a source for human listeriosis.

Recent actions taken to control the zoonoses

Generally, the Norwegian Food Safety Authority recommends that findings of L. monocytogenes in ready-to-eat food products with a shelf life longer than 15 days and in which the bacteria easily can grow, should result in recall from the market of the corresponding lot. The producer is recommended to review production routines and shelf-life of the product.
Dietary advice is given to pregnant women.

2.3.2. Listeriosis in humans

A. Listeriosis in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.

Case definition

A case from which L. monocytogenes has been detected in blood, cerebrospinal fluid or other normally sterile sites or a case with serology indicating recent infection.

Diagnostic/ analytical methods used

Bacteriology (isolation of L. monocytogenes from a normally sterile site) followed by voluntary confirmation (species identification and serotyping) at the National Reference Laboratory.

Notification system in place

According to the Communicable Disease Act, human cases are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1975.

History of the disease and/ or infection in the country

Since 1982, the number of notified cases has varied from 2-51. The incidence rate has varied from 0.05-1.07 per 100 000. There were more cases reported in 2007 than any year before. Most of the cases are sporadic, occurring in elderly individuals or persons with underlying disease. A few congenital cases are also being reported. The first recorede outbreak of listeriosis in Norway occured in 1992, involving six reported cases. The outbreak was linked to vacuum packed cold cuts. In 2005, an outbreak occured in a hosptal in the middle of Norway. Three cases were reported, and the outbreak was linked to cold cuts. Another outbreak occured in 2007, involving 21 reported cases of whom two died. The outbreak was linked to a pasteurised soft-cheese product.

Results of the investigation

In 2007, a total of 51 confirmed cases of listeriosis were notified (incidence rate 1.07 per 100 000), 21 of these cases belonged to one outbreak. Seven deaths were recorded, two of whom were pregnancy related.

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

Listeriosis in humans is a relatively rare disease in Norway and has been so for many years. Most of the cases are sporadic, occurring in elderly individuals or persons with underlying diseases.

Relevance as zoonotic disease

Listeriosis in humans is a relatively rare disease in Norway.

2.3.3. Listeria in foodstuffs

A. Listeria spp. in food

Monitoring system

Sampling strategy

No continuous monitoring in foodstuffs takes place. Surveys are occasionally performed. Norway follows the EU requirements regarding testing for L. monocytogenes in milk products. Samples are taken as part of internal control programmes in the food porducing industry.

Definition of positive finding

At the production plant

A positive sample is a sample from which Listeria spp. has been isolated.

Diagnostic/ analytical methods used

At the production plant

Bacteriological method: NMKL No 136:2007

At retail

Bacteriological method: NMKL No136:2007 for qualitative analyses, direct plating on Rapid mono Listeria agar for quantitative analyses

Control program/ mechanisms

The control program/ strategies in place

No official control programmes in place. When relevant, monitoring and control take place as an integral part of food business operators' internal control systems.

Measures in case of the positive findings

Generally, the Norwegian Food Safety Authority recommends that findings of L. monocytogenes in ready-to-eat food products with a shelf life longer than 15 days and in which the bacteria easily can grow, should result in recall from the market of the corresponding lot. The producer is recommended to review production routines and shelf-life of the product.
Internal control: Corrective actions will be taken according to the frequency of positive findings, product type, step of process at which the isolation was done, and whether the product is a ready-to-eat-product or special dietary product.

Results of the investigation

In 2007, a total of 106 samples of sushi sampled at retail or in restaurants were investigated, 50 of them also quantitatively. All samples were negative for L. monocytogenes.
All 70 samples of smoked fish and 26 samples from pelagic fish were negative. A total of 14 out of 48 investigated samples from farmed fish were positive for L. monocytogenes.

A total of 84 environmental samples from fish processing environment were investigated, four samples were positive.

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

In general, the occurrence of L. monocytogenes in food products is low.

Table Listeria monocytogenes in other foods

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for L.monocytogenes	Units tested with detection method	Listeria monocytogenes presence in x g	Units tested with enumeration method	> detection limit but <= 100 cfu/ g	L. monocytogenes > 100 cfu/ g
Fish										
smoked										
- at processing plant	NIFES	single	25 g	70	0	70	0	0		
raw										
- at retail (1)	NIFES/ NVI	single	25 g	106	0	106	0	50	0	0
- at processing plant (2)	NIFES	single	25 g	48	14	48	14	0		
- at processing plant - environmental sample	NIFES	single	Swabs	84	4	84	4	0		
(Wild catch) (3)	NIFES	single	25 g	26	0	26	0	0		

(1) : Sushi
(2) : Farmed fish
(3) : Wild catch of pelagic fish sampled on fishing vessels

2.3.4. Listeria in animals

A. Listeria spp., unspecified in animal - All animals

Monitoring system

Sampling strategy

Listeriosis is a notifiable disease in animals.
There are no monitoring programmes in regard to L. monocytogenes in animals. Information is achieved through clinical and laboratory reports.

Frequency of the sampling

When there is a suspected case.

Case definition

A case may be defined as 1) positive histopathology combined with clinical signs, 2) positive bacteriology.

Diagnostic/ analytical methods used

Bacteriology, histopathology and immunohistochemistry.

Measures in case of the positive findings or single cases

Normally none.

Notification system in place

Listeriosis has been a list C disease according to the Animal Disease Act since 1965.

Results of the investigation

Many animals are investigated with regard to L. monocytogenes and listeriosis in clinical laboratories. In 2007, at the National Veterinary Institute, 34 sheep, four goats, four cattle, one hen, one chinchilla and one hare were found positive for L. monocytogenes.

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

Listeria spp. is present in the environment and also in food-producing animals. However, there is no epidemiological evidence that listeriosis in humans are linked to listeriosis in animals.

2.4. E. COLI INFECTIONS

2.4.1. General evaluation of the national situation

A. Verotoxigenic Escherichia coli infections general evaluation

History of the disease and/ or infection in the country

The reported incidence of VTEC infections in humans in Norway has so far been low (0-47 cases per year). Approximately half of the cases are acquired domestically. In 2006 there was a severe outbreak caused by VTEC O103:H25 with 17 patients, out of which 10 developed HUS and one died.
A study conducted in 1995 revealed a low prevalence of VTEC O157 among Norwegian dairy cattle; animal prevalence 0.3% and herd prevalence 1.0%. In a survey conducted in 1998-1999, one out of 574 dairy cattle herds were positive for VTEC O157 (herd prevalence 0.2%, animal prevalence between 0.02 and 0.06%).
In 2000, none of the tested 1435 beef cattle from 165 herds were positive for VTEC O157. A survey in 2002, in which 453 pooled faecal samples from 155 beef cattle herds were tested for the presence of VTEC O26, O103, O111, O145 and O157, revealed five pooled samples from five herds positive for VTEC O103, all eae negative.
In the surveillance programme for VTEC O157 in cattle, sheep, and goat carcasses running in the period 1998-2004, the total carcass prevalence was 0.06% for cattle and 0.03% for sheep. None of the 510 goat carcasses tested were positive.

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

Although the annual incidence in humans in Norway up to 2006 was low and predominantly involved sporadic cases, the fear that the incidence might increase in the future, and that outbreaks may occur proved valid in 2006. Data show that VTEC O157 is present in the cattle and sheep populations, and although the prevalences seem to be low, this reservoir represents a source of possible human infection. The 2006 outbreak caused by VTEC O103:H25 showed that other VTEC than the "high five" (VTEC O26, O103:H2, O111, O145 and O157) may be of potential danger for humans.

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

Although the prevalence of VTEC O157 in the cattle and sheep populations seems to be low, there are other VTEC where the knowledge is sparse. In general, there is always a potential for contamination in the food chain, which requires alertness at all steps from primary production, through processing, and retail and food preparation, as well as alertness among physicians and diagnostic laboratories.

2.4.2. E. Coli Infections in humans

A. Verotoxigenic Escherichia coli infections in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.
Haemolytic uremic syndrome (HUS) became a notifiable disease in December 2006. Before that, HUS was not notifiable per se, but was reported in relation to an EHEC diagnosis.

Case definition

A case from which enterohaemorrhagic E. coli or its toxins have been detected from faecal samples.

Diagnostic/ analytical methods used

Most clinical microbiological laboratories use plating on selective media (such as SMAC) in order to detect presumptive VTEC O157. Presumptive isolates are tested for agglutination with O157 antiserum before being submitted for confirmation at the National Reference Laboratory. Confirmation includes examination for the presence of Shiga toxin genes.
Some laboratories use genetic methods directed towards detection of Shiga toxin genes followed by isolation of VTEC and confirmation at the National Reference Laboratory.

Notification system in place

According to the Communicable Disease Act, human cases are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1995. Haemolytic uremic syndrome (HUS) became a notifiable disease in December 2006.

History of the disease and/ or infection in the country

The reported incidence of VTEC infections in humans in Norway is low. The number of cases has varied between 0-47 per year, and the incidence rate has varied between 0-9.9 per 100 000 inhabitants. Of the 127 cases that were registered in the period 1992-2005, approximately half of the cases were acquired domestically. Of the reported cases, 76 were due to VTEC O157, eight due to O26, five due to O145, five due to O103, two due to O111 and one due to each of O86, O113, O119, O128 and O130. For the remaining cases, the serogroups were not identified. There were in total nine cases of haemolytic uremic syndrome (HUS) and one death attributable to VTEC infection reported in this period.
The first foodborne VTEC outbreak in Norway occurred in 1999 and involved four culture-positive patients (O157). Epidemiological investigations incriminated domestically produced lettuce as the most likely source of infection. A severe outbreak caused by VTEC O103:H25 in 2006 involved 17 patients of which 10 developed HUS and one died.

Results of the investigation

In 2007, 28 cases (incidence rate 0.59) of VTEC and HUS were reported. A total of 4 cases of HUS were reported, of these one was caused by O 145, one by O26, and two of unknown origin. A total of 24 cases of VTEC infections (excluding HUS) were reported, of which the most commonly isolated serotypes were O157 (6 cases), O145 (3 cases) and O26 (3 cases) A total of 13 of the patients were reported as infected in Norway. Ten cases were imported, and five cases had an unknown place of infection.

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

Although the annual incidence in Norway up to 2006 was low and predominantly involved sporadic cases, the outbreak in 2006 caused by VTEC O103:H25 called for increased attention.
Data show that potential human pathogenic VTEC O157 is present in the cattle and sheep populations. Although the prevalences seem to be low, these reservoirs represent possible sources of infection. Due to the methods currently used, there is probably a significant underreporting of non-O157 human cases.

Relevance as zoonotic disease

Data show that VTEC is present in the cattle and sheep populations, although the prevalences seem to be low. Thus, there is a potential for contamination in the food chain or by direct animal contact, which requires alertness at all steps from primary production, through processing, and retail and food preparation, as well as alertness among physicians and diagnostic laboratories.

Additional information

Patients whose work represents a risk for spread of the disease, e.g., in food production and health care, are advised to stay away from such work while they are having symptoms. It is recommended that for these patients five consecutive faecal samples examined after the symptoms have disappeared should be negative before returning to work.

2.4.3. Escherichia coli, pathogenic in foodstuffs

2.4.4. Escherichia coli, pathogenic in animals

A. Verotoxigenic E. coli (VTEC) in animal - All animals (Ruminants)

Monitoring system

Sampling strategy

Prevalence surveys in cattle, sheep and goats have been conducted occasionally since 1998.
In November 2006 a survey regarding VTEC in sheep was started, with 94 flocks sampled in 2006, and 499 flocks sampled in 2007. Results will be presented in the 2008 report.

Type of specimen taken

Animals at farm

Faeces

Case definition

Animals at farm

An animal or herd from which VTEC is isolated.

Diagnostic/ analytical methods used

Animals at farm

Other: Modification of NMKL No 164:1999 with IMS (or IMS-ELISA) followed by virulence characterization by PCR.

Measures in case of the positive findings or single cases

If VTEC O157 is detected in an official survey among live animals, the Norwegian Food Safety Authority and Municipal Medical Officer are notified. Restrictions may be imposed on livestock holdings where VTEC O157 is detected. Herds found positive for VTEC O157 are followed up with extensive testing.
The holdings sampled in the survey of sheep flocks in 2006-2007 are anonymized.

Notification system in place

Findings in carcasses of VTEC O157 or other VTEC that can pose a health risk for humans lead to condemnation of the carcasses and notification to the authorities. Findings of VTEC O157 in samples from live animals are not notifiable as an animal disease, but since VTEC is a pathogen that can be transmitted from animals to humans, competent authorities have to be informed about positive findings.

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

The prevalence of human pathogenic VTEC O157, O103, O26, O45 and O111 is still considered low in Norwegian cattle, sheep and goats.

2.5. TUBERCULOSIS, MYCOBACTERIAL DISEASES

2.5.1. General evaluation of the national situation

A. Tuberculosis general evaluation

History of the disease and/ or infection in the country

Norway has been granted the officially tuberculosis-free status of bovine herds by the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 28/ 07/ COL) as Norway fulfills the requirements laid down in Council Directive 64/ 432/ EEC as amended.
Bovine tuberculosis (M. bovis) was declared eliminated in cattle in Norway in 1963 as a result of an official eradication programme against the disease. During the period 1895-1896, 26% of 2195 tuberculin-tested herds were positive. In 1950, 18 herds were registered as being infected, while in the beginning of the 1960s only one or two infected herds were reported annually. Since bovine tuberculosis was declared eliminated, it has only been recorded three times; in 1984 in two cattle herds and in 1986 in one cattle herd. These herds were in the same geographical area and the origin of the infection in these herds was probably a man with tuberculosis. Tuberculosis caused by M. bovis in other animal species than cattle has not been recorded in Norway after the disease was eliminated from cattle in 1963.
Tuberculosis in humans caused by M. bovis is only sporadically recorded in Norway, and since 1977 the few recorded cases have been imported except for one case of reactivation in 1994.

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

As Norway is officially free from bovine tuberculosis, the probability of contracting M. bovis infection from Norwegian animals or animal products of Norwegian origin is close to zero.

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

There have been no findings of M. bovis in animals or foodstuffs. The probability of contracting M. bovis infection from Norwegian animals or animal products of Norwegian origin is close to zero.

2.5.2. Tuberculosis, Mycobacterial Diseases in humans

A. Tuberculosis due to Mycobacterium bovis in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between Norwegian and foreign born cases. The severity of the disease at the time of reporting is also recorded. The surveillance system includes individual treatment outcome data for all tuberculosis patients.

Case definition

A confirmed case of M. bovis, M. tuberculosis, or M. africanum is a case that has been confirmed by isolation of M. bovis, M. tuberculosis, or M. africanum, respectively. Cases of tuberculosis that are diagnosed without laboratory confirmation (diagnoses based on clinical symptoms and X-ray examination) are also notified and included in the statistics.

Diagnostic/ analytical methods used

Clinical indications: Bacteriology, X-ray, pathology.
Screening: Miniature X-ray, tuberculin skin testing, Interferon-gamma release assays.

Notification system in place

According to the Communicable Disease Act, human cases caused by bacilli belonging to the M. tuberculosis complex (including M. tuberculosis, M. bovis, and M. africanum) are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1975, and before that notifiable to a separate Tuberculosis Register since 1900.

History of the disease and/ or infection in the country

The incidence of human tuberculosis (M. bovis and M. tuberculosis) has steadily decreased during the last 50 years in persons of Norwegian origin. BCG vaccination was introduced in 1947 and was mandatory until 1995. Pasteurisation of milk for commercial sale became mandatory in 1951. Since 1977, the annual incidence rate in persons born in Norway has decreased from 11 to 1.4 per 100 000, and most cases in this part of the population are recurrent cases in elderly patients. Along with increased immigration to Norway, the proportion of tuberculosis cases involving persons born outside Norway has increased during the last two decades (from less than 10% in 1977 to 81% in 2006).
Since bovine tuberculosis in cattle was eliminated in Norway in 1963, almost all bacteriologically confirmed cases in humans have been caused by M. tuberculosis. The last domestic case of tuberculosis caused by M. bovis was reported in 1994 in a 100-year old woman infected in her youth. Apart from this case, no indigenous cases of tuberculosis caused by M. bovis in humans have been reported since 1977. Imported cases of tuberculosis caused by M. bovis are sporadically reported; in 2005 in two patients from Somalia and Afghanistan, respectively, in 2002 one patient from Somalia, in 2001 one patient from Tanzania, in 2000 two patients from Somalia and Morocco, respectively, in 1999 one patient from Sri Lanka, in 1998 one patient from Somalia, and in 1994 one patient infected in India.

Results of the investigation

In 2007, no cases with tuberculosis caused by M. bovis were notified.

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

Tuberculosis caused by M. bovis is only sporadically recorded in Norway, and except for a case of reactivation in 1994, the few recorded cases reported since 1977 have been imported.

Relevance as zoonotic disease

As Norway is officially free from bovine tuberculosis, the probability of contracting M. bovis infection from Norwegian animals or animal products of Norwegian origin is close to zero.

Additional information

In Norway, the child vaccination programme has included vaccination against tuberculosis since 1947. The BCG vaccine (live attenuated M. bovis) is offered to unvaccinated and tuberculin negative persons belonging to certain risk groups; immigrants from countries with high prevalence of tuberculosis, persons travelling to highendemic areas for a prolonged timeperiod, teachers, health personnel, personnel on ships and in offshore industry, and military personnel.
In addition, the BCG vaccine is offered to all children during junior high school (13-14 years old). In general, the immunisation coverage in Norwegian children is high; for the BCG vaccine it is estimated to be 99%. In Norway, the BCG vaccine is estimated to give 80% protection against tuberculosis.
Tuberculin skin test is mandatory for immigrants coming to Norway from high prevalence countries. Immigrants who are 15 years or older must also undergo chest radiograph screening. Screening for tuberculosis in certain risk populations is sometimes conducted.

2.5.3. Mycobacterium in animals

A. Mycobacterium bovis in bovine animals

Status as officially free of bovine tuberculosis during the reporting year

The entire country free

Norway has been granted the officially tuberculosis-free status of bovine herds by the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 28/ 07/ COL) as Norway fulfills the requirements laid down in Council Directive 64/ 432/ EEC as amended.

Monitoring system

Sampling strategy

Every slaughtered animal, except animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/ 433/ EEC.
All breeding bulls are tuberculin tested several times.
Imported animals are tuberculin tested if considered relevant based upon individual assessment.

If suspicion arises whether an animal may have tuberculosis (sick or dead animal), relevant tests will be carried out.

Frequency of the sampling

All slaughtered animals are subject to meat inspection.
Imported animals are tested during week 22 of the six months long isolation period.
Breeding bulls are tuberculin tested before being transferred to a semen collection centre and thereafter subject to yearly testing.

Type of specimen taken

Organs/ tissues: Animals for slaughter: Lymph nodes. Breeding animals and imported animals: Tuberculin testing.

Methods of sampling (description of sampling techniques)

Slaughtered animals: Meat inspection at the slaughterhouse; lymph node examination.
Imported animals and breeding animals: Tuberculin testing.
Clinical indications: Methods will vary depending on the problem.

Case definition

A single animal from which M. bovis or M. tuberculosis has been isolated. The herd is the epidemiological unit.

Diagnostic/ analytical methods used

Slaughtered animals: Meat inspection regarding tuberculosis (lymph node examination) by an

official veterinarian according to Council Directive 64/ 433/ EEC. If indicated: bacteriology and histology.
Clinical indications: Tuberculin testing (intradermal comparative test), pathology, and/ or bacteriology.
Breeding animals and imported animals: Tuberculin testing (intradermal comparative test).

Vaccination policy

Vaccination of animals against tuberculosis is prohibited in Norway.

Control program/ mechanisms

The control program/ strategies in place

Every slaughtered animal, except animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/ 433/ EEC.

Measures in case of the positive findings or single cases

Norway would as a minimum implement the measures as laid down in Council Directive 64/ 432/ EEC as amended in case of positive findings or if suspicion of tuberculosis in bovine animals should arise.

Notification system in place

Tuberculosis caused by Mycobacterium bovis or M. tuberculosis of all species has been a notifiable List B disease according to the Animal Diseases Act since 1894. Cases are to be notified to the Norwegian Food Safety Authority.

Results of the investigation

In 2007, none of the 319000 slaughtered bovine animals had findings at slaughter indication tuberculosis, and no samples were submitted for examination for Mycobacterium species.
A total of 187 bulls in a breeding company all had negative tuberculin tests.

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

Bovine tuberculosis was declared eliminated in cattle in 1963.

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

There have been no findings of M. bovis in animals or foodstuffs. The risk for humans contracting tuberculosis from livestock within the country is negligible.

B. Mycobacterium bovis in farmed deer

Monitoring system

Sampling strategy

Every slaughtered animal, except animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/ 433/ EEC.
Imported deer are tuberculin tested if considered relevant based upon individual assessment.
If suspicion arises whether an animal may have tuberculosis (sick or dead animal), relevant tests will be carried out.

Frequency of the sampling

All slaughtered animals are subject to meat inspection.
Imported deer are tested during week 5 of the two months long isolation period.

Type of specimen taken

Organs/ tissues: Animals for slaughter: Lymph nodes. Imported animals: Tuberculin testing.

Methods of sampling (description of sampling techniques)

Slaughtered animals: Meat inspection at the slaughterhouse; lymph node examination.
Imported animals: Tuberculin testing.
Clinical indications: Methods will vary depending on the problem.

Case definition

A single animal from which M. bovis or M. tuberculosis has been isolated. The herd is the epidemiological unit.

Diagnostic/ analytical methods used

Slaughtered animals: Meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/ 433/ EEC. If indicated: bacteriology and histology.
Imported animals: Tuberculin testing (intradermal comparative test).
Clinical indications: Tuberculin testing (intradermal comparative test), pathology, and/ or bacteriology.

Vaccination policy

Vaccination of animals against tuberculosis is prohibited in Norway.

Control program/ mechanisms

The control program/ strategies in place

Every slaughtered animal, except animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/ 433/ EEC.
Required autopsy of animals older than 12 months of age that die or are killed because of a disease.

Measures in case of the positive findings or single cases

Norway would as a minimum implement the measures as laid down in Council Directive 64/ 432/ EEC as amended in case of positive findings or if suspicion of tuberculosis should arise.

Notification system in place

Tuberculosis caused by Mycobacterium bovis or M. tuberculosis of all species has been a notifiable List B disease according to the Animal Diseases Act since 1894. Cases are to be reported to the Norwegian Food Safety Authority.

Results of the investigation

In 2007, none of the slaughtered deer had findings at slaughter indicating tuberculosis.

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

Bovine tuberculosis has not been diagnosed in farmed deer in Norway. The population of farmed deer is very small in Norway.

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

There have been no findings of M. bovis in animals or foodstuffs. The risk for humans contracting tuberculosis from livestock within the country is negligible.

C. Mycobacterium spp. in animal

Monitoring system

Sampling strategy

For cattle and farmed deer, see the respective chapters.
Every slaughtered animal, except poultry and animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/ 433/ EEC.
Imported animals are tuberculin tested if considered relevant based upon individual assessment.
If suspicion arises whether an animal may have tuberculosis (sick or dead animal), relevant tests will be carried out.

Frequency of the sampling

All slaughtered animals are subject to meat inspection.
Sheep and goats are tested during week 23 of the two years long isolation period. Pigs are tested during week 7 of the two months long isolation period. Lamas are tested during week 22 of the six months long isolation period.

Type of specimen taken

Organs/ tissues: Animals for slaughter: Lymph nodes. Imported animals: Tuberculin testing.

Methods of sampling (description of sampling techniques)

Slaughtered animals: Meat inspection at the slaughterhouse; lymph node examination.

Imported animals and breeding animals: Tuberculin testing.
Clinical indications: Methods will vary depending on the problem.

Case definition

A single animal from which M. bovis or M. tuberculosis has been isolated. The herd is the epidemiological unit.

Diagnostic/ analytical methods used

Slaughtered animals: Meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/ 433/ EEC. If indicated: bacteriology and histology.
Tests of imports, exports: Tuberculin testing (intradermal comparative test).
Clinical indications: Tuberculin testing (intradermal comparative test), pathology, and/ or bacteriology.

Vaccination policy

Vaccination of animals against tuberculosis is prohibited.

Control program/ mechanisms

The control program/ strategies in place

Every slaughtered animal, except poultry and animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/ 433/ EEC.

Measures in case of the positive findings or single cases

Norway would as a minimum implement the measures as laid down in Council Directive 64/ 432/ EEC as amended in case of positive findings or if suspicion of tuberculosis should arise.

Notification system in place

Tuberculosis caused by Mycobacterium bovis or M. tuberculosis in all species has been a notifiable List B disease according to the Animal Diseases Act since 1894. Cases are to be notified to the Norwegian Food Safety Authority.

Results of the investigation

In 2007, tuberculin tests were performed on 112 breeding boars at AI stations, all were negative.
Samples from 16 pigs, 12 ferrets, two birds, and one animal each of the species dog, horse, goat, duck, moose, mink were analyzed for the presence of Mycobacterium species. M. avium subsp. avium was isolated from 12 of the pigs, two of the ferrets and from the moose. Mycobacterium sp. was isolated from one of the pigs.

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

Bovine tuberculosis was declared eliminated in cattle in 1963, and has since then not been recorded in other animal species.

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

There have been no findings of M. bovis in animals or foodstuffs. The risk for humans contracting tuberculosis from livestock within the country is negligible.

Table Tuberculosis in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Mycobacterium spp.	M. bovis	M. tuberculosis	Mycobacterium spp., unspecified	M. avium complex - M. avium subsp. avium
Goats	NVI	animal	1	0				
Pigs	NVI	animal	16	13			1	12
breeding animals								
- at AI station	Breeding company	animal	112	0				
Dogs	NVI	animal	1	0				
Ferrets								
pet animals	NVI	animal	12	2				2
Solipeds, domestic								
horses	NVI	animal	1	0				
Minks								
farmed	NVI	animal	1	0				
Ducks	NVI	animal	1	0				
Moose								
wild	NVI	animal	1	1				1
Birds (1)	NVI	animal	2	0				

(1) : One bird from a zoo and one pet bird.

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

Region	Total number of existing bovine		Officially free herds		Infected herds		Routine tuberculin testing		Number of tuberculin tests carried out before the introduction into the herds (Annex A(I)(2)(c) third indent (1) of Directive 64/ 432/ EEC)	Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological examinations	Number of animals detected positive in bacteriological examination
	Herds	Animals	Number of herds	%	Number of herds	%	Interval between routine tuberculin tests (*)	Number of animals tested			
NORGE	19300	902000	19300	100	0	0	0			0	0
Total	19300	902000	19300	100	0	0		0	0	0	0

(*) Legend:

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

Table Tuberculosis in farmed deer

Region	Total number of existing farmed deer		Free herds		Infected herds		Routine tuberculin testing		Number of tuberculin tests carried out before the introduction into the herds	Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological examinations	Number of animals detected positive in bacteriological examination
	Herds	Animals	Number of herds	%	Number of herds	%	Interval between routine tuberculin tests (*)	Number of animals tested			
NORGE	62	2000	62	100	0	0	0			0	
Total	62	2000	62	100	0	0		0	0	0	0

(*) Legend:

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

2.6. BRUCELLOSIS

2.6.1. General evaluation of the national situation

A. Brucellosis general evaluation

History of the disease and/ or infection in the country

Bovine brucellosis has been a notifiable disease since 1903. An offensive eradication programme to eliminate the disease was launched in 1935, and Norway was declared free from bovine brucellosis in 1953. Ovine, caprine, or porcine brucellosis has never been recorded in Norway. Norway has been granted official brucellosis-free status of bovine herds by the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 28/ 07/ COL). Due to its history in regard to Brucella melitensis, Norway has been granted an officially brucellosis free status for sheep and goats.
Human brucellosis has always been a rare disease in Norway, the majority of the cases being imported, and a few cases due to laboratory infections domestically.

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

As bovine brucellosis was declared eliminated in Norway in 1953, and ovine, caprine, or porcine brucellosis has never been recorded, Norway is considered free from brucellosis in production animals.
Research studies have shown that antibodies against Brucella can be detected in marine mammals (minke whales and hooded seals) from the North Atlantic Ocean, and in polar bears from the archipelago of Svalbard and the Barents Sea. Brucella sp. different from previously described species has also been isolated from hooded seals from the Greenland Sea.

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

There have been no findings of Brucella spp. in terrestrial animals or foodstuffs. The probability of contracting brucellosis from Norwegian animals or animal products of Norwegian origin is close to zero.

2.6.2. Brucellosis in humans

A. Brucellosis in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.

Case definition

A clinically compatible case that is laboratory confirmed.

Diagnostic/ analytical methods used

Serology (serum antibody test or antigen test of clinical specimen) and bacteriology (isolation).

Notification system in place

According to the Communicable Disease Act, human cases are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1975.

History of the disease and/ or infection in the country

Human brucellosis has always been a rare disease in Norway. During the period 1983-2007, only 18 cases of brucellosis were reported: In 2006 three cases of which two had travelled to countries outside Europe and for the third case, there was no information available. In 2005 one case infected in Africa. In 2004 two cases; one infected at work (health care/ laboratory), the other infected in Cyprus. In 2003 three cases; two probably infected in Ethiopia and one probably infected in a laboratory. In 2002 three cases; from Spain, Iraq and Georgia. In 2001 two cases; both probably infected in Lebanon. In 2000 one case infected in Turkey probably through milk. In 1999 one case infected through milk in Turkey. In 1997 one immigrant from Turkey. In 1987 a Norwegian UN soldier stationed in Lebanon (B. melitensis).

Results of the investigation

No cases were reported

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

Brucellosis is rarely recorded in Norway. Since 1983, only 18 cases have been recorded. Two of these are known to be infected in Norway, both laboratory contracted.

Relevance as zoonotic disease

As Norway is free from brucellosis in terrestrial food producing animals, the risk of humans contracting brucellosis from such animals or from Norwegian animal products is considered negligible. However, the recent findings of Brucella species in marine mammals needs further

research to better understand the epidemiology and to address possible public health implications.

2.6.3. Brucella in foodstuffs

2.6.4. Brucella in animals

A. Brucella abortus in bovine animals

Status as officially free of bovine brucellosis during the reporting year

The entire country free

Norway is regarded as officially free from bovine brucellosis according to the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 28/ 07/ COL).

Monitoring system

Sampling strategy

Surveillance programme: During the years 2000-2004, the programme consisted of an active surveillance part, where 20% of the Norwegian cattle population were sampled each year, and a passive surveillance part, where aborted foetuses and blood samples from their dams were investigated. Since 20% of the Norwegian cattle population had been tested annually for five consecutive years and thereby fulfilled the requirements from the EU, the programme in 2005 was reduced to passive surveillance only. According to the programme, all abortions between the fifth month of pregnancy and 14 days before expected birth in a herd in which there has been at least two such abortions the last 12 months, should be sampled. In addition, blood samples from the cow should be examined.
All breeding bulls are tested.
Imported animals are serologically tested if considered relevant, based upon an assessment of the health status in the country of origin.
Tests are also carried out in connection with clinical indications and export.

Frequency of the sampling

All breeding bulls are tested serologically twice before being transferred to a semen collection centre, and subsequently retested within 12 months. Bulls are thereafter subject to yearly testing.
Imported cattle are tested at week 22 during the six months long isolation period.

Type of specimen taken

Other: Blood or foetus.

Methods of sampling (description of sampling techniques)

Surveillance programme: Foetus and the foetal membranes and paired blood samples from the mother are collected.
Other monitoring systems: Blood samples.
All samples are collected at farm.

Case definition

An animal which is seropositive for Brucella spp. even after retesting at least four weeks later, or an animal from which Brucella spp. has been isolated. The herd is the epidemiological unit.

Diagnostic/ analytical methods used

Foetus: Full autopsy, histopathology, bacteriology.
Blood samples from cows: Antibodies against Brucella in an indirect ELISA (Svanova). If the results are doubtful or positive, the samples are retested in duplicates. If the result still is doubtful or positive, the sample is tested with a competitive ELISA (C-ELISA, Svanova). If still positive, a complement fixation (CF) test is used. If the CF test is positive, new samples are taken four to six weeks after the initial sampling. If this is positive, or if there is a need for immediate follow up, the animal will be tested with an intracutane test using Brucellergene OCB from B. melitensis (Synbiotics).
Breeding animals, imports, exports: Serology (Rose bengal plate agglutination test, serum agglutination test or complement fixation test depending on the customers demands).
All tests are performed according to the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, 5th ed. 2004. The indirect ELISA is standardized against EU Directive 64/ 432/ EEC Annex C.

Vaccination policy

Vaccination of animals against brucellosis is prohibited in Norway.

Control program/ mechanisms

The control program/ strategies in place

The surveillance programme in cattle herds (in accordance to Council Directive 64/ 432/ EEC Annex I) was established in 2000.
All breeding bulls are serologically tested twice before being transferred to a semen collection centre, and subsequently within 12 months. Bulls are thereafter subjected to yearly testing.
Imported cattle are serologically tested if considered relevant based upon an individual assessment.
Tests are also carried out in connection with clinical indications and export.

Measures in case of the positive findings or single cases

Norway would as a minimum implement the measures as laid down in Council Directive 64/ 432/ EEC as amended in case of positive findings or if suspicion of brucellosis in bovine animals should arise.

Notification system in place

Bovine brucellosis has been a notifiable List A disease according to the Animal Diseases Act since 1903. Cases are to be notified to the Norwegian Food Safety Authority.

Results of the investigation

In 2007, all 352 bulls that were tested for brucellosis at the AI stations were negative.
A total of 12 foetal samples with corrsponding blood samples from the mother cows, and blood samples from three more cows were investigated for brucellosis, all were negative.

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

Bovine brucellosis was eliminated from Norway in 1953. No positive cases have been found since then.

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

There have been no findings of Brucella spp. in cattle or foodstuffs from cattle. The probability of contracting brucellosis from Norwegian animals or animal products of Norwegian origin is close to zero.

B. Brucella melitensis in sheep

Status as officially free of ovine brucellosis during the reporting year

The entire country free

Due to its history in regard to Brucella melitensis, Norway has been granted an officially brucellosis free status for small ruminants.

Monitoring system

Sampling strategy

Surveillance programme: A large proportion of herds being part of the breeding system with ram circles are tested. Randomly selected flocks not being part of any ram circles are also tested.
Imported sheep are serologically tested if considered relevant based upon an assessment of the health status in the country of origin.

Frequency of the sampling

Surveillance programme: A selection of herds in the population is tested every year.
Imported sheep are tested for brucellosis at week 2 and 23 during the two year isolation period.

Type of specimen taken

Blood

Methods of sampling (description of sampling techniques)

Individual blood samples are collected at the farms.
Surveillance programme: In flocks with less than 30 animals, all animals are sampled; in herds with 30 - 100 animals, 30 are sampled; in herds with 100 - 200 animals, 35 are sampled; in herds with more than 200 animals, 40 animals are sampled.

Case definition

An animal which is seropositive for Brucella spp. or an animal from which Brucella spp. has been isolated. The herd is the epidemiological unit.

Diagnostic/ analytical methods used

Rose bengal plate agglutination test is used for the initial screening. A competitive ELISA (C-ELISA, Svanova) was used to follow up unclear or positive reactions due to possible cross reactions.

Vaccination policy

Vaccination of animals against brucellosis is prohibited.

Control program/ mechanisms

The control program/ strategies in place

The national surveillance programme and the control of imported animals are run by the Norwegian Food Safety Authority.

Measures in case of the positive findings or single cases

Norway would as a minimum implement the measures as laid down in Council Directive 91/ 68/ EEC in case of positive findings or if suspicion of brucellosis in ovine animals should arise.

Notification system in place

Brucellosis in all species has been a notifiable List A disease according to the Animal Diseases Act since 1903. Cases are to be notified to the Norwegian Food Safety Authority.

Results of the investigation

In 2007, in the surveillance programme, 29633 animals from 1004 herds were tested for antibodies against B. melitensis. All were negative.
Animals tested in relation to import were negative.
All rams tested for brucellosis at the AI stations were negative.

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

Ovine brucellosis has never been recorded in Norway.

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

There have been no findings of Brucella spp. in sheep or foodstuffs from sheep. The probability of contracting brucellosis from Norwegian animals or animal products of Norwegian origin is close to zero.

C. Brucella melitensis in goats

Status as officially free of caprine brucellosis during the reporting year

The entire country free

Due to its history in regard to Brucella melitensis, Norway has been granted an officially

brucellosis free status for small ruminants.

Monitoring system

Sampling strategy

Surveillance programme: A large proportion of herds are selected for sampling each year. The programme started in 2007.
Imported goats are serologically tested if considered relevant based upon an assessment of the health status in the country of origin.

Frequency of the sampling

Surveillance programme: A selection of herds in the population is tested every year.
Imported goats are tested for brucellosis in week 2 and 23 during the two year's isolation period.

Type of specimen taken

Blood

Methods of sampling (description of sampling techniques)

Individual blood samples are collected at farm.
Surveillance programme: In flocks with less than 30 animals, all animals are sampled; in herds with 30 - 100 animals, 30 are sampled; in herds with 100 - 200 animals, 35 are sampled; in herds with more than 200 animals, 40 animals are sampled.

Case definition

An animal showing significant antibody titre to Brucella spp. or an animal from which Brucella spp. has been isolated. The herd is the epidemiological unit.

Diagnostic/ analytical methods used

Rose bengal plate agglutination test was used for initial screening. A competitive ELISA (C-ELISA, Svanova) was used to follow up unclear or positive reactions due to possible cross reactions.

Vaccination policy

Vaccination of animals against brucellosis is prohibited.

Control program/ mechanisms

The control program/ strategies in place

The national surveillance programme and the control of imported animals are run by the Norwegian Food Safety Authority.

Measures in case of the positive findings or single cases

Norway would as a minimum implement the measures as laid down in Council Directive 91/ 68/ EEC

in case of positive findings or if suspicion of brucellosis in caprine animals should arise.

Notification system in place

Brucellosis in all species has been a notifiable List A disease according to the Animal Diseases Act since 1903. Cases are to be notified to the Norwegian Food Safety Authority.

Results of the investigation

In 2007, inthe surveillance programme, 5734 animals from 183 herds were tested for antibodies against B. melitensis. All were negative.

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

Caprine brucellosis has never been recorded in Norway.

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

There have been no findings of Brucella spp. in goat or foodstuffs from goat. The probability of contracting brucellosis from Norwegian animals or animal products of Norwegian origin is close to zero.

D. Brucella spp. in animal - Pigs

Monitoring system

Sampling strategy

All breeding boars are tested.
Imported pigs are tested if considered relevant based upon an individual assessment.

Frequency of the sampling

All breeding boars are tested twice before being transferred to a semen collection centre, and subsequently within 12 months or before slaughter.
Imported pigs are tested during week 4 of the two months long isolation period.

Type of specimen taken

Blood

Methods of sampling (description of sampling techniques)

Blood samples are taken at the farms.

Case definition

An animal which is seropositive for Brucella spp. or an animal from which Brucella spp. has been isolated. The herd is the epidemiological unit.

Diagnostic/ analytical methods used

Rose bengal plate agglutination test performed according to the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, 5th ed. 2004.

Vaccination policy

Vaccination of animals against brucellosis is prohibited in Norway.

Control program/ mechanisms

The control program/ strategies in place

All breeding boars are tested.
Imported pigs are tested if considered relevant based upon an individual assessment.

Measures in case of the positive findings or single cases

If Brucella should be detected, the competent authorities must be notified without delay. Actions would be taken to identify and eliminate the source of the contamination in order to prevent further spread. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission would be imposed on the infected holding. The whole herd would be destroyed.

Notification system in place

Brucellosis in all species has been a notifiable List A disease according to the Animal Diseases Act since 1903. Cases are to be notified to the Norwegian Food Safety Authority.

Results of the investigation

In 2007, all 1450 investigated pigs belonging to a breeding company tested negative. A total of 349 of these were tested in relation to export of live animals.

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

Porcine brucellosis has never been recorded in Norway.

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

There have been no findings of Brucella spp. in swine or foodstuffs from swine. The probability of contracting brucellosis from Norwegian animals or animal products of Norwegian origin is close to zero.

Table Brucellosis in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Brucella spp.	B. melitensis	B. abortus	B. suis	Brucella spp., unspecified
Pigs	Breeding Company	animal	1450	0				
Dogs (1)	NVI	animal	25	0				

(1) : Mainly tested in relation to export.

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

Region	Total number of existing bovine		Officially free herds		Infected herds		Surveillance						Investigations of suspect cases								
							Serological tests			Examination of bulk milk samples			Information about abortions			Epidemiological investigation					
	Herds	Animals	Number of herds	%	Number of herds	%	Number of bovine herds tested	Number of animals tested	Number of infected herds tested	Number of bovine herds tested	Number of animals or pools tested	Number of infected herds	Number of notified abortions whatever cause	Number of isolations of Brucella infection	Number of abortions due to Brucella abortus	Number of animals tested with serological blood tests	Number of suspended herds	Number of positive animals		Number of animals examined microbio logically	Number of animals positive microbio logically
																		Serologically	BST		
NORGE	19300	902000	19300	100	0	0								0	0	15		0	0	12	0
Total	19300	902000	19300	100	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	12	0

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

Region	Total number of existing ovine / caprine		Officially free herds		Infected herds		Surveillance			Investigations of suspect cases				
	Herds	Animals	Number of herds	%	Number of herds	%	Number of herds tested	Number of animals tested	Number of infected herds	Number of animals tested with serological blood tests	Number of animals positive serologically	Number of animals examined microbio logically	Number of animals positive microbio logically	Number of suspended herds
NORGE	16700	2314900	16700	100	0	0	1187	35367	0	0				0
Total	16700	2314900	16700	100	0	0	1187	35367	0	0	0	0	0	0

2.7. YERSINIOSIS

2.7.1. General evaluation of the national situation

A. Yersinia enterocolitica general evaluation

History of the disease and/ or infection in the country

In the years 1982 - 1994, the number of notified cases in humans varied between 154 and 274 (mean 187). From 1994 there was a steady decline in the reported incidence of yersiniosis. The decline was interrupted in 1998, and since then the incidence has been between 71 and 150 notified cases per year.

Studies conducted during the 1980s revealed that a large proportion of Norwegian pigs were carriers of Y. enterocolitica serogroup O:3 and that the same variant frequently could be isolated from pig carcasses. In 1995-1996 a serological survey of all multiplier herds (n=66) belonging to the cooperative slaughterhouse organisation showed that 35.5% of the fattening pigs had antibodies against Y. enterocolitica O:3, and 80% of the herds had at least one pig (of 40 pigs tested per herd) with antibodies against Y. enterocolitica O:3. In an other survey where blood samples from 5 fatteners in each of 326 randomly selected herds were analysed for antibodies against Y. enterocolitica O:3, 53% of the pigs and 64% of the herds tested positive.
In 1997-1998, 300 samples of raw pork products were analyzed. Y. enterocolitica O:3 was isolated from 2% of the samples by a culturing method (NMKL method no. 117), while use of a PCR method indicated the presence of pathogenic Y. enterocolitica in 17%. This was lower than in a similar survey conducted in 1988-1989.

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

From 1994 to 1998, a reduction in the incidence of yersiniosis in humans was identified. This decline coincided with a gradual introduction of improved slaughter routines with the aim of preventing pig carcasses from becoming contaminated with Y. enterocolitica.

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

Pork products are generally considered the most important source of yersiniosis in humans. A Norwegian case-control study conducted in the period 1988-1990 identified consumption of such products as an important risk factor in addition to consumption of untreated drinking water and a general preference for undercooked meat.
In 2006 two smaller outbreaks of yersiniosis both linked to a traditional cold cuts pork product were reported.

Recent actions taken to control the zoonoses

During the mid 1990s, there was a gradual introduction of improved slaughter routines that aid in preventing pig carcasses from being contaminated with Y. enterocolitica. A significant reduction of reported cases of human yersiniosis cases was noted parallel to this.

2.7.2. Yersiniosis in humans

A. Yersinosis in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.
Cases confirmed by serology only are also reported, but due to recent changes in laboratory practices these are not included in this report.

Case definition

A case from which Yersinia enterocolitica or Y. pseudotuberculosis has been isolated or a clinical compatible case with an epidemiological link to a culture confirmed case.

Diagnostic/ analytical methods used

Bacteriology (isolation of Yersinia species) followed by voluntary confirmation (species identification and serotyping) at the National Reference Laboratory.

Notification system in place

According to the Communicable Disease Act, human cases are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1992.

History of the disease and/ or infection in the country

In the years 1982-1994, the number of notified cases varied between 154 and 274 (mean 187, median 182). From 1994 there was a steady decline in yersiniosis reports. This decline coincided with a gradual introduction of improved routines when slaughtering pigs, which resulted in reduced contamination with Y. enterocolitica to pig carcasses. The decline was interrupted in 1998, and since then the incidence has been between 71 and 150 notified cases per year.

Results of the investigation

In 2007, a total of 71 cases of yersiniosis were reported (incidence rate 1.5 per 100 000). A total of 44 (62%) cases were indigenous.

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

Although the incidence of yersiniosis has decreased in recent years and the number of registered cases is moderate, the disease is still the third most commonly recorded foodborne zoonotic infection in Norway. Moreover, the majority of the cases have acquired the infection within Norway. The vast majority of cases are sporadic, and most cases are indigenous. The most common serogroup is O:3. The number reported in 2007 is the lowest number since the surveillance of yersiniosis started.

Relevance as zoonotic disease

Yersiniosis is an important zoonotic disease in Norway, with the majority of cases acquired within Norway. Pigs are considered to be a major reservoir, and pork products are considered to be an important source for pathogenic Y. enterocolitica, although uncertainties still remain regarding the epidemiology.

Additional information

Patients whose work represents a risk for spread of the disease, e.g., in food production and health care, are advised to stay away from such work while they are having symptoms. It is recommended that for these patients two consecutive faecal samples examined after the symptoms have disappeared should be negative before returning to work.

2.7.3. Yersinia in foodstuffs

2.7.4. Yersinia in animals

A. Yersinia enterocolitica in pigs

Monitoring system

Sampling strategy

Animals at farm

There are no official monitoring programmes for Y. enterocolitica in live animals.

Animals at slaughter (herd based approach)

There are no official monitoring programmes for Y. enterocolitica in animals at slaughter.

Control program/ mechanisms

The control program/ strategies in place

There are no official monitoring programmes for Y. enterocolitica in animals.

Recent actions taken to control the zoonoses

During the mid 1990s, there was a gradual introduction of improved slaughter routines that aid in preventing pig carcasses from being contaminated with Yersinia enterocolitica. A significant reduction in the incidence of reported yersiniosis in humans was noted subsequent to this action.

Measures in case of the positive findings or single cases

None.

2.8. TRICHINELLOSIS

2.8.1. General evaluation of the national situation

A. Trichinellosis general evaluation

History of the disease and/ or infection in the country

Trichinellosis has been found sporadically in farmed food producing animals and was last detected in two pig herds in 1994. This was the first report of trichinellosis in pigs since 1981.
Trichinellosis occurs endemically among wild red foxes in mainland Norway and among wild arctic foxes and polar bears in the archipelago of Svalbard. In a survey in red foxes killed during the licenced hunting season in 1994-1995 and 2002-2005, 4.8% of 393 examined animals were positive for Trichinella larvae. Trichinellosis has also been diagnosed in farmed foxes.
T. spiralis and T. pseudospiralis have not been found in Norway. T. nativa is the most commonly found species.
Human trichinellosis acquired in Norway has not been reported since 1980. The two last reported cases of human trichinellosis, in 1996, were both imported.

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

Trichinellosis was last detected in food producing animals in 1994, in two pig herds.
Trichinellosis occurs endemically among wildlife.

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

As Norwegian food producing animals very rarely are infected with Trichinella, and all slaughtered pigs and horses are analysed for the parasite, the probability of contracting trichinellosis from food producing animals of Norwegian origin is close to zero.

2.8.2. Trichinellosis in humans

A. Trichinellosis in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.

Case definition

A clinically compatible case that is laboratory confirmed.

Diagnostic/ analytical methods used

Muscle biopsy and histopathology (demonstration of Trichinella larvae in tissue) and serology.

Notification system in place

According to the Communicable Disease Act, human cases are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1975.

History of the disease and/ or infection in the country

Human trichinellosis acquired in Norway is very rare, the last case being reported in 1980. The last two cases of imported trichinellosis were reported in 1996, in immigrants from ex-Yugoslavia.

Results of the investigation

No cases of human trichinellosis were reported.

Relevance as zoonotic disease

The risk of acquiring trichinellosis from domestic sources is considered very low because trichinellosis only has been detected twice in food producing animals since 1981, extensive surveillance programmes are in place, and Norwegian swine production is run under intensive and controlled conditions.

Additional information

If a human case should be diagnosed, epidemiological investigations will be initiated in order to identify the source and prevent further cases.

2.8.3. Trichinella in animals

A. Trichinella in pigs

Monitoring system

Sampling strategy

General

All pigs must be controlled for Trichinella at slaughter according to Council Directive 64/ 433/ EEC. This control is compulsory according to the Meat Inspection Act except for those animals slaughtered for on-the-farm consumption.

Frequency of the sampling

General

Every slaughtered animal is sampled.

Type of specimen taken

General

Diaphragm muscle.

Methods of sampling (description of sampling techniques)

General

Methods used are in accordance to Council Directive 77/ 96/ EEC. Up to 100 samples, each of 1 gram, can be analysed as a pooled sample when using a digestion method. Sometimes the compression method is used instead of a digestion method.

Case definition

General

An animal with a positive test result in the official examination.

Diagnostic/ analytical methods used

General

Artificial digestion method of pooled samples.

Preventive measures in place

It is prohibited to feed pigs with unsterilized household offal.

Control program/ mechanisms

The control program/ strategies in place

All pigs must be controlled for Trichinella at slaughter according to Council Directive 64/ 433/ EEC. This control is compulsory according to the Meat Inspection Act except for those animals slaughtered for on the-farm consumption.

Measures in case of the positive findings or single cases

Measures taken are according to Council Directive 64/ 433/ EEC. Measures imposed on holdings with positive findings of Trichinella are in accordance with Regulations concerning measures against contagious animal diseases of 27.06.2002 no 732 (not allowed to sell animals, carcasses must be incinerated, epidemiological investigations will be initiated). Detection of Trichinella must be reported immediately.
Farms delivering positive carcasses will be identified. The following six months animals from such farms will be given special attention at slaughter. The sample size for the digestion method will be increased to 2 grams.

Notification system in place

Trichinellosis has been a notifiable List B disease according to the Animal Diseases Act since 1965. Cases are to be notified to the Norwegian Food Safety Authority.

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

In 2007, no cases of trichinellosis among slaughtered pigs were reported.

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

Trichinellosis was last detected in two pig herds in 1994.

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

There have not been any findings of Trichinella in pigs or pig meat for many years. The risk of obtaining trichinellosis from Norwegian pig meat is negligible.

B. Trichinella in horses

Monitoring system

Sampling strategy

All horses must be controlled for Trichinella at slaughter according to Council Directive 64/ 433/ EEC. This control is compulsory according to the Meat Inspection Act except for those animals slaughtered for on-the-farm consumption.

Frequency of the sampling

Every slaughtered animal is sampled.

Type of specimen taken

Tongue or masseter muscle.

Methods of sampling (description of sampling techniques)

Methods used are in accordance to Council Directive 77/ 96/ EEC. A total of 10 g per carcass is sampled. For analyses, 5 g per animal is included in a pooled sample of maximum 100 g.

Case definition

An animal with a positive test result in the official examination.

Diagnostic/ analytical methods used

Artificial digestion method of pooled samples.

Results of the investigation including the origin of the positive animals

In 2007, no cases of trichinellosis among slaughtered horses were reported.

Measures in case of the positive findings or single cases

All horse carcasses that are included in a positive pooled sample will be retested individually (samples of 10 g). Measures taken are in accordance to Council Directive 64/ 433/ EEC. Measures imposed on holdings with positive findings of Trichinella are in accordance with Regulations concerning measures against contagious animal diseases of 27.06.2002 no 732 (not allowed to sell animals, carcasses must be incinerated, epidemiological investigations will be initiated). Detection of Trichinella must be reported immediately. Farms delivering positive carcasses will be identified. The following six months animals from such farms will be given special attention at slaughter.

Notification system in place

Trichinellosis has been a notifiable List B disease according to the Animal Diseases Act since 1965. Cases are to be notified to the Norwegian Food Safety Authority.

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

There have not been any findings of Trichinella in horses or horse meat. The risk of obtaining trichinellosis from Norwegian horse meat is negligible.

C. Trichinella spp., unspecified in animal - Wild animals

Monitoring system

Sampling strategy

All wild boars and animals belonging to the badger or bear families must be controlled for Trichinella at slaughter according to Council Directive 64/ 433/ EEC. This control is compulsory. Wild and farmed foxes and other species of wildlife are occasionally sampled.

Frequency of the sampling

Depending on the situation and animal species.

Type of specimen taken

Diaphragm, tongue or masseter muscles.

Methods of sampling (description of sampling techniques)

Dependig on the situation and animal species.

Case definition

An animal with a positive test result.

Diagnostic/ analytical methods used

Digestion methods or compression method.

Measures in case of the positive findings or single cases

If trichinellosis is diagnosed in a farmed fox, the animal holding will get official restrictions in accordance with Regulations concerning measures against contagious diseases of 27.06.2002 no 732 (not allowed to sell animals, carcasses must be incinerated, epidemiological investigations will be initiated).

Notification system in place

Trichinellosis has been a notifiable disease according to the Animal Diseases Act since 1965.

Results of the investigation including the origin of the positive animals

In 2007, one Raccoon dog (Nyctereutes procyonoides) was investigated for Trichinella and was found negative.

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

Trichinellosis occurs endemically among wildlife.

Table Trichinella in animals

	Source of information	Sampling unit	Units tested	Total units positive for Trichinella spp.	T. spiralis	Trichinella spp., unspecified
Pigs	Slaughter statistics	animal	1470100	0		
Solipeds, domestic						
horses	Slaughter statistics	animal	1400	0		
Raccoon dogs						
wild	NVI	animal	1	0		

2.9. ECHINOCOCCOSIS

2.9.1. General evaluation of the national situation

A. Echinococcus spp. general evaluation

History of the disease and/ or infection in the country

E. granulosus used to be relatively common in reideer in Northern Norway until the 1950s (approx. 10% prevalence in the 1950s). Today, the parasite is almost eliminated due to systematic anti-helmintic treatment of herd dogs and reduced use of raw slaughter offal to herd dogs. In 2003, one reindeer had pathological findings compatible with E. granulosus infestation. E. granulosus was last diagnosed in cattle in 1987.
E. multilocularis has never been detected in mainland Norway in any animal species. In 1999, in a research project on echinococcosis in the archipelago of Svalbard, E. multilocularis was detected in 16 % of 172 sibling voles tested. Pathological examinations revealed liver cysts. In a follow-up study, faecal samples from polar foxes, dogs, and cats were collected. The parasite was diagnosed in three of six faecal samples from polar foxes, in one of 48 dogs, and in none of two cats. The methods used were coproantigen ELISA, flotation (egg detection), and PCR. Of the wintered voles tested in 2000-2006, between 19% and 96% were positive each year.
Human echinococcosis has never been a public health problem in Norway.

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

The risk of acquiring echinococcosis in Norway is considered very low. The pathological finding compatible with E. granulosus infestation in a reindeer in 2003 is a reminder that this parasite still may be present and that this requires alertness in reindeer environments, especially as regard the importance of regular treatment of herd dogs with an anti-helmintic drug.
The occurrence of E. multilocularis among animals in the archipelago of Svalbard requires alertness among health personnel, especially in this region.

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

The pathological finding compatible with E. granulosus infestation in a reindeer in 2003 is a reminder that this parasite still may be present and that this requires alertness in reindeer environments.
As E. multilocularis has never been detected in mainland Norway in any animal species, the risk to humans of contracting echinococcosis caused by E. multilocularis in mainland Norway is probably very low. The occurrence of E. multilocularis among animals in the archipelago of Svalbard requires alertness among health personnel, especially in this region. Inhabitants of Svalbard have been informed about the risk.

2.9.2. Echinococcosis in humans

A. Echinococcus spp. in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.

Case definition

A clinical compatible case that is laboratory confirmed.

Diagnostic/ analytical methods used

Serology and histopathology.

Notification system in place

According to the Communicable Disease Act, human cases are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1 July 2003.

History of the disease and/ or infection in the country

Human echinococcosis has never been a public health problem in Norway and the incidence is considered to be at most very low.

Results of the investigation

In 2007, no cases were reported.

Relevance as zoonotic disease

The risk of acquiring echinococcosis in Norway is considered very low. The pathological finding compatible with E. granulosus infestation in a reindeer in 2003 is a reminder that this parasite still is around and that this requires alertness in reindeer environments, especially as regard the importance of regular treatment of herd dogs with an anti-helmintic drug.
As E. multilocularis has never been detected in mainland Norway in any animal species, the risk to humans of contracting echinococcosis caused by E. multilocularis in mainland Norway is close to zero. The recent detection of E. multilocularis among animals in the archipelago of Svalbard requires alertness among health personnel, especially in this region. Inhabitants of Svalbard have been informed about the risk.

2.9.3. Echinococcus in animals

A. E. granulosus in animal

Monitoring system

Sampling strategy

Surveillance in intermediate hosts is achieved through the official meat inspection.
There are no official monitoring programmes for Echinococcus granulosus among the final hosts (dogs).

Frequency of the sampling

All possible intermediate hosts are being subject to meat inspection procedure according to Council Directive 64/ 433/ EEC.

Methods of sampling (description of sampling techniques)

Inspection for hydatid cysts at the abattoir.

Case definition

An animal with a positive test result.

Diagnostic/ analytical methods used

Macroscopic (visual) examination of organs

Other preventive measures than vaccination in place

Dogs imported to Norway, except those imported from Sweden and Finland, must be treated with an anti-helmintic drug the last ten days before entering Norway and also one week after arrival. Treatment with an anti-helmintic drug is also advocated on a general basis, especially for herd dogs in areas with reindeer.

Control program/ mechanisms

The control program/ strategies in place

Mandatory official meat control.

Measures in case of the positive findings or single cases

An animal with cystic echinococcosis will be condemned. Epidemiological data will be collected in order to find the source of infection and measures will be introduced to prevent further spread.

Notification system in place

Echinococcosis has been a notifiable List B disease according to the Animal Diseases Act since 1985.

Results of the investigation

In 2007, all slaughtered animals subjected to official meat control were negative for E. granulosus. No cases of infection with E. granulosus were diagnosed in carnivores.

Additional information

Methods in use when examining final hosts: Faecal material: Coproantigen ELISA, flotation (egg detection), and PCR.

B. E. multilocularis in animal

Monitoring system

Sampling strategy

In 2006 a National surveillance porgramme regarding E. multilocularis in red foxes was started. In 2006, foxes killed during hunting in 2002-2005 were investigated. In 2007, animals hunted during the 2006-2007 hunting season were investigated.
There are no official monitoring programmes for E. multilocularis in other animals.

Methods of sampling (description of sampling techniques)

Foxes: Faecal samples.
Intermediate hosts: Autopsy.

Case definition

An animal with a positive test result.

Diagnostic/ analytical methods used

Other: Isolation of eggs and multiplex PCR

Other preventive measures than vaccination in place

Dogs and cats imported to Norway, except those imported from Sweden and Finland, must be treated with an anti-helmintic drug the last ten days before entering Norway and also one week after arrival. Treatment with an anti-helmintic drug is also advocated on a general basis. Due to findings of E. multilocularis in the archipelago of Svalbard, the Norwegian Animal Health Authority requires that dogs and cats that are introduced into mainland Norway from Svalbard must be treated with an anti-helmintic drug approved for treatment of E. multilocularis.

Control program/ mechanisms

Recent actions taken to control the zoonoses

The findings of E. multilocularis in the archipelago of Svalbard in 1999 resulted in follow-up studies, requirements regarding anti-helmintic treatment of dogs and cats in regard to export, and an information campaign directed to the inhabitants of Svalbard.

Notification system in place

Echinococcosis has been a notifiable List B disease according to the Animal Diseases Act since 1985.

Results of the investigation

A total of 483 red foxes killed during the hunting season 2006-2007 were investigated. All were negative.

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

In mainland Norway, E. multilocularis has never been detected in any animal species. In a study, serum samples from 98 farmed foxes were free from circulating antibodies to Em2 antigen. In mainland Norway the main host of E. multilocularis, the fox, has been investigated by examining a total of 811 red foxes killed during hunting from 2002-2007. All samples have been negative, and the red fox is therefore not suspected to harbour this parasite, and the parasite is not likely to be present in dogs and cats either.
In 1999, in a research project on echinococcosis in the archipelago of Svalbard, E. multilocularis was detected in 16 % of 172 sibling voles tested. In a follow-up study, the parasite was diagnosed in samples from polar foxes and dogs. Of the wintered voles tested in 2000-2006, between 19% and 96% were positive each year.

Table Echinococcus in animals

	Source of information	Sampling unit	Units tested	Total units positive for Echinococcus spp.	E. granulosus	E. multilocularis	Echinococcus spp., unspecified
Cattle (bovine animals)	Slaughter statistics	animal	319000	0			
Sheep	Slaughter statistics	animal	1139700	0			
Goats	Slaughter statistics	animal	19500	0			
Pigs	Slaughter statistics	animal	1470100	0			
Solipeds, domestic	Slaughter statistics	animal	1400	0			
Reindeers	Slaughter statistics	animal	46800	0			
Foxes	NVI	animal	483	0			

2.10. TOXOPLASMOSIS

2.10.1. General evaluation of the national situation

A. Toxoplasmosis general evaluation

History of the disease and/ or infection in the country

In 1994, the last year human toxoplasmosis was notifiable, 33 cases were reported (incidence rate 0.77 per 100 000 inhabitants) of which eight were children less than one year.
Toxoplasma gondii is endemic in animals in Norway with the domestic cat and wild lynx being the final hosts. Studies indicate that the parasite is relatively common among sheep; 18% of the lambs were seropositive in a survey conducted during the 1990s, and seropositive lambs were identified on 44% of the farms included. The parasite is assumed to be less common among Norwegian pigs. In the above mentioned survey, 2% of the slaughtering pigs tested were seropositive.
Also wild ruminants (cervids) can be infected; a survey carried out among 4300 cervids killed during hunting in 1992-2000, revealed 34% seropositive roe deer, 13% seropositive moose, 8% seropositive red deer and 1% seropositive reindeer.

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

Toxoplasma gondii is endemic in Norway with the domestic cat and wild lynx being the final hosts. Studies indicate that the parasite is relatively common among sheep and less common among Norwegian pigs. Also wild ruminants (cervids) can be infected. There are no data indicating recent developments in the prevalence of the infection in various species.

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

A case-control study designed to identify risk factors for maternal toxoplasma infection during pregnancy showed that the following exposures were associated with an increased risk:
Eating raw or undercooked minced meat, eating unwashed raw vegetables or fruits, eating raw or undercooked mutton, eating raw or undercooked pork, cleaning the cat litter box and washing the kitchen knife infrequently after preparing raw meat.
This implies that Norwegian farm animals and food products of Norwegian origin may well be an important source of human toxoplasmosis.

2.10.2. Toxoplasmosis in humans

A. Toxoplasmosis in humans

Reporting system in place for the human cases

Human cases that manifest as encephalitis are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.
Other cases of toxoplasmosis are not reported.

Case definition

A clinically compatible case that is laboratory confirmed.

Diagnostic/ analytical methods used

Serology (antibody detection) and parasitological examination (identification of parasite in clinical specimens).

Notification system in place

Since 1995, human toxoplasmosis has not been a notifiable disease in Norway except for when it manifests itself as encephalitis.

History of the disease and/ or infection in the country

In different epidemiological surveys conducted in Norway, 7-27% of pregnant women tested have been seropositive. The percentages have been age-dependent, with the proportion of seropositive individuals increasing with age, and have also varied with region and ethnicity.
It is estimated that approximately 90% of fertile women are susceptible to the disease and that approximately two out of 1000 susceptible pregnant women are infected during pregnancy.
In 1994, the last year human toxoplasmosis was notifiable, 33 cases were reported (incidence rate 0.77 per 100 000 inhabitants) of which eight were children less than one year.

Results of the investigation

In 2007, no cases were reported.

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

Toxoplasma gondii is endemic in Norway although the parasite is considered to be somewhat less prevalent as compared to countries more south in Europe. The public health importance of toxoplasmosis is its potential of causing severe disease in infants who are born to women infected during pregnancy, and its potential of causing severe disease in immunocompromised individuals, such as people with AIDS. Seroprevalence surveys among pregnant women indicate that infection with Toxoplasma is common in Norway. Pregnant women are advised how to avoid infection during pregnancy.

Relevance as zoonotic disease

A case-control study designed to identify risk factors for maternal toxoplasma infection during pregnancy showed that the following exposures were associated with an increased risk:
Eating raw or undercooked minced meat, eating unwashed raw vegetables or fruits, eating raw or undercooked mutton, eating raw or undercooked pork, cleaning the cat litter box and washing the kitchen knife infrequently after preparing raw meat. This implies that Norwegian farm animals and food products of Norwegian origin may well be an important source of Toxoplasma for spread to humans.

2.10.3. Toxoplasma in animals

A. T. gondii in animal

Monitoring system

Sampling strategy

Sampling of animals is performed in case of clinical suspicion and in connection to import/ export. Surveys are occasionally performed.

Frequency of the sampling

In cases of clinical suspicion.

Case definition

An animal with a positive test result.

Diagnostic/ analytical methods used

Serology (direct agglutination test) or pathology.

Measures in case of the positive findings or single cases

Normally none.

Notification system in place

Toxoplasmosis in animals has been a List C disease according to the Animal Diseases Act since 1965.

Results of the investigation

In 2007, several animal species were investigated for Toxoplasma at the National Veterinary Institute. Animal species with more than five investigated animals and more than one positive animal were: Wolves; six out of 42 animals had antibodies to Toxoplasma. Sheep; 15 animals (from 11 herds) out of 43 investigated sheep (from 25 herds) were positive. Goats: 31 animals (from 3 herds) out of 39 investigated goats (from 6 herds) were positive. The majority of investigated and positive goats came from one herd (a University herd used for research projects), which had a large problem with abortions.

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

Toxoplasma gondii is endemic in Norway. There are no data indicating recent developments in the prevalence of the infection in various species.

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

A risk for humans of contracting toxoplasmosis in Norway does exist. However, the relevance of clinical toxoplasmosis is most important in immunosuppressed persons and in pregnant women.

Additional information

T. spiralis and T. pseudospiralis have not been found in Norway. T. nativa is the most commonly found species.

Table Toxoplasma in animals

	Source of information	Sampling unit	Units tested	Total units positive for Toxoplasma	T. gondii
Sheep (1)	NVI	animal	43	15	15
Goats (2)	NVI	animal	39	31	31
Wolves					
wild	NVI	animal	42	6	6

(1) : A total of 11 out of 25 herds had positive animals
(2) : The 39 animals came from 6 herds, while the positive animals came from 3 herds. The majority of investigated and positive goats came from one herd (a University herd used for research projects), which had a large problem with abortions.

2.11. RABIES

2.11.1. General evaluation of the national situation

A. Rabies general evaluation

History of the disease and/ or infection in the country

Rabies in animals has not been recorded in mainland Norway. The disease has sporadically been diagnosed in polar fox, reindeer, and seal in the archipelago of Svalbard, the last time in a fox found dead in 1999 (25 animal cases were diagnosed during the period 1980-2007). However, transmission of rabies to humans has never been recorded in the archipelago of Svalbard.

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

The situation in mainland Norway regarding rabies is stable. However, there are concerns about the risk of introducing rabies through illegally imported dogs.

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

Rabies has sporadically been diagnosed in wild animals in the archipelago of Svalbard, the last occurrence was in 1999. Although no transmission of rabies to humans has been recorded in Svalbard, people being in contact with wild animals in Svalbard should be aware of the risk. In mainland Norway, the possible risk for introduction of rabies through illegally imported animals could pose a risk for humans.

2.11.2. Rabies in humans

A. Rabies in humans

Reporting system in place for the human cases

Human cases are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS), from microbiological laboratories as well as from clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.
Cases are also reported immediately to the Municipal Medical Officer. If a domestic animal source is suspected, the Municipal Medical Officer also informs the Norwegian Food Safety Authority. Investigations will be initiated in order to identify the source and prevent further cases.

Case definition

A clinical case that is laboratory confirmed.

Diagnostic/ analytical methods used

Detection of viral antigens by an immunofluorescence test in neurological tissue (usually brain) in connection to post-mortem examination, virus isolation in cell culture, or identification of an antibody titre greater than the threshold value in serum or cerebro-spinal fluid from an unvaccinated person.

Notification system in place

According to the Communicable Disease Act, human cases are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1975.

History of the disease and/ or infection in the country

Human rabies was last described in Norway in 1815.

Results of the investigation

In 2007, no human cases were reported.

Relevance as zoonotic disease

As mainland Norway has been free from rabies for almost two centuries and stringent regulation regarding import of animals are in place, the risk of contracting rabies in mainland Norway is close to zero. Rabies has sporadically been diagnosed in wild animals in the archipelago of Svalbard, the last time in a fox found dead in 1999. Although no transmission of rabies to humans has been recorded in Svalbard, people being in contact with wild animals in Svalbard should be aware of the risk.

Additional information

Rabies vaccine containing inactivated virus is available for the following indications: Pre-exposure prophylaxis to; 1) individuals with prolonged travels to countries with high incidence of rabies; 2) individuals who will work with animals in endemic areas; 3) persons who are at frequent risk of bites

from bats; 4) laboratory personnel involved in rabies diagnostics. Post-exposure prophylaxis to individuals presumably exposed to rabies virus abroad or in the archipelago of Svalbard, or who have been bitten by bats. The post-exposure prophylaxis includes specific antiserum in addition to the vaccine

2.11.3. Lyssavirus (rabies) in animals

A. Rabies in dogs

Monitoring system

Sampling strategy

There are no active surveillance programmes regarding rabies. However, being a notifiable disease, clinical suspicion of rabies must be reported immediately.

Frequency of the sampling

On clinical suspicion.

Type of specimen taken

Organs/ tissues: Brain

Methods of sampling (description of sampling techniques)

The brain is removed at autopsy, and samples are taken according the procedures described in the OIE manual.

Case definition

A case that is laboratory confirmed.

Diagnostic/ analytical methods used

Other: Fluorescent antibody test (FAT), cell culture test or mouse inoculation test. All performed according to the OIE manual, 5th ed. 2004. A very sensitive PCR method is also used.

Vaccination policy

Vaccines containing inactivated rabies virus antigen are available for dogs and cats intended for international transport that makes vaccination necessary or practical. Otherwise, vaccination against rabies is not done on a routine basis.

Other preventive measures than vaccination in place

Infected animals will be destroyed and measures taken to prevent further cases.

Control program/ mechanisms

The control program/ strategies in place

Dogs and cats entering Norway from countries not considered rabies free, are subject to four months of quarantine in an officially approved station, followed by a two months period in home quarantine. However, dogs and cats from EEA countries not considered rabies free are permitted into Norway without quarantine, provided they have been vaccinated against rabies

and have been proven antibody positive according to a given protocol.

Measures in case of the positive findings or single cases

Infected animals will be destroyed and measures taken to prevent further cases.

Notification system in place

Rabies has been a notifiable List A disease according to the Animal Diseases Act since 1965. Rabies is dealt with in Council Directive 92/ 65/ EEC, which is implemented in Regulations on animal health conditions regarding import and export of certain animals of 31.12.98 no. 1478.

Results of the investigation

In 2007 no cases were reported. Two dogs were investigated, but were found negative.

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

Mainland Norway is recognized as rabies-free. Rabies has sporadically been diagnosed in wild animals in the archipelago of Svalbard, the last time in a fox found dead in 1999. Although no transmission of rabies to dogs has been recorded in Svalbard, people in Svalbard should be aware of the risk.
There is a concern regarding a possible increase in the number of illegally imported dogs.

B. Rabies virus in animal - Wildlife

Monitoring system

Sampling strategy

There are no active surveillance programmes regarding rabies. However, the disease must be reported immediately on clinical suspicion.

Frequency of the sampling

On clinical suspicion.

Type of specimen taken

Organs/ tissues: Brain, in bats also oral swabs..

Methods of sampling (description of sampling techniques)

The brain is removed at autopsy, and samples are taken according the procedures described in the OIE manual.

Case definition

A case that is laboratory confirmed.

Diagnostic/ analytical methods used

Fluorescent antibody test (FAT), cell culture test or mouse inoculation test, all performed

according to the OIE Manual of Diagnostic Tests and vaccines for Terrestrial Animals, 5th ed. 2004. In addition, a very sensitive PCR method is used.

Measures in case of the positive findings or single cases

Infected animals will be destroyed and measures taken to prevent further cases.

Notification system in place

Rabies has been a notifiable List A disease according to the Animal Diseases Act since 1965. Rabies is dealt with in Council Directive 92/ 65/ EEC, which is implemented in Regulations on animal health conditions regarding import and export of certain animals of 31.12.98 no. 1478.

Results of the investigation

In 2007, all 30 tested animals were negative. The animals came from the Svalbard area and other polar areas (15 polar foxes and one polar bear) and from mainland Norway (14 red foxes). A total of 17 of these animals were killed/ found dead in 2006, but have not been reported earlier.

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

Mainland Norway is considered rabies-free. Rabies has sporadically been diagnosed in wild animals in the archipelago of Svalbard, the last time in a fox found dead in 1999. Although no transmission of rabies to other animal species has been recorded in Svalbard, people in Svalbard should be aware of the risk.

Table Rabies in animals

	Source of information	Sampling unit	Units tested	Total units positive for Lyssavirus (rabies)	Unspecified Lyssavirus	European Bat Lyssavirus - unspecified	Classical rabies virus (genotype 1)
Dogs	NVI	animal	2	0			
Foxes							
wild (1)	NVI	animal	29	0			
Polar bears							
wild	NVI	animal	1	0			

(1) : 14 red foxes from mainland Norway and 15 polar foxes from Svalbard and other polar areas

2.12. Q-FEVER

2.12.1. General evaluation of the national situation

2.12.2. Coxiella (Q-fever) in animals

3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE

3.1. ENTEROCOCCUS, NON-PATHOGENIC

3.1.1. General evaluation of the national situation

3.1.2. Enterococcus, non-pathogenic in animals

A. Enterococcus spp., unspecified in animal

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

Earlier surveys as well as data from the monitoring programme NORM-VET indicate a low to moderate prevalence of resistance in indicator enterococci from Norwegian food producing animals and food. Those resistances that are most commonly encountered are to antimicrobials that have been or still are typically used therapeutically.

3.1.3. Antimicrobial resistance in Enterococcus, non-pathogenic isolates

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

Sampling strategy used in monitoring

Frequency of the sampling

The sampling of animals for isolation of indicator enterococci to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET. The sampling is spread throughout the year and each year one or several animal species are included.
In 2007, turkey and swine were monitored. Only one sample from each herd or flock was included in NORM-VET. The samples from turkey and swine were collected within the frame of other surveillance programs. The number of samples from swine were organised to obtain approximately 200 isolates, whereas from turkey, all flocks in the turkey baseline survey were sampled.

Type of specimen taken

Faecal material taken at farm.

Methods of sampling (description of sampling techniques)

The samples from pigs were systematically selected throughout the year from faecal samples taken in the Salmonella surveillance programme. For turkeys, samples collected in the baseline survey were used.

Procedures for the selection of isolates for antimicrobial testing

Only one isolate from each flock or herd was included.

Methods used for collecting data

All samples were sent to the National Veterinary Institute in Oslo for identification and for antimicrobial susceptibility testing.

Laboratory methodology used for identification of the microbial isolates

A sample was plated directly onto the surface of Slanetz & Bartley agar (Oxoid) without broth enrichment. After incubation of the agar plates at 44°C for 48h, typical colonies were plated onto blood agar (Heart infusion agar (Difco) with 5% bovine blood). Typical colonies were tested by catalase reaction and E. faecium and E. faecalis were identified by ddl-PCR (Dutka-Malen et al., 1995). For the selective isolation of vancomycin resistant Enterococcus spp. (VRE), the samples were treated as described above, and plated out on additional Slanetz and Bartley's agar plates containing 32 mg/ L vancomycin. Colonies from each positive sample were selected, and the isolates confirmed as Enterococcus spp. by phenotypic characterization. The isolates were further identified to species level and tested for the presence of the vanA gene using PCR (Dutka-Malen et al, 1995, Simonsen et al, 2000).

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) was used for the susceptibility testing of all isolates. The antimicrobials included are listed in the tables.

Breakpoints used in testing

For interpretation of results epidemiological cut-off values recommended by EFSA were applied. When no cut-off value was reccomended, or the range of concentrations tested was inappropriate for the recommended value, a cut-off value was defined on basis of the actual MIC distributions obtained in the NORM-VET programme. The same approach was used when recommended cut-off values would have cut through distributions of MIC-values in a manner not in agreement with the concept of wildtype distributions, causing an erroneously high frequency of resistance in single year(s).

Control program/ mechanisms

The control program/ strategies in place

The sampling of animals for isolation of indicator enterococci to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET.

Results of the investigation

No vancomycin resistance was observed in the isolates obtained by a random selection. Five (3.9 %) of the strains obtained by a selective isolation procedure were vanA positive with MIC-values >128mg/ L. All of these isolates were E. faecium from faecal samples. For other results - see tables.

B. Antimicrobial resistance of Enterococcus spp., unspecified in food

Sampling strategy used in monitoring

Frequency of the sampling

The sampling of food for isolation of indicator enterococci to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET. The sampling is spread throughout the year and organized as to obtain approximately 100 isolates from each animal species. In 2007 turkey was monitored.

Type of specimen taken

Turkey meat was sampled from two slaughterhouses with processing plants within a project studying the occurrence of Campylobacter spp. in turkey meat.

Procedures for the selection of isolates for antimicrobial testing

Only one isolate from each sample was included.

Methods used for collecting data

All samples were sent directly to the National Veterinary Institute in Oslo for identification and for antimicrobial susceptibility testing.

Laboratory methodology used for identification of the microbial isolates

Five grams of material from each specimen were incubated in 45 ml of Azide dextrose broth (Oxoid). After incubation at 44°C for 24 h, a small amount (approx. 10µl) of broth was plated onto the surface of Slanetz & Bartley agar (Oxoid). After incubation of the agar plates at 44°C for 48h, typical colonies were plated onto blood agar (Heart infusion agar (Difco) with 5% bovine blood). Typical colonies were tested by catalase reaction and E. faecium and E. faecalis were identified by ddl-PCR (Dutka-Malen et al., 1995).
For the selective isolation of vancomycin resistant Enterococcus spp. (VRE), the samples were treated as described above, and plated out on additional Slanetz and Bartley's agar plates containing 32 mg/ L vancomycin. Colonies from each positive sample were selected, and the isolates confirmed as Enterococcus spp. by phenotypic characterization. The isolates were further identified to species level and tested for the presence of the vanA gene using PCR (Dutka-Malen et al, 1995, Simonsen et al, 2000).

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) was used for the susceptibility testing of all isolates. The antimicrobials included are listed in the tables.

Breakpoints used in testing

For interpretation of results epidemiological cut-off values recommended by EFSA were applied. When no cut-off value was reccomended, or the range of concentrations tested was inappropriate for the recommended value, a cut-off value was defined on basis of the actual MIC distributions obtained in the NORM-VET programme. The same approach was used when recommended cut-off values would have cut through distributions of MIC-values in a manner not in agreement with the concept of wildtype distributions, causing an erroneously high frequency of resistance in single year(s).

Control program/ mechanisms

The control program/ strategies in place

The sampling of food for isolation of indicator enterococci to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET.

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

	E. faecium
	Pigs
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	67

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	32	67	0							1	11	40	13	2									
Streptomycin	512	67	8											16	41	1		1	5		3		
Amphenicols																							
Chloramphenicol	32	67	0								36	29		2									
Glycopeptides (Cyclic peptides, Polypeptides)																							
Vancomycin	4	67	0						46	12	9												
Macrolides																							
Erythromycin	4	67	20					9	3	13	22	13	4	1		2							
Penicillins																							
Ampicillin	4	67	1					10	23	25	8	1											
Streptogramins																							
Virginiamycin	4	67	1					8	22	9	27	1											
Tetracyclines	2	67	13					41	13					2	10	1							

Table Antimicrobial susceptibility testing of E. faecium in Turkeys - quantitative data [Dilution method]

	E. faecium
	Turkeys
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	55

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	32	55	0								10	37	8										
Streptomycin	512	55	1											21	31	2					1		
Amphenicols																							
Chloramphenicol	32	55	0							5	24	19	3	4									
Glycopeptides (Cyclic peptides, Polypeptides)																							
Vancomycin	4	55	0						42	10	3												
Macrolides																							
Erythromycin	4	55	11					12	17	14	1	2	1	3		5							
Penicillins																							
Ampicillin	4	55	6				3	4	15	15	12	5		1									
Streptogramins																							
Virginiamycin	4	55	2					2	18	13	20	2											
Tetracyclines	2	55	13					38	4					1	11	1							

Table Antimicrobial susceptibility testing in E. faecium

n = Number of resistant isolates	E. faecium			
	Pigs		**Turkeys**	
Isolates out of a monitoring programme	no		no	
Number of isolates available in the laboratory	67		55	
Antimicrobials:	**N**	**n**	**N**	**n**
Aminoglycosides				
Gentamicin	67	0	55	0
Streptomycin	67	8	55	1
Amphenicols				
Chloramphenicol	67	0	55	0
Fully sensitive	67	34	55	37
Glycopeptides (Cyclic peptides, Polypeptides)				
Vancomycin	67	0	55	0
Macrolides				
Erythromycin	67	20	55	11
Penicillins				
Ampicillin	67	0	55	6
Resistant to 1 antimicrobial	67	25	55	11
Resistant to 2 antimicrobials	67	6	55	4
Resistant to 3 antimicrobials	67	1	55	3
Resistant to 4 antimicrobials	67	1	55	0
Resistant to >4 antimicrobials	67	0	55	0
Streptogramins				
Virginiamycin	67	1	55	2
Tetracyclines	67	13	55	13

Table Antimicrobial susceptibility testing of E. faecium in Meat from turkey - quantitative data [Dilution method]

	E. faecium
	Meat from turkey
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	47

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	32	47	0							1	6	26	14										
Streptomycin	512	47	0										1	8	30	8							
Amphenicols																							
Chloramphenicol	32	47	0							2	21	17	7										
Glycopeptides (Cyclic peptides, Polypeptides)																							
Vancomycin	4	47	0						29	14	4												
Macrolides																							
Erythromycin	4	47	18					7	8	9	5	7	4	3		4							
Penicillins																							
Ampicillin	4	47	2				1	8	19	10	7	2											
Streptogramins																							
Virginiamycin	4	47	1					5	18	6	17		1										
Tetracyclines	2	47	8					37	2			1	1		6								

Table Antimicrobial susceptibility testing in E. faecium

n = Number of resistant isolates	E. faecium	
	Meat from turkey	
Isolates out of a monitoring programme		no
Number of isolates available in the laboratory		47
Antimicrobials:	**N**	**n**
Aminoglycosides		
Gentamicin	47	0
Streptomycin	47	0
Amphenicols		
Chloramphenicol	47	0
Fully sensitive	47	23
Glycopeptides (Cyclic peptides, Polypeptides)		
Vancomycin	47	0
Macrolides		
Erythromycin	47	18
Penicillins		
Ampicillin	47	2
Resistant to 1 antimicrobial	47	22
Resistant to 2 antimicrobials	47	2
Resistant to 3 antimicrobials	47	0
Resistant to 4 antimicrobials	47	0
Resistant to >4 antimicrobials	47	0
Streptogramins		
Virginiamycin	47	1
Tetracyclines	47	8

Table Antimicrobial susceptibility testing of E. faecalis in Turkeys - quantitative data [Dilution method]

	E. faecalis
	Turkeys
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	1

Antimicrobials:	**Break point**	**N**	**n**	**Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to**																		
				<=0.03	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	32	1	0									1											
Streptomycin	512	1	0											1									
Amphenicols																							
Chloramphenicol	32	1	0									1											
Glycopeptides (Cyclic peptides, Polypeptides)																							
Vancomycin	4	1	0								1												
Macrolides																							
Erythromycin	4	1	1													1							
Penicillins																							
Ampicillin	4	1	0						1														
Tetracyclines	2	1	1											1									

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

	E. faecalis
	Pigs
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	19

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	32	19	1								1	3	14					1					
Streptomycin	512	19	4										1		3	11					4		
Amphenicols																							
Chloramphenicol	32	19	1								2	16				1							
Glycopeptides (Cyclic peptides, Polypeptides)																							
Vancomycin	4	19	0							16	3												
Macrolides																							
Erythromycin	4	19	2					3	7	5	2					2							
Penicillins																							
Ampicillin	4	19	0					1	15	3													
Tetracyclines	2	19	15					2	2		1			4	10								

Table Antimicrobial susceptibility testing in E. faecalis

n = Number of resistant isolates	E. faecalis			
	Pigs		**Turkeys**	
Isolates out of a monitoring programme	no		no	
Number of isolates available in the laboratory	19		1	
Antimicrobials:	**N**	**n**	**N**	**n**
Aminoglycosides				
Gentamicin	19	1	1	0
Streptomycin	19	4	1	0
Amphenicols				
Chloramphenicol	19	1	1	0
Fully sensitive	19	5	1	0
Glycopeptides (Cyclic peptides, Polypeptides)				
Vancomycin	19	0	1	0
Macrolides				
Erythromycin	19	2	1	1
Penicillins				
Ampicillin	19	0	1	0
Resistant to 1 antimicrobial	19	12	1	0
Resistant to 2 antimicrobials	19	0	1	1
Resistant to 3 antimicrobials	19	0	1	0
Resistant to 4 antimicrobials	19	2	1	0
Resistant to >4 antimicrobials	19	0	1	0
Tetracyclines	19	15	1	1

Table Antimicrobial susceptibility testing of E. faecalis in Meat from turkey - quantitative data [Dilution method]

	E. faecalis
	Meat from turkey
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	25

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	32	25	0									10	15										
Streptomycin	512	25	1												7	16	1		1				
Amphenicols																							
Chloramphenicol	32	25	0								13	12											
Glycopeptides (Cyclic peptides, Polypeptides)																							
Vancomycin	4	25	0						2	17	6												
Macrolides																							
Erythromycin	4	25	6					4	4	7	4			2	1	3							
Penicillins																							
Ampicillin	4	25	0					1	21	1	2												
Tetracyclines	2	25	13					10	2					10	3								

Table Antimicrobial susceptibility testing in E. faecalis

n = Number of resistant isolates	E. faecalis	
	Meat from turkey	
Isolates out of a monitoring programme		no
Number of isolates available in the laboratory		25
Antimicrobials:	**N**	**n**
Aminoglycosides		
Gentamicin	25	0
Streptomycin	25	1
Amphenicols		
Chloramphenicol	25	0
Fully sensitive	25	9
Glycopeptides (Cyclic peptides, Polypeptides)		
Vancomycin	25	0
Macrolides		
Erythromycin	25	6
Penicillins		
Ampicillin	25	0
Resistant to 1 antimicrobial	25	12
Resistant to 2 antimicrobials	25	4
Resistant to 3 antimicrobials	25	0
Resistant to 4 antimicrobials	25	0
Resistant to >4 antimicrobials	25	0
Tetracyclines	25	13

Table Breakpoints for antibiotic resistance of Enterococcus, non-pathogenic in Animals

Test Method Used

Broth dilution

Standards used for testing

NCCLS

Enterococcus, non-pathogenic	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracyclines	EFSA	2		2	0.5	64				
Amphenicols										
Chloramphenicol	EFSA	32		32	0.5	64				
Aminoglycosides										
Streptomycin (1)	EFSA	512		512	8	1064				
Gentamicin	EFSA	32		32	2	256				
Macrolides										
Erythromycin	EFSA	4		4	0.5	64				
Glycopeptides (Cyclic peptides, Polypeptides)										
Vancomycin	EFSA	4		4	1	128				
Penicillins										
Ampicillin	EFSA	4		4	0.25	32				
Streptogramins										
Virginiamycin (2)	E	4		4	0.5	64				

(1) : Cut-off value for E. faecium = 128, Cut-off value for E. faecalis = 512
(2) : Cut-off value only relevant for E. faecium

Footnote

EFSA = Cut-off values given in Report from EFSA (EFSA Journal (2008) 141:1-44).
E = epidemiological cut-off values based on MIC distribution.

Table Breakpoints for antibiotic resistance of Enterococcus, non-pathogenic in Food

Test Method Used

Broth dilution

Standards used for testing

NCCLS

Enterococcus, non-pathogenic	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracyclines	EFSA	2		2	0.5	64				
Amphenicols										
Chloramphenicol	EFSA	32		32	0.5	64				
Aminoglycosides										
Streptomycin (1)	EFSA	512		512	8	1064				
Gentamicin	EFSA	32		32	2	256				
Macrolides										
Erythromycin	EFSA	4		4	0.5	64				
Glycopeptides (Cyclic peptides, Polypeptides)										
Vancomycin	EFSA	4		4	1	128				
Penicillins										
Ampicillin	EFSA	4		4	0.25	32				
Streptogramins										
Virginiamycin (2)	E	4		4	0.5	64				

(1) : Cut-off value for E. faecium = 128, Cut-off value for E. faecalis = 512
(2) : Cut-off value only relevant for E. faecium

Footnote

EFSA = Cut-off values given in Report from EFSA (EFSA Journal (2008) 141:1-44).
E = epidemiological cut-off values based on MIC distribution.

3.2. ESCHERICHIA COLI, NON-PATHOGENIC

3.2.1. General evaluation of the national situation

A. Escherichia coli general evaluation

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

Earlier surveys as well as data from the monitoring programme NORM-VET indicate a low to moderate prevalence of resistance in indicator E. coli from Norwegian food producing animals and food. Those resistances that are most commonly encountered are to antimicrobials that have been or still are typically used therapeutically such as streptomycin, sulphonamides, tetracycline and ampicillin. Fluoroquinolone resistance is rarely detected, which is a reflection of a very low use of such antimicrobials in food producing animals in Norway.

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

A. Antimicrobial resistance of E.coli in animal - all animals - monitoring programme (NORM-VET)

Sampling strategy used in monitoring

Frequency of the sampling

The sampling of animals for isolation of indicator E. coli to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET. The sampling is spread throughout the year and each year one or several animal species are included.
In 2007, sheep, turkey and swine were monitored. Only one sample from each herd or flock was included in NORM-VET. The samples from sheep, turkey and swine were collected within the frame of other surveillance programmes. The number of samples from swine and sheep were organised to obtain approximately 200 isolates, whereas from turkey, all flocks in the turkey baseline survey were sampled.

Type of specimen taken

Faecal material taken at farm.

Methods of sampling (description of sampling techniques)

The samples from sheep and pigs were systematically selected throughout the year from faecal samples taken in the Salmonella surveillance programme. For turkey, samples collected in the baseline survey were used.

Procedures for the selection of isolates for antimicrobial testing

Only one isolate from each flock or herd was included.

Methods used for collecting data

All samples were sent to the National Veterinary Institute in Oslo for identification and for antimicrobial susceptibility testing.

Laboratory methodology used for identification of the microbial isolates

A sample was plated directly onto the surface of lactose-saccarose-bromthymol blue agar without broth enrichment. After incubation of the agar plates at 37 C for 24 h, a typical colony was plated onto blood agar (Heart infusion agar (Difco) containing 5% bovine blood). Colonies were identified as E. coli by typical appearance, lactose and/ or saccarose fermentation and a positive indole reaction.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) was used for the susceptibility testing of all isolates. The antimicrobials included are

listed in the tables.

Breakpoints used in testing

For interpretation of results epidemiological cut-off values recommended by EFSA were applied. When no cut-off value was reccomended, or the range of concentrations tested was inappropriate for the recommended value, a cut-off value was defined on basis of the actual MIC distributions obtained in the NORM-VET programme. The same approach was used when recommended cut-off values would have cut through distributions of MIC-values in a manner not in agreement with the concept of wild-type distributions, causing an erroneously high frequency of resistance in single year(s).

Control program/ mechanisms

The control program/ strategies in place

The sampling of animals for isolation of indicator E. coli to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET.

B. Antimicrobial resistance of E.coli in food - all foodstuffs - monitoring programme (NORM-VET)

Sampling strategy used in monitoring

Frequency of the sampling

The sampling of food for isolation of indicator E. coli to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET. The sampling is spread throughout the year and organized as to obtain approximately 100 isolates from each animal species. In 2007 turkey meat was monitored.

Type of specimen taken

Turkey meat was sampled at two slaughterhouses with processing plants within a project studying the occurrence of Campylobacter spp. in turkey meat.

Procedures for the selection of isolates for antimicrobial testing

Only one isolate from each sample was included.

Methods used for collecting data

All samples were sent directly to the National Veterinary Institute in Oslo for identification and for antimicrobial susceptibility testing.

Laboratory methodology used for identification of the microbial isolates

Five grams of the meat samples were incubated in 45 ml of MacConkey broth (Oxoid). After incubation at 44 C for 24 h, a small amount (approx. 10 microlitre) of broth was plated onto the surface of lactose-saccarose-bromthymol blue agar. After incubation of the agar plates at 37 C for 24

h, a typical colony was plated onto blood agar (Heart infusion agar (Difco) containing 5% bovine blood). Colonies were identified as E. coli by typical appearance, lactose and/ or saccarose fermentation and a positive indole reaction.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) was used for the susceptibility testing of all isolates. The antimicrobials included are listed in the tables.

Breakpoints used in testing

For interpretation of results epidemiological cut-off values recommended by EFSA were applied. When no cut-off value was reccomended, or the range of concentrations tested was inappropriate for the recommended value, a cut-off value was defined on basis of the actual MIC distributions obtained in the NORM-VET programme. The same approach was used when recommended cut-off values would have cut through distributions of MIC-values in a manner not in agreement with the concept of wild-type distributions, causing an erroneously high frequency of resistance in single a year(s).

Control program/ mechanisms

The control program/ strategies in place

The sampling of food for isolation of indicator E. coli to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET.

Table Antimicrobial susceptibility testing of E. coli in Sheep - quantitative data [Dilution method]

	E. coli
	Sheep
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	207

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	207	0					89	109	9													
Kanamycin	16	207	0							66	133	6	2										
Streptomycin	16	207	2							6	110	84	5			2							
Amphenicols																							
Chloramphenicol	16	207	0							17	153	37											
Florfenicol	16	207	0								109	98											
Cephalosporins																							
Cefotaxim	0.25	207	0		104	87	16																
Ceftiofur	1	207	0			2	78	124	3														
Fluoroquinolones																							
Ciprofloxacin	0.064	207	0	73	134																		
Penicillins																							
Ampicillin	8	207	2						20	95	70	20			2								
Quinolones																							
Nalidixic acid	16	207	0						1	150	56												
Sulfonamides																							
Sulfamethoxazol	256	207	2										199	6							2		
Tetracyclines																							
Tetracyclin	8	207	0						129	77	1												
Trimethoprim	2	207	1				148	56	2						1								

Table Antimicrobial susceptibility testing of E. coli in animals

n = Number of resistant isolates	E. coli									
	Sheep		**Cattle (bovine animals)**		**Pigs**		**Gallus gallus (fowl)**		**Turkeys**	
Isolates out of a monitoring programme	yes				yes				yes	
Number of isolates available in the laboratory	207				198				53	
Antimicrobials:	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**
Aminoglycosides										
Gentamicin	207	0			198	0			53	0
Kanamycin	207	0			198	2			53	2
Streptomycin	207	2			198	48			53	5
Amphenicols										
Chloramphenicol	207	0			198	0			53	1
Florfenicol	207	0			198	0			53	0
Cephalosporins										
Cefotaxim	207	0			198	1			53	0
Ceftiofur	207	0			198	1			53	0
Fluoroquinolones										
Ciprofloxacin	207	0			198	1			53	1
Fully sensitive	207	203			198	141			53	38
Penicillins										
Ampicillin	207	2			198	20			53	8
Quinolones										
Nalidixic acid	207	0			198	1			53	1
Resistant to 1 antimicrobial	207	2			198	23			53	9
Resistant to 2 antimicrobials	207	0			198	15			53	1
Resistant to 3 antimicrobials	207	1			198	6			53	4
Resistant to 4 antimicrobials	207	1			198	8			53	0
Resistant to >4 antimicrobials	207	0			198	5			53	1
Sulfonamides										
Sulfamethoxazol	207	2			198	25			53	3
Tetracyclines										
Tetracyclin	207	0			198	18			53	7
Trimethoprim	207	1			198	14			53	0

Table Antimicrobial susceptibility testing of E. coli in Turkeys - quantitative data [Dilution method]

	E. coli
	Turkeys
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	53

Antimicrobials:	**Break point**	**N**	**n**	**Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to**																			
				<=0.03	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	53	0					23	29	1													
Kanamycin	16	53	2							22	28	1		2									
Streptomycin	16	53	5								32	16		1	1	2		1					
Amphenicols																							
Chloramphenicol	16	53	1							5	39	8				1							
Florfenicol	16	53	0								32	21											
Cephalosporins																							
Cefotaxim	0.25	53	0		25	24	4																
Ceftiofur	1	53	0				9	42	2														
Fluoroquinolones																							
Ciprofloxacin	0.064	53	1	26	26		1																
Penicillins																							
Ampicillin	8	53	8					1	5	24	11	4			8								
Quinolones																							
Nalidixic acid	16	53	1						1	27	24					1							
Sulfonamides																							
Sulfamethoxazol	256	53	3										41	8	1						3		
Tetracyclines																							
Tetracyclin	8	53	7						21	25				3	1	3							
Trimethoprim	2	53	0				21	29	3														

Table Antimicrobial susceptibility testing of E. coli in Pigs - quantitative data [Dilution method]

	E. coli
	Pigs
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	198

Antimicrobials:	**Break point**	**N**	**n**	**Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to**																			
				<=0.03	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	198	0					101	91	6													
Kanamycin	16	198	2							107	84	5		2									
Streptomycin	16	198	48							7	92	51		8	15	16	7	2					
Amphenicols																							
Chloramphenicol	16	198	0						1	30	141	26											
Florfenicol	16	198	0								127	70	1										
Cephalosporins																							
Cefotaxim	0.25	198	1		106	72	19	1															
Ceftiofur	1	198	1			5	93	95	4	1													
Fluoroquinolones																							
Ciprofloxacin	0.064	198	1	129	68			1															
Penicillins																							
Ampicillin	8	198	20					1	35	63	57	22		1	19								
Quinolones																							
Nalidixic acid	16	198	1						8	120	67	2					1						
Sulfonamides																							
Sulfamethoxazol	256	198	25										143	27	3						25		
Tetracyclines																							
Tetracyclin	8	198	18					2	92	85	1			7	10	1							
Trimethoprim	2	198	14				88	89	7						14								

Table Antimicrobial susceptibility testing of E. coli in food

n = Number of resistant isolates	E. coli							
	Meat from pig		**Meat from bovine animals**		**Meat from broilers (Gallus gallus)**		**Meat from other poultry species**	
Isolates out of a monitoring programme							yes	
Number of isolates available in the laboratory							97	
Antimicrobials:	**N**	**n**	**N**	**n**	**N**	**n**	**N**	**n**
Aminoglycosides								
Gentamicin							97	1
Kanamycin							97	0
Streptomycin							97	6
Amphenicols								
Chloramphenicol							97	1
Florfenicol							97	0
Cephalosporins								
Cefotaxim							97	0
Ceftiofur							97	0
Fluoroquinolones								
Ciprofloxacin							97	0
Fully sensitive							97	73
Penicillins								
Ampicillin							97	13
Quinolones								
Nalidixic acid							97	0
Resistant to 1 antimicrobial							97	17
Resistant to 2 antimicrobials							97	4
Resistant to 3 antimicrobials							97	3
Resistant to 4 antimicrobials							97	0
Resistant to >4 antimicrobials							97	0
Sulfonamides								
Sulfamethoxazol							97	3
Tetracyclines								
Tetracyclin							97	10
Trimethoprim							97	0

Footnote

Turkey meat

Table Antimicrobial susceptibility testing of E. coli in Meat from turkey - quantitative data [Dilution method]

	E. coli
	Meat from turkey
Isolates out of a monitoring programme	yes
Number of isolates available in the laboratory	97

Antimicrobials:	Number of resistant isolates (n) and number of isolates with the concentration (u/ ml) or zone (mm) of inhibition equal to																						
	Break point	**N**	**n**	**<=0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**2048**	**>2048**	**lowest**	**highest**
Aminoglycosides																							
Gentamicin	2	97	1					26	65	5	1												
Kanamycin	16	97	0							29	62	5	1										
Streptomycin	16	97	6							2	44	43	2		1	2	3						
Amphenicols																							
Chloramphenicol	16	97	1							5	81	10				1							
Florfenicol	16	97	0								58	38	1										
Cephalosporins																							
Cefotaxim	0.25	97	0		45	47	5																
Ceftiofur	1	97	0			1	31	63	2														
Fluoroquinolones																							
Ciprofloxacin	0.064	97	0	48	49																		
Penicillins																							
Ampicillin	8	97	13					1	8	35	31	9			13								
Quinolones																							
Nalidixic acid	16	97	0						4	58	35												
Sulfonamides																							
Sulfamethoxazol	256	97	3										80	12	2						3		
Tetracyclines																							
Tetracyclin	8	97	10						42	45				3	4	3							
Trimethoprim	2	97	0				39	50	8														

Table Breakpoints used for antimicrobial susceptibility testing in Animals

Test Method Used

Broth dilution

Standards used for testing

NCCLS

Escherichia coli, non-pathogenic	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Amphenicols										
Chloramphenicol	EFSA	16		16	1	128				
Florfenicol	E	16		16	4	32				
Tetracyclines										
Tetracyclin	EFSA	8		8	0.5	64				
Fluoroquinolones										
Ciprofloxacin	E	0.064		0.064	0.008	1				
Enrofloxacin										
Quinolones										
Nalidixic acid	EFSA	16		16	1	128				
Trimethoprim	EFSA	2		2	0.25	32				
Sulfonamides										
Sulfonamide										
Sulfamethoxazol	EFSA	256		256	16	2048				
Aminoglycosides										
Streptomycin	EFSA	16		16	2	256				
Gentamicin	EFSA	2		2	0.5	64				
Neomycin										
Kanamycin	E	16		16	2	16				
Trimethoprim + sulfonamides										
Cephalosporins										
Cefotaxim	EFSA	0.25		0.25	0.064	2				
Ceftiofur	E	1		1	0.125	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	EFSA	8		8	0.25	32				

Footnote

EFSA = Cut-off values given in Report from EFSA (EFSA Journal (2008), 141:1-44).
E = epidemiological cut-off values based on MIC distribution.

Table Breakpoints used for antimicrobial susceptibility testing in Food

Test Method Used

Broth dilution

Standards used for testing

NCCLS

Escherichia coli, non-pathogenic	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Amphenicols										
Chloramphenicol	EFSA	16		16	1	128				
Florfenicol	E	16		16	4	32				
Tetracyclines										
Tetracyclin	EFSA	8		8	0.5	64				
Fluoroquinolones										
Ciprofloxacin	E	0.064		0.064	0.008	1				
Enrofloxacin										
Quinolones										
Nalidixic acid	EFSA	16		16	1	128				
Trimethoprim	EFSA	2		2	0.25	32				
Sulfonamides										
Sulfonamide										
Sulfamethoxazol	EFSA	256		256	16	2048				
Aminoglycosides										
Streptomycin	EFSA	16		16	2	256				
Gentamicin	EFSA	2		2	0.5	64				
Neomycin										
Kanamycin	E	16		16	2	16				
Trimethoprim + sulfonamides										
Cephalosporins										
Cefotaxim	EFSA	0.25		0.25	0.064	2				
Ceftiofur	E	1		1	0.125	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	EFSA	8		8	0.25	32				

Footnote

EFSA = Cut-off values given in Report from EFSA (EFSA Journal (2008), 141:1-44).
E = epidemiological cut-off values based on MIC distribution.

4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS

4.1. HISTAMINE

4.1.1. General evaluation of the national situation

4.1.2. Histamine in foodstuffs

A. Histamine in foodstuffs

Monitoring system

Sampling strategy

Regular testing of selected species is requiresd as an internal part of food business operators quality assurance system.
Occasionally surveys are performed.

Definition of positive finding

Histamine values above 100 mg/ kg.

Diagnostic/ analytical methods used

Reverse phase HPLC/ UV

Table Histamine in food

	Source of information	Sampling unit	Sample weight	Units tested	Total units in non- conformity	<= 100 mg/ kg	>100 - <= 200 mg/ kg	>200 - <= 400 mg/ kg	> 400 mg/ kg
Fish									
smoked (1)	NIFES	single		35	5	30	2	3	

(1) : Smoked or cured ("gravet") salmon and trout

4.2. ENTEROBACTER SAKAZAKII

4.2.1. General evaluation of the national situation

4.2.2. Enterobacter sakazakii in foodstuffs

4.3. STAPHYLOCOCCAL ENTEROTOXINS

4.3.1. General evaluation of the national situation

4.3.2. Staphylococcal enterotoxins in foodstuffs

5. FOODBORNE OUTBREAKS

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

A. Foodborne outbreaks

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

Health personnel are required to report suspected foodborne outbreaks to the Municipal Health Officer, who is required to report to the County Governor (Fylkesmannen) and to the Norwegian Institute of Public Health. Suspected outbreaks are reported immediately to the Municipal Medical Officer who notifies the Norwegian Institute of Public Health the same day. If a domestic food or animal source is suspected, the Municipal Medical Officer also informs the local Food Safety Authority.
The Norwegian Food Safety Authority has voluntary reporting where the District Offices report foodborne outbreaks.
Norway has since 2005 a web-based reporting system called Vesuv where all outbreaks in humans are to be reported and stored in a database at the Norwegian Institute of Public Health.
If an indigenous outbreak is suspected, epidemiological investigations will be initiated in order to identify the source and prevent further cases. For imported cases, the country of acquisition will be recorded. If information through international networks indicates that a case belongs to an outbreak, epidemiological investigations will be initiated.

Description of the types of outbreaks covered by the reporting:

All suspected foodborne outbreaks are notifiable. The definition of a foodborne outbreak is two or more human cases with the same infection where the cases are linked or are probably linked to the same food source, or when observed number of human cases exceeds the expected number of cases during the same time period and place, and food is a likely vehicle.

National evaluation of the reported outbreaks in the country:

Trends in numbers of outbreaks and numbers of human cases involved

The number of reported foodborne outbreaks has increased in Norway since the web-based reporting system was established in 2005 (42 in 2005, 65 in 2006 and 80 in 2007). We believe that this increasing trend is due to a higher reporting frequency rather than a real higher number of outbreaks.

Relevance of the different causative agents, food categories and the agent/ food category combinations

Traditionally, the most common cause of foodborne outbreaks in Norway has been bacterial intoxication (Clostridium perfringens, Bacillus cereus and Staphylococcus aureus). Recently, foodborne outbreaks of norovirus caused by infected foodhandlers have become more common.

Reported domestic outbreaks of salmonellosis and campylobacteriosis have been relatively rare.

Relevance of the different type of places of food production and preparation in outbreaks

Traditionally, outbreaks have mainly been associated with inadequate handling and temperature abuse, causing food intoxication. In addition, untreated water has caused several outbreaks.

Evaluation of the severity and clinical picture of the human cases

In 2007 there was one severe outbreak of listerosis due to contamination of a locally produced soft cheese, and 5 people with underlying diseases died. We also had a large waterborne outbreak in one municipality where more than 1000 out of 5000 citizens got infected with Campylobacter. The other outbreaks were not so severe.

Descriptions of single outbreaks of special interest

The severe outbreak of listeriosis in two hospitals in Oslo was caused by a soft cheese produced in a small private dairy on a farm with milk production. The Food Safety Authority found a very high number of Listeria monocytogenes both in the cheese and in the production facilities. The cheese had been sold to the hospitals and also on small markets. Nineteen patients were infected in the hospitals and two people bought the cheese on a local market.
A large outbreak of salmonellosis with 27 verified cases was caused by S. Weltevreden. The source was Alfalfa sprouts which were produced in Norway and the seeds were imported from Italy.
A large waterborne outbreak took place in Røros municipality and more than 1000 people were infected with Campylobacter jejuni. A case control study was conducted and the results showed that tap water was the source. The agent was not isolated from water samples after the outbreak.

Foodborne Outbreaks: summarized data

	Total number of outbreaks	Number of possible outbreaks	Number of verified outbreaks
Bacillus	5	4	1
Campylobacter	6	0	6
Clostridium	5	2	3
Escherichia coli, pathogenic	2	0	2
Foodborne viruses	14	12	2
Listeria	1	0	1
Other agents	4	0	4
Parasites	2	0	2
Salmonella	4	0	4
Staphylococcus	6	4	2
Unknown	31	31	0
Yersinia	2	0	2

Verified Foodborne Outbreaks: detailed data

B. cereus

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	70
Hospitalized	0
Deaths	0
Foodstuff implicated	Fish and fish products
More Foodstuff	Fish soup
Type of evidence	Laboratory detection in implicated food
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Domestic
Contributory factors	Inadequate heat treatment
Outbreaks	1
Comment	

C. jejuni

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	1000
Hospitalized	4
Deaths	0
Foodstuff implicated	Tap water, including well water
More Foodstuff	
Type of evidence	Analytical epidemiological evidence, Laboratory detection in human cases
Setting	Other setting
Place of origin of problem	Water distribution system
Origin of foodstuff	Not relevant
Contributory factors	Cross-contamination
Outbreaks	1
Comment	

C. jejuni

	Value
Code	
Subagent Choice	
Outbreak type	Household
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Tap water, including well water
More Foodstuff	Private water source
Type of evidence	Laboratory detection in human cases
Setting	Other setting
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	

C. jejuni

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	21
Hospitalized	3
Deaths	0
Foodstuff implicated	Sheep meat and products thereof
More Foodstuff	Lamb meat
Type of evidence	Laboratory detection in human cases, Analytical epidemiological evidence
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Domestic
Contributory factors	Cross-contamination
Outbreaks	1
Comment	

Thermophilic Campylobacter spp., unspecified

	Value
Code	
Subagent Choice	
Outbreak type	Household
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Turkey meat and products thereof
More Foodstuff	Fresh turkey meat
Type of evidence	Laboratory detection in human cases
Setting	Household
Place of origin of problem	Household, domestic kitchen
Origin of foodstuff	Domestic
Contributory factors	Unprocessed contaminated ingredient
Outbreaks	1
Comment	

Thermophilic Campylobacter spp., unspecified

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	13
Hospitalized	1
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Unknown
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	

Thermophilic Campylobacter spp., unspecified

	Value
Code	
Subagent Choice	
Outbreak type	Household
Human cases	2
Hospitalized	1
Deaths	0
Foodstuff implicated	Tap water, including well water
More Foodstuff	Private water source
Type of evidence	Laboratory detection in human cases
Setting	Other setting
Place of origin of problem	Unknown
Origin of foodstuff	Not relevant
Contributory factors	Unknown
Outbreaks	1
Comment	

C. perfringens

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	20
Hospitalized	0
Deaths	0
Foodstuff implicated	Broiler meat (Gallus gallus) and products thereof
More Foodstuff	
Type of evidence	Laboratory detection in implicated food
Setting	Canteen or workplace catering
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Domestic
Contributory factors	Inadequate heat treatment
Outbreaks	1
Comment	

C. perfringens

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	25
Hospitalized	0
Deaths	0
Foodstuff implicated	Bovine meat and products thereof
More Foodstuff	Stew
Type of evidence	Laboratory detection in implicated food
Setting	School, kindergarten
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Domestic
Contributory factors	Inadequate heat treatment
Outbreaks	1
Comment	

C. perfringens

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Broiler meat (Gallus gallus) and products thereof
More Foodstuff	Chicken wings
Type of evidence	Laboratory detection in implicated food
Setting	Other setting
Place of origin of problem	Household, domestic kitchen
Origin of foodstuff	Domestic
Contributory factors	Inadequate chilling
Outbreaks	1
Comment	

E.coli, pathogenic, unspecified

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	4
Hospitalized	1
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	

E.coli, pathogenic, unspecified

	Value
Code	
Subagent Choice	
Outbreak type	Household
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Household
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	

norovirus (Norwalk-like virus)

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	14
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Aircraft, ship, train
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Unknown
Contributory factors	Infected food handler
Outbreaks	1
Comment	

norovirus (Norwalk-like virus)

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	5
Hospitalized	0
Deaths	0
Foodstuff implicated	Fish and fish products
More Foodstuff	Sushi
Type of evidence	Laboratory detection in human cases
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Processing plant
Origin of foodstuff	Domestic
Contributory factors	Infected food handler
Outbreaks	1
Comment	

L. monocytogenes

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	21
Hospitalized	21
Deaths	5
Foodstuff implicated	Cheese
More Foodstuff	Local produced soft cheese
Type of evidence	Laboratory characterization of isolates
Setting	Hospital or medical care facility
Place of origin of problem	Other place of origin
Origin of foodstuff	Domestic
Contributory factors	Cross-contamination
Outbreaks	1
Comment	19 people were infected in the two hospitals and 2 had bought the cheese on a local market

Other

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	10
Hospitalized	0
Deaths	0
Foodstuff implicated	Tap water, including well water
More Foodstuff	Private water sources
Type of evidence	Laboratory detection in implicated food
Setting	Household
Place of origin of problem	Water source
Origin of foodstuff	Not relevant
Contributory factors	Unknown
Outbreaks	3
Comment	Fransicella tularensis

S. sonnei

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	6
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Unknown
Place of origin of problem	Travel abroad
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	

Cryptosporidium

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	33
Hospitalized	0
Deaths	0
Foodstuff implicated	Tap water, including well water
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Not relevant
Contributory factors	Unknown
Outbreaks	1
Comment	

G. intestinalis (lamblia)

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	5
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Unknown
Place of origin of problem	Travel abroad
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	Travel in Brazil

S. Paratyphi B var. Java

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	10
Hospitalized	0
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff	Baby spinach imported to Sweden from Italy
Type of evidence	Laboratory characterization of isolates
Setting	Other setting
Place of origin of problem	Travel abroad
Origin of foodstuff	Imported from outside EU
Contributory factors	Unknown
Outbreaks	1
Comment	Spinach bought in Sweden

S. Typhimurium

	Value
Code	
Subagent Choice	
Outbreak type	Household
Human cases	8
Hospitalized	3
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Other setting
Place of origin of problem	Unknown
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	

S. Typhimurium

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	50
Hospitalized	0
Deaths	0
Foodstuff implicated	Mixed or buffet meals
More Foodstuff	Norwegian and Tamil dishes
Type of evidence	Laboratory detection in human cases
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Unknown
Origin of foodstuff	Not relevant
Contributory factors	Unknown
Outbreaks	1
Comment	

S. Weltevreden

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	27
Hospitalized	3
Deaths	0
Foodstuff implicated	Herbs and spices
More Foodstuff	Sprouts of the type Alfalfa
Type of evidence	Laboratory characterization of isolates
Setting	Other setting
Place of origin of problem	Unknown
Origin of foodstuff	Imported from outside EU
Contributory factors	Unknown
Outbreaks	1
Comment	Seed imported from outside the EU

S. aureus

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	19
Hospitalized	0
Deaths	0
Foodstuff implicated	Cheese
More Foodstuff	French soft cheese
Type of evidence	Laboratory detection in implicated food
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	Catering services, restaurant
Origin of foodstuff	Intra community trade
Contributory factors	Unknown
Outbreaks	1
Comment	

S. aureus

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Other foods
More Foodstuff	Pizza
Type of evidence	Laboratory detection in implicated food
Setting	Household
Place of origin of problem	Processing plant
Origin of foodstuff	Unknown
Contributory factors	Unknown
Outbreaks	1
Comment	

O:3

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	7
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Unknown
Place of origin of problem	Travel abroad
Origin of foodstuff	Domestic
Contributory factors	Cross-contamination
Outbreaks	1
Comment	Travel to Greece

Y. enterocolitica

	Value
Code	
Subagent Choice	
Outbreak type	General
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Unknown
More Foodstuff	
Type of evidence	Laboratory detection in human cases
Setting	Unknown
Place of origin of problem	Unknown
Origin of foodstuff	Domestic
Contributory factors	Unknown
Outbreaks	1
Comment	