



NORWAY

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

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

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

IN 2006

INFORMATION ON THE REPORTING AND MONITORING SYSTEMCountry: **Norway**Reporting Year: **2006****Institutions and laboratories involved in reporting and monitoring:**

Laboratory name	Description	Contribution
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.
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.
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 advises 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.

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.
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PREFACE

This report is submitted to the European Commission in accordance with Article 9 of Council Directive 2003/99/EC¹. The information has also been forwarded to the European Food Safety Authority (EFSA).

The report contains information on trends and sources of zoonoses and zoonotic agents in Norway during the year 2006. The information covers the occurrence of these diseases and agents in humans, animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and commensal bacteria as well as information on epidemiological investigations of foodborne outbreaks. Complementary data on susceptible animal populations in the country is also given.

The information given covers both zoonoses that are important for the public health in the whole European Community as well as zoonoses, which are relevant on the basis of the national epidemiological situation.

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

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

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

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

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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 2006.

Data on slaughtered animals: Slaughtered in 2006.

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 17.6 cows. There are also a number of specialized beef herds with an average number of suckling cows being 11.0. 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 destined for the national market. A national breeding program is organized by the industry. Approximately 160 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 greatest 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 1994 there was a general ban on the import of live animals and animal products to Norway. As a consequence of the European Economic Area (EEA) agreement which came into force in 1994, the general ban on the import of these animals and animal products to Norway was lifted. But the import of live animals since 1994 has been very restricted. In 2006, eight live cattle, one live swine, 71 live sheep and 20 live goats were imported. Regarding poultry, grandparents are imported day old, mainly from Sweden.

Table Susceptible animal populations

* Only if different than current reporting year

Animal species	Category of animals	Number of herds or flocks		Number of holdings		Number of slaughtered animals		Livestock numbers (live animals)	
			Year*		Year*		Year*		Year*
Cattle (bovine animals)	mixed herds			1300				33300	
	dairy cows and heifers			13500				233700	
	meat production animals			4100				50800	
	in total			20500		332100		918200	
Deer	farmed - in total (1)			62		1300		2000	
Gallus gallus (fowl)	broilers			520		49167500			
	laying hens (2)			740		1764300		3235800	
Goats	milk goats			510				42500	
	in total			1300		21100		72100	
Pigs	breeding animals			1800				62200	
	fattening pigs			2700				432000	
	in total			3000		1527500		813800	
Sheep	animals over 1 year			15800				894100	
	in total			16000		1211300		2334200	
Solipeds, domestic	horses - in total					1600			
Turkeys	in total (3)			51		1025200		250400	

(1): Data on holdings and animals are from the Norwegian Red Deer Centre in 2005, data on slaughtered animals from the Norwegian Food Safety Authority.

(2): Only flocks >250 birds, except for slaughtered animals.

(3): Numbers includes small amounts of ducks and geese. Data includes only flocks >25 birds, except for slaughtered animals.

Footnote

Herd and holding is considered equivalent, and the numbers are reported in the column "Number of holdings". For poultry the numbers are reported either as number of holdings or number of flocks.

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

2. INFORMATION ON SPECIFIC ZOOSES AND ZOOBOTIC 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.

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 does not occur in 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 2006, a total of 1813 cases of salmonellosis were reported (incidence rate 39.4 per 100 000), of which 384 (21%) were infected in Norway. Altogether 895 (49%) of the cases were due to *S. Enteritidis*, of which 85 (9%) were infected in Norway, while 295 (16%) of the cases were due to *S. Typhimurium*, of which 135 (46%) 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 seems to have been quite stable the last five years. The number of reported cases infected in Norway in 2006 was the highest since 1987, this can mainly be ascribed to one large outbreak caused by *S. Kedougou*.

There has been an increase in the incidence of multiresistant *S. Typhimurium* DT104 infection acquired in Norway the last few years. In 2006 a total number of 18 domestic cases and 21 imported cases were reported. This is a reduction compared with 2005 (27 domestic and 26 imported).

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.

B. Salmonella spp. in broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Norwegian Salmonella Control Programme: All broiler flocks are sampled at slaughter. Samples of crushed meat are each year collected according to production capacity at the cutting plant.

Frequency of the sampling

At slaughterhouse and cutting plant

Other: At slaughterhouse: Every batch is sampled. At cutting plant: Production less than 2 tons; twice a year. Production 2 - 20 tons; once a month. Production greater than 20 tons; Once a week.

Type of specimen taken

At slaughterhouse and cutting plant

Other: At slaughterhouse: Neck skin. At cutting plant: Crushed meat from equipment or trimmings.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: All slaughter batches of poultry are sampled by taking neck skin at the end of the slaughter line.

At cutting 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.

Diagnostic/ analytical methods used

At slaughterhouse and cutting 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

One out of 5420 neck skin samples from poultry was found positive (*S. Anatum*). The positive sample was a pooled sample with neck skins from three different broiler flocks.

None of the crushed meat samples taken at meat production facilities were positive.

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.

C. Salmonella spp. in turkey meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Norwegian Salmonella Control Programme: All turkey flocks are sampled at slaughter. Samples of crushed meat are each year collected according to production capacity at the cutting plant.

Frequency of the sampling

At slaughterhouse and cutting plant

Other: At slaughterhouse: Every batch is sampled. At cutting plant: Production less than 2 tons; twice a year. Production 2-20 tons; once a month. Production greater than 20 tons; once a week.

Type of specimen taken

At slaughterhouse and cutting plant

Other: At slaughterhouse: Neck skin. At cutting plant: Crushed meat from equipment or from trimmings.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: All slaughter batches of poultry are sampled by taking neck skin at the end of the slaughter line.

At cutting 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 where Salmonella has been isolated.

Diagnostic/ analytical methods used

At slaughterhouse and cutting 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

No neck skins from turkey were found positive for Salmonella. None of the crushed meat samples taken at meat production facilities were positive.

For details, see tables.

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

The Norwegian Salmonella Control Programme document that domestically produced food products of animal origin is 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.

D. Salmonella spp. in pig meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Norwegian Salmonella Control Programme: A number of samples each year are collected randomly from the pig population at slaughterhouse according to the slaughter volume, both carcass swabs and lymph nodes. 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

A total of 3122 carcasses were swabbed, and none were positive.

One of the crushed pig meat samples taken at meat production facilities was positive (S. Dublin).

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.

E. Salmonella spp. in bovine meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Norwegian Salmonella Control Programme: A number of samples each year are collected randomly from the cattle population at slaughterhouse according to the slaughter volume, both carcass swabs and lymph nodes. 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

A total of 2035 carcasses were swabbed, all were negative.

The samples of crushed bovine meat samples 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%.

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.

F. Salmonella spp. in food - Meat from sheep

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant: The Norwegian Salmonella Control Programme: A number of samples each year is 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 95/ 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.

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

A total of 2538 carcasses were swabbed, and one was positive (*S. diarizonae*).
The samples of crushed sheep meat samples 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 poultry meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Anatum
Meat from poultry, unspecified									
carcass									
- at slaughterhouse - animal sample - neck skin (1)	NSCP	slaughter batch	>10 g	5420	1	0	0	0	1
- at cutting plant (2)	NSCP	single	25g	170	0				

(1) : The majority of samples are from broiler flocks. S. Anatum was isolated from one pooled sample consisting of neck skins from three broiler flocks.
 (2) : Crushed meat samples.

Footnote

NSCP = Norwegian Salmonella Control Programme

Table Salmonella in red meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Dublin	S. IIb61:k:1,5,7
Meat from pig										
carcass										
- at slaughterhouse - animal sample - carcass swabs	NSCP	animal	Swab	3122	0					
Meat from bovine animals										
carcass										
- at slaughterhouse - animal sample - carcass swabs	NSCP	animal	Swab	2035	0					
Meat from sheep										
carcass										
- at slaughterhouse - animal sample - carcass swabs	NSCP	animal	Swab	2538	1					1
Meat, red meat (meat from bovines, pigs, goats, sheep, horses, donkeys, bison and water buffalos)										
- at cutting plant (1)	NSCP	single	25g	1235	1				1	

(1) : Samples of crushed meat from cattle, pigs and sheep. The positive sample was crushed pig meat.

Footnote

NSCP = 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. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Live bivalve molluscs	NIFES	single	25g	45	0			

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 Programmes include all poultry breeding flocks. Sampling of breeding flocks of Gallus gallus is carried out in accordance with the programme laid down in Annex III of Council Directive 92/ 117/ EEC. The Norwegian Food Safety Authority is responsible for the sampling.

Other strategies: Animals are tested in relation to clinical surveillance and import.

Laying hens flocks

The Norwegian Salmonella Control Programme: All laying hen flocks are tested at farm and at slaughter.

Other strategies: Animals are tested in relation to clinical surveillance and import.

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: Grandparents: At the age of 1-2, 4, 9-11 and 13-14 weeks. Parents: At the age of 4 weeks and 2 weeks before transfer.

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

Other: Grandparents: At hatchery: Every 2 weeks, at farm: Every 4 weeks. Parents: Hatchery: Every 2 weeks.

Laying hens: Rearing period

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

Laying hens: Production period

Other: At the age of 25-30 and 48-52 weeks.

Laying hens: Before slaughter at farm

Every flock is sampled

Laying hens: At slaughter

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

Faeces

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

Other: At hatchery: Internal linings of hatching baskets. At farm: Faeces.

Laying hens: Rearing period

Faeces

Laying hens: Production period

Faeces

Laying hens: Before slaughter at farm

Faeces

Laying hens: At slaughter

Neck skin

Methods of sampling (description of sampling techniques)

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

30 internal lining of delivery boxes are sampled and pooled 5 and 5 in the laboratory. In some instances dead chickens is sampled, and the caecae from 10 birds are pooled to one sample.

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

60 faecal samples are pooled to one sample.

Breeding flocks: Production period

At hatchery: Meconium from at least 250 birds from the internal linings of hatching baskets is pooled to one sample.

At farm: 60 faecal samples are pooled to one sample.

Laying hens: Rearing period

60 faecal samples are pooled to one sample.

Laying hens: Production period

60 faecal samples are pooled to one sample.

Laying hens: Before slaughter at farm

60 faecal samples are pooled to one sample.

Laying hens: At slaughter

At least one neck skin sample from each flock is sampled.

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: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Laying hens: Day-old chicks

Bacteriological method: NMKL No 71:1999

Laying hens: Rearing period

Bacteriological method: NMKL No 71:1999

Laying hens: Production period

Bacteriological method: NMKL No 71:1999

Laying hens: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Laying hens: At slaughter

Bacteriological method: NMKL No 71:1999

Vaccination policy

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

Vaccination against 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, 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 invasive Salmonella serovars (*S. Gallinarum*, *S. Pullorum*, *S. Enteritidis*, *S. Berta*, *S. Typhimurium*, *S. Thompson*, *S. Infantis*) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be destroyed. Eggs from hatcheries where non-invasive Salmonella serovars have been detected must 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

None of the Norwegian breeding flocks were positive. None of the layer flocks were positive. For details, see table.

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

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 poultry production. However, Salmonella was in 2001 for the first time since the surveillance and control programme was implemented in 1995, detected in a breeding flock (*S. Agona* in a broiler parent flock).

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 carried out in accordance with the programme laid down in Annex III of Council Directive 92/ 117/ EEC. The Norwegian Food Safety Authority is responsible for the sampling.

Other strategies: Animals are tested in relation to clinical surveillance and import.

Broiler flocks

The Norwegian Salmonella Control Programmes: All broiler flocks are tested at slaughter.

The baseline survey in broilers (Commission Decision 2005/ 636/ EC) was performed according to instructions.

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: Grandparents: At the age of 1-2, 4, 9-11 and 13-14 weeks. Parents: At the age of 4 weeks and 2 weeks before transfer.

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

Other: Grandparents: At hatchery: Every 2 weeks, at farm: Every 4 weeks. Parents: Hatchery: Every 2 weeks.

Broiler flocks: Before slaughter at farm

Every flock is sampled

Broiler flocks: At slaughter (flock based approach)

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

Faeces

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

Other: At hatchery: internal linings of hatching baskets. At farm: Faeces.

Broiler flocks: Before slaughter at farm

Faeces

Broiler flocks: At slaughter (flock based approach)

Neck skin

Methods of sampling (description of sampling techniques)

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

30 internal lining of delivery boxes are sampled and pooled 5 and 5 in the laboratory. In some instances dead chickens is sampled, and the caecae from 10 birds are pooled to one sample.

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

60 faecal samples are pooled to one sample.

Breeding flocks: Production period

At hatchery: Meconium from at least 250 birds from the internal linings of hatching baskets is pooled to one sample.

At farm: 60 faecal samples are pooled to one sample.

Broiler flocks: Before slaughter at farm

60 faecal samples are pooled to one sample.

Baseline study (Commission Decision 2005/ 636/ EC): Sampled and analyzed according to instructions.

Broiler flocks: At slaughter (flock based approach)

At least one neck skin sample from each flock is sampled.

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.

Broiler flocks: At slaughter (flock 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

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Broiler flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Broiler flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Broiler flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Broiler flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

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

Vaccination against Salmonella is 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, 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 invasive Salmonella serovars (*S. Gallinarum*, *S. Pullorum*, *S. Enteritidis*, *S. Berta*, *S. Typhimurium*, *S. Thompson*, *S. Infantis*) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be destroyed. Eggs from hatcheries where non-invasive Salmonella serovars have been detected must 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: Day-old chicks

See breeding flocks, day-old chicks.

Broiler flocks: Rearing period

See breeding flocks, day-old chicks.

Broiler flocks: Before slaughter at farm

See breeding flocks, day-old chicks.

Broiler flocks: At slaughter (flock based approach)

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

None of the Norwegian breeding flocks or broiler flocks were positive. At slaughter, one pooled neck skin sample was positive for *S. Anatum* (see text and table on Salmonella in foodstuffs).

Regarding the baseline study in broilers (Commission Decision 2005/ 636/ EC), a total of 320 flocks were sampled (October 2005 - September 2006). One flock was positive (*S. Typhimurium*). The isolate was phagetyped (protocol defined by Colindale), but was characterized as non-typable. The isolate was also typed by MLVA, and the profile has never been seen in Norway before (or after), neither in isolates from humans nor in isolates from non-human sources. The strain was multi resistant, but the resistance profile is not a common one in Norway.

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

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 poultry production. However, Salmonella was in 2001 for the first time since the surveillance and control programme was implemented in 1995, detected in a breeding flock (*S. Agona* in a broiler parent flock).

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: A number of samples each year are collected randomly from the sow population at slaughterhouse according to the slaughter volume, both carcass swabs and lymph nodes. 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: A number of samples each year are collected randomly from the fattening pig population at slaughterhouse according to the slaughter volume, both carcass swabs and lymph nodes. 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 least 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 will be aseptically removed and pooled in a plastic bag. All samples will be 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

All of the 3484 lymph nodes taken in the Norwegian Salmonella Control Programme were negative. None of the 143 breeding herds were positive.

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

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 0.1%.

D. Salmonella spp. in bovine animals

Monitoring system

Sampling strategy

The Norwegian Salmonella Control Programme: A number of samples each year are collected randomly from the cattle population at slaughterhouse according to the slaughter volume, both carcass swabs and lymph nodes. 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 will be aseptically removed and pooled in a plastic bag. All samples will be 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

None of the 2317 animals tested in the Norwegian Salmonella Control Programme was positive. One herd of cattle was positive for *S. Typhimurium*.

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.

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 0.1%.

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 considerable 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

Animals at slaughter (herd based approach)

Other: Every flock is sampled.

Type of specimen taken

Animals at farm

Other: See the description of the programme in Gallus gallus

Animals at slaughter (herd based approach)

Other: Neck skin

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: 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. 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 invasive Salmonella serovars (*S. Gallinarum*, *S. Pullorum*, *S. Enteritidis*, *S. Berta*, *S. Typhimurium*, *S. Thompson*, *S. Infantis*) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be destroyed. Eggs from hatcheries where non-invasive Salmonella serovars have been detected must 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

None of the Norwegian breeder flocks were positive. None of the production flocks sampled in the Control Programme were positive on farm or at slaughter.

In addition to the results presented above and in the tables, animals/ flocks may have been sampled due to clinical problems, follow up or various projects. One back yard flock of ducks was found positive for *S. Typhimurium* when investigated as part of a follow up for another problem (in horses) at the farm. 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 flocks have been found, the last time *S. Muenchen* in a turkey flock in 1999. *S. Enteritidis* has never been detected in Norwegian poultry production.

Table Salmonella in breeding flocks of Gallus gallus

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Gallus gallus (fowl)							
grandparent breeding flocks, unspecified	NSCP	holding	2	0			
parent breeding flocks, unspecified	NSCP	holding	70	0			

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. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Gallus gallus (fowl)							
laying hens	NSCP	holding	641	0			
broilers sampling in the framework of the broiler baseline study (1)	NSCP	flock	4051	0			
		flock	320	1		1	
Ducks							
breeding flocks	NSCP	holding	2	0			
meat production flocks	NSCP	flock	50	0			
unspecified (2)	NVI	flock		1		1	
Turkeys							
breeding flocks	NSCP	holding	3	0			
meat production flocks	NSCP	flock	345	0			

(1) : The data covers the whole survey (October 2005 - September 2006).

(2) : As a follow up of another problem, a flock of ducks was found positive for S. Typhimurium.

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 (1)	NVI	animal	16	3		3	
Quails	NVI	animal	3	0			
Pheasants	NVI	animal	4	0			
Ostriches	NVI	animal	2	0			
Birds							
wild	NVI	animal	67	23		22	1

(1) : Not including wild pigeons.

Table Salmonella in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella spp.	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Montevideo	S. IIIb 61
Cattle (bovine animals)									
- Clinical investigations (2)	NVI	animal	281	2		2			
- at slaughterhouse - animal sample - lymph nodes	NSCP	animal	2317	0					
Sheep									
- Clinical investigations (3)	NVI	herd	84	15					15
Goats	NVI	herd	10	0					
Pigs									
breeding animals									
- at farm	NSCP	herd	143	0					
- at slaughterhouse - animal sample - lymph nodes	NSCP	animal	1073	0					
fattening pigs									
- at slaughterhouse - animal sample - lymph nodes	NSCP	animal	2411	0					
- Clinical investigations	NVI	animal	105	0					
Solipeds, domestic (1)	NVI	holding	69	3		2	2		
Cats	NVI	animal	41	1		1			
Dogs	NVI	animal	137	3		2		1	
Wild animals (4)	NVI	animal	7	1		1			
Zoo animals, all (5)	NVI	animal	39	13			13		

(1) : Three holdings were positive: One with S. Kedougou and S. diarizonae (38:r:z), one with S. Typhimurium and one with S. Typhimurium and S. Mikawasima.

(2) : Both animals came from the same farm.

(3) : All isolates were S. diarizonae (61:(k):1,5,(7))

(4) : One positive fox.

(5) : Samples from four different zoos. The isolated serotypes are: S. Poona (3), S. Tennessee (2), S. Glostrup, S. Lome, S. Agbeni, S. Paratyphi var. Java, S. enterica subsp enterica (4,12:-:e,n,x), S. enterica subsp. enterica serogroup 4, S. houtenae (44:z4z23:-), S. salamae (47:a:1,5).

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 level 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)

Norway's favourable salmonella situation in animals and humans is partly dependant upon the efficient control of animal feedingstuffs. The number of animals infected from feedingstuffs is probably very low, and feedingstuffs thereby represents 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
Feed material of land animal origin								
meat and bone meal (1)	NFSA	single	25g	625	8			8
Feed material of marine animal origin								
fish meal (2)	NFSA	single	25g	43	0			
fish oil	NFSA	single	25g	3	0			

(1) : Data from the Industry's Surveillance Programme

(2) : A total of 24 samples from feed mills producing fish feed and 19 samples from feed mills producing feed for land animals.

Footnote

NFSA = Norwegian Food Safety Authority. Data from the Compulsory Surveillance Programme unless stated otherwise. The isolates classified as Salmonella spp., unspecified: The data on serotypes are currently not available.

Table Salmonella in other feed matter

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Typhimurium	S. Enteritidis	Salmonella spp., unspecified
Feed material of cereal grain origin								
maize (1)	NFSA	single	25g	31	0			
Feed material of oil seed or fruit origin								
soya (bean) derived	NFSA	single	25g	27	0			
(Data from Industry's Surveillance Programme)	NFSA	single	25g	4036	160			160

(1) : Including maize derived.

Footnote

NFSA = Norwegian Food Safety Authority. Data from the Compulsory Surveillance Programme unless stated otherwise. The isolates classified as Salmonella spp., unspecified: The data on serotypes are currently not available.

Table Salmonella in compound feedingstuffs

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella spp.	S. Typhimurium	S. Enteritidis	Salmonella spp., unspecified	S. Agona
Compound feedingstuffs for cattle									
final product	NFSA	single	25g	3	0				
Compound feedingstuffs for pigs									
final product (1)	NFSA	single	25g	60	0				
Compound feedingstuffs for poultry (non specified)									
final product	NFSA	single	25g	61	0				
Pet food (3)									
	NFSA	single	25g	2	0				
dog snacks (pig ears, chewing bones) (2)	NVI	single	25g	39	4	1		1	2
Compound feedingstuffs for fur animal (4)	NFSA	single	25g	720	1			1	
All feedingstuffs									
- at feed mill - environmental sample - Surveillance - HACCP or own checks by industry (5)	NFSA	single	25g	11117	30	1		29	
Compound feedingstuffs for fish									
final product	NFSA	single	25g	800	0				

(1) : Including 8 samples of "Wet feed"

(2) : The Salmonella spp. was a 4,5,12:i:-.

(3) : Compound feed

(4) : Data from Norwegian Fur Breeders Association, Compulsory Surveillance Programme.

(5) : From feed mills producing feed for food producing land animals. Includes imported feedingstuffs. A total of 117 of the reported samples (all negative) are from the NFSA's Compulsory Surveillance Programme.

Footnote

NFSA = Norwegian Food Safety Authority. Data from the Compulsory Surveillance Programme unless stated otherwise. The isolates classified as Salmonella spp., unspecified: Unless stated otherwise, the data on serotypes are currently not available.

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	Sheep		Solipeds, domestic		Birds - wild		Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry		Dogs and cats		Zoo animals, all		Wild animals		Pigeons	
	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C
Sources of isolates (*)																						
Number of isolates in the laboratory	N=	0	15	5	23	23	0	2	0	0	0	1	0	1	0	4	13	13	1	1	0	3
Number of isolates serotyped	N=	0	15	0	5	0	2	0	0	0	1	0	1	0	0	4	0	13	0	1	0	3
Number of isolates per type																						
S. Agbeni																						1
S. Glostrup																						1
S. Kedougou			1																			
S. Lome																						1
S. Mikawasima																						
S. Montevideo																1						
S. Poona																						
S. Tennessee																						
S. Typhimurium																						
S. Paratyphi B var. Java																						
Salmonella spp. (1)																						
Salmonella spp., unspecified																						
S. IIIb 61 (2)																						15

(1) : From the horse: S. diarizonae (38:r:z). From the zoo animals: S. enterica subsp enterica (4,12:-:e,n,x), S. enterica subsp. enterica serogroup 4, S. houtenae (44:z4z23:-), S. salamae (47:a:1,5).
 (2) : S. diarizonae 61:(k):1,5,(7)

Footnote

(*) M : Monitoring, C : Clinical

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	
	M	C	M	C	M	C	M	C	M	C	M	C
Sources of isolates (*)												
Number of isolates in the laboratory	N=											
Number of isolates serotyped	N=											
	1	0	1	0	1	0	1	0	0	0	0	0
	1	0	0	0	1	0	1	0	0	0	0	0
Number of isolates per type												
S. Anatum (1)												
S. Dublin (2)					1							
S. IIIb61:k:1,5,7 (3)	1											

(1) : From a pooled neck skin sample consisting of neck skins from three different broiler flocks.
 (2) : From a sample of crushed pig meat at cutting plant.
 (3) : From a swab from a sheep carcasse.

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 resistance tested as well. Exceptions from the rules described above are that not all *S. diarizonae* from sheep or *S. Typhimurium* from wild birds or Salmonella from reptiles or other 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, NMKL No 71:1999 is 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 the European Committee on Antimicrobial Susceptibility Testing (EUCAST) were used (<http://www.esamid.org>). When no cut-off value was available, 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.

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. Typhimurium in All animals - quantitative data [Dilution method]

S. Typhimurium																							
All animals																							
Number of resistant isolates (n) and number of isolates with the concentration µl/ml or zone (mm) of inhibition equal to																							
Isolates out of a monitoring programme																							
Number of isolates available in the laboratory	7																						
Antimicrobials:	N	n	<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
Tetracyclines																							
Tetracyclin	7	0							7														
Amphenicols																							
Chloramphenicol	7	1						1		5						1							
Florfenicol	7	0								7													
Cephalosporins																							
Cefotaxim	7	0		3	4																		
Ceftiofur	7	0				1	2	4															
Fluoroquinolones																							
Ciprofloxacin	7	0	2	5																			
Quinolones																							
Nalidixic acid	7	0							5	2													
Sulfonamides																							
Sulfonamide	7	1									1	5											1
Trimethoprim																							
Trimethoprim	7	1				3	2	1						1									
Aminoglycosides																							
Streptomycin	7	1									4	2											1
Gentamicin	7	0					4	3															
Kanamycin	7	0						5	2														
Penicillins																							
Ampicillin	7	1					3	2	1						1								

Footnote

The table includes one isolate from each of the following species: cattle, broiler (from the baseline survey), dog, cat, horse, pigeon and duck.

Table Antimicrobial susceptibility testing of S. Typhimurium in animals

n = Number of resistant isolates										
S. Typhimurium										
	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Turkeys		Other animals (See footnote)	
Isolates out of a monitoring programme	no				yes					
Number of isolates available in the laboratory	1				1				5	
Antimicrobials:	N	n	N	n	N	n	N	n	N	n
Tetracyclines										
Tetracyclin	1	0			1	0			5	0
Amphenicols										
Chloramphenicol	1	0			1	1			5	0
Cephalosporins										
Cefotaxim	1	0			1	0			5	0
Ceftiofur	1	0			1	0			5	0
Fluoroquinolones										
Ciprofloxacin	1	0			1	0			5	0
Quinolones										
Nalidixic acid	1	0			1	0			5	0
Sulfonamides										
Sulfonamide	1	0			1	1			5	0
Trimethoprim	1	0			1	1			5	0
Aminoglycosides										
Streptomycin	1	0			1	1			5	0
Gentamicin	1	0			1	0			5	0
Kanamycin	1	0			1	0			5	0
Penicillins										
Ampicillin	1	0			1	1			5	0
Fully sensitive	1				0				5	
Resistant to 1 antimicrobial	0				0				0	
Resistant to 2 antimicrobials	0				0				0	
Resistant to 3 antimicrobials	0				0				0	
Resistant to 4 antimicrobials	0				0				0	
Resistant to >4 antimicrobials	0				1				0	
Number of multiresistant S. Typhimurium DT104										
with penta resistance					0					
resistant to other antimicrobials					0					

Footnote

The table includes one isolate from cattle and one isolate from a broiler flock (from the baseline survey). The five isolates listed under other animals are from a dog, a cat, a horse, a pigeon and a flock of ducks.

Table Antimicrobial susceptibility testing of Salmonella spp. in All animals (Not including S. Typhimurium or S. Enteritidis) - quantitative data [Dilution method]

Number of resistant isolates (n) and number of isolates with the concentration µl/ml or zone (mm) of inhibition equal to		Salmonella spp.																					
All animals (Not including S. Typhimurium or S. Enteritidis)																							
Isolates out of a monitoring programme																							
Number of isolates available in the laboratory	6																						
Antimicrobials:	N	n	<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
Tetracyclines																							
Tetracyclin	6	1						2	3				1										
Amphenicols																							
Chloramphenicol	6	0						2	1	3													
Florfenicol	6	0							3	3													
Cephalosporins																							
Cefotaxim	6	0		3	2	1																	
Ceftiofur	6	0				1	4	1															
Fluoroquinolones																							
Ciprofloxacin	6	0	1	5																			
Quinolones																							
Nalidixic acid	6	0						1	5														
Sulfonamides																							
Sulfonamide	6	0				2	4				1	3	2										
Trimethoprim																							
Aminoglycosides																							
Streptomycin	6	0							1	4	1												
Gentamicin	6	0				5	1																
Kanamycin	6	0					4	2															
Penicillins																							
Ampicillin	6	0				2	3	1															

Footnote

This table includes all Salmonella except S. Typhimurium. The table includes One S. Montevideo from a dog, one S. Kedougou and one S. diarizonae (38:r:z) from the same holding with horses, one S. Mikawasima from another horse, one S. Anatum from neck skins from broiler, and one S. Dublin from a crushed pig meat sample. The two latter strains were isolated in the Norwegian Salmonella Control Programme.

Table Antimicrobial susceptibility testing of Salmonella in animals

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

Footnote

This table includes all Salmonella except *S. Typhimurium*. The table includes One *S. Montevideo* from a dog, one *S. Kedougou* and one *S. diarizonae* (38:r:z) from the same holding with horses, one *S. Mikawasima* from another horse, one *S. Anatum* from neck skins from broiler, and one *S. Dublin* from a crushed pig meat sample. The two latter strains were isolated in the Norwegian Salmonella Control Programme.

Table Breakpoints for antibiotic resistance testing in Animals

Test Method Used

Disc diffusion

Agar dilution

Broth dilution

E-test

Standards used for testing

NCCLS

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

Footnote

E = Epidemiological cut-off values

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 has 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 bio security. 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% and 4.9% in 2002, 2003, 2004, 2005 and 2006, respectively. The number of flocks going positive out on the market has been reduced from 127 in 2002 to 48 in 2006.

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. 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 decreased slightly in 2006 compared to the 2005.

The prevalence in broiler flocks increased from 3.6% in 2005 to 4.9% in 2006. However, the number of positive flocks reaching the market untreated (ie. not frozen or heat treated) was almost identical in 2006 as in 2005. This is due to the improved detection of positive flocks before slaughter and the channeling of products from these flocks to heat treatment or freezing.

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

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 species 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 both domestic and imported cases increased again and approached the numbers reported in 2001.

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

A total of 2593 cases (incidence rate 56.3 per 100 000) were reported of which 1252 (48%) were

known to be imported. 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 decreased slightly in 2006 compared to 2005. 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 must be 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 retail

A total of 100 samples per month are taken, 25 in each of four Norwegian cities (part of the Norwegian action plan against Campylobacter in broilers).

Frequency of the sampling

At retail

Other: 100 samples each month

Type of specimen taken

At retail

Fresh meat

Methods of sampling (description of sampling techniques)

At retail

A total of 100 samples per month (March - December) are taken at retail, 25 in each of four Norwegian cities. Each month, several shops are visited and the visits are distributed throughout the month, with the purpose to sample different production batches. 10 grams of each sample is analysed.

Definition of positive finding

At retail

A product where Campylobacter spp. is found.

Diagnostic/ analytical methods used

At retail

Bacteriological method: NMKL no 119, 1990

Preventive measures in place

The broiler flocks found positive in the surveillance programme before slaughter are subject 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

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

No measures are taken upon positive findings at retail level.

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

A total of 958 fresh products were investigated, 81 (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 government. 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 2006 prevented more than 7 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. jejuni	C. upsaliensis	thermophilic Campylobacter spp., unspecified
Meat from broilers (Gallus gallus)										
fresh	NACB	single	10g	958	81	8	4	68		1

Footnote

NACB = Norwegian Action plan against Campylobacter in Broilers.

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 Method published by DFVF, Denmark: Å-5-AR-531

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 be 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

Of the 3908 flocks slaughtered in Norway in 2005, 190 flocks (4.9%) were positive for *Campylobacter* spp. (either positive pre-slaughter, positive at slaughter or positive at both sampling times).

At farm, maximum four days before slaughter, a total of 142 positive flocks were discovered, and

thereby subject to heat treatment or freezing for at least 3 weeks. At slaughter, all flocks (in fact all slaughter batches) were again sampled, and out of the 4035 slaughter batches, 191 (4.7%) were positive. Of these, a total of 23 batches were positive only by the pre-slaughter sample, and not by the sample taken at the slaughterhouse. Therefore, a total of 168 positive slaughter batches were identified at the slaughterhouse.

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

There has been a reduction in the prevalence of positive flocks from 2002 to 2006. The yearly prevalence these years has been 6.3%, 4.9%, 3.3%, 3.6% and 4.9%, 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 2006 being 22%. With such amounts of positive flocks, of which approximately 25% is not detected before slaughter and therefore not 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	41	15	10				5
Sheep	NVI	animal	8	2	1				1
Gallus gallus (fowl)									
broilers									
- at farm	NACB	flock	3878	142					142
- at slaughterhouse	NACB	slaughter batch	4035	168	148	12			8
Turkeys		flock	36	10	6	1			3
Dogs	NVI	animal	103	20	4		2	10	4
Cats	NVI	animal	23	2					2

Footnote

NACB = Norwegian Action Plan against Campylobacter in broilers. All broiler flocks are tested maximum four days before slaughter and again at slaughter. There is no information available on the Campylobacter species from broiler farm samples because the method used is a PCR method where no isolates are obtained.
 NVI = National Veterinary Institute, mainly diagnostic submissions.

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

The isolates of Campylobacter being included in the monitoring of antimicrobial resistance are isolated in connection with the Norwegian action plan against Campylobacter in broilers. For description of the action plan, see Thermophilic Campylobacter in Gallus gallus.

Type of specimen taken

See Thermophilic Campylobacter in Gallus gallus.

Methods of sampling (description of sampling techniques)

See Thermophilic Campylobacter in Gallus gallus.

Procedures for the selection of isolates for antimicrobial testing

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

Methods used for collecting data

Strains are 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) 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 the European Committee on Antimicrobial Susceptibility Testing (EUCAST) were used (<http://www.esamid.org>). When no cut-off value was available, 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.

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.

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

Number of resistant isolates (n) and number of isolates with the concentration µl/ ml) or zone (mm) of inhibition equal to																							
<i>C. jejuni</i>																							
Gallus gallus (fowl) - broilers - at slaughterhouse - Surveillance																							
Isolates out of a monitoring programme	yes																						
	N	n	<=0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
Number of isolates available in the laboratory	108	0				102	6																
Antimicrobials:																							
Tetracyclines																							
Tetracyclin	108	0				102	6																
Fluroquinolones																							
Enrofloxacin	108	2		6	87	13					2												
Quinolones																							
Nalidixic acid	108	2						2	34	70			1										
Aminoglycosides																							
Gentamicin	108	0				11	79	18															
Macrolides																							
Erythromycin	108	0				13	62	33															
Penicillins																							
Ampicillin	108	7						3	9	68	21	2	3	1	1								

Table Antimicrobial susceptibility testing of Campylobacter in animals

n = Number of resistant isolates						
Campylobacter spp., unspecified						
	Gallus gallus (fowl)		Cattle (bovine animals)		Pigs	
Isolates out of a monitoring programme	yes					
Number of isolates available in the laboratory	108					
Antimicrobials:						
	N	n	N	n	N	n
Tetracyclines						
Tetracyclin	108	0				
Fluoroquinolones						
Enrofloxacin	108	2				
Quinolones						
Nalidixic acid	108	2				
Aminoglycosides						
Gentamicin	108	0				
Macrolides						
Erythromycin	108	0				
Penicillins						
Ampicillin	108	7				
Fully sensitive	99					
Resistant to 1 antimicrobial	7					
Resistant to 2 antimicrobials	2					
Resistant to 3 antimicrobials	0					
Resistant to 4 antimicrobials	0					
Resistant to >4 antimicrobials	0					

Table Breakpoints used for antimicrobial susceptibility testing in Animals

Test Method Used

Disc diffusion

Agar dilution

Broth dilution

E-test

Standards used for testing

NCCLS

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ ml)			Range tested concentration (microg/ ml)		Disk content microg	Breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest		Susceptible >=	Intermediate	Resistant <=
Tetracyclines										
Tetracyclin	E	2		2	0.25	32				
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	E	0.5		0.5	0.03	4				
Quinolones										
Nalidixic acid	E	16		16	1	128				
Aminoglycosides										
Gentamicin	E	2		2	0.25	8				
Macrolides										
Erythromycin	E	4		4	0.12	16				
Penicillins										
Ampicillin	E	8		8	0.5	64				

Footnote

E = Epidemiological cut-off values

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 in animals, especially among sheep.

Since 1982, the number of notified human cases has varied from 2-21. The incidence rate has varied from 0.05-0.5 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 another outbreak was reported, this time a hospital outbreak 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 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 had decreased to 3.4% in a survey conducted in 1996-1997. In 2002 4.3% of 703 samples of domestically produced fish and fish products, mostly unprocessed and smoked salmon, were positive for *L. monocytogenes*. 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 raw milk and raw milk products 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 in the Nordic countries.

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 2-21. The incidence rate has varied from 0.05-0.5 per 100 000. Most of the cases are sporadic, occurring in elderly individuals or persons with underlying disease. A few congenital cases are also being reported. An outbreak occurred in 1992, involving six reported cases linked to vacuum packed cold cuts. Another outbreak occurred in 2005 with three cases probably linked to cold cuts.

Results of the investigation

A total of 28 confirmed cases of listeriosis were notified (incidence rate 0.6 per 100 000). Two deaths were recorded, both in patients with underlying disease.

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

Norway follows the EU requirements regarding testing for *L. monocytogenes* in milk products. Internal control in the industry: Samples are taken as part of the internal control programmes.

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 136

Control program/ mechanisms

The control program/ strategies in place

Norway follows the EU requirements regarding testing for *L. monocytogenes* in milk products. Samples are taken as part of the internal control programmes in the industry.

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. Findings of *L. monocytogenes* in cheeses and other ready-to-eat dairy products would result in recall of the whole lot.

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

Of 53 samples of smoked fish, a total of 2 samples (both mackerel) were positive for *L. monocytogenes*. In addition, a total of 70 samples of wild fish (herring and mackerel) were investigated and all were negative.

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

In general, the occurrence of *L. monocytogenes* in raw 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	Listeria monocytogenes presence in x g	> detection limit but =< 100 cfu/ g	L. monocytogenes > 100 cfu/ g
Fish								
smoked	NIFES	single	25g	53	2	2		
raw	NIFES	single	25g	70	0			

2.3.4. Listeria in animals

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

Monitoring system

Sampling strategy

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 2006, at the National Veterinary Laboratory 42 sheep, 20 goats, four cattle, one chinchilla and one roe deer were found positive.

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 to a small degree in food-producing animals. Epidemiologically, however, cases of listeriosis in animals and humans are rarely linked.

Table Listeria in animals

	Source of information	Sampling unit	Units tested	Total units positive for Listeria spp.	L. monocytogenes	Listeria spp., unspecified
Cattle (bovine animals)	NVI	animal		4		
Sheep	NVI	animal		42		
Goats	NVI	animal		20		
Deer						
wild						
roe deer	NVI	animal		1		
Chinchillas	NVI	animal		1		

Footnote

The investigation of clinical problems and deaths don't usually look specifically for Listeria, therefore the exact number of animals analysed for Listeria is hard to define. Most positive findings were identified as L. monocytogenes, but several were also diagnosed as listeriosis, based on histopathology.

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 (0-18 cases per year). Approximately half of the cases are acquired domestically. In 2006 a severe outbreak caused by VTEC O103:H25 with 17 patients of which 10 developed HUS and one died occurred.

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 representing 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 carcasse 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 has been 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 has up to 2006 been low (0-18 cases per year, incidence rate 0-0.4 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 involving 17 patients of which 10 developed HUS and one died, is described more closely in the chapter regarding outbreaks.

Results of the investigation

A total of 50 cases of VTEC and HUS were reported (incidence rate 1.1 per 100 000). A total of 12 cases of HUS were reported, of these 10 were caused by O103:H25 and two by O157. A total of 38 cases of VTEC infections (excluding HUS) were reported, of which 15 were caused by VTEC O103 (seven of these included in the outbreak belonging to O103:H25) and six by O157. A total of 41 of the patients were infected in Norway. Six cases were imported, two caused by O157 and one by O103. Three 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 has been low and predominantly involved sporadic cases, the outbreak in 2006 caused by VTEC O103:H25 calls for increased attention. Data show that VTEC O157 is present in the cattle and sheep populations, and although the prevalences seem to be low, these reservoirs represent possible sources of infection. Due to the methods currently used, it 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. Results will be presented in the 2007 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: Based on 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 four times the following year, or until two negative testing rounds.

Notification system in place

Findings of VTEC O157 in carcasses 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, however, competent authorities have to be informed about positive findings.

Results of the investigation

As a follow up of the outbreak in humans caused by VTEC O103:H25, several cattle and sheep farms were investigated. In sheep farms, it was not uncommon to find E. coli O103:H25 with Intimin genes (eae), but none of these harboured Stx genes.

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

The prevalence of VTEC O157 is 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 225/ 96/ COL of December 4, 1996) as Norway fulfils 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 campaign 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

No cases with tuberculosis caused by *M. bovis* were notified in 2006.

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

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

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 225/ 96/ COL of December 4, 1996) as Norway fulfils the requirements laid down in Council Directive 64/ 432/ EEC as amended.

Monitoring system

Sampling strategy

Animals for slaughter: 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.

Breeding animals: All breeding bulls are tuberculin tested several times.

Imported animals: Imported animals are tuberculin tested if considered relevant based upon individual assessment.

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

Frequency of the sampling

Animals for slaughter: All are subject to meat inspection.

Imported animals: Tested during week 22 of the six months long isolation period.

Breeding animals: 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

Animals for slaughter: Mandatory control programme. 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

A total of 332100 bovine animals were slaughtered and subject to a routine post mortem examination. Samples from three cattle were collected during post-mortem examinations at the slaughterhouse and analysed for the presence of *Mycobacterium* species. Neither *M. bovis* nor *M. tuberculosis* were isolated.

A total of 161 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

Animals for slaughter: 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 animals: Imported deer are tuberculin tested if considered relevant based upon individual assessment.

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

Frequency of the sampling

Animals for slaughter: All are subject to meat inspection.

Imported deer: 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.

Clinical indications: Tuberculin testing (intradermal comparative test), pathology, and/ or bacteriology.

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

Animals for slaughter: Mandatory control programme. 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 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

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.

Animals for slaughter: 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: Animals entering the Norwegian territory from abroad are tuberculin tested if considered relevant based upon individual assessment.

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

Frequency of the sampling

Animals for slaughter: All 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. Llamas 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.

Clinical indications: Tuberculin testing (intradermal comparative test), pathology, and/ or bacteriology.

Tests of imports, exports: Tuberculin testing (intradermal comparative test).

Vaccination policy

Vaccination of animals against tuberculosis is prohibited.

Control program/ mechanisms

The control program/ strategies in place

Animals for slaughter: Mandatory control programme. 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

Tuberculin tests were performed on 50 breeding boars at AI stations, all were negative.

Samples from 18 pigs (from three herds), one dog, one roe deer and three wild birds (*Buteo buteo*, *Lagopus lagopus*, *Anas platyrhynchos*) were analysed for the presence of *Mycobacterium* species. *M. avium* subsp. *avium* was isolated from 15 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
Pigs	NVI	animal	18	15	0	0	0	15
breeding animals								
- at AI station (1)	Breeding company	animal	50	0				
Birds								
wild	NVI	animal	3	0				
Deer								
wild								
roe deer	NVI	animal	1	0				
Dogs	NVI	animal	1	0				

(1) : Tested by tuberculin testing.

Footnote

NVI = National Veterinary Institute, diagnostic submissions.

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	20500	918200	20500	100	0	0	0	0	0	3	0
Total	20500	918200	20500	100	0	0	0	0	0	3	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 campaign 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 227/ 96/ COL of December 4, 1996). 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. There is a need for more research to better understanding the epidemiology regarding *Brucella* species among marine mammals and to address possible public health implications.

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 1983-2005, only 14 cases of brucellosis were reported; in 2004 two cases; one was infected at work (health care/ laboratory), the other had been infected in Cyprus, in 2003 two cases probably being infected in Ethiopia and one case probably acquiring the infection in a laboratory, in 2002 three cases from Spain, Iraq and Georgia, respectively, in 2001 two cases probably infected in Lebanon, in 2000 a woman infected in Turkey probably through milk, in 1999 a man contracting the disease from milk in Turkey, in 1997 a male immigrant from Turkey, and in 1987 a Norwegian UN soldier stationed in Lebanon (*B. melitensis*).

Results of the investigation

In 2006, three cases of human brucellosis were reported, two infected abroad (Iraq, Ethiopia), one with an unknown place of infection.

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

Brucellosis is rarely recorded in Norway. Since 1983, only 17 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 understanding 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 227/ 96/ COL of December 4, 1996).

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 fetuses 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. 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, will be sampled.

Breeding animals: All breeding bulls are tested.

Imported animals: 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

Breeding animals: 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 animals: Cattle are tested at week 22 during the six months long isolation period.

Type of specimen taken

Other: Blood or fetuses.

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

Foetuses: 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.

Breeding animals: All breeding bulls are serologically tested twice before being transferred to a semen collection centre, and subsequently within 12 months. Bulls are thereafter subject to yearly testing.

Imported animals: Animals entering the Norwegian territory from abroad 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

All 11 foetuses from 11 herds as well as blood samples from 20 cows tested negative.

All 203 bulls that were tested for brucellosis at the AI stations 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 in addition to randomly selected flocks not being part of any ram circles.
Imported animals: Animals entering the Norwegian territory from abroad 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.
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 the surveillance programme, 27812 animals from 911 herds were tested for antibodies against *B. melitensis*. All were negative.

Animals tested in relation to import 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

Imported animals: Animals entering the Norwegian territory from abroad are serologically tested if considered relevant based upon an assessment of the health status in the country of origin.

Frequency of the sampling

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.

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 is 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.

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

All goats tested for antibodies against *B. melitensis* 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

Breeding animals: All breeding boars are tested.

Imported animals: Animals entering the Norwegian territory from abroad are tested if considered relevant based upon an individual assessment.

Frequency of the sampling

Breeding animals: All breeding boars are tested twice before being transferred to a semen collection centre, and subsequently within 12 months or before slaughter.

Imported animals: 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

Breeding animals: All breeding boars are tested.

Imported animals: Animals entering the Norwegian territory from abroad 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

All 1002 pigs belonging to a breeding company tested negative. A total of 57 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	1002	0				
Dogs (1)	NVI	animal	45	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							
	Herds	Animals	Number of herds	%	Number of herds	%	Serological tests		Examination of bulk milk samples		Information about abortions			Epidemiological investigation				
							Number of bovine herds tested	Number of animals tested	Number of bovine herds tested	Number of animals or pools tested	Number of notified abortions whenever cause whatever	Number of isolations of Brucella infection	Number of abortions due to Brucella infection	Number of animals tested with serological blood tests	Number of suspended herds	Number of positive animals Serologically	Number of positive animals BIST	Number of animals examined microbiologically
NORGE (1)	20500	918200	20500	100	0	0	0	0	0	0	0	0	20	0	0	0	11	0
Total	20500	918200	20500	100	0	0	0	0	0	0	0	0	20	0	0	0	11	0

(1) : The microbiological investigations were performed on 11 foetuses from 11 different herds. In addition blood samples from 20 cows were analysed. All samples were negative.

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 intraherd logically	Number of animals positive intraherd logically	Number of animals tested with serological blood tests	Number of animals positive serologically	Number of animals examined intraherd logically	Number of animals positive intraherd logically	Number of unpenfolded herds
NORGE	17300	2406300	17300	100	0	0	911	27812	0	0	0	0	0	0	0	0	0	0
Total	17300	2406300	17300	100	0	0	911	27812	0	0	0	0	0	0	0	0	0	0

Footnote

The majority of animals and herds are sheep.

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 85 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/ 96 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 is 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 as 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.

Additional information

In diagnostic submissions at the National Veterinary Institute, one wild hare was diagnosed with *Yersinia pseudotuberculosis*.

2.7.2. Yersiniosis in humans

A. Yersiniosis 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* spp. has been isolated.

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 85 and 150 notified cases per year.

Results of the investigation

In 2006, a total of 165 cases of yersiniosis were reported (incidence rate 3.6 per 100 000). A total of 99 (60%) cases were indigenous.

Two outbreaks were reported. They are described in the chapter on outbreaks.

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.

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 parallel 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.

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 animals 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 collective 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

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 animals or foodstuffs.

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 collective samples.

Results of the investigation including the origin of the positive animals

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 animals or foodstuffs. 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

One lynx was investigated for Trichinella and was 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		animal	1527500	0		
Solipeds, domestic						
horses		animal	1600	0		
Lynx						
wild		animal	1	0		

Footnote

All slaughtered pigs and horses are tested.

2.9. ECHINOCOCCOSIS

2.9.1. General evaluation of the national situation

A. Echinococcus spp. general evaluation

History of the disease and/ or infection in the country

The 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-helminthic 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 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.

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-helminthic 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, especially as regard the importance of regular treatment of herd dogs with an anti-helminthic 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 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

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-helminthic 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 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-helminthic drug the last ten days before entering Norway and also one week after arrival. Treatment with an anti-helminthic 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

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 five year survey regarding *E. multilocularis* in red foxes was started. In 2006, foxes killed during hunting in 2002 - 2005 were investigated. The following years, recently killed foxes will be 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, DNA extraction and PCR followed by sequencing.

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-helminthic drug the last ten days before entering Norway and also one week after arrival. Treatment with an anti-helminthic drug is also advocated on a general basis. Due to recent 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-helminthic drug approved for treatment of *E. multilocularis*.

Control program/ mechanisms

Recent actions taken to control the zoonoses

The recent findings of *E. multilocularis* in the archipelago of Svalbard resulted in follow-up studies, requirements regarding anti-helminthic 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 327 red foxes killed during hunting in 2002 - 2005 were investigated. All were negative. A research project conducted in the archipelago of Svalbard identified *E. multilocularis* from two (14%) of 14 sibling voles tested. The positive animals were both wintered voles.

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 although no systematic investigation has been undertaken in wild animals. 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, is 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. 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. The findings have been followed up. Of the wintered voles tested in 2000, 2001, 2002, 2003, 2004 and 2005, 96%, 36%, 25%, 36%, 19% and 59% were positive, respectively.

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)		animal	332100	0			
Sheep		animal	1211300	0			
Goats		animal	21100	0			
Pigs		animal	1527500	0			
Solipeds, domestic		animal	1600	0			
Reindeers		animal	29700	0			
Voles							
wild	U	animal	14	2		2	

Footnote

All farm animals are inspected for hydatid cysts at slaughter. Number of slaughtered animals are obtained from the Register of Slaughtered Animals.

U = University of Tromsø - Survey in the Archipelago of Svalbard.

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 abovementioned 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 2006, 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

Out of 50 investigated sheep originating from 24 herds, 26 animals from 13 herds were positive.

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.

Table Toxoplasma in animals

	Source of information	Sampling unit	Units tested	Total units positive for Toxoplasma gondii
Sheep (1)	NVI	animal	50	26

(1) : The 50 sheep originated from 24 herds and the 26 positive animals originated from 13 different herds.

Footnote

NVI = National Veterinary Institute, mainly diagnostic submissions.

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 since the beginning of the 19th century. 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 1980-2006). 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

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 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.

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, the disease must be reported immediately on clinical suspicion.

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 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

No cases were reported. One dog from Svalbard was investigated, but was 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.

A survey regarding rabies in wildlife in Svalbard is ongoing.

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

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 PCR method has been established.

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

All tested animals were negative; 17 polar foxes from Svalbard, two red foxes and two imported bats (*Vespertilio murinus* and *Pippistrellus nathusii*).

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	1	0			
Bats							
wild	NVI	animal	2	0			
Foxes							
wild (1)	NVI	animal	19	0			

(1) : Including 17 polar foxes from the Archipelago of Svalbard and two red foxes.

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. ESCHERICHIA COLI, NON-PATHOGENIC

3.1.1. 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.

3.1.2. 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 organized as to obtain approximately 100 isolates from each animal species. In 2006, poultry was monitored and the number of samples were increased to obtain approximately 200 isolates.

Type of specimen taken

Faecal material taken at farm.

Methods of sampling (description of sampling techniques)

The fecal samples were systematically selected throughout the year from faecal samples taken in the Salmonella surveillance programme.

Procedures for the selection of isolates for antimicrobial testing

Only one isolate from each flock 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

Faeces was gathered on swabs and plated directly onto the surface of lactose-saccharose-bromthymol blue agar without broth enrichment.

After incubation of the agar plates at 37C for 24 h, a typical colony was sub-cultivated onto blood agar (Heart infusion agar (Difco) containing 5% bovine blood). Colonies were identified as E. coli by typical appearance, lactose 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. All the testing was performed at one laboratory.

Breakpoints used in testing

For interpretation of results epidemiological cut-off values recommended by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) were used (<http://www.escmid.org>). When no cut-off value was available, 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 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). This applies to ciprofloxacin and gentamicin in E. coli.

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 2006 poultry was monitored.

Type of specimen taken

Meat sampled at retail.

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 44C for 24 h, a small amount (approx. 10 microlitre) of broth was plated onto the surface of lactose-saccharose-bromthymol blue agar. After incubation of the agar plates at 37C for 24 h, a typical colony was sub-cultivated onto blood agar (Heart infusion agar (Difco) containing 5% bovine blood). Colonies were identified as E. coli by typical appearance, lactose 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. All testing was performed at one laboratory.

Breakpoints used in testing

For interpretation of results epidemiological cut-off values recommended by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) were used (<http://www.esamid.org>). When no cut-off value was available, 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 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). This applies to ciprofloxacin and gentamicin in *E. coli*.

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 animals

n = Number of resistant isolates								
	E. coli							
	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Turkeys	
Isolates out of a monitoring programme						yes		
Number of isolates available in the laboratory						190		
Antimicrobials:	N	n	N	n	N	n	N	n
Tetracyclines								
Tetracyclin					190	7		
Amphenicols								
Chloramphenicol					190	0		
Florfenicol					190	0		
Cephalosporins								
Cefotaxim					190	2		
Ceftiofur					190	1		
Fluoroquinolones								
Ciprofloxacin					190	2		
Quinolones								
Nalidixic acid					190	2		
Sulfonamides								
Sulfonamide					190	17		
Trimethoprim					190	6		
Aminoglycosides								
Streptomycin					190	4		
Gentamicin					190	2		
Kanamycin					190	0		
Penicillins								
Ampicillin					190	25		
Fully sensitive					153			
Resistant to 1 antimicrobial					19			
Resistant to 2 antimicrobials					13			
Resistant to 3 antimicrobials					1			
Resistant to 4 antimicrobials					2			
Resistant to >4 antimicrobials					2			

Table Antimicrobial susceptibility testing of E. coli in Gallus gallus (fowl) - broilers - at farm - Monitoring - quantitative data [Dilution method]

Number of resistant isolates (n) and number of isolates with the concentration µl/ml or zone (mm) of inhibition equal to																							
E. coli																							
Gallus gallus (fowl) - broilers - at farm - Monitoring																							
Isolates out of a monitoring programme	yes																						
	190																						
Number of isolates available in the laboratory																							
	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	
Antimicrobials:																							
Tetracyclines																							
Tetracyclin	190	7						60	114	9			3	3	1								
Amphenicols																							
Chloramphenicol	190	0						19	108	63													
Florfenicol	190	0							81	98	11												
Cephalosporins																							
Cefotaxim	190	2		121	58	9	1	1															
Ceftiofur	190	1			10	74	93	12		1													
Fluoroquinolones																							
Ciprofloxacin	190	2	152	36	2																		
Quinolones																							
Nalidixic acid	190	2						2	78	94	13	1		2									
Sulfonamides																							
Sulfonamide	190	17										162	10	1			1						16
Trimethoprim																							
Trimethoprim	190	6				58	103	21	2	1				5									
Aminoglycosides																							
Streptomycin	190	4						4	89	88	5	1		1			2						
Gentamicin	190	2				95	80	13	2														
Kanamycin	190	0						88	85	15	2												
Penicillins																							
Ampicillin	190	25					2	19	92	49	3		1	24									

Table Antimicrobial susceptibility testing of E. coli in Meat from broilers (Gallus gallus) - at retail - Monitoring - quantitative data [Dilution method]

Number of resistant isolates (n) and number of isolates with the concentration µl/ml or zone (mm) of inhibition equal to																							
E. coli																							
Meat from broilers (Gallus gallus) - at retail - Monitoring																							
Isolates out of a monitoring programme	yes																						
	119																						
Number of isolates available in the laboratory																							
	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	
Antimicrobials:																							
Tetracyclines																							
Tetracyclin	119	6				1	33	77	2	4	8	16	32	64	128	256	512	1024	2048	>2048			
Amphenicols																							
Chloramphenicol	119	0						16	58	45													
Florfenicol	119	0							56	53	10												
Cephalosporins																							
Cefotaxim	119	0		72	44	3																	
Ceftiofur	119	0			3	49	56	11															
Fluoroquinolones																							
Ciprofloxacin	119	0	97	22																			
Quinolones																							
Nalidixic acid	119	0					1	41	75	2													
Sulfonamides																							
Sulfonamide	119	8										99	10	2									8
Trimethoprim	119	1				31	71	14	2					1									
Aminoglycosides																							
Streptomycin	119	9						2	59	42	7	1	4	3	1								
Gentamicin	119	2				58	53	6	2														
Kanamycin	119	0						53	57	6	3												
Penicillins																							
Ampicillin	119	9					15	61	33	1				9									

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					119			
Antimicrobials:	N	n	N	n	N	n	N	n
Tetracyclines								
Tetracyclin					119	6		
Amphenicols								
Chloramphenicol					119	0		
Florfenicol					119	0		
Cephalosporins								
Cefotaxim					119	0		
Ceftiofur					119	0		
Fluoroquinolones								
Ciprofloxacin					119	0		
Quinolones								
Nalidixic acid					119	0		
Sulfonamides								
Sulfonamide					119	8		
Trimethoprim					119	1		
Aminoglycosides								
Streptomycin					119	9		
Gentamicin					119	2		
Kanamycin					119	0		
Penicillins								
Ampicillin					119	9		
Fully sensitive					98			
Resistant to 1 antimicrobial					12			
Resistant to 2 antimicrobials					6			
Resistant to 3 antimicrobials					0			
Resistant to 4 antimicrobials					3			
Resistant to >4 antimicrobials					0			

Table Breakpoints used for antimicrobial susceptibility testing in Animals

Test Method Used

Disc diffusion

Agar dilution

Broth dilution

E-test

Standards used for testing

NCCLS

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

Footnote

E = Epidemiological cut-off values.

Table Breakpoints used for antimicrobial susceptibility testing in Food

Test Method Used

Disc diffusion

Agar dilution

Broth dilution

E-test

Standards used for testing

NCCLS

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

Footnote

E = Epidemiological cut-off values.

4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS

4.1. HISTAMINE

4.1.1. General evaluation of the national situation

4.1.2. Histamine in foodstuffs

4.2. ENTEROBACTER SAKAZAKII

4.2.1. General evaluation of the national situation

4.2.2. Enterobacter sakazakii in foodstuffs

4.3. STAPHYLOCOCCAL ENTEROTOXINS

4.3.1. General evaluation of the national situation

4.3.2. Staphylococcal enterotoxins in foodstuffs

5. **FOODBORNE OUTBREAKS**

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

A. Foodborne outbreaks

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

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 a voluntary reporting system where the District Offices report foodborne outbreaks to the Head Office.

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 disease of 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

In 2006 there was one severe outbreak of EHEC/ HUS due to VTEC O103:H25 in fermented sausage. Two other outbreaks due to Salmonella Kedougou and Yersinia enterocolitica were caused by other products of cold cuts.

As in previous years some small outbreaks of salmonellosis related to travel abroad occurred, in addition to a few domestic outbreaks which are described below.

There were three smaller outbreaks of campylobacteriosis. This is similar to previous years.

Several norovirus outbreaks were reported. However, for many of these the transmission route was unclear and could have been either foodborne or person-to-person.

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 due to

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. In 2006 three outbreaks were caused by cold cuts.

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

The outbreak of EHEC/ HUS caused by VTEC O103:H25 was severe with 10 HUS cases and one death. The other outbreaks were less severe.

Descriptions of single outbreaks of special interest

The severe outbreak of EHEC/ HUS caused by O103:H25 was caused by a fermented sausage ("morrpoelse") produced in Norway and the source of infection was probably meat from sheep used in the sausage. A total of 17 cases were reported. A total of 10 kids developed HUS and one died.

A large outbreak of salmonellosis with more than 60 verified cases was caused by *S. Kedougou*. The source was a Norwegian salami product produced for the national market. Another outbreak of salmonellosis took place at a restaurant and was caused by *S. Typhimurium* DT193.

Two relatively small outbreak of yersiniosis occurred. One was caused by *Y. enterocolitica* O:9 and involved 11 reported cases, the other was caused by *Y. enterocolitica* O:3 and involved four reported cases. The source of infection in both outbreaks was a traditional cold cuts pork product usually made for Christmas.

Table Foodborne outbreaks in humans

Causative agent	General outbreak	Household outbreak	Total Number of persons		Food implicated	Confirmed as a source		Type of evidence for implication of the food	Place where food was consumed	Contributing factors
			ill (in total)	died		Suspected as a source	Confirmed as a source			
	2	3	4	5	6	7	8	9	10	
Bacillus - B. cereus	X		2			Dip (for pizza)	X	Laboratory confirmed	Catering food	
Bacillus - B. cereus	X		2			Rice	X	Laboratory confirmed	Snack bar	
Bacillus - B. cereus	X		5			Sauce (pepper)	X	Descriptive epidemiology	Restaurant	
Bacillus - B. cereus	X		21			mashed potatoes	X	Laboratory confirmed	Catering food	
Bacillus - B. cereus	X		35			Creamed rice	X	Laboratory confirmed	Restaurant	
Campylobacter		X	2			Chicken	X	Descriptive epidemiology	Private household	
Campylobacter	X		2			Water	X	Descriptive epidemiology	Drinking water	
Campylobacter	X		6			Unknown			Day care centre	
Escherichia coli, pathogenic - Verotoxigenic E. coli (VTEC) - VTEC O103	X		17	1	14	Cured sausage (morrpølse)	X	Laboratory confirmed and descriptive		
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	X		2			Oyster	X	Descriptive epidemiology	Restaurant	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	X		4			Pork dish	X	Descriptive epidemiology	Snack bar	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	X		4			Unknown			Restaurant	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	X		6			Scallop	X	Descriptive epidemiology	Restaurant	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	X		7			Unknown			Restaurant	
Food borne viruses - calicivirus (including norovirus) - norovirus (Norwalk-like virus)	X		8			Unknown			Restaurant	

