

## NORWAY

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

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

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

## IN 2009

## INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Country: Norway

Reporting Year:

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 the 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.
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.

## INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Laboratory name	Description	Contribution
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.

## PREFACE

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

The report contains information on trends and sources of zoonoses and zoonotic agents in Norway during the year 2009 .

The information covers the occurrence of these diseases and agents in humans, animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and commensal bacteria as well as information on epidemiological investigations of foodborne outbreaks. Complementary data on susceptible animal populations in the country is also given. The information given covers both zoonoses that are important for the public health in the whole European Community as well as zoonoses, which are relevant on the basis of the national epidemiological situation.

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

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

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

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\* 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 2009.

### 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 average number of animals per herd/holding has increased.

### 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 20.1 cows. There are also a number of specialized beef herds with an average number of suckling cows of 14.4. 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 126 approved elite and multiplier breeding herds house 5% of the live sows in the population, while more than 95% of the sows producing piglets for fattening and slaughter are raised in these herds. The swine population is denser in some counties and about 50% of the swine production is concentrated in four counties in the southern and middle part of Norway.

Sheep: The Norwegian sheep flocks are widely distributed over the country, with the largest population found in the south-west. The sheep population consists of combined meat and wool producing breeds, with various Norwegian breeds predominating.

Goat: The Norwegian goat population is principally composed of one Norwegian breed. The main product is milk used for cheese production. The goat flocks are located in some mountainous regions in the southern part of the country, in the fjord districts of the western part, and in the northern counties.

Poultry: The Norwegian poultry production has a hierarchical structure and is strictly regulated. Egg and broiler meat production are the most important branches, but the number of holdings keeping turkey and



other species is increasing. The Norwegian layer population consists of two strains (Lohmann white and Shaver white). The layer population is located throughout Norway. The commercial broiler production consists of two strains (Cobb and Ross). The broiler production is mainly located in five counties in the southern and middle part of Norway.

#### **Additional information**

The livestock production in Norway is targeted for the national market. Until 1999 there was a general ban on the import of live animals and animal products to Norway. Following the extension of the European Economic Area (EEA) Agreement 1 January 1999 regarding Veterinary and Phytosanitary matters, the general ban was lifted. However, imports of live animals remained limited.

Table Susceptible animal populations

\* Only if different than current reporting year

Animal species	Category of animals	Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
		Data	Year*	Data	Year*	Data	Year*	Data	Year*
Cattle (bovine animals)	meat production animals <sup>1)</sup>	5700							
	mixed herds	950							
	dairy cows and heifers	10800							
	- in total	17400		313300	2009	876300			
Deer	farmed - in total	75				6800			
Ducks	parent breeding flocks <sup>2)</sup>	4						3	
	meat production flocks <sup>3)</sup>	68						7	
Gallus gallus (fowl)	grandparent breeding flocks for egg production line	6						3	
	parent breeding flocks for egg production line <sup>4)</sup>	24						10	
	broilers <sup>5)</sup>	4200		62234900	2008			640	
	laying hens	1000		988200	2008			650	
	parent breeding flocks for meat production line <sup>6)</sup>	157						80	
Geese	meat production flocks <sup>7)</sup>	4						1	

Table Susceptible animal populations

Animal species	Category of animals	Number of herds or flocks		Number of slaughtered animals		Livestock numbers (live animals)		Number of holdings	
		Data	Year*	Data	Year*	Data	Year*	Data	Year*
Geese	parent breeding flocks <sup>8)</sup>	2						2	
Goats	milk goats	450				37700			
	- in total	1300		23300	2009	67800			
Pigs	breeding animals	1500				58700			
	fattening pigs	2300							
	- in total	2500		1522300	2009	828600			
Sheep	animals over 1 year	14700				877400			
	- in total	14800		1165300	2009	2228200			
Solipeds, domestic	horses - in total			1600	2009				
Turkeys	parent breeding flocks <sup>9)</sup>	19						5	
	meat production flocks <sup>10)</sup>	455						71	
	- in total <sup>11)</sup>			1388600	2008				

## Comments:

<sup>1)</sup> of the 5700 meat production herds, 4100 have suckling cows

<sup>2)</sup> production flocks

<sup>3)</sup> slaughter batches

## Table Susceptible animal populations

- 4) production flocks
- 5) slaughter batches
- 6) production flocks
- 7) slaughter batches
- 8) production flocks
- 9) production flocks
- 10) slaughter batches
- 11) Includes small amounts of duck and geese

### Footnote:

Numbers >100 are rounded to the nearest ten, numbers >1000 are rounded to the nearest hundred.  
For animals other than poultry, the number of herds and holdings are the same.

## 2. INFORMATION ON SPECIFIC ZONOSSES 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 for domestic nor imported cases. However, there seem to be have been a slightly increasing trend in domestic infections during the last decade.

For feedingstuffs and animals, the situation is very good and has been so for many years. Regarding food, the food produced in Norway is virtually free from Salmonella. Risk of exposure is mainly associated with international trade in food.

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

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

## 2.1.2 Salmonellosis in humans

### A. Salmonellosis in humans

#### Reporting system in place for the human cases

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

#### Case definition

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

#### Diagnostic/analytical methods used

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

#### Notification system in place

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

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

The recorded incidence of salmonellosis in Norway has increased during the last three decades with a sharp rise in the early 1980s due to the emergence of *S. Enteritidis*. In the majority of cases of salmonellosis (approximately 80%), the patients have acquired the disease abroad. The number of reported cases of salmonellosis corresponds well with charter tourism to foreign countries; in years with an increased charter tourism, such as in the mid-1980s and in the period 1992-1998, the incidence of salmonellosis also increased, whereas in years with a lower charter tourism activity due to economical depression, such as in the period 1988-1991, the incidence of salmonellosis dropped. Since 1998, the incidence of salmonellosis has leveled off. However, an increase was noted during 2001, mostly due to a few large outbreaks.

Since 1984, *S. Enteritidis* has become the most common serovar reported, except in 1987 when it was surpassed by *S. Typhimurium* due to a domestic outbreak traced to contaminated chocolate bars. While *S. Typhimurium* predominated in earlier years, *S. Enteritidis* has increased substantially from a low level in 1975-1982 to a higher level from the mid-1990s. No increase of similar magnitude has been observed for any other serovar.

The proportion of imported cases of *S. Enteritidis* infections is particularly high (approximately 90% among patients with known place of acquisition) as this pathogen is not established in the Norwegian poultry production. Among domestic cases, *S. Typhimurium* is the most common serovar. This serovar, although not established among food producing animals in Norway, does occur in the Norwegian environment such as in wild birds and hedgehogs.

#### Results of the investigation

## Norway - 2009 Report on trends and sources of zoonoses

In 2009, a total of 1234 cases of salmonellosis were reported (incidence rate 25.4 per 100 000), of which 216 (18%) were infected in Norway. Altogether 554 (45%) of the cases were due to *S. Enteritidis*, of which 44 (8%) were infected in Norway. Altogether, 223 (18%) of the cases were due to *S. Typhimurium*, of which 93 (42%) were domestic cases. The outbreaks are described in the chapter on foodborne outbreaks.

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

There was a decrease in the overall number of *Salmonella*-infections in 2009. Most of the reduction is in the number of patients who have contracted the infection abroad.

For domestically acquired infections, 2006 and 2007 were record years when nearly 400 cases contracted salmonellosis inside Norway, - the highest recorded number since 1987. However, both in 2008 and in 2009, there has been a decrease in the number of patients who get the infection without travelling prior to getting ill. This decrease is probably linked to the decrease in cases who contract salmonellosis abroad, since we assume that a number of the domestic cases are secondary cases to imported infections.

One outbreak was recorded in 2009. Five persons were ill with *Salmonella* Goldcoast after having travelled to Mallorca. 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 pig meat and products thereof

#### Monitoring system

##### Sampling strategy

###### At slaughterhouse and cutting plant

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

Samples of crushed meat are each year collected according to production capacity of cutting plants.

###### At meat processing plant

Samples according to Council Directive 94/65/EC (still in force in Norway 2009).

##### Frequency of the sampling

###### At slaughterhouse and cutting plant

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 according to Council Directive 94/65/EC (still in force in Norway 2009).

##### Type of specimen taken

###### At slaughterhouse and cutting plant

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

###### At meat processing plant

Samples according to Council Directive 94/65/EC (still in force in Norway 2009).

##### 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 cm<sup>2</sup> of each carcass.

Cutting plant: Each sample consists of 25 grams of meat.

###### At meat processing plant

Samples according to Council Directive 94/65/EC (still in force in Norway 2009).

##### 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 or, exceptionally, submitted to processing by a treatment eliminating the hazard, 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 or, exceptionally, submitted to processing by a treatment eliminating the hazard.

#### Notification system in place

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

#### Results of the investigation

In 2009, a total of 2029 carcasses were swabbed, all were negative. None of the samples of crushed meat from pig 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. A connection between meat or meat products of domestic origin and human infection has never been established.

## B. Salmonella spp. in bovine meat and products thereof

### Monitoring system

#### Sampling strategy

##### At slaughterhouse and cutting plant

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

Samples of crushed meat are each year collected according to production capacity of cutting plants.

##### At meat processing plant

Samples according to Council Directive 94/65/EC (still in force in Norway 2009).

#### Frequency of the sampling

##### At slaughterhouse and cutting plant

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 according to Council Directive 94/65/EC (still in force in Norway 2009).

#### Type of specimen taken

##### At slaughterhouse and cutting plant

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

##### At meat processing plant

Samples according to Council Directive 94/65/EC (still in force in Norway 2009).

#### Methods of sampling (description of sampling techniques)

##### At slaughterhouse and cutting plant

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 cm<sup>2</sup> of each carcass.

Cutting plant: Each sample consists of 25 grams of meat.

##### At meat processing plant

Samples according to Council Directive 94/65/EC (still in force in Norway 2009).

#### 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

## Norway - 2009 Report on trends and sources of zoonoses

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 or, exceptionally, submitted to processing by a treatment eliminating the hazard, 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 or, exceptionally, submitted to processing by a treatment eliminating the hazard.

### Notification system in place

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

### Results of the investigation

In 2009, a total of 2097 carcasses were swabbed, all were negative for Salmonella. One sample of crushed bovine meat was positive for Salmonella 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 meat and meat products of domestic origin is negligible.

## C. Salmonella spp. in broiler meat and products thereof

### Monitoring system

#### Sampling strategy

##### At slaughterhouse and cutting plant

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

Surveys are performed occasionally.

## D. Salmonella spp. in eggs and egg products

### Monitoring system

#### Sampling strategy

Eggs and egg products are monitored indirectly by monitoring of the layer population, see chapter on Salmonella spp. in Gallus gallus - breeding flocks for egg production and flocks of laying hens.

Additional testing of egg products is carried out by the food business operators as an integral part of their own check procedures.

## E. Salmonella spp. in turkey meat and products thereof

### Monitoring system

#### Sampling strategy

##### At slaughterhouse and cutting plant

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

Occasionally, surveys are performed.

## F. Salmonella spp. in food - Meat from sheep

### Monitoring system

#### Sampling strategy

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

At meat processing plant: Samples according to Council Directive 94/65/EC (still in force in Norway 2009).

#### 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 according to Council Directive 94/65/EC (still in force in Norway 2009).

#### Type of specimen taken

At slaughterhouse: Surface of carcass. At cutting plant: Crushed meat. At meat processing plant: Samples according to Council Directive 94/65/EC (still in force in Norway 2009).

#### 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 cm<sup>2</sup> 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 according to Council Directive 94/65/EC (still in force in Norway 2009).

#### Definition of positive finding

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

#### Diagnostic/analytical methods used

Bacteriological method: NMKL No 71:1999

### Control program/mechanisms

#### The control program/strategies in place

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

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

Whenever Salmonella is detected in samples taken in the National Control Programmes, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread. However, in the sheep population in some regions, *S. diarizonae* is endemic. When this serovar is detected in sheep, less extensive measures are carried out.

When Salmonella is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed or, exceptionally, submitted to processing by a treatment eliminating the hazard, and investigation into the source of the contamination initiated if relevant. If Salmonella is detected in food



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controls at the Border Inspection Posts, the consignments will be either rejected or destroyed or, exceptionally, submitted to processing by a treatment eliminating the hazard.

### Notification system in place

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

### Results of the investigation

In 2009, a total of 1742 carcasses were swabbed, one was positive for *S. diarizonae* (61:k:1,5,7). For details, see tables.

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

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

Table Salmonella in red meat and products thereof

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Dublin	S. IIIb61:k:1,5,7
Meat from bovine animals - carcass - at slaughterhouse (carcass swabs)	NSCP	Single	swab	2097	0					
Meat from other animal species or not specified (Crushed meat from pig, cattle, sheep collected at cutting plants)	NSCP	Batch	25 g	1184	1				1	
Meat from pig - carcass - at slaughterhouse (Carcass swabs)	NSCP	Single	swab	2029	0					
Meat from sheep - carcass - at slaughterhouse (carcass swabs)	NSCP	Single	swab	1742	1			0		1

## Comments:

<sup>1)</sup> positive sample from bovine meat

Table Salmonella in other food

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Crustaceans - unspecified - cooked	NIFES	Single	25 g	7	0			
Crustaceans - unspecified - raw	NIFES	Single	25 g	4	0			
Fish (farmed fish)	NIFES	Single	25 g	29	0			
Fish (from wild stocks)	NIFES	Single	25 g	113	0			
Molluscan shellfish - raw	NIFES	Single	25 g	92	0			

## 2.1.4 Salmonella in animals

### A. Salmonella spp. in Gallus Gallus - breeding flocks

#### Monitoring system

##### Sampling strategy

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

The Norwegian Salmonella Control Programme include all poultry breeding flocks. Sampling of breeding flocks of Gallus gallus is established pursuant to Article 5 of Regulation (EC) 2160/2003 and approved by the EFTA Surveillance Authority (ESA) (364/07/COL). Sampling takes place at the initiative of the food business operator and by the Competent Authority according to Regulation (EC) 1003/2005.

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

##### Frequency of the sampling

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

Every flock is sampled

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

Every flock is sampled twice

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

Every second week

##### Type of specimen taken

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

Internal linings of delivery boxes

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

Socks/ boot swabs

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

Socks/ boot swabs

##### Methods of sampling (description of sampling techniques)

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

All flocks: Transport crates are tested (crate liners or swabs).

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

All flocks: Tested at 4 weeks of age and 2 weeks before moving by two pairs of socks.

Breeding flocks: Production period

All flocks: Tested every 2nd week by five pairs of socks (caged birds: faecal samples).

##### 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.

#### Diagnostic/analytical methods used

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

Bacteriological method: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

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

Bacteriological method: ISO 6579:2002

#### Vaccination policy

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

Vaccination 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.

#### 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, relevant food business operators, such as slaughterhouses, hatcheries, and egg collecting centers receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If Salmonella is detected, the flock will be destroyed or subjected to sanitation slaughter. Eggs from hatcheries where Salmonella has been detected will be destroyed or pasteurized. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well. Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

#### Notification system in place

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

#### Results of the investigation

In 2009, a total of 126 rearing flocks and 187 production flocks were tested, all were negative for Salmonella.

In addition to the Control Programme, samples have been taken in relation to clinical problems, follow up

or various projects. None of these samples were positive for Salmonella. For details, see table.

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

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

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

The Norwegian Salmonella Control Programmes have documented that so far poultry in Norway as well as domestically produced poultry products 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.

## B. Salmonella spp. in Gallus Gallus - broiler flocks

### Monitoring system

#### Sampling strategy

##### Broiler flocks

The Norwegian Salmonella Control Programme: All poultry flocks are tested before slaughter. Sampling takes place at the initiative of the food business operator and by the Competent Authority once a year according to Regulation (EC) 646/2007. If poultry for slaughter are imported, additional guarantees according to 95/410/EC applies.

#### Frequency of the sampling

Broiler flocks: Before slaughter at farm

Every flock is sampled

#### Type of specimen taken

Broiler flocks: Before slaughter at farm

Socks/ boot swabs

#### Methods of sampling (description of sampling techniques)

Broiler flocks: Before slaughter at farm

Every flock is sampled by two pair of socks.

#### Case definition

Broiler flocks: Before slaughter at farm

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

#### Diagnostic/analytical methods used

Broiler flocks: Before slaughter at farm

Bacteriological method: ISO 6579:2002

### Vaccination policy

#### Broiler flocks

Vaccination against Salmonella is prohibited in Norway.

### Control program/mechanisms

#### The control program/strategies in place

Broiler flocks

Every flock is sampled before slaughter.

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

Broiler flocks: Before slaughter at farm

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, relevant food business operators, such as slaughterhouses, hatcheries, and egg collecting centers receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If Salmonella is detected, the flock will be destroyed

or subjected to sanitation slaughter. Eggs from hatcheries where Salmonella has been detected will be destroyed or pasteurized. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well. Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

### Notification system in place

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

### Results of the investigation

In 2009, 4243 broiler flocks (batches for slaughter) were investigated, and one was positive for S. Typhimurium DT40. In addition to the Control Programme, samples have been taken in relation to clinical problems, follow up or various projects. None of these samples were positive for Salmonella. For details, see table.

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

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

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

The Norwegian Salmonella Control Programmes have documented that so far poultry in Norway as well as domestically produced poultry products 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.



## C. Salmonella spp. in Gallus Gallus - flocks of laying hens

### Monitoring system

#### Sampling strategy

##### Laying hens flocks

The Norwegian Salmonella Control Programme: All laying hen flocks are tested at the farm. Sampling takes place at the initiative of the food business operator and by the Competent Authority according to Regulation (EC) 1168/2006.

Other strategies: Animals are tested in relation to clinical surveillance and import. Additional guaranties according to Commission decision 2004/235/EC also applies to Norway.

#### Frequency of the sampling

##### Laying hens: Day-old chicks

Every flock is sampled

##### Laying hens: Rearing period

2 weeks prior to moving

##### Laying hens: Production period

Every 15 weeks

##### Laying hens: Before slaughter at farm

Every flock for slaughter is sampled

#### Type of specimen taken

##### Laying hens: Day-old chicks

Internal linings of delivery boxes

##### Laying hens: Rearing period

Socks/ boot swabs

##### Laying hens: Production period

Socks/boot swabs or faeces (caged birds).

##### Laying hens: Before slaughter at farm

Socks/boot swabs or faeces (caged birds).

#### Methods of sampling (description of sampling techniques)

##### Laying hens: Day-old chicks

All flocks: Transport crates are tested (crate liners or swabs).

##### Laying hens: Rearing period

All flocks: Tested two weeks before moving by 2 pair of socks (caged birds: faeces).

##### Laying hens: Production period

All flocks: Tested every 15 weeks by two pairs of socks (caged birds: faeces).

##### Laying hens: Before slaughter at farm

All flocks for slaughter: Tested before slaughter by 2 pair of socks (caged birds: faeces).

#### Case definition

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.

Diagnostic/analytical methods used

Laying hens: Day-old chicks

Bacteriological method: ISO 6579:2002

Laying hens: Rearing period

Bacteriological method: ISO 6579:2002

Laying hens: Production period

Bacteriological method: ISO 6579:2002

Laying hens: Before slaughter at farm

Bacteriological method: ISO 6579:2002

Vaccination policy

Laying hens flocks

Vaccination against Salmonella is prohibited in Norway.

Control program/mechanisms

The control program/strategies in place

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

Laying hens flocks

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

been empty for at least 30 days following cleaning and disinfection.

### Notification system in place

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

### Results of the investigation

In 2009, a total of 1031 flocks were tested, all were negative.

For details, see table.

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

The favourable salmonella situation in Norwegian poultry is partly dependent upon an efficient control of breeding flocks. Due to extensive surveillance during many years, stringent measures in case of positive findings, and restricted import, poultry breeding flocks in Norway are virtually free from Salmonella. S.

Enteritidis has never been detected in Norwegian breeding flocks or in laying hens.

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

The Norwegian Salmonella Control Programmes have documented that so far poultry in Norway as well as domestically produced poultry products 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.

## D. Salmonella spp. in bovine animals

### Monitoring system

#### Sampling strategy

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

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

#### Frequency of the sampling

Animals at slaughter (herd based approach)

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

#### Type of specimen taken

Animals at slaughter (herd based approach)

Lymph nodes

#### Methods of sampling (description of sampling techniques)

Animals at farm

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

Animals at slaughter (herd based approach)

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

#### Case definition

Animals at farm

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

Animals at slaughter (herd based approach)

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

#### Diagnostic/analytical methods used

Animals at farm

Bacteriological method: ISO 6579:2002

Animals at slaughter (herd based approach)

Bacteriological method: NMKL No 71:1999

### Vaccination policy

Vaccination against Salmonella is prohibited in Norway.

### Control program/mechanisms

#### The control program/strategies in place

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

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

Whenever Salmonella is detected, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread. Also, slaughterhouses, dairies, and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding.

Infected animals must be isolated from other animals. Animals are not allowed to be sent to slaughter without permission from the Food Safety Authority and if sent to slaughter, the slaughterhouse must be notified so that sanitation slaughtering can be conducted. Milk from infected herds must be pasteurised.

Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. There will be intensified sampling, also on farms that have had contact with the infected holding. Restrictions will be lifted when all animals have been tested with a negative test result in two consecutive samplings with a minimum interval of 30 days. Following lifting of the restrictions, retesting will be conducted after approx. six months.

### Notification system in place

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

### Results of the investigation

In 2009, a total of 2441 animals were sampled in the Norwegian Salmonella Control Programme. All samples were negative for Salmonella.

In addition, 934 animals from 148 different herds were investigated, mainly due to clinical problems. One herd was positive for *S. Typhimurium*.

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

The Norwegian Salmonella Control Programmes document that Norwegian food producing animals are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.0%.

## E. Salmonella spp. in pigs

### Monitoring system

#### Sampling strategy

##### Breeding herds

The Norwegian Salmonella Control Programme: All elite breeding herds are tested.

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

##### Multiplying herds

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

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

##### Fattening herds

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

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

#### Frequency of the sampling

##### Breeding herds

Once a year

##### Fattening herds at slaughterhouse (herd based approach)

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)

Lymph nodes

#### Methods of sampling (description of sampling techniques)

##### Breeding herds

Faecal samples are taken.

##### Fattening herds at slaughterhouse (herd based approach)

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

### Case definition

#### Breeding herds

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

#### Multiplying herds

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

#### Fattening herds at farm

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

#### Fattening herds at slaughterhouse (herd based approach)

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

### Diagnostic/analytical methods used

#### Breeding herds

Bacteriological method: ISO 6579:2002

#### Multiplying herds

Bacteriological method: ISO 6579:2002

#### Fattening herds at farm

Bacteriological method: ISO 6579:2002

#### Fattening herds at slaughterhouse (herd based approach)

Bacteriological method: NMKL No 71:1999

### Vaccination policy

#### Breeding herds

Vaccination against Salmonella is prohibited in Norway.

#### Multiplying herds

Vaccination against Salmonella is prohibited in Norway.

#### Fattening herds

Vaccination against Salmonella is prohibited in Norway.

### Control program/mechanisms

#### The control program/strategies in place

##### Breeding herds

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

##### Multiplying herds

See "breeding herds".

##### Fattening herds

See "breeding herds".

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

Whenever Salmonella is detected, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding.

Infected animals must be isolated from other animals. Animals are not allowed to be sent to slaughter without permission from the Food Safety Authority and if sent to slaughter, the slaughterhouse must be

notified so that sanitation slaughtering can be conducted.

Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. There will be intensified sampling, also on farms that have had contact with the infected holding. Restrictions will be lifted when all animals have been tested with a negative test result in two consecutive samplings with a minimum interval of 30 days. Following lifting of the restrictions, retesting will be conducted after approx. six months.

### Notification system in place

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

### Results of the investigation

In 2009, all of the lymph node samples from 2479 animals sampled in the Norwegian Salmonella Control Programme were negative. None of the 116 herds tested were positive.

In addition, 166 animals from 23 different herds were investigated, mainly due to clinical problems. All these were negative.

### 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%.



## F. Salmonella spp. in animal

### Monitoring system

#### Sampling strategy

Described here is Salmonella in sheep and goats and other animal species than food producing animals, such as pets, zoo animals, reptiles and wild life.

Sampling is done in relation to clinical surveillance and import.

#### Case definition

##### Animals at farm

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

### Vaccination policy

Vaccination against Salmonella is prohibited in Norway.

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

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

### Notification system in place

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

### Results of the investigation

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

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

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

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

### Monitoring system

#### Sampling strategy

The Norwegian Salmonella Control Programme include all breeder flocks and all flocks for slaughter of ducks, geese, turkeys and guinea fowl.

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

#### Frequency of the sampling

##### Animals at farm

See the description of the programme in Gallus gallus

#### Type of specimen taken

##### Animals at farm

See the description of the programme in Gallus gallus

#### Methods of sampling (description of sampling techniques)

##### Animals at farm

See the description of the programme in Gallus gallus.

##### Animals at slaughter (herd based approach)

See the description of the programme in Gallus gallus.

#### Case definition

##### Animals at farm

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

##### Animals at slaughter (herd based approach)

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

#### Diagnostic/analytical methods used

##### Animals at farm

Bacteriological method: ISO 6579:2002

### Vaccination policy

Vaccination against Salmonella is prohibited in Norway.

### Control program/mechanisms

#### The control program/strategies in place

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

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

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source

of infection. If Salmonella is detected, the whole flock will be destroyed or subjected to sanitation slaughter. Eggs from hatcheries will be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well.

Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

### Notification system in place

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

### Results of the investigation

In 2009, none of the Norwegian duck or turkey breeder flocks were positive. None of the production flocks were positive.

In addition to the Control Programme, samples have been taken in relation to clinical problems, follow up or various projects. None of these samples were positive for Salmonella. For details, see table.

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

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

Table Salmonella in breeding flocks of Gallus gallus

	Number of existing flocks	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Hadar	S. Infantis	S. Typhimurium	S. Virchow	Salmonella spp., unspecified
Gallus gallus (fowl) - parent breeding flocks for egg production line - during rearing period	36	NSCP	Flock	36	0						
Gallus gallus (fowl) - parent breeding flocks for egg production line - adult	24	NSCP	Flock	24	0						
Gallus gallus (fowl) - grandparent breeding flocks for egg production line	6	NSCP	Flock	6	0						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - during rearing period	90	NSCP	Flock	90	0						
Gallus gallus (fowl) - parent breeding flocks for broiler production line - adult	157	NSCP	Flock	157	0						

Table Salmonella in other poultry

	Number of existing flocks	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Gallus gallus (fowl) - laying hens - during rearing period	156	NSCP	Flock	156	0			
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - official and industry sampling	1031	NSCP	Flock	1031	0			
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - sampling by industry	1031	NSCP	Flock	1031	0			
Gallus gallus (fowl) - laying hens - adult - at farm - Control and eradication programmes - official sampling - objective sampling	1031	NSCP	Flock	469	0			
Gallus gallus (fowl) - broilers - before slaughter - at farm - Control and eradication programmes - official and industry sampling	4243	NSCP	Slaughter batch	4243	1		1	
Turkeys - breeding flocks, unspecified	19	NSCP	Flock	19	0			
Turkeys - meat production flocks	455	NSCP	Flock	455	0			
Ducks - breeding flocks, unspecified	6	NSCP	Flock	6	0			
Ducks - meat production flocks	68	NSCP	Slaughter batch	68	0			
Geese - breeding flocks, unspecified	2	NSCP	Flock	2	0			
Geese - meat production flocks	4	NSCP	Slaughter batch	4	0			
Ducks - unspecified		NVI	Flock	1	0			
Gallus gallus (fowl) - unspecified <sup>1)</sup>		NVI	Holding	19	0			
Turkeys - unspecified		NVI	Flock	9	0			

Table Salmonella in other poultry

Comments:

<sup>1)</sup> 80 samples from 19 holdings

Footnote:

NVI: Mainly diagnostic submissions

Table Salmonella in other animals

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Amsterdam	S. Apapa	S. Illb61:k:1,5,7	S. Muenchen
Cattle (bovine animals) <sup>1)</sup>	NSCP	Animal	2441	0							
Goats	NVI	Animal	4	0							
Pigs <sup>2)</sup>	NVI	Herd	23	0							
Pigs - breeding animals <sup>3)</sup>	NSCP	Animal	859	0							
Pigs - fattening pigs <sup>4)</sup>	NSCP	Animal	1620	0							
Sheep <sup>5)</sup>	NVI	Herd	25	5						5	
Solipeds, domestic <sup>6)</sup>	NVI	Animal	59	2		2					
Alpacas - farmed <sup>7)</sup>	NVI	Animal	46	0							
Cats	NVI	Animal	110	0							
Cattle (bovine animals) - unspecified <sup>8)</sup>	NVI	Herd	148	1		1					
Deer - farmed <sup>9)</sup>	NVI	Animal	6	0							
Dogs	NVI	Animal	372	12		9	1			1	
Lamas - farmed	NVI	Animal	2	0							
Minks - farmed	NVI	Animal	1	0							
Pet animals, all <sup>10)</sup>	NVI	Animal	9	0							
Pigs - breeding animals - Control and eradication programmes - official sampling <sup>11)</sup>	NSCP	Animal	1898	0							
Wild animals	NVI	Animal	3	0							
Zoo animals, all <sup>12)</sup>	NVI	Animal	17	13				1	1		3

Table Salmonella in other animals

		S. Paratyphi B	S. Senftenberg	S. enterica subsp. diarizonae
Cattle (bovine animals)	1)			
Goats				
Pigs	2)			
Pigs - breeding animals	3)			
Pigs - fattening pigs	4)			
Sheep	5)			
Solipeds, domestic	6)			
Alpacas - farmed	7)			
Cats				
Cattle (bovine animals) - unspecified	8)			
Deer - farmed	9)			
Dogs			1	
Lamas - farmed				
Minks - farmed				
Pet animals, all	10)			
Pigs - breeding animals - Control and eradication programmes - official sampling	11)			
Wild animals				
Zoo animals, all	12)	1		7

Comments:



## Table Salmonella in other animals

- 1) Lymph nodes
- 2) Samples from 166 animals
- 3) Lymph nodes
- 4) Lymph nodes
- 5) Samples from 40 animals (7 positive animals)
- 6) The two positive animals had the same owner
- 7) Animals from 3 holdings - import control
- 8) Samples from 934 animals
- 9) Animals from 3 holdings
- 10) Small pets (chinchilla, rabbit, ferret etc.)
- 11) Faecal samples from 116 elite and multiplier herds
- 12) 13 reptiles from 3 zoos and 4 hedgehogs from 1 zoo. All reptiles were positive.

### Footnote:

NSCP = Norwegian Salmonella Control Programme

NVI: Mainly diagnostic samples

Table Salmonella in other birds

	Source of information	Sampling unit	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Ostriches	NVI	Animal	1	0			
Pigeons	NVI	Animal	1	0			
Quails	NVI	Flock	3	0			
Birds - pet animals	NVI	Animal	36	0			
Birds - wild	NVI	Animal	21	0			

## 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 order to prevent animals from being exposed to contaminated feed. Feedingstuffs for both terrestrial animals and fish are covered by surveillance programmes. The surveillance programmes document a low prevalence of Salmonella in domestically produced animal compound feedingstuffs. However, data from process control, including environmental sampling, indicates that there are certain serovars that sometimes contaminate production facilities, especially those producing fish feed.

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

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

#### Recent actions taken to control the zoonoses

Detection of Salmonella is notifiable and the establishment must take immediate actions to prevent the distribution of contaminated feed. Contaminated feed will either be destroyed, heat or acid treated.

In general, complete feedingstuffs and protein concentrates (supplementary feedingstuffs) intended for poultry, pigs, and cattle are subjected to heat treatment of at least 81 degrees Celsius core temperature, and the production has to take place in a production line where all the other feedingstuffs are heat treated.

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 (all poultry feed mills and pig and cattle feed mills with a capacity above 10,000 tons per year) or every fourth week (pig and cattle feed mills with a capacity below 10,000 tons per year). 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 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 compound feedingstuffs

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Senftenberg
Compound feedingstuffs for cattle - final product <sup>1)</sup>	NFSA	Batch	25 g	2	0				
Compound feedingstuffs for poultry (non specified) - process control <sup>2)</sup>	NFSA	Batch	25 g	100	0				
Compound feedingstuffs for fish - Monitoring - industry sampling - objective sampling	NFSA	Batch	25 g	2411	3		1	1	1
Compound feedingstuffs for fish - Monitoring - industry sampling - selective sampling	NFSA	Batch	25 g	395	4			3	1
Compound feedingstuffs for fish - process control - at feed mill - environmental sample - Monitoring - industry sampling - objective sampling	NFSA	Single	25 g	1907	44		1	31	12
Compound feedingstuffs for fish - process control - at feed mill - environmental sample - Monitoring - industry sampling - selective sampling	NFSA	Single	25 g	199	21		1	19	1
Compound feedingstuffs for fur animal - Monitoring - industry sampling - objective sampling	NFSA	Batch	25 g	403	0				
Compound feedingstuffs for fur animal - Monitoring - official sampling	NFSA	Batch	25 g	1	0				
Compound feedingstuffs for horses - Monitoring - official sampling	NFSA	Batch	25 g	2	0				
Compound feedingstuffs, not specified - process control - Monitoring - industry sampling - objective sampling (Feed for land animals - sampling at storage facilities and transport vehicles)	NFSA	Single	25 g	1115	5			5	

Table Salmonella in compound feedingstuffs

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified	S. Senftenberg
Compound feedingstuffs, not specified - process control - Monitoring - industry sampling - selective sampling (Feed for land animals - sampling at storage facilities and transport vehicles)	NFSA	Single	25 g	38	0				
Compound feedingstuffs, not specified - process control - at feed mill - environmental sample - Monitoring - industry sampling - objective sampling (Feed for land animals)	NFSA	Single	25 g	8365	10		1	6	3
Compound feedingstuffs, not specified - process control - at feed mill - environmental sample - Monitoring - industry sampling - selective sampling (Feed for land animals)	NFSA	Single	25 g	140	13			13	
Pet food - Monitoring - official sampling	NFSA	Batch	25 g	17	0				

## Comments:

- 1) industry sampling
- 2) official sampling

Table Salmonella in other feed matter

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Feed material of cereal grain origin - Monitoring - official sampling	NFSA	Batch	25 g	14	0			
Feed material of cereal grain origin - barley derived - Monitoring - industry sampling - objective sampling (imported material)	NFSA	Single	25 g	1	0			
Feed material of cereal grain origin - maize - Monitoring - industry sampling - objective sampling (imported material)	NFSA	Batch	25 g	156	0			
Feed material of cereal grain origin - oat derived - Monitoring - industry sampling - objective sampling (imported material)	NFSA	Batch	25 g	5	0			
Feed material of cereal grain origin - wheat derived - Monitoring - industry sampling - objective sampling (imported material)	NFSA	Batch	25 g	91	0			
Feed material of oil seed or fruit origin - Monitoring - official sampling	NFSA	Batch	25 g	34	0			
Feed material of oil seed or fruit origin - rape seed derived - Monitoring - industry sampling - objective sampling (imported material)	NFSA	Batch	25 g	245	0			
Feed material of oil seed or fruit origin - soya (bean) derived - Monitoring - industry sampling - objective sampling (imported material)	NFSA	Batch	25 g	173	1			1
Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - Surveillance - HACCP and own checks (imported soy beans) <sup>1)</sup>	NFSA	Batch	25 g	312	105		2	103

Table Salmonella in other feed matter

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - domestic production - Surveillance - HACCP and own checks (samples taken from production)	NFSA	Batch	25 g	1222	0			
Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - domestic production - Surveillance - HACCP and own checks (samples taken from transport cars and boats)	NFSA	Batch	25 g	1389	0			
Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - environmental sample - Surveillance - HACCP and own checks (samples from "clean side" of processing plant)	NFSA	Batch	25 g or swab	952	0			
Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - environmental sample - Surveillance - HACCP and own checks (samples from "unclean side" of processing plant)	NFSA	Batch	25g or swab	261	15			15
Feed material of oil seed or fruit origin - sunflower seed derived - Monitoring - industry sampling - objective sampling (imported material)	NFSA	Batch	25 g	90	4			4
Other feed material - legume seeds and similar products - at feed mill - domestic production - Monitoring - industry sampling	NFSA	Batch	25 g	89	0			
Other feed material - legume seeds and similar products - at feed mill - imported - Monitoring - industry sampling	NFSA	Batch	25 g	63	0			
Other feed material - tubers, roots and similar products - Monitoring - industry sampling - objective sampling (imported material)	NFSA	Batch	25 g	24	0			



## Table Salmonella in other feed matter

### Comments:

- <sup>1)</sup> Dust from boat shipments, 13 ships in total (24 single samples (approx 5 g) from each ship pooled). The 103 isolates listed in the column "Salmonella spp. unspecified" consists of 23 different serovars.

### Footnote:

The sampling unit is "Batch" in the majority of cases, but a few single samples are included in the numbers.

Industry data both from fish feed and land animal feed industry.

Table Salmonella in feed material of animal origin

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Salmonella	S. Enteritidis	S. Typhimurium	Salmonella spp., unspecified
Feed material of marine animal origin - fish meal <sup>1)</sup>	NFSA	Batch	25 g	23	0			
Feed material of marine animal origin - fish oil <sup>2)</sup>	NFSA	Batch	25 g	6	0			
Feed material of land animal origin - bone meal - Monitoring - industry sampling - objective sampling (Norwegian origin)	NFSA	Batch	25 g	295	3			3
Feed material of land animal origin - bone meal - Monitoring - industry sampling - selective sampling (Norwegian origin)	NFSA	Batch	25 g	20	1			1
Feed material of marine animal origin - fish meal (Imported) <sup>3)</sup>	NFSA	Batch	25 g	142	6			6
Feed material of marine animal origin - fish meal - Monitoring - industry sampling - selective sampling	NFSA	Batch	25 g	21	1			1
Feed material of marine animal origin - fish meal - Monitoring - official sampling	NFSA	Batch	25 g	7	0			
Feed material of marine animal origin - fish meal - at processing plant - environmental sample	NFSA	Batch	25 g	216	0			
Feed material of marine animal origin - fish oil (Imported)	NFSA	Batch	25 g	2	0			

## Comments:

- <sup>1)</sup> Industry sampling - Norwegian origin  
<sup>2)</sup> Industry sampling - Norwegian origin  
<sup>3)</sup> objective sampling

Footnote:

The sampling unit is mainly "Batch", but a few single samples are included in some of the numbers.

## 2.1.6 Salmonella serovars and phagetype distribution

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

Table Salmonella serovars in animals

Serovar	Cattle (bovine animals)		Pigs		Gallus gallus (fowl)		Other poultry	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
Sources of isolates								
Number of isolates in the laboratory	0	1	0	0	1	0	0	0
Number of isolates serotyped	0	1	0	0	1	0	0	0
Number of isolates per serovar								
S. Typhimurium		1			1			

Table Salmonella serovars in food

Serovar	Meat from bovine animals	Meat from pig	Meat from broilers (Gallus gallus)	Meat from other poultry species	Other products of animal origin
Sources of isolates	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring
Number of isolates in the laboratory	1				
Number of isolates serotyped	1	0	0	0	0
Number of isolates per serovar					
S. Dublin	1				

Footnote:

Other products of animal origin = carcass swab from sheep

Table Salmonella serovars in feed

Serovar	Compound feedingstuffs for pigs		Compound feedingstuffs for fish - at feed mill (including feed material of fish origin and environmental samples)		Compound feedingstuffs, not specified - at feed mill (including feed material of land animal origin and environmental samples)		Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - Monitoring (imported material)	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
Sources of isolates								
Number of isolates in the laboratory			79		32		125	
Number of isolates serotyped	0	0	79	0	32	0	125	0
Number of isolates per serovar								
Salmonella spp., unspecified			31		1		2	
S. Abaetetuba							1	
S. Adelaide							3	
S. Agona			1		2		4	
S. Cerro			1				3	
S. Cubana							27	
S. Gatow							1	
S. Give					1		6	
S. Glostrup							1	
S. Havana			1		17		2	

Table Salmonella serovars in feed

Serovar	Compound feedingstuffs for pigs		Compound feedingstuffs for fish - at feed mill (including feed material of fish origin and environmental samples)		Compound feedingstuffs, not specified - at feed mill (including feed material of land animal origin and environmental samples)		Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - Monitoring (imported material)	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
Sources of isolates								
Number of isolates in the laboratory			79		32		125	
Number of isolates serotyped	0	0	79	0	32	0	125	0
Number of isolates per serovar								
S. Infantis			3		2		3	
S. Lexington			6				3	
S. Livingstone			2					
S. Maricopa							1	
S. Mbandaka			2				26	
S. Minnesota							10	
S. Montevideo			7				6	
S. Morehead							1	
S. Muenchen					1			
S. Ohio			2					

Table Salmonella serovars in feed

Serovar	Compound feedingstuffs for pigs		Compound feedingstuffs for fish - at feed mill (including feed material of fish origin and environmental samples)		Compound feedingstuffs, not specified - at feed mill (including feed material of land animal origin and environmental samples)		Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - Monitoring (imported material)	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
Sources of isolates								
Number of isolates in the laboratory			79		32		125	
Number of isolates serotyped	0	0	79	0	32	0	125	0
Number of isolates per serovar								
S. Okatie					1			
S. Oranienburg			2				2	
S. Regent							1	
S. Rissen							1	
S. Rubislaw					2			
S. Schwarzengrund							2	
S. Senftenberg			16		3		12	
S. Tennessee			1				4	
S. Typhimurium			3		1		2	
S. Vejle							1	



Table Salmonella serovars in feed

Serovar	Compound feedingstuffs for pigs		Compound feedingstuffs for fish - at feed mill (including feed material of fish origin and environmental samples)		Compound feedingstuffs, not specified - at feed mill (including feed material of land animal origin and environmental samples)		Feed material of oil seed or fruit origin - soya (bean) derived - at processing plant - Monitoring (imported material)	
	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical	Monitoring	Clinical
Sources of isolates								
Number of isolates in the laboratory			79		32		125	
Number of isolates serotyped	0	0	79	0	32	0	125	0
Number of isolates per serovar								
S. Westhampton			1					
S. enterica subsp. diarizonae					1			

Footnote:

Isolates from "Feed material of oil seed or fruit origin (soya)" includes 5 isolates from sunflower seed.

## 2.1.7 Antimicrobial resistance in Salmonella isolates

### A. Antimicrobial resistance of Salmonella spp. in animal

#### Sampling strategy used in monitoring

##### Frequency of the sampling

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

For description of the Norwegian Salmonella Control programmes, see the parts describing Salmonella in the various animal species.

##### Type of specimen taken

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

##### Methods of sampling (description of sampling techniques)

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

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

Only one isolate per herd is selected for antimicrobial testing.

##### Methods used for collecting data

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

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

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

#### Laboratory used for detection for resistance

##### Antimicrobials included in monitoring

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

##### Cut-off values used in testing

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

#### Control program/mechanisms

##### The control program/strategies in place

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

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

Salmonella	S. Enteritidis		S. Typhimurium		Salmonella spp.	
	Isolates out of a monitoring program (yes/no)			yes		
Number of isolates available in the laboratory			1			
Antimicrobials:	N	n	N	n	N	n
Amphenicols - Chloramphenicol			1	0		
Cephalosporins - 3rd generation cephalosporins			1	0		
Fluoroquinolones - Ciprofloxacin			1	0		
Quinolones - Nalidixic acid			1	0		
Trimethoprim			1	0		
Sulfonamides - Sulfonamide			1	0		
Aminoglycosides - Streptomycin			1	0		
Penicillins - Ampicillin			1	0		
Tetracyclines - Tetracycline			1	0		
Fully sensitive			1	1		

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

Salmonella	S. Enteritidis		S. Typhimurium		Salmonella spp.	
	Isolates out of a monitoring program (yes/no)			no		
Number of isolates available in the laboratory			1			
Antimicrobials:	N	n	N	n	N	n
Amphenicols - Chloramphenicol			1	0		
Cephalosporins - 3rd generation cephalosporins			1	0		
Fluoroquinolones - Ciprofloxacin			1	0		
Quinolones - Nalidixic acid			1	0		
Trimethoprim			1	0		
Sulfonamides - Sulfonamide			1	0		
Aminoglycosides - Streptomycin			1	0		
Penicillins - Ampicillin			1	0		
Tetracyclines - Tetracycline			1	0		
Fully sensitive			1	1		

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

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

S. Typhimurium	Cattle (bovine animals)																								
	no																								
	1																								
Antimicrobials:	Cut-off value	N	n	<=0.008	0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest
Amphenicols - Chloramphenicol	16	1	0										1												
Tetracyclines - Tetracycline	8	1	0									1													
Fluoroquinolones - Ciprofloxacin	0.06	1	0			1																			
Quinolones - Nalidixic acid	16	1	0										1												
Trimethoprim	2	1	0						1																
Aminoglycosides - Streptomycin	32	1	0											1											
Aminoglycosides - Gentamicin	2	1	0							1															
Penicillins - Ampicillin	4	1	0								1														
Cephalosporins - Cefotaxim	0.5	1	0					1																	
Sulfonamides	256	1	0													1									

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

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

S. Typhimurium	Gallus gallus (fowl) - broilers																								
	yes																								
	1																								
Antimicrobials:	Cut-off value	N	n	<=0.008	0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest
Amphenicols - Chloramphenicol	16	1	0										1												
Tetracyclines - Tetracycline	8	1	0								1														
Fluoroquinolones - Ciprofloxacin	0.06	1	0				1																		
Quinolones - Nalidixic acid	16	1	0											1											
Trimethoprim		1	0						1																
Aminoglycosides - Streptomycin	32	1	0											1											
Aminoglycosides - Gentamicin	2	1	0							1															
Penicillins - Ampicillin	4	1	0								1														
Cephalosporins - Cefotaxim	0.5	1	0					1																	
Sulfonamides	256	1	0													1									

Table Antimicrobial susceptibility testing of *S. Typhimurium* in Solipeds, domestic - horses - quantitative data [Dilution method]

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

S. Typhimurium	Solipeds, domestic - horses																								
	no																								
	1																								
Antimicrobials:	Cut-off value	N	n	<=0.008	0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest
Amphenicols - Chloramphenicol	16	1	0									1													
Tetracyclines - Tetracycline	8	1	0								1														
Fluoroquinolones - Ciprofloxacin	0.06	1	0			1																			
Quinolones - Nalidixic acid	16	1	0										1												
Trimethoprim	2	1	0						1																
Aminoglycosides - Streptomycin	32	1	0												1										
Aminoglycosides - Gentamicin	2	1	0								1														
Penicillins - Ampicillin	4	1	0								1														
Cephalosporins - Cefotaxim	0.5	1	0				1																		
Sulfonamides	256	1	0													1									

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

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

S. Typhimurium	Dogs																									
	no																									
	8																									
Antimicrobials:	Cut-off value	N	n	<=0.008	0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
Amphenicols - Chloramphenicol	16	8	3									2	2	1					3							
Tetracyclines - Tetracycline	8	8	3								1	4			2	1										
Fluoroquinolones - Ciprofloxacin	0.06	8	1			7				1																
Quinolones - Nalidixic acid	16	8	1										6	1					1							
Trimethoprim		8	0						7	1																
Aminoglycosides - Streptomycin	32	8	3												1	3	1	1	2							
Aminoglycosides - Gentamicin	2	8	0							3	5															
Penicillins - Ampicillin	4	8	3								5								3							
Cephalosporins - Cefotaxim	0.5	8	0				2	6																		
Sulfonamides	256	8	3													2	3						3			



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

Test Method Used
Broth dilution

Standard methods used for testing
NCCLS/CLSI

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

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

Test Method Used

Standard methods used for testing

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

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

Test Method Used

Standard methods used for testing

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

## 2.2 CAMPYLOBACTERIOSIS

### 2.2.1 General evaluation of the national situation

#### A. Thermophilic Campylobacter general evaluation

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

Norwegian studies have shown that many species of wild birds, especially crows and seagulls, are frequent carriers of thermophilic *Campylobacter* spp. Thermophilic *Campylobacter* spp. have also been isolated from poultry, dogs, cats, pigs, sheep, cattle, and flies, and sporadically from wild mammals. Before 2001, when the surveillance programme in broilers was implemented, the prevalence of thermophilic *Campylobacter* spp. in Norwegian broiler flocks had been studied twice. In 1990, 18% of the flocks tested were infected, whereas this proportion in 1997-1998 had decreased to 4%. This reduction was attributed to an increased focus on the importance of biosecurity. The Action Plan against *Campylobacter* in broilers that started in 2001 has shown that the yearly incidence of broiler flocks being positive for *Campylobacter* has been 6.3%, 4.9%, 3.3%, 3.6%, 4.9%, 5.7% and 4.1% in 2002, 2003, 2004, 2005, 2006, 2007 and 2008, respectively. The number of flocks going positive out on the market has been reduced from 127 in 2002 to 58 in 2007. The data from 2008 and 2009 are not directly comparable to previous years, but the percentage of positive flocks in 2008 was probably approximately the same as in 2007 and the results from 2009 probably slightly better. The number of positive flocks out on the market was probably similar in 2008 and 2009 and slightly higher than in 2007.

In 1998, campylobacteriosis for the first time surpassed salmonellosis as the most frequently reported bacterial cause of acute human gastroenteritis in Norway, and since then the reported incidence of campylobacteriosis has been above that of salmonellosis. Since the beginning of the 1990s and until it peaked in 2001, there was a major increase in the incidence of campylobacteriosis in Norway, both in domestic and imported cases. Usually, 50-60% of the cases are imported.

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

The reported human incidence in 2009 was slightly lower than the incidence reported in 2008. The data on prevalence in broiler flocks in 2009 were not as complete as the data from the period 2001 – 2007, but we assume that there is no major change in the prevalence. We also assume that in 2009, as in earlier years, the majority of the positive flocks were detected before slaughter, and were therefore treated (i.e. frozen or heat treated) before they went on the market. The use of untreated water is considered an important source of campylobacteriosis in Norway.

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

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

##### Recent actions taken to control the zoonoses

The implementation of the Norwegian action plan against *Campylobacter* in broilers in 2001 was a direct response from the authorities, scientific institutions and the industry to the major increase in human campylobacteriosis that was seen during the late 1990s and up to 2001.

## 2.2.2 Campylobacteriosis in humans

### A. Thermophilic Campylobacter in humans

#### Reporting system in place for the human cases

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

#### Case definition

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

#### Diagnostic/analytical methods used

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

#### Notification system in place

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

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

Since the beginning of the 1990s and until it peaked in 2001, there was a significant increase in the incidence of campylobacteriosis in Norway. From 1997 to 2001, the incidence increased by ~145%. In 1998, campylobacteriosis for the first time surpassed salmonellosis as the most frequently reported bacterial cause of acute gastroenteritis in Norway, and since then the reported incidence of campylobacteriosis has been above that of salmonellosis. Usually, 50-60% of the cases are imported. The increased incidences observed throughout the 1990s and until 2001 were due to a rising number of both domestic and imported cases. The number of cases, both domestic and imported declined in 2002 and was stable during the period from 2002 to 2004. In 2005, the number of cases increased again and the number of domestic and imported cases were for the first time almost the same. In 2006 the number of imported cases were stable and the number of domestic cases decreased compared to 2005. Also in 2007, the incidence of imported cases raised compared to the domestic cases. The number of imported cases decreased again in 2009 and the number of domestic cases increased to the same level as in 2001 and 2005. Most cases are sporadic. A case control study conducted in Norway during 1999-2000 identified consumption of untreated drinking water, consumption of poultry meat purchased fresh, consumption of barbecued meat, and professional contact with animals as significant risk factors in regard to campylobacteriosis. Daily contact with dogs/cats was identified as a risk factor in case control studies conducted during the early 1990s, but was not identified as a risk factor in the 1999-2000 study. Studies indicate that the vast majority (~95%) of reported cases are due to *C. jejuni*, and that *C. coli* is the cause of most of the remaining cases.

#### Results of the investigation

In 2009, a total of 2850 cases (incidence rate 58.7 per 100 000) were reported of which 1337 (47%) were known to be imported, 1255 (44%) were domestic and 258 (9%) had an unknown place of infection.

Altogether four foodborne outbreaks of campylobacteriosis were registered. No deaths due to campylobacteriosis were reported.

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

The number of reported domestic cases increased in 2009 compared to 2008. The incidence of domestic human campylobacteriosis has been relatively stable with more than 1000 cases during the last five years, but the overall occurrence of positive broiler flocks is low. Therefore, there must be other important sources to human campylobacteriosis apart from poultry products in Norway, untreated drinking water probably being the most important one.

### Relevance as zoonotic disease

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

### Additional information

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

## 2.2.3 Campylobacter in foodstuffs

### A. Thermophilic Campylobacter in Broiler meat and products thereof

#### Monitoring system

##### Sampling strategy

At slaughterhouse and cutting plant

See chapter on Campylobacter in Gallus gallus.

##### Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

See chapter on Campylobacter in Gallus gallus.

##### Definition of positive finding

At slaughterhouse and cutting plant

See chapter on Campylobacter in Gallus gallus.

##### Diagnostic/analytical methods used

At retail

NMKL no 119, 2007

#### Preventive measures in place

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

#### Control program/mechanisms

##### The control program/strategies in place

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

##### Recent actions taken to control the zoonoses

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

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

See chapter on Campylobacter in Gallus gallus.

#### Notification system in place

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

#### Results of the investigation

The results from the Norwegian action plan against Campylobacter in broilers are presented in the chapter on Campylobacter in Gallus gallus.

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

The Norwegian campylobacteriosis situation is a concern for the authorities. The establishment of the Norwegian action plan against Campylobacter sp. in broilers in 2001 was a response to the urgent situation. This action plan has since it was established and through 2009 prevented more than 13 million

Campylobacter positive broiler carcasses from entering the market raw.



## 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

Between 1 May and 31 October, which corresponds with the high season for Campylobacter positive flocks, every flock is sampled.

###### At slaughter

Flocks where the result from the pre slaughter sample are lacking at the time of slaughter are sampled by staff at the Norwegian Food Safety Authority.

##### Type of specimen taken

###### Before slaughter at farm

Faeces

###### At slaughter

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

Real time PCR.

###### At slaughter

Bacteriological method: NMKL 119, 2007 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.

The poultry industry uses data from the surveillance programme as an incentive for improving the hygienic conditions on broiler farms.

### Notification system in place

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

### Results of the investigation

In 2009, in the period 1 May – 31 October, a total of 1924 samples (representing approx 1924 flocks, and covering virtually all slaughtered flocks in Norway in that period) were taken approximately four days before slaughter. A total of 117 samples (6.1%) were positive for Campylobacter spp. In addition - a total of 7 samples were taken at slaughter due to lack of results from the pre-slaughter sample.

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

The poultry production has increased in Norway during the last years. There has been a reduction in the prevalence of flocks being positive for Campylobacter since 2002. Until 2005 there was a declining trend. Since then, however, the prevalence has slowly increased again. The yearly prevalence from 2002 to 2007 has been 6.3%, 4.9%, 3.3%, 3.6%, 4.9% and 5.7%, respectively. The results from 2008 and 2009 are not directly comparable to previous years, but the prevalence was probably approximately the same in 2008 as in 2007 and slightly lower in 2009.

### 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 with a peak during the summer and autumn, and the surveillance programme is therefore covering that period of the year. Even though approximately 75% of the positive flocks are discovered before slaughter, and thereby subject to compulsory freezing or heat treatment, the number of Campylobacter positive broiler carcasses on the market during the summer can be considerable.

Table Campylobacter in animals

	Source of information	Sampling unit	Units tested	Total units positive for Campylobacter	C. coli	C. jejuni	C. lari	C. upsaliensis	Thermophilic Campylobacter spp., unspecified
Cats	NVI	Animal	97	9		3		5	1
Dogs	NVI	Animal	342	94		5		82	7
Gallus gallus (fowl) - broilers - at farm <sup>1)</sup>	NACB	Flock	1924	117					117
Pigs	NVI	Animal	12	1	1				
Sheep	NVI	Animal	41	4		4			
Solipeds, domestic	NVI	Animal	16	0					
Cattle (bovine animals)	NVI	Animal	90	20		17			3

## Comments:

<sup>1)</sup> Only covering the peak season (1 May - 31 October)

## Footnote:

NVI: National Veterinary Institute, mainly diagnostic samples.

NACB: Norwegian Action plan against Campylobacter in broilers. There is no available data on the Campylobacter species because the method used is a Real time PCR method where no isolates are obtained.

## 2.2.5 Antimicrobial resistance in Campylobacter isolates

### A. Antimicrobial resistance in Campylobacter jejuni and coli in pigs

#### Sampling strategy used in monitoring

##### Frequency of the sampling

Samples from the Norwegian Salmonella Control Programme in pig was investigated for occurrence of Campylobacter spp. One isolate per positive farm was included for susceptibility testing.

##### Type of specimen taken

Faecal samples collected at farm.

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

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

##### Methods used for collecting data

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

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

NMKL No 119 without enrichment.

#### Laboratory used for detection for resistance

##### Antimicrobials included in monitoring

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

##### Cut-off values used in testing

Epidemiological cut-off values recommended by EFSA were used, except for Streptomycin where the distribution of MIC values clearly indicated that 8 was a more correct cut-off than 4.

Table Antimicrobial susceptibility testing of Campylobacter in Pigs

<b>Campylobacter</b>  Isolates out of a monitoring program (yes/no)  Number of isolates available in the laboratory	Campylobacter spp., unspecified	
	yes	
	67	
<b>Antimicrobials:</b>	N	n
Fluoroquinolones - Ciprofloxacin	67	3
Quinolones - Nalidixic acid	67	4
Aminoglycosides - Gentamicin	67	0
Macrolides - Erythromycin	67	0
Tetracyclines - Tetracycline	67	0

Footnote:  
All isolates were C. coli.

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

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

C. coli	Pigs																								
	Isolates out of a monitoring program (yes/no)																								
	yes																								
Number of isolates available in the laboratory																									
67																									
Antimicrobials:	Cut-off value	N	n	<=0.008	0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest
Tetracyclines - Tetracycline	2	67	0					41	20	6															
Fluoroquinolones - Ciprofloxacin	1	67	3				23	38	3					1	2										
Quinolones - Nalidixic acid	16	67	4										29	33	1		4								
Aminoglycosides - Streptomycin	2	67	15									3	36	13			1	14							
Aminoglycosides - Gentamicin	1	67	0							16	45	6													
Macrolides - Erythromycin	4	67	0							46	20	1													

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

Test Method Used
Broth dilution

Standard methods used for testing
NCCLS/CLSI

		Concentration (microg/ml)		Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Tetracyclines	Tetracycline		2	
Fluoroquinolones	Ciprofloxacin		1	
Quinolones	Nalidixic acid		16	
Aminoglycosides	Gentamicin		2	
	Streptomycin		8	
Macrolides	Erythromycin		16	

Footnote:

Epidemiological cut-off values recommended by EFSA were used, except for Streptomycin where a cut-off value of 8 was defined on the basis of the actual MIC distribution.

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

Test Method Used

Standard methods used for testing

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



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

Test Method Used

Standard methods used for testing

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

## 2.3 LISTERIOSIS

### 2.3.1 General evaluation of the national situation

#### A. Listeriosis general evaluation

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

Listeriosis is endemic in Norway with sporadic clinical cases in humans and animals, especially among sheep.

Since 1982, the number of notified human cases has varied from 2-50. The incidence rate has varied from 0.05-1.07 per 100 000. Most of the cases are sporadic, occurring in elderly individuals or persons with other underlying diseases. A few congenital cases have been reported. An outbreak occurred in 1992 which involved six reported cases and was traced back to contaminated, vacuum packed cold cuts from a Norwegian meat producer. In 2005 a hospital outbreak occurred with 3 cases, probably linked to cold cuts (the same strain of *L. monocytogenes* as isolated from the patients was found on the slicing machine in the hospital kitchen). In 2007 an outbreak with 21 verified cases occurred and was caused by contaminated soft cheese.

In a survey conducted in 1994, the prevalence of *L. monocytogenes* in samples of vacuum packed cold cuts and smoked salmon was 1.7% and 7.8%, respectively. The prevalence in smoked salmon was 3.4% in a survey conducted in 1996-1997. In 2002 4.3% of 703 samples of domestically produced fish and fish products, mainly unprocessed and smoked salmon, were positive for *L. monocytogenes*. In 2003, 8.6% of 990 samples of smoked salmon taken at retail level were positive for *L. monocytogenes*. The level of contamination was less than 10 CFU/g in 53 samples, between 10 and 100 in 20 samples, between 100 and 1000 in 10 samples and more than 1000 CFU/g in two samples. In a survey conducted in 1995 involving ready-to-eat poultry products, the prevalence of *L. monocytogenes* was 0.4%.

A survey of domestically produced raw milk products conducted in 1999 revealed that one out of 282 samples (0.4%) was positive for *L. monocytogenes*. A survey of raw bulk milk at Norwegian dairy farms, also conducted in 1999, did not detect any *L. monocytogenes* in 336 samples from cattle bulk milk, whereas four of 100 samples from goat bulk milk were positive for *L. monocytogenes*. This illustrates that products made of raw milk might be risk products with regard to *L. monocytogenes*.

Fermented trout is a traditional food product in Norway that is consumed without heat treatment. Studies have revealed that a large proportion of samples may contain *L. monocytogenes*, sometimes in high concentrations (up to 2000 CFU per gram). Guidelines issued by the Food Safety Authority recommend a maximum level of 1000 CFU per gram for this particular product. Information about risk products to consumers belonging to risk populations has been issued. A recent study has shown that it is possible to produce fermented trout without *L. monocytogenes* if hygienic precautionary measures, including temperature control and appropriate salt levels, are implemented throughout the process.

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

Listeriosis is endemic in Norway with sporadic clinical cases in animals, especially among sheep. However, listeriosis is not a common disease in humans in Norway. Most cases are sporadic and seen in the elderly or in patients with underlying disease.

Processed ready-to-eat products have been identified as a source for human listeriosis.

### Recent actions taken to control the zoonoses

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

Dietary advice is given to pregnant women.

## 2.3.2 Listeriosis in humans

### A. Listeriosis in humans

#### Reporting system in place for the human cases

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

#### Case definition

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

#### Diagnostic/analytical methods used

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

#### Notification system in place

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

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

Since 1982, the number of notified cases has varied from 2-50. The incidence rate has varied from 0.05-1.07 per 100 000. Most of the cases are sporadic, occurring in elderly individuals or persons with underlying disease. A few congenital cases are also being reported. The first recorded outbreak of listeriosis in Norway occurred in 1992, involving six reported cases. The outbreak was linked to vacuum packed cold cuts. In 2005, an outbreak occurred in a hospital in the middle of Norway. Three cases were reported, and the outbreak was linked to cold cuts. Another outbreak occurred in 2007, involving 21 reported cases of whom two died. The outbreak was linked to a pasteurised soft-cheese produced in Norway.

#### Results of the investigation

In 2009, a total of 31 confirmed cases of listeriosis were notified (incidence rate 0.6 per 100 000), 24 cases were infected in Norway, and none of the cases reported having been infected abroad. One of the cases was pregnancy-associated. Four deaths were recorded.

#### 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. There is, however, an increasing trend if we look at the number of recorded cases over a twenty year period. The increase is not seen in pregnancy-associated cases. The reason for this increasing trend is unknown, but could be related both to an increase in the number of elderly individuals and persons with other underlying diseases, and to increased exposure to *L. monocytogenes* in consumed food.

#### Relevance as zoonotic disease

Listeriosis in humans is a relatively rare disease in Norway.

### 2.3.3 Listeria in foodstuffs

#### A. Listeria spp. in food

##### Monitoring system

###### Sampling strategy

No continuous monitoring in foodstuffs takes place. Surveys are occasionally performed. Norway follows the EU requirements regarding testing for *L. monocytogenes* in milk products.

Samples are taken as part of internal control programmes in the food producing industry.

###### Definition of positive finding

At the production plant

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

###### Diagnostic/analytical methods used

At the production plant

NMKL No 136:2007

At retail

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

##### Control program/mechanisms

###### The control program/strategies in place

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

##### Measures in case of the positive findings

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

Internal control: Corrective actions will be taken according to the frequency of positive findings, product type, step of process at which the isolation was done, and whether the product is a ready-to-eat-product or special dietary product.

##### Results of the investigation

In 2009, a total of 64 samples of fish from wild stock were investigated. All were negative.

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

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

Table Listeria monocytogenes in other foods

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for Listeria	Units tested with detection method	Listeria monocytogenes presence in x g	Units tested with enumeration method	> detection limit but ≤ 100 cfu/g	L. monocytogenes > 100 cfu/g
Fish (from wild stocks)	NIFES	Single	25 g	64	0	64	0	0		

## 2.3.4 Listeria in animals

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

#### Monitoring system

##### Sampling strategy

Listeriosis is a notifiable disease in animals.

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

##### Frequency of the sampling

When there is a suspected case.

##### Case definition

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

##### Diagnostic/analytical methods used

Bacteriology, histopathology and immunohistochemistry.

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

Normally none.

#### Notification system in place

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

#### Results of the investigation

Many animals are investigated with regard to *L. monocytogenes* and listeriosis in clinical laboratories. In 2009, at the National Veterinary Institute, 25 sheep, five goats, four cattle, two pigs and one moose (*Alces alces*) were found positive for *Listeria* spp.

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

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

Table Listeria in animals

	Source of information	Sampling unit	Units tested	Total units positive for Listeria	L. monocytogenes	Listeria spp., unspecified
Cattle (bovine animals)	NVI	Animal	4	4	4	
Goats	NVI	Animal	5	5	5	
Pigs	NVI	Animal	2	2	2	
Sheep	NVI	Animal	25	25	10	15
Moose - wild	NVI	Animal	1	1	1	

## Footnote:

Many animals are each year investigated due to disease problems, and Listeria spp. is sometimes found. Therefore it's difficult to state how many animals there should be in "Units tested" (but as it is impossible to leave the column blank, the same number at positive animals is added for each animal species).



## 2.4 E. COLI INFECTIONS

### 2.4.1 General evaluation of the national situation

#### A. Verotoxigenic Escherichia coli infections general evaluation

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

The reported incidence of VTEC infections in humans in Norway has so far been low (0-47 cases per year). Approximately half of the cases are acquired domestically. In 2006 there was a severe outbreak caused by VTEC O103:H25 with 17 patients, out of which 10 developed HUS and one died.

A study conducted in 1995 revealed a low prevalence of VTEC O157 among Norwegian dairy cattle; animal prevalence 0.3% and herd prevalence 1.0%. In a survey conducted in 1998-1999, one out of 574 dairy cattle herds were positive for VTEC O157 (herd prevalence 0.2%, animal prevalence between 0.02 and 0.06%).

In 2000, none of the tested 1435 beef cattle from 165 herds were positive for VTEC O157. A survey in 2002, in which 453 pooled faecal samples from 155 beef cattle herds were tested for the presence of VTEC O26, O103, O111, O145 and O157, revealed five pooled samples from five herds positive for VTEC O103, all eae negative.

In the surveillance programme for VTEC O157 in cattle, sheep, and goat carcasses running in the period 1998-2004, the total carcass prevalence was 0.06% for cattle and 0.03% for sheep. None of the 510 goat carcasses tested were positive.

In a national survey in sheep conducted in 2006-2007, samples from 585 flocks were analysed, 94 flocks from 2006 and 491 flocks from 2007. VTEC O103:H2 (stx1 and eae positives) were detected in 0.7% and VTEC O157:H7 (stx2 and eae positives, one was also stx1 positive) in 0.9% of the flocks, respectively. Only the 2007 samples were analysed for E. coli O26, and VTEC O26 were detected in 0.8% of these. In addition stx negative and eae positive E. coli O26 were detected in 16.1%, stx negative and eae positive E. coli O103:H2 in 3.1%, and stx negative and eae positive E. coli O103:H25 in 5.8% of the flocks.

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

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

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

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

## 2.4.2 E. coli infections in humans

### A. Verotoxigenic Escherichia coli infections in humans

#### Reporting system in place for the human cases

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

Haemolytic uremic syndrome (HUS) became a notifiable disease in December 2006. Before that, HUS was not notifiable per se, but was reported in relation to an EHEC diagnosis.

#### Case definition

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

#### Diagnostic/analytical methods used

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

Some laboratories use genetic methods directed towards detection of Shiga toxin genes followed by isolation of VTEC and confirmation at the National Reference Laboratory.

#### Notification system in place

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

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

The reported incidence of VTEC infections in humans in Norway has been low. The number of cases has varied between 0-47 per year, and the incidence rate up until 2009 has varied between 0-9.9 per 100 000 inhabitants. Of the around 220 cases that were registered in the period 1992-2008, approximately half of the cases were acquired domestically. Most reported cases were caused by VTEC O157. There were in total 24 cases of haemolytic uremic syndrome (HUS) and two deaths attributable to VTEC infection reported in this period. The first foodborne VTEC outbreak in Norway occurred in 1999 and involved four culture positive patients (O157). Epidemiological investigations incriminated domestically produced lettuce as the most likely source of infection. A severe outbreak caused by VTEC O103:H25 in 2006 involved 17 patients of which 10 developed HUS and one died. In 2009, an outbreak caused by sorbitol fermenting O157:H- occurred. Thirteen children got ill, and of these nine developed HUS and one child died. The source of the outbreak was not found.

#### Results of the investigation

In 2009, 108 cases (incidence rate 2.2) of VTEC and HUS were reported. A total of 14 cases of HUS were reported; sorbitol fermenting O157:H- was isolated from 9 of the patients, O145:H? from 2 patients, O121:H19 from one, and O157:H7 from one. There was no isolate from the last patient. Of the 108 cases of VTEC infections reported, the most commonly isolated serotypes were O157 (7 cases), O103 (2 cases) and O117 (2 cases). Twelve of the 108 cases reported contracting the infection abroad.

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

The number of cases reported in 2009 is high compared to earlier years and seven outbreaks were reported. Many of the notified cases were detected because of increased attention and testing due to the outbreaks. The laboratory methods have probably improved since the O103 outbreak Norway experienced in 2006. However, the number of HUS cases in 2009 is also higher than ever reported before, and the high numbers of cases in 2009 compared to earlier years therefore seems to reflect a real increase in occurrence of this infection. The reason for the increase in both sporadic cases and outbreak-related cases in 2009 is unknown.

### 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 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 2006-2007 a survey regarding VTEC in sheep was conducted, with a total of 593 flocks sampled. From each flock, 50 single faecal samples were requested from the youngest animals.

##### Type of specimen taken

Animals at farm

Faeces

##### Methods of sampling (description of sampling techniques)

Animals at farm

Faecal samples

##### Case definition

Animals at farm

An animal or herd from which VTEC is isolated.

##### Diagnostic/analytical methods used

Animals at farm

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

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

If VTEC O157 or other VTEC that can pose a health risk for humans 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 such VTEC is detected.

The holdings sampled in the survey of sheep flocks in 2006-2007 were anonymized.

#### Notification system in place

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

#### Results of the investigation

More than 460 samples from animals and more than 740 samples from food, feed and environment were investigated due to follow up of human cases. Definite links between human cases and the samples from animals, food, feed and environment were not identified.

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

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

## 2.5 TUBERCULOSIS, MYCOBACTERIAL DISEASES

### 2.5.1 General evaluation of the national situation

#### A. Tuberculosis general evaluation

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

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

Bovine tuberculosis (*M. bovis*) was declared eliminated in cattle in Norway in 1963 as a result of an official eradication programme against the disease. During the period 1895-1896, 26% of 2195 tuberculin-tested herds were positive. In 1950, 18 herds were registered as being infected, while in the beginning of the 1960s only one or two infected herds were reported annually. Since bovine tuberculosis was declared eliminated, it has only been recorded three times; in 1984 in two cattle herds and in 1986 in one cattle herd. These herds were in the same geographical area and the origin of the infection in these herds was probably a man with tuberculosis. Tuberculosis caused by *M. bovis* in other animal species than cattle has not been recorded in Norway after the disease was eliminated from cattle in 1963.

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

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

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

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

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

## 2.5.2 Tuberculosis, mycobacterial diseases in humans

### A. Tuberculosis due to *Mycobacterium bovis* in humans

#### Reporting system in place for the human cases

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

#### Case definition

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

#### Diagnostic/analytical methods used

Clinical indications: Bacteriology, X-ray, pathology.

Screening: Miniature X-ray, tuberculin skin testing, Interferon-gamma release assays.

#### Notification system in place

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

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

The incidence of human tuberculosis (*M. bovis* and *M. tuberculosis*) has steadily decreased during the last 50 years in persons of Norwegian origin. BCG vaccination was introduced in 1947 and was mandatory until 1995. Pasteurisation of milk for commercial sale became mandatory in 1951. Since 1977, the annual incidence rate in persons born in Norway has decreased from 11 to 1.4 per 100 000, and most cases in this part of the population are recurrent cases in elderly patients. Along with increased immigration to Norway, the proportion of tuberculosis cases involving persons born outside Norway has increased during the last two decades (from less than 10% in 1977 to 81% in 2006).

Since bovine tuberculosis in cattle was eliminated in Norway in 1963, almost all bacteriologically confirmed cases in humans have been caused by *M. tuberculosis*. The last domestic case of tuberculosis caused by *M. bovis* was reported in 1994 in a 100-year old woman infected in her youth. Apart from this case, no indigenous cases of tuberculosis caused by *M. bovis* in humans have been reported since 1977. Imported cases of tuberculosis caused by *M. bovis* are sporadically reported; in 2005 in two patients from Somalia and Afghanistan, respectively, in 2002 one patient from Somalia, in 2001 one patient from Tanzania, in 2000 two patients from Somalia and Morocco, respectively, in 1999 one patient from Sri Lanka, in 1998 one patient from Somalia, and in 1994 one patient infected in India.

#### Results of the investigation

In 2009, no cases with tuberculosis caused by *M. bovis* were notified.

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

Tuberculosis caused by *M. bovis* is only sporadically recorded in Norway, and except for a case of

reactivation in 1994, the few recorded cases reported since 1977 have been imported.

### Relevance as zoonotic disease

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

### Additional information

In Norway, the child vaccination programme has included vaccination against tuberculosis since 1947. The BCG vaccine (live attenuated *M. bovis*) is offered to unvaccinated and tuberculin negative persons belonging to certain risk groups; immigrants from countries with high prevalence of tuberculosis, persons travelling to highendemic areas for a prolonged timeperiod, teachers, health personnel, personnel on ships and in offshore industry, and military personnel.

In addition, the BCG vaccine is offered to all children during junior high school (13-14 years old). In general, the immunisation coverage in Norwegian children is high; for the BCG vaccine it is estimated to be 99%. In Norway, the BCG vaccine is estimated to give 80% protection against tuberculosis.

Tuberculin skin test is mandatory for immigrants coming to Norway from high prevalence countries. Immigrants who are 15 years or older must also undergo chest radiograph screening. Screening for tuberculosis in certain risk populations is sometimes conducted.

## 2.5.3 Mycobacterium in animals

### A. Mycobacterium bovis in bovine animals

#### Status as officially free of bovine tuberculosis during the reporting year

##### The entire country free

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

#### Monitoring system

##### Sampling strategy

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

All breeding bulls are tuberculin tested several times.

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

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

##### Frequency of the sampling

All slaughtered animals are subject to meat inspection.

Imported animals are tested during week 22 of the six months long isolation period.

Breeding bulls are tuberculin tested before being transferred to a semen collection centre and thereafter subject to yearly testing.

##### Type of specimen taken

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

##### Methods of sampling (description of sampling techniques)

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

Imported animals and breeding animals: Tuberculin testing.

Clinical indications: Methods will vary depending on the problem.

##### Case definition

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

##### Diagnostic/analytical methods used

Slaughtered animals: Meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/433/EEC. If indicated: bacteriology and histology.

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



Breeding animals and imported animals: Tuberculin testing (intradermal comparative test).

### Vaccination policy

Vaccination of animals against tuberculosis is prohibited in Norway.

### Control program/mechanisms

#### The control program/strategies in place

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

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

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

### Notification system in place

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

### Results of the investigation

In 2009, one of the slaughtered bovine animals had findings at slaughter indicating tuberculosis, and was submitted for examination for *Mycobacterium* sp. The samples were negative.

A total of 290 bulls owned by a breeding company all had negative tuberculin tests.

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

Bovine tuberculosis was declared eliminated in cattle in 1963.

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

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

## B. Mycobacterium bovis in farmed deer

### Monitoring system

#### Sampling strategy

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

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

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

#### Frequency of the sampling

All slaughtered animals are subject to meat inspection.

Imported deer are tested during week 5 of the two months long isolation period.

#### Type of specimen taken

Animals for slaughter: Lymph nodes. Imported animals: Tuberculin testing.

#### Methods of sampling (description of sampling techniques)

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

Imported animals: Tuberculin testing.

Clinical indications: Methods will vary depending on the problem.

#### Case definition

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

#### Diagnostic/analytical methods used

Slaughtered animals: Meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/433/EEC. If indicated: bacteriology and histology.

Imported animals: Tuberculin testing (intradermal comparative test).

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

### Vaccination policy

Vaccination of animals against tuberculosis is prohibited in Norway.

### Control program/mechanisms

#### The control program/strategies in place

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

Required autopsy of animals older than 12 months of age that die or are killed because of a disease.

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

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

### Notification system in place

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

### Results of the investigation

In 2009, none of the slaughtered deer had findings at slaughter indicating tuberculosis.

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

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

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

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

## C. Mycobacterium spp. in animal

### Monitoring system

#### Sampling strategy

For cattle and farmed deer, see the respective chapters.

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

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

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

#### Frequency of the sampling

All slaughtered animals are subject to meat inspection.

Imported animals: Sheep and goats are tested during week 23 of the two years long isolation period. Pigs are tested during week 7 of the two months long isolation period. Lamas are tested during week 22 of the six months long isolation period.

#### Type of specimen taken

Animals for slaughter: Lymph nodes. Imported animals: Tuberculin testing.

#### Methods of sampling (description of sampling techniques)

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

Imported animals and breeding animals: Tuberculin testing.

Clinical indications: Methods will vary depending on the problem.

#### Case definition

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

#### Diagnostic/analytical methods used

Slaughtered animals: Meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Council Directive 64/433/EEC. If indicated: bacteriology and histology.

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

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

### Vaccination policy

Vaccination of animals against tuberculosis is prohibited.

### Control program/mechanisms

#### The control program/strategies in place

Every slaughtered animal, except poultry and animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian

according to Council Directive 64/433/EEC.

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

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

### Notification system in place

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

### Results of the investigation

In 2009, tuberculin tests were performed on 122 breeding boars at AI stations, all were negative. Samples from 22 pigs, one dog and one cattle were analyzed for the presence of *Mycobacterium* species. *M. avium* "hominissuis" was isolated from 15 of the pigs. The other animals were negative.

### 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	M. bovis	M. tuberculosis	Mycobacterium spp., unspecified	M. avium complex - M. avium subsp. hominissuis
Pigs	NVI	Animal	22	15				15
Dogs - pet animals - Clinical investigations	NVI	Animal	1	0				

Table Tuberculosis in farmed deer

Region	Total number of existing farmed deer		Free herds		Infected herds		Routine tuberculin testing		Number of tuberculin tests carried out before the introduction into the herds	Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological examinations	Number of animals detected positive in bacteriological examination
	Herds	Animals	Number of herds	%	Number of herds	%	Interval between routine tuberculin tests	Number of animals tested			
Norge	75	6800	75	100	0	0				0	
Total :	75	6800	75	100	0	0	N.A.	0	0	0	0

## Comments:

<sup>1)</sup> N.A.

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

Region	Total number of existing bovine		Officially free herds		Infected herds		Routine tuberculin testing		Number of tuberculin tests carried out before the introduction into the herds (Annex A(I)(2)(c) third indent (1) of Directive 64/432/EEC)	Number of animals with suspicious lesions of tuberculosis examined and submitted to histopathological and bacteriological	Number of animals detected positive in bacteriological examination
	Herds	Animals	Number of herds	%	Number of herds	%	Interval between routine tuberculin tests	Number of animals tested			
Norge	17400	876300	17400	100	0	0		290		1	0
Total : <sup>1)</sup>	17400	876300	17400	100	0	0	N.A.	290	0	1	0

## Comments:

<sup>1)</sup> N.A.



## 2.6 BRUCELLOSIS

### 2.6.1 General evaluation of the national situation

#### A. Brucellosis general evaluation

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

Bovine brucellosis has been a notifiable disease since 1903. An offensive eradication programme to eliminate the disease was launched in 1935, and Norway was declared free from bovine brucellosis in 1953. Ovine, caprine, or porcine brucellosis has never been recorded in Norway. Norway has been granted official brucellosis-free status of bovine herds by the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 28/07/COL). Also regarding *Brucella melitensis*, Norway is officially free for the disease in sheep and goats.

Human brucellosis has always been a rare disease in Norway, the majority of the cases being imported, and a few cases due to laboratory infections domestically.

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

As bovine brucellosis was declared eliminated in Norway in 1953, and ovine, caprine, or porcine brucellosis has never been recorded, Norway is considered free from brucellosis in production animals.

Research studies have shown that antibodies against *Brucella* can be detected in marine mammals (minke whales and hooded seals) from the North Atlantic Ocean, and in polar bears from the archipelago of Svalbard and the Barents Sea. *Brucella* sp. different from previously described species has also been isolated from hooded seals from the Greenland Sea.

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

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

## 2.6.2 Brucellosis in humans

### A. Brucellosis in humans

#### Reporting system in place for the human cases

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

#### Case definition

A clinically compatible case that is laboratory confirmed.

#### Diagnostic/analytical methods used

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

#### Notification system in place

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

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

Human brucellosis has always been a rare disease in Norway. During the period 1983-2009, only 18 cases of brucellosis were reported: In 2006 three cases of which two had travelled to countries outside Europe and for the third case, there was no information available. In 2005 one case infected in Africa. In 2004 two cases; one infected at work (health care/laboratory), the other infected in Cyprus. In 2003 three cases; two probably infected in Ethiopia and one probably infected in a laboratory. In 2002 three cases; from Spain, Iraq and Georgia. In 2001 two cases; both probably infected in Lebanon. In 2000 one case infected in Turkey probably through milk. In 1999 one case infected through milk in Turkey. In 1997 one immigrant from Turkey. In 1987 a Norwegian UN soldier stationed in Lebanon (*B. melitensis*).

#### Results of the investigation

In 2009 no cases were reported.

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

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

#### Relevance as zoonotic disease

As Norway is free from brucellosis in terrestrial food producing animals, the risk of humans contracting brucellosis from such animals or from Norwegian animal products is considered negligible. However, the recent findings of *Brucella* species in marine mammals needs further research to better understand the epidemiology and to address possible public health implications.

## 2.6.3 Brucella in animals

### A. Brucella abortus in bovine animals

#### Status as officially free of bovine brucellosis during the reporting year

The entire country free

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

#### Monitoring system

##### Sampling strategy

Surveillance programme: During the years 2000-2004, the programme consisted of an active surveillance part, where 20% of the Norwegian cattle population were sampled each year, and a passive surveillance part, where aborted 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. According to the programme, all abortions between the fifth month of pregnancy and 14 days before expected birth in a herd in which there has been at least two such abortions the last 12 months, should be sampled. In addition, blood samples from the cow should be examined.

All breeding bulls are tested.

Imported animals are serologically tested if considered relevant, based upon an assessment of the health status in the country of origin.

Tests are also carried out in connection with clinical indications and export.

##### Frequency of the sampling

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

Imported cattle are tested at week 22 during the six months long isolation period.

##### Type of specimen taken

Blood or foetus.

##### Methods of sampling (description of sampling techniques)

Surveillance programme: Foetus and the foetal membranes and paired blood samples from the mother are collected.

Other monitoring systems: Blood samples.

All samples are collected at farm.

##### Case definition

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

##### Diagnostic/analytical methods used

Foetus: Full autopsy, histopathology, bacteriology.

Blood samples from cows: Antibodies against Brucella in an indirect ELISA (Svanova). If the results are doubtful or positive, the samples are retested in duplicates. If the result still is doubtful or positive, the sample is tested with a competitive ELISA (C-ELISA, Svanova). If still positive, a complement fixation (CF) test is used. If the CF test is positive, new samples are taken four to six weeks after the initial sampling. If this is positive, or if there is a need for immediate follow up, the animal will be tested with an intracutane test using Brucellergene OCB from *B. melitensis* (Synbiotics).

Breeding animals, imports, exports: Serology (Rose bengal plate agglutination test, serum agglutination test or complement fixation test depending on the customers demands).

All tests are performed according to the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, 5th ed. 2004. The indirect ELISA is standardized against EU Directive 64/432/EEC Annex C.

### Vaccination policy

Vaccination of animals against brucellosis is prohibited in Norway.

### Control program/mechanisms

#### The control program/strategies in place

The surveillance programme in cattle herds (in accordance to Council Directive 64/432/EEC Annex I) was established in 2000.

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

Imported cattle are serologically tested if considered relevant based upon an individual assessment.

Tests are also carried out in connection with clinical indications and export.

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

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

### Notification system in place

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

### Results of the investigation

In 2009, a total of 19 fetuses and 26 cows from 15 herds were investigated in the surveillance programme. A total of 506 bulls were tested for brucellosis at the AI stations. All samples 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 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 is officially considered brucellosis free.

### Monitoring system

#### Sampling strategy

Surveillance programme: A large proportion of herds are selected for sampling each year. The programme started in 2007.

Imported goats are serologically tested if considered relevant based upon an assessment of the health status in the country of origin.

#### Frequency of the sampling

Surveillance programme: A selection of herds in the population is tested every year.

Imported goats are tested for brucellosis in week 2 and 23 during the two year's isolation period.

#### Type of specimen taken

Blood

#### Methods of sampling (description of sampling techniques)

Individual blood samples are collected at farm.

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

#### Case definition

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

#### Diagnostic/analytical methods used

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

### Vaccination policy

Vaccination of animals against brucellosis is prohibited.

### Control program/mechanisms

#### The control program/strategies in place

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

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

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

### Notification system in place

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

### Results of the investigation

In 2009, in the surveillance programme, 3124 animals from 104 herds were tested for antibodies against *B. melitensis*. All were negative.

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

Caprine brucellosis has never been recorded in Norway.

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

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

## C. 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 is officially considered as brucellosis free.

### Monitoring system

#### Sampling strategy

Surveillance programme: A large proportion of herds being part of the breeding system with ram circles are tested. Randomly selected flocks not being part of any ram circles are also tested.

Imported sheep are serologically tested if considered relevant based upon an assessment of the health status in the country of origin.

#### Frequency of the sampling

Surveillance programme: A selection of herds in the population is tested every year.

Imported sheep are tested for brucellosis at week 2 and 23 during the two year isolation period.

#### Type of specimen taken

Blood

#### Methods of sampling (description of sampling techniques)

Individual blood samples are collected at the farms.

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

#### Case definition

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

#### Diagnostic/analytical methods used

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

### Vaccination policy

Vaccination of animals against brucellosis is prohibited.

### Control program/mechanisms

#### The control program/strategies in place

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

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

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

### Notification system in place

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

### Results of the investigation

## Norway - 2009 Report on trends and sources of zoonoses

In 2009, in the surveillance programme, 26681 animals from 816 herds were tested for antibodies against *B. melitensis*. All were negative. All 140 rams tested for brucellosis were negative. All 36 animals tested in relation to export or health control 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.



## D. Brucella spp. in animal - Pigs

### Monitoring system

#### Sampling strategy

All breeding boars are tested.

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

#### Frequency of the sampling

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

Imported pigs are tested during week 4 of the two months long isolation period.

#### Type of specimen taken

Blood

#### Methods of sampling (description of sampling techniques)

Blood samples are taken at the farms.

#### Case definition

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

#### Diagnostic/analytical methods used

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

### Vaccination policy

Vaccination of animals against brucellosis is prohibited in Norway.

### Control program/mechanisms

#### The control program/strategies in place

All breeding boars are tested.

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

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

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

### Notification system in place

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

### Results of the investigation

In 2009, all 1153 investigated pigs belonging to a breeding company tested negative. A total of 134 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	B. abortus	B. melitensis	B. suis	Brucella spp., unspecified
Pigs	Breeding Company	Animal	1153	0				
Alpacas	NVI	Animal	1	0				
Dogs <sup>1)</sup>	NVI	Animal	16	0				
Other animals - wild <sup>2)</sup>	NVI	Animal	2	0				

## Comments:

<sup>1)</sup> Mainly tested in relation to export

<sup>2)</sup> Seal (*Phoca vitulina*)

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

Region	Total number of existing		Officially free herds		Infected herds		Surveillance			Investigations of suspect cases				
	Herds	Animals	Number of herds	%	Number of herds	%	Number of herds tested	Number of animals tested	Number of infected herds	Number of animals tested with serological blood tests	Number of animals positive serologically	Number of animals examined microbiologically	Number of animals positive microbiologically	Number of suspended herds
Norge	16100	2296000	100	.62	0	0	920	29805	0					
Total : <sup>1)</sup>	16100	2296000	100	.62	0	0	920	29805	0	0	0	0	0	0

Comments:

<sup>1)</sup> N.A.

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			Information about			Epidemiological investigation					
							Number of bovine herds tested	Number of animals tested	Number of infected herds	Number of bovine herds tested	Number of animals or pools tested	Number of infected herds	Number of notified abortions whatever cause	Number of isolations of Brucella infection	Number of abortions due to Brucella abortus	Number of animals tested with serological blood tests	Number of suspended herds	Number of positive animals		Number of animals examined microbiologically	Number of animals positive microbiologically
																	Sero logically	BST			
Norge	17400	876300	17400	100	0	0		506	0					0	0	45		0	0		
Total : <sup>1)</sup>	17400	876300	17400	100	0	0	0	506	0	0	0	0	0	0	0	45	0	0	0	0	0

## Comments:

<sup>1)</sup> N.A.

## 2.7 YERSINIOSIS

### 2.7.1 General evaluation of the national situation

#### A. Yersinia enterocolitica general evaluation

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

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 50 and 150 notified cases per year.

Studies conducted during the 1980s revealed that a large proportion of Norwegian pigs were carriers of *Y. enterocolitica* serogroup O:3 and that the same variant frequently could be isolated from pig carcasses. In 1995-1996 a serological survey of all multiplier herds (n=66) belonging to the cooperative slaughterhouse organisation showed that 35.5% of the fattening pigs had antibodies against *Y. enterocolitica* O:3, and 80% of the herds had at least one pig (of 40 pigs tested per herd) with antibodies against *Y. enterocolitica* O:3. In an other survey where blood samples from 5 fatteners in each of 326 randomly selected herds were analysed for antibodies against *Y. enterocolitica* O:3, 53% of the pigs and 64% of the herds tested positive.

In 1997-1998, 300 samples of raw pork products were analyzed. *Y. enterocolitica* O:3 was isolated from 2% of the samples by a culturing method (NMKL method no. 117), while use of a PCR method indicated the presence of pathogenic *Y. enterocolitica* in 17% of the samples. This was lower than in a similar survey conducted in 1988-1989.

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

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

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

Pork products are generally considered the most important source of yersiniosis in humans. A Norwegian case-control study conducted in the period 1988-1990 identified consumption of such products as an important risk factor in addition to consumption of untreated drinking water and a general preference for undercooked meat.

In 2006 two smaller outbreaks of yersiniosis both linked to a traditional cold cuts pork product were reported.

##### Recent actions taken to control the zoonoses

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

## 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 enterocolitica* or *Y. pseudotuberculosis* has been isolated or a clinical compatible case with an epidemiological link to a culture confirmed case.

#### Diagnostic/analytical methods used

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

#### Notification system in place

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

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

In the years 1982-1994, the number of notified cases varied between 154 and 274 (mean 187, median 182). From 1994 there was a steady decline in yersiniosis reports. This decline coincided with a gradual introduction of improved routines when slaughtering pigs, which resulted in reduced contamination with *Y. enterocolitica* to pig carcasses. The decline was interrupted in 1998, and since then the incidence has been between 50 and 150 notified cases per year.

#### Results of the investigation

In 2009, a total of 60 cases of yersiniosis were reported (incidence rate 1.2 per 100 000). A total of 34 (57%) cases were domestic.

#### 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 fourth 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. The most common serogroup is O:3. The number reported in 2009 is slightly higher than in 2008 which had the lowest number of reported cases since the surveillance of yersiniosis started.

#### Relevance as zoonotic disease

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

#### Additional information

Patients whose work represents a risk for spread of the disease, e.g., in food production and health care, are advised to stay away from such work while they are having symptoms. It is recommended that for

these patients two consecutive faecal samples examined after the symptoms have disappeared should be negative before returning to work.



## 2.7.3 Yersinia in animals

### A. Yersinia enterocolitica in pigs

#### Monitoring system

##### Sampling strategy

###### Animals at farm

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

###### Animals at slaughter (herd based approach)

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

#### Control program/mechanisms

##### The control program/strategies in place

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

##### Recent actions taken to control the zoonoses

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

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

None.

Table Yersinia in animals

	Source of information	Sampling unit	Units tested	Total units positive for Yersinia	Y. enterocolitica	Y. pseudotuberculosis	Yersinia spp., unspecified	Y. enterocolitica - O:3	Y. enterocolitica - O:9	Y. enterocolitica - Y. enterocolitica, unspecified
Goats	NVI	Animal	3	3		3				
Hares - wild	NVI	Animal	1	1		1				

## Footnote:

Many animals are each year investigated due to disease problems, and Yersinia spp. is sometimes found. Therefore it's difficult to state how many animals there should be in "Units tested" (but as it is impossible to leave the column blank, the same number as positive animals is added for each animal species).

## 2.8 TRICHINELLOSIS

### 2.8.1 General evaluation of the national situation

#### A. Trichinellosis general evaluation

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

Trichinellosis has been found sporadically in farmed food producing animals and was last detected in two pig herds in 1994. This was the first report of trichinellosis in pigs since 1981.

Trichinellosis occurs endemically among wild red foxes in mainland Norway and among wild arctic foxes and polar bears in the archipelago of Svalbard. In a survey in red foxes killed during the licenced hunting season in 1994-1995 and 2002-2005, 4.8% of 393 examined animals were positive for *Trichinella* larvae. Trichinellosis has also been diagnosed in farmed foxes.

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

Human trichinellosis acquired in Norway has not been reported since 1980. The two last reported cases of human trichinellosis, in 1996, were both imported.

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

Trichinellosis was last detected in food producing animals in 1994, in two pig herds.

Trichinellosis occurs endemically among wildlife.

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

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

## 2.8.2 Trichinellosis in humans

### A. Trichinellosis in humans

#### Reporting system in place for the human cases

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

#### Case definition

A clinically compatible case that is laboratory confirmed.

#### Diagnostic/analytical methods used

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

#### Notification system in place

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

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

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

#### Results of the investigation

In 2009, 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 horses

#### Monitoring system

##### Sampling strategy

All horses must be controlled for Trichinella at slaughter according to Council Directive 64/433/EEC (still in force in 2009). 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 (still in force in 2009). For analyses, 5 g per animal is included in a pooled sample of maximum 100 g.

##### Case definition

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

##### Diagnostic/analytical methods used

Artificial digestion method of pooled samples.

#### Results of the investigation including the origin of the positive animals

In 2009, no cases of trichinellosis were reported among slaughtered horses.

#### 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 (still in force in 2009).

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. Animals from such farms will be given special attention at slaughter the following six months.

#### Notification system in place

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

Cases are to be notified to the Norwegian Food Safety Authority.

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

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

## B. Trichinella in pigs

### Monitoring system

#### Sampling strategy

##### General

All pigs must be controlled for *Trichinella* at slaughter according to Council Directive 64/433/EEC (still in force in 2009). 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 (still in force in 2009). Up to 100 samples, each of 1 gram, can be analysed as a pooled sample when using a digestion method. Sometimes the compression method is used instead of a digestion method.

#### Case definition

##### General

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

#### Diagnostic/analytical methods used

##### General

Artificial digestion method of pooled samples. Occasionally a compression method is used.

#### 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 (still in force in 2009). 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 (still in force in 2009). 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. Animals from such farms will be given special attention at slaughter the following six months. The sample size for the digestion method will be increased to 2 grams.

### Notification system in place

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

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

In 2009, no cases of trichinellosis among slaughtered pigs were reported.

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

Trichinellosis was last detected in two pig herds in 1994.

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

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

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

#### Monitoring system

##### Sampling strategy

All wild boars and bears must be controlled for *Trichinella* at slaughter according to Council Directive 64/433/EEC (still in force in 2009). 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, masseter or occasionally other muscles.

##### Methods of sampling (description of sampling techniques)

Depending on the situation and animal species.

##### Case definition

An animal with a positive test result.

##### Diagnostic/analytical methods used

Digestion methods or compression method.

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

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

#### Notification system in place

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

#### Results of the investigation including the origin of the positive animals

In 2009, one lynx (*Lynx lynx*) was investigated and found negative for *Trichinella*.

#### 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	T. spiralis	Trichinella spp., unspecified
Pigs	<sup>1)</sup>	NFSA	Animal	1522300	0		
Solipeds, domestic - horses	<sup>2)</sup>	NFSA	Animal	1300	0		
Lynx - wild		NVI	Animal	1	0		

## Comments:

- <sup>1)</sup> number of slaughtered animals from 2008, as 2009 was not available  
<sup>2)</sup> number of slaughtered animals from 2008, as 2009 was not available

## 2.9 ECHINOCOCCOSIS

### 2.9.1 General evaluation of the national situation

#### A. Echinococcus spp. general evaluation

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

*E. granulosus* used to be relatively common in reindeer in Northern Norway until the 1950s (approx. 10% prevalence in the 1950s). Today the parasite has virtually been eliminated as a result of systematic anthelmintic treatment of herder dogs and a reduction in the feeding of raw offal from slaughter to the herder dogs. In 2003, one reindeer had pathological findings compatible with *E. granulosus* infestation. *E. granulosus* was last diagnosed in cattle in 1987.

*E. multilocularis* has never been detected in mainland Norway in any animal species. In 1999, a research project on echinococcosis in the archipelago of Svalbard detected *E. multilocularis* 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 neither of the two cats. The methods used were coproantigen ELISA, flotation (egg detection), and PCR. Of the wintered voles tested in 2000-2006, between 19% and 96% were positive each year. . In mainland Norway in the period 2002-2009, a total of 1633 red foxes have been investigated, all have been negative for *E. multilocularis*.

Human echinococcosis has never been a public health problem in Norway.

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

The risk of acquiring echinococcosis in Norway is considered very low. The pathological finding compatible with *E. granulosus* infestation in a reindeer in 2003 is a reminder that this parasite still may be present and that this requires awareness in the reindeer industry, especially with regard to the importance of regular treatment of herd dogs with an anti-helmintic drug.

The occurrence of *E. multilocularis* among animals in the archipelago of Svalbard requires alertness among health personnel, especially in this region.

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

The pathological finding compatible with *E. granulosus* infestation in a reindeer in 2003 is a reminder that this parasite still may be present and that this requires awareness in the reindeer industry.

As *E. multilocularis* has never been detected in mainland Norway in any animal species, the risk to humans of contracting echinococcosis caused by *E. multilocularis* in mainland Norway is probably very low. The occurrence of *E. multilocularis* among animals in the archipelago of Svalbard requires alertness among health personnel, especially in this region. Inhabitants of Svalbard have been informed about the risk.

## 2.9.2 Echinococcosis in humans

### A. Echinococcus spp. in humans

#### Reporting system in place for the human cases

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

#### Case definition

A clinical compatible case that is laboratory confirmed.

#### Diagnostic/analytical methods used

Serology and histopathology.

#### Notification system in place

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

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

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

#### Results of the investigation

In 2009, four cases were reported, all had recently moved to Norway.

#### 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 awareness in the reindeer industry, 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 granulosus among the final hosts (dogs).

##### Frequency of the sampling

All possible intermediate hosts are being subject to meat inspection procedure according to Council Directive 64/433/EEC (still in force in 2009).

##### 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

In 2009, all slaughtered animals subjected to official meat control were negative for E. granulosus. No cases of infection with E. granulosus were diagnosed in carnivores.

#### Additional information

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

## B. E. multilocularis in animal

### Monitoring system

#### Sampling strategy

In 2006 a National surveillance programme regarding *E. multilocularis* in red foxes was started including foxes killed during hunting in 2002-2005. In 2009, animals hunted during the 2008-2009 hunting season were investigated.

There are no official monitoring programmes for *E. multilocularis* in other animals.

#### Methods of sampling (description of sampling techniques)

Foxes: Faecal samples.

Intermediate hosts: Autopsy.

#### Case definition

An animal with a positive test result.

#### Diagnostic/analytical methods used

Faecal samples: Taeniid egg isolation and multiplex PCR techniques. Autopsy of intermediate hosts: Macroscopic examination of organs.

### 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 findings of *E. multilocularis* in the archipelago of Svalbard, the Norwegian Food Safety 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 findings of *E. multilocularis* in the archipelago of Svalbard in 1999 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 396 red foxes killed during the hunting season 2008-2009 were investigated. All were negative.

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

In mainland Norway, *E. multilocularis* has never been detected in any animal species. In a study, serum samples from 98 farmed foxes were free from circulating antibodies to Em2 antigen. In mainland Norway the main host of *E. multilocularis*, the fox, has been investigated by examining a total of 1633 red foxes killed during hunting from 2002-2009. All samples have been negative, and it is therefore considered unlikely that this parasite has established in wild foxes in Norway, and the parasite is not likely to be present in dogs and cats either.

In 1999, in a research project on echinococcosis in the archipelago of Svalbard, *E. multilocularis* was detected in 16 % of 172 sibling voles tested. In a follow-up study, the parasite was diagnosed in samples from polar foxes and dogs. Of the wintered voles tested in 2000-2006, between 19% and 96% were

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positive each year.

Table Echinococcus in animals

	Source of information	Sampling unit	Units tested	Total units positive for Echinococcus	E. granulosus	E. multilocularis	Echinococcus spp., unspecified
Cattle (bovine animals)	NFSA	Animal	313300	0			
Foxes	NVI	Animal	396	0			
Goats	NFSA	Animal	23300	0			
Pigs	NFSA	Animal	1522300	0			
Sheep	NFSA	Animal	1165300	0			
Solipeds, domestic	NFSA	Animal	1600	0			

## Footnote:

Numbers of slaughtered animals (all species except foxes) are from 2008, as data from 2009 was not available.

## 2.10 TOXOPLASMOSIS

### 2.10.1 General evaluation of the national situation

#### A. Toxoplasmosis general evaluation

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

In 1994, the last year human toxoplasmosis was notifiable, 33 cases were reported (incidence rate 0.77 per 100 000 inhabitants) of which eight were children less than one year.

*Toxoplasma gondii* is endemic in animals in Norway with the domestic cat and wild lynx being the final hosts. Studies indicate that the parasite is relatively common among sheep; 18% of the lambs were seropositive in a survey conducted during the 1990s, and seropositive lambs were identified on 44% of the farms included. The parasite is assumed to be less common among Norwegian pigs. In the above mentioned survey, 2% of the slaughtering pigs tested were seropositive. In 2008, a survey using goat sera collected in the period 2002-2008 were tested. A total of 18.5% of the animals were positive.

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 goat 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 are not reported to the Norwegian Surveillance System for Communicable Diseases (MSIS).

#### 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.

#### 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 2009, 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 or specific surveys.

##### Case definition

An animal with a positive test result.

##### Diagnostic/analytical methods used

Serology (direct agglutination test) or pathology.

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

Normally none.

#### Notification system in place

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

#### Results of the investigation

In 2009, several animal species were investigated for Toxoplasma at the National Veterinary Institute. Only for sheep were there more than five investigated animals and more than one positive animal: A total of nine out of 31 investigated sheep 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	T. gondii
Sheep	NVI	Animal	31	9	9

## 2.11 RABIES

### 2.11.1 General evaluation of the national situation

#### A. Rabies general evaluation

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

Rabies in animals has not been recorded in mainland Norway. The disease has sporadically been diagnosed in polar fox, reindeer, and seal in the archipelago of Svalbard, the last time in a fox found dead in 1999 (25 animal cases were diagnosed during the period 1980-2009). However, transmission of rabies to humans has never been recorded in the archipelago of Svalbard.

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

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

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

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

## 2.11.2 Rabies in humans

### A. Rabies in humans

#### Reporting system in place for the human cases

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

Cases are also reported immediately to the Municipal Medical Officer. If a domestic animal source is suspected, the Municipal Medical Officer also informs the Norwegian Food Safety Authority. Investigations will be initiated in order to identify the source and prevent further cases.

#### Case definition

A clinical case that is laboratory confirmed.

#### Diagnostic/analytical methods used

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

#### Notification system in place

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

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

Human rabies was last described in Norway in 1815.

#### Results of the investigation

In 2009, no human cases were reported.

#### Relevance as zoonotic disease

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

#### Additional information

Rabies vaccine containing inactivated virus is available for the following indications: Pre-exposure prophylaxis to; 1) individuals with prolonged travels to countries with high incidence of rabies; 2) individuals who will work with animals in endemic areas; 3) persons who are at frequent risk of bites from bats; 4) laboratory personnel involved in rabies diagnostics. Post-exposure prophylaxis to individuals presumably exposed to rabies virus abroad or in the archipelago of Svalbard, or who have been bitten by bats. The post-exposure prophylaxis includes specific antiserum in addition to the vaccine

### 2.11.3 Lyssavirus (rabies) in animals

#### A. Rabies in dogs

##### Monitoring system

###### Sampling strategy

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

###### Frequency of the sampling

On clinical suspicion.

###### Type of specimen taken

Brain

###### Methods of sampling (description of sampling techniques)

The brain is removed at autopsy, and samples are taken according to 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, 5th ed. 2004. A very sensitive PCR method is also used.

##### Vaccination policy

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

##### Other preventive measures than vaccination in place

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

##### Control program/mechanisms

###### The control program/strategies in place

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

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

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

##### Notification system in place

Rabies has been a notifiable List A disease according to the Animal Diseases Act since 1965. Rabies is dealt with in Council Directive 92/65/EEC, which is implemented in Regulations on animal health conditions regarding movements, import and export of certain animals [FOR 2004-07-01 No 1105 and FOR 2004-02-20 No 464].

##### Results of the investigation

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In 2009 no cases were reported. Three dogs were investigated and found negative.

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

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

There is a concern regarding a possible increase in the number of illegally imported dogs.

## B. Rabies virus in animal - Wildlife

### Monitoring system

#### Sampling strategy

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

#### Frequency of the sampling

On clinical suspicion.

#### Type of specimen taken

Brain, in bats also oral swabs.

#### Methods of sampling (description of sampling techniques)

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

#### Case definition

A case that is laboratory confirmed.

#### Diagnostic/analytical methods used

Fluorescent antibody test (FAT), cell culture test or mouse inoculation test, all performed according to the OIE Manual of Diagnostic Tests and vaccines for Terrestrial Animals, 5th ed. 2004. In addition, a very sensitive PCR method is used.

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

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

### Notification system in place

Rabies has been a notifiable List A disease according to the Animal Diseases Act since 1965. Rabies is dealt with in Council Directive 92/65/EEC, which is implemented in Regulations on animal health conditions regarding movements, import and export of certain animals [FOR 2004-07-01 No 1105 and FOR 2004-02-20 No 464].

### Results of the investigation

In 2009, all tested animals were negative. The majority of animals came from the Svalbard area (64 polar foxes (mainly from the 2007-2008 hunting season) and three polar bears). In addition one bat from mainland Norway was investigated and found negative.

### 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)	Lyssavirus, unspecified	Classical rabies virus (genotype 1)	European Bat Lyssavirus - unspecified
Bats - wild	NVI	Animal	1	0			
Dogs	NVI	Animal	3	0			
Foxes - wild <sup>1)</sup>	NVI	Animal	64	0			
Polar bears - wild	NVI	Animal	3	0			

## Comments:

<sup>1)</sup> Polar foxes from Svalbard

## 2.12 Q-FEVER

### 2.12.1 General evaluation of the national situation

#### A. Coxiella burnetii (Q-fever) general evaluation

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

Q-fever has not been diagnosed in animals in Norway. In a survey in 2008, bulk milk samples from 470 dairy herds and 550 blood samples from 55 suckling cattle herds were sampled in five cattle dense counties (Rogaland, Trøndelag, Hedmark, Oppland and Østfold). All samples were negative.

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

C. burnetii has never been detected in animals in Norway.

## 2.12.2 Coxiella (Q-fever) in animals

### A. C. burnetii in Animals

#### Monitoring system

##### Sampling strategy

Surveys are performed occasionally.

##### Case definition

Sample positive for antibodies against C. burnetii.

##### Diagnostic/analytical methods used

Detection of antibodies to C. burnetii in milk or serum by ELISA.

#### Results of the investigation

In 2009, a total of 349 goat herds (bulk milk samples from 348 herds and blood samples from 31 animals from one herd), 627 sheep (from 124 herds) and 68 cattle (from 46 herds) were tested for Q-fever. All samples were negative.

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

C. burnetii has never been detected in animals in Norway.

Table Coxiella burnetii (Q fever) in animals

		Source of information	Sampling unit	Units tested	Total units positive for Coxiella (Q-fever)	C. burnetii
Cattle (bovine animals)	<sup>1)</sup>	NVI	Animal	68	0	
Goats	<sup>2)</sup>	NVI	Herd	349	0	
Sheep	<sup>3)</sup>	NVI	Animal	627	0	

**Comments:**

- <sup>1)</sup> From 46 herds, one animal due to clinical investigations, the rest as part of a survey.  
<sup>2)</sup> Bulk milk from 348 herds and 31 blood samples from one herd.  
<sup>3)</sup> From 124 herds, 602 animals from 121 herds as part of a survey, the rest in the context of clinical investigations.

**Footnote:**

Samples analyzed with an ELISA.

### 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

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

##### Sampling strategy used in monitoring

###### Frequency of the sampling

The sampling of animals for isolation of indicator *E. coli* to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET. The sampling is spread throughout the year and each year one or several animal species are included. In 2009, broilers, horse and sheep were monitored.

###### Type of specimen taken

Faecal material.

###### Methods of sampling (description of sampling techniques)

The samples were taken as part of other surveillance programmes (broiler, sheep) or collected at veterinary horse clinics or from stables in the field (horse).

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

Only one isolate from each herd was included.

###### Methods used for collecting data

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

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

A sample was plated directly onto the surface of lactose-saccharose-bromthymol blue agar without broth enrichment. After incubation of the agar plates at 37 C for 24 h, a typical colony was plated onto blood agar (Heart infusion agar (Difco) containing 5% bovine blood) and incubated at 37 C for 18-24 h. Colonies were identified as *E. coli* by typical appearance, lactose and/or saccharose fermentation and a positive indole reaction.

##### Laboratory used for detection for resistance

###### Antimicrobials included in monitoring

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

###### Cut-off values used in testing

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

##### Control program/mechanisms

###### The control program/strategies in place

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

Table Antimicrobial susceptibility testing of E. coli in Gallus gallus (fowl)

Escherichia coli, non-pathogenic	E.coli, non-pathogenic, unspecified	
	yes	
Isolates out of a monitoring program (yes/no)	162	
Number of isolates available in the laboratory	N	n
<b>Antimicrobials:</b>		
Amphenicols - Chloramphenicol	162	0
Cephalosporins - 3rd generation cephalosporins	162	0
Fluoroquinolones - Ciprofloxacin	162	13
Quinolones - Nalidixic acid	162	13
Trimethoprim	162	4
Sulfonamides - Sulfonamide	162	12
Aminoglycosides - Streptomycin	162	5
Aminoglycosides - Gentamicin	162	0
Penicillins - Ampicillin	162	19
Tetracyclines - Tetracycline	162	13



Table Antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Sheep

Escherichia coli, non-pathogenic	E.coli, non-pathogenic, unspecified	
	yes	
Isolates out of a monitoring program (yes/no)	136	
Number of isolates available in the laboratory	136	
Antimicrobials:	N	n
Amphenicols - Chloramphenicol	136	0
Tetracyclines - Tetracycline	136	2
Fluoroquinolones - Ciprofloxacin	136	0
Quinolones - Nalidixic acid	136	0
Trimethoprim	136	0
Aminoglycosides - Streptomycin	136	19
Aminoglycosides - Gentamicin	136	0
Penicillins - Ampicillin	136	3
Cephalosporins - Cefotaxim	136	0
Sulfonamides	136	4

Table Antimicrobial susceptibility testing of Escherichia coli, non-pathogenic in Solipeds, domestic - horses

Escherichia coli, non-pathogenic	E.coli, non-pathogenic, unspecified	
	yes	
Isolates out of a monitoring program (yes/no)	171	
Number of isolates available in the laboratory	171	
Antimicrobials:	N	n
Amphenicols - Chloramphenicol	171	0
Tetracyclines - Tetracycline	171	3
Fluoroquinolones - Ciprofloxacin	171	0
Quinolones - Nalidixic acid	171	0
Trimethoprim	171	15
Aminoglycosides - Streptomycin	171	13
Aminoglycosides - Gentamicin	171	0
Penicillins - Ampicillin	171	3
Cephalosporins - Cefotaxim	171	0
Sulfonamides	171	13

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

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

E.coli, non-pathogenic, unspecified  Isolates out of a monitoring program (yes/no)  Number of isolates available in the laboratory	Gallus gallus (fowl) - broilers																									
	yes																									
	162																									
Antimicrobials:	Cut-off value	N	n	≤0.008	0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
Amphenicols - Chloramphenicol	16	162	0								1	15	102	43	1											
Tetracyclines - Tetracycline	8	162	13							2	85	62				8	4	1								
Fluoroquinolones - Ciprofloxacin	0.03	162	13		4	92	53	1	5	5	1	1														
Quinolones - Nalidixic acid	16	162	13								6	59	80	4		2	1	5	5							
Trimethoprim	2	162	4						79	71	7	1	1				3									
Aminoglycosides - Streptomycin	16	162	5									2	72	74	9	3	1		1							
Aminoglycosides - Gentamicin	2	162	0							70	82	10														
Penicillins - Ampicillin	8	162	19							2	27	90	23	1			19									
Cephalosporins - Cefotaxim	2	162	0				101	54	7																	
Sulfonamides	256	162	12												101	44	5							12		

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

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

E.coli, non-pathogenic, unspecified  Isolates out of a monitoring program (yes/no)  Number of isolates available in the laboratory	Sheep																									
	yes																									
	136																									
Antimicrobials:	Cut-off value	N	n	<=0.008	0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
Amphenicols - Chloramphenicol	16	136	0									2	97	36	1											
Tetracyclines - Tetracycline	8	136	2								116	18					1	1								
Fluoroquinolones - Ciprofloxacin	0.03	136	0			58	78																			
Quinolones - Nalidixic acid	16	136	0									37	98	1												
Trimethoprim	2	136	0						63	72	1															
Aminoglycosides - Streptomycin	16	136	19									3	51	63		1	5	9	3	1						
Aminoglycosides - Gentamicin	2	136	0							36	96	4														
Penicillins - Ampicillin	8	136	3								2	59	63	9		1	2									
Cephalosporins - Cefotaxim	0.25	136	0				52	74	10																	
Sulfonamides		136	4												43	64	25							4		

Table Antimicrobial susceptibility testing of E. coli in Solipeds, domestic - horses - quantitative data [Dilution method]

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

E.coli, non-pathogenic, unspecified  Isolates out of a monitoring program (yes/no)  Number of isolates available in the laboratory	Solipeds, domestic - horses																									
	yes																									
	171																									
Antimicrobials:	Cut-off value	N	n	<=0.008	0.015	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	2048	>2048	lowest	highest	
Amphenicols - Chloramphenicol	16	171	0									23	98	50												
Tetracyclines - Tetracycline	8	171	3							1	71	94	2				1	2								
Fluoroquinolones - Ciprofloxacin	1	171	0		17	125	29																			
Quinolones - Nalidixic acid		171	0								5	92	72	2												
Trimethoprim	2	171	15						89	64	3						15									
Aminoglycosides - Streptomycin	16	171	13									8	86	60	4	2	3	4	2	2						
Aminoglycosides - Gentamicin	2	171	0							82	83	6														
Penicillins - Ampicillin	8	171	3							3	24	88	50	3			3									
Cephalosporins - Cefotaxim	0.25	171	0				121	49	1																	
Sulfonamides		171	13												125	31	2						13			

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

Test Method Used
Broth dilution

Standard methods used for testing
NCCLS/CLSI

			Concentration (microg/ml)	Zone diameter (mm)
		Standard	Resistant >	Resistant <=
Amphenicols	Chloramphenicol		16	
Tetracyclines	Tetracycline		8	
Fluoroquinolones	Ciprofloxacin		0.064	
Quinolones	Nalidixic acid		16	
Trimethoprim	Trimethoprim		2	
Sulfonamides	Sulfonamides		256	
Aminoglycosides	Streptomycin		16	
	Gentamicin		2	
Cephalosporins	Cefotaxim		0.25	
Penicillins	Ampicillin		8	

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

Test Method Used

Standard methods used for testing

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

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

Test Method Used

Standard methods used for testing

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



## 3.2 ENTEROCOCCUS, NON-PATHOGENIC

### 3.2.1 General evaluation of the national situation

### 3.2.2 Antimicrobial resistance in Enterococcus, non-pathogenic isolates

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

Test Method Used

Standard methods used for testing

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

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

Test Method Used

Standard methods used for testing

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

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

Test Method Used

Standard methods used for testing

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

## 4. INFORMATION ON SPECIFIC MICROBIOLOGICAL AGENTS

## 4.1 ENTEROBACTER SAKAZAKII

### 4.1.1 General evaluation of the national situation

## 4.2 HISTAMINE

### 4.2.1 General evaluation of the national situation

### 4.2.2 Histamine in foodstuffs

#### A. Histamine in foodstuffs

##### Monitoring system

###### Sampling strategy

Regular testing of selected species is required as an internal part of food business operators quality assurance system.

Surveys are performed occasionally.

###### Definition of positive finding

Histamine values above 100 mg/kg.

###### Diagnostic/analytical methods used

Reverse phase HPLC/UV

Table Histamine in food

	Source of information	Sampling unit	Sample weight	Units tested	Total units in non-conformity	<= 100 mg/kg	100 - <= 200 mg/kg	>200 - <= 400 mg/kg	> 400 mg/kg
Fish - Fishery products from fish species associated with a high amount of histidine - not enzyme matured <sup>1)</sup>	NIFES	Single	5 g	113	0	113			

Comments:

<sup>1)</sup> All samples < 5 mg/kg

## 4.3 STAPHYLOCOCCAL ENTEROTOXINS

### 4.3.1 General evaluation of the national situation

## 5. FOODBORNE

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



## A. Foodborne outbreaks

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

Health personnel are required to report suspected foodborne outbreaks to the Municipal Health Officer, who is required to report to the County Governor (Fylkesmannen) and to the Norwegian Institute of Public Health. Suspected outbreaks are reported immediately to the Municipal Medical Officer who notifies the Norwegian Institute of Public Health the same day. If a domestic food or animal source is suspected, the Municipal Medical Officer also informs the local Food Safety Authority.

The Norwegian Food Safety Authority has voluntary reporting where the District Offices report foodborne outbreaks.

Norway has since 2005 a web-based reporting system called Vesuv where all outbreaks in humans are to be reported and stored in a database at the Norwegian Institute of Public Health.

If an indigenous outbreak is suspected, epidemiological investigations will be initiated in order to identify the source and prevent further cases. For imported cases, the country of acquisition will be recorded. If information through international networks indicates that a case belongs to an outbreak, epidemiological investigations will be initiated.

### Description of the types of outbreaks covered by the reporting:

All suspected foodborne outbreaks are notifiable. The definition of a foodborne outbreak is two or more human cases with the same infection where the cases are linked or are probably linked to the same food source, or when observed number of human cases exceeds the expected number of cases during the same time period and place, and food is a likely vehicle.

### National evaluation of the reported outbreaks in the country:

#### Trends in numbers of outbreaks and numbers of human cases involved

The number of reported foodborne outbreaks has increased in Norway since the web-based reporting system was established in 2005 (42 in 2005, 65 in 2006 and 80 in 2007). We believe that this increasing trend is due to a higher reporting frequency rather than a real higher number of outbreaks. The number of reported outbreaks decreased again in 2008 (64) and 2009 (47).

#### Relevance of the different causative agents, food categories and the agent/food category combinations

Traditionally, the most common cause of foodborne outbreaks in Norway has been bacterial intoxication (*Clostridium perfringens*, *Bacillus cereus* and *Staphylococcus aureus*). Recently, foodborne outbreaks of norovirus caused by infected foodhandlers have become more common. Reported domestic outbreaks of salmonellosis and campylobacteriosis have been relatively rare.

#### Relevance of the different type of places of food production and preparation in outbreaks

Traditionally, outbreaks have mainly been associated with inadequate handling and temperature abuse, causing food intoxication. In addition, untreated water has caused several outbreaks.

#### Evaluation of the severity and clinical picture of the human cases

In 2009, several severe outbreaks were reported. No deaths were related to foodborne outbreaks.

#### Descriptions of single outbreaks of special interest

## Norway - 2009 Report on trends and sources of zoonoses

We registered one severe outbreak caused by sorbitol fermenting *E. coli* O157 including 13 children and nine of the patients developed haemolytic uremic syndrome (HUS). Two other severe *E. coli* outbreaks caused by O145 (3 HUS) and O121 (1 HUS) were also reported. A total of 23 persons were included in an outbreak of *Shigella sonnei* which was discovered with PCR in imported sugar peas.

Table Foodborne Outbreaks: summarised data

	Total number of outbreaks	Outbreaks	Human cases	Hospitalized	Deaths	Number of verified outbreaks
Bacillus	3	2	9	0	0	1
Campylobacter	4	4	26	0	0	0
Clostridium	1	0	unknown	unknown	unknown	1
Escherichia coli, pathogenic	5	5	31	13	0	0
Foodborne viruses	15	14	332	0	0	1
Listeria	1	1	2	2	0	0
Other agents	3	1	11	0	0	2
Parasites	1	1	66	0	0	0
Salmonella	1	1	5	1	0	0
Staphylococcus	0	0	unknown	unknown	unknown	0
Unknown	13	13	160	0	0	0
Yersinia	0	0	0	0	0	0

Table Verified Foodborne Outbreaks: detailed data for Bacillus

Please use CTRL for multiple selection fields

**B. cereus**

Value

Code	
Outbreaks	1
Human cases	2
Hospitalized	0
Deaths	0
Foodstuff implicated	Crustaceans, shellfish, molluscs and products thereof
More Foodstuff information	Shrimps in sushi
Type of evidence	Laboratory detection in implicated food
Outbreak type	General
Setting	Household
Place of origin of problem	unknown
Origin of foodstuff	unknown
Contributory factors	Storage time/temperature abuse
Other Agent (Mixed Outbreaks)	
Comment	

Table Verified Foodborne Outbreaks: detailed data for Clostridium

Please use CTRL for multiple selection fields

## C. perfringens

Value

Code	
Outbreaks	1
Human cases	33
Hospitalized	0
Deaths	0
Foodstuff implicated	Pig meat and products thereof
More Foodstuff information	Stew with swine meat
Type of evidence	Laboratory detection in implicated food
Outbreak type	General
Setting	Restaurant, Cafe, Pub, Bar, Hotel
Place of origin of problem	unknown
Origin of foodstuff	Domestic
Contributory factors	Inadequate heat treatment
Other Agent (Mixed Outbreaks)	
Comment	

Table Verified Foodborne Outbreaks: detailed data for Foodborne viruses

Please use CTRL for multiple selection fields

## Calicivirus - norovirus (Norwalk-like virus)

Value

Code	
Outbreaks	1
Human cases	3
Hospitalized	0
Deaths	0
Foodstuff implicated	Crustaceans, shellfish, molluscs and products thereof
More Foodstuff information	Oysters
Type of evidence	Laboratory detection in implicated food
Outbreak type	General
Setting	Household
Place of origin of problem	unknown
Origin of foodstuff	Intra community trade
Contributory factors	Unknown
Other Agent (Mixed Outbreaks)	
Comment	

Table Verified Foodborne Outbreaks: detailed data for Other agents

Please use CTRL for multiple selection fields

## Histamine

Value

Code	
Outbreaks	1
Human cases	4
Hospitalized	0
Deaths	0
Foodstuff implicated	Fish and fish products
More Foodstuff information	Smoked mackerel
Type of evidence	Laboratory detection in implicated food
Outbreak type	General
Setting	Household
Place of origin of problem	unknown
Origin of foodstuff	Domestic
Contributory factors	Unknown
Other Agent (Mixed Outbreaks)	
Comment	

## Shigella - S. sonnei

Value

Code	
Outbreaks	1
Human cases	23
Hospitalized	3
Deaths	0
Foodstuff implicated	Vegetables and juices and other products thereof
More Foodstuff information	Sugar pies
Type of evidence	Laboratory detection in implicated food
Outbreak type	General
Setting	Household
Place of origin of problem	unknown
Origin of foodstuff	Imported from outside EU
Contributory factors	Other contributory factor
Other Agent (Mixed Outbreaks)	
Comment	Imported from Kenya