ZOONOSES MONITORING

NORWAY

The Report referred to in Article 5 of Directive 92/117/EEC

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

including information on foodborne outbreaks and antimicrobial resistance in zoonotic agents

IN 2004

INFORMATION ON THE REPORTING AND MONITORING SYSTEM

Country: **Norway**

Reporting Year: **2004**

Institutions and laboratories involved in monitoring:

Laboratory name	Description	Contribution
National Veterinary Institute (NVI)	The National Veterinary Institute is a governmental agency funded by the Ministry of Agriculture and Food, Ministry of Fisheries and Coastal Affairs and the Norwegian Research Council. The primary function is supply of independent research based advisory support to the governing authorities regarding animal health, fish health and food safety.	Contributing with data and text. The reporting officer is employed at the Zoonosis Centre at NVI.
Norwegian Food Safety Authority (NFSA)	The Norwegian Food Safety Authority is the competent authority for the purpose of Council directive 92/117/EEC (now replaced by directive 2003/99/EC of the European Parliament and of the Council and regulation (EC) No 2160/2003 of the European Parliament and of the Council by decision 49/2005 of the EEA Joint Committee of 30 April 2005).	Contributing with data and text.

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

PREFACE

This report is submitted to the European Commission in accordance with Article 5 of Council Directive 92/117/EEC[1]. The information has also been forwarded to the European Food Safety Authority (EFSA).

The report contains information on trends and sources of zoonoses and zoonotic agents in Norway during the year 2004. The information covers the occurrence of these diseases and agents in humans, animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and commensal bacteria as well as information on epidemiological investigations of foodborne outbreaks. Complementary data on susceptible animal populations in the country is also given.

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

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

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

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

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1 Council Directive 92/117/ECC of 17 December 1992 concerning measures for protection against specified zoonoses and specified zoonotic agents in animals and products of animal origin in order to prevent outbreaks of foodborne infections and intoxications, OJ L 62, 15.3.1993, p. 38

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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 2004.
Data on slaughtered animals: Slaughtered in 2004.

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

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

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

For cattle, swine, sheep, goat and poultry (layers and broilers) there has been a downward trend in the number of herds/holdings during the last decade. However, the number of animals per herd/holding has increased for all species.
From 2003 to 2004 there was a large increase in the production of pork and poultry, with seven and 11 percent, respectively.

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 16.3 cows. There are also a number of specialized beef herds with an average number of suckling cows being 10. 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 programme is organised by the industry. The swine population is denser in some counties and about 50% of the swine production is concentrated in four counties in the southern and middle part of Norway.
Sheep: The Norwegian sheep flocks are widely distributed over the country, with the greatest population found in the south-west. The sheep population consists of combined meat and wool

producing breeds, with various Norwegian breeds predominating.
Goat: The Norwegian goat population is 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 two most northern counties.
Poultry: The Norwegian poultry production is strictly regulated and the population has a hierarchical structure. Egg and broiler meat production are the most important branches, but the production of turkey is increasing slightly. The Norwegian layer population consists of two strains (Lohmann white and Shaver white). The layer population is located throughout Norway. The commercial broiler production consists of two strains (Cobb and Ross). The broiler production is mainly located in five counties in the southern and middle part of Norway.

Additional information

The livestock production in Norway is targeted for the national market. Until 1994 there was a general ban on the import of live animals and animal products to Norway. As a consequence of the European Economic Area (EEA) agreement which came into force in 1994, the general ban on the import of these animals and animal products to Norway was lifted. But the import of live animals since 1994 has been very restricted. In 2004, no live cattle or swine were imported, while 11 and 26 sheep and goats respectively were imported. Regarding poultry, grand parents and parents are imported day old, mainly from Sweden.

Table 14.1 Susceptible animal populations: number of herds and holdings rearing animals

* Only if different than current reporting year

Animal species	Category of animals	Number of herds or flocks	Year*	Number of holdings	Year*
Cattle (bovine animals)	dairy cows and heifers			15677	
	meat production animals			3793	
	mixed herds			934	
	in total			22500	
Ducks	in total			5	
Gallus gallus	grandparent birds for meat production line	10		3	
	grandparent birds for egg production line	4		3	
	broilers	3626		489	
	laying hens (1)			777	2005
	parent birds for meat production line	172		78	
	parent birds for egg production line	27		7	
Goats	milk goats			568	
	in total			1090	
Pigs	fattening pigs			3344	
	breeding animals (2)			2199	
	in total			3762	
Sheep	animals over 1 year			17439	
Turkeys	in total			70	
Farmed deer	in total (3)			67	2005

(1): Only flocks >250 birds.
(2): > 6 months
(3): Data from the Norwegian Red Deer Centre

Footnote

For poultry the number of herds/holdings (considered equivalent - defined as a geographical area (farm) where the same owner have one or more houses with birds) are given in the column "Number of holdings" while the numbers of poultry flocks being kept in 2004 are given in the column "Number of herds or flocks". The number of breeder flocks is given as the total number of flocks present during 2004 (both rearing and production flocks).
For other animals, herd and holding is considered equivalent, and the numbers are reported in the column "Number of holdings".

Table 14.2 Susceptible animal populations: number of animals

* Only if different than current reporting year

Animal species	Category of animals	Livestock numbers (live animals)	Year*	Number of slaughtered animals	Year*
Cattle (bovine animals)	in total	936600		334100	
Ducks	in total			64700	
Gallus gallus	broilers			42851700	
	laying hens (1)			2469200	
Geese	in total			260	
Goats	milk goats	44600			
	in total	71000		18400	
Pigs	breeding animals	61800			
	in total			1469200	
Sheep	animals over 1 year	918500			
	in total	2412700		1264200	
Solipeds	horses - in total			2000	
Turkeys	in total			1035200	
Farmed reindeers	in total			4000	
Farmed deer	in total (2)	2000	2005	34	

(1): For slaughter, this includes breeders.
(2): Data on live animals are from the Norwegian Red Deer Centre and is the estimated number of animals in 2005

Footnote

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

2. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

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

2.1. SALMONELLOSIS

2.1.1. General evaluation of the national situation

A. General evaluation

History of the disease and/or infection in the country

The situation regarding Salmonella in feedingstuffs, animals and food produced in Norway has for many years been very good. Most cases of salmonellosis in humans are acquired abroad.

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

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

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

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

Suggestions to the Community for the actions to be taken

In 2004 an international outbreak linked to imported rocket lettuce was detected in Norway. International outbreaks linked to imported fresh vegetables have also previously been reported in Europe. A greater focus should be put on controling that fresh produce are produced according to good manufacturing practices.

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 levelled off. However, an increase was noted during 2001, mostly due to a few large outbreaks.

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

The proportion of imported cases of S. Enteritidis infections is particularly high (approximately 90% among patients with known place of acquisition) as this pathogen does not occur in Norwegian poultry production. In contrast, in the period 1995-2003 among those cases with S. Typhimurium infections with known place of acquisition, 22-61% were indigenous. This serovar, although not established among food animals in Norway, does occur in the Norwegian environment such as in wild birds and hedgehogs.

Results of the investigation

In 2004, a total of 1567 cases of salmonellosis were reported, of which 345 (22%) were infected in Norway. Altogether 807 (51%) of the cases were due to S. Enteritidis, of which 80 (10%) were infected in Norway, while 200 (13%) of the cases were due to S. Typhimurium, of which 83 (42%) were infected in Norway. The outbreaks are described in the chapter on foodborne outbreaks.

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

The overall situation seem to have been stable the last three years. Although the number of reported cases infected in Norway in 2004 was the highest since 1987, this can mainly be ascribed to two outbreaks; a nosocomial outbreak of S. Infantis and an outbreak of S. Thompson linked to imported rocket lettuce.
The increase in the incidence of multiresistant S. Typhimurium DT104 infection acquired in Norway seen the last few years seem to have stopped, and a reduction has now been observed. In 2004 there were no reported cases infected in Norway, and only 11 reported infected abroad.

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. Especially the regular occurrence of hedgehog-associated outbreaks of S. Typhimurium infection in the Bergen area is a reason for concern and requires proper and well-targeted risk communication and alertness among health personnel.

Additional information

Patients whose work represent 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 returning to work.

Table 3.4.1.A Salmonellosis in man - species/serotype distribution

	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc	unknown status
Salmonella	1567	34.2	345	7.5	1134	24.8	88
S. Enteritidis	807	17.6	80	1.7	693	15.1	34
S. Infantis	88	1.9	75	1.6	8	0.2	5
S. Stanley	59	1.3	7	0.2	50	1.1	2
S. Typhimurium	200	4.4	83	1.8	101	2.2	16
S. Virchow	41	0.9	3	0.1	36	0.8	2
other serovars	372	8.1	97	2.1	246	5.4	29

Table 3.4.1.B Salmonellosis in man - age distribution

Age Distribution	S. Enteritidis			S. Typhimurium			Salmonella spp.		
	All	M	F	All	M	F	All	M	F
<1 year	5	3	2	3	2	1	30	18	11
1 to 4 years	42	24	17	32	18	14	102	59	41
5 to 14 years	61	32	29	22	8	14	111	53	56
15 to 24 years	101	49	52	18	8	10	189	78	111
25 to 44 years	219	112	107	64	29	35	474	227	246
45 to 64 years	300	118	182	44	16	28	508	198	310
65 years and older	79	38	41	17	8	9	153	68	85
Age unknown									
Total :	807	376	430	200	89	111	1567	701	860

Footnote

The column Salmonella spp. includes all serotypes, including S. Enteritidis and S. Typhimurium

Table 3.4.2 Salmonellosis in man - seasonal distribution

Month	S. Enteritidis	S. Typhimurium	Salmonella spp.
	Cases	Cases	Cases
January	39	14	85
February	24	19	82
March	40	16	99
April	54	16	96
May	38	9	69
June	73	16	124
July	136	19	196
August	123	32	211
September	104	14	156
October	102	16	216
November	45	20	165
December	29	9	68
not known			
Total :	807	200	1567

Footnote

The column Salmonella spp. includes all serotypes, including S. Enteritidis and S. Typhimurium

2.1.3. Salmonella in foodstuffs

A. Salmonella spp in eggs and egg products

Monitoring system

Sampling strategy

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

B. Salmonella spp. in broiler meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

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

At meat processing plant

Samples are taken at border inspection for food imported from third countries, and randomly on the market for food entering Norway from the EEA area.

Frequency of the sampling

At slaughterhouse and cutting plant

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

At meat processing plant

Other: Import: From the EEA area, approx. 20% of the consignments are sampled. From third countries, all consignments are sampled.

Type of specimen taken

At slaughterhouse and cutting plant

Other: At slaughterhouse: Neck skin. At cutting plant: Crushed meat.

At meat processing plant

Other: Import: Meat.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

At slaughterhouse: All slaughter batches of poultry are sampled by taking neck skin at the end of the slaughter line.
At cutting plant: Each sample consists of 25 grams of meat (crushed meat, from the equipment or from trimmings).

At meat processing plant

Import: A number of single samples from each consignment sufficient to detect 5% prevalence with 95% confidence is taken. Five single samples are pooled to one before analysis.

Definition of positive finding

At slaughterhouse and cutting plant

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

At meat processing plant

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

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL No 71:1999

At meat processing plant

Bacteriological method: NMKL No 71:1999

Control program/mechanisms

The control program/strategies in place

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

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

None of the broiler flocks were positive. One sample of neck skin from a laying hen flock was found positive for S. Senftenberg at slaughter, see chapter on Salmonella spp. in Gallus gallus - breeding flocks for egg production and flocks of laying hens.
None of the crushed meat samples taken at meat production facilities were positive.
For details, see tables.

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

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

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

Domestic outbreaks of salmonellosis recorded in recent years, illustrate that many kinds of food may be involved in outbreaks, also those of non-animal origin, including imported foods.

C. Salmonella spp. in pig meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Norwegian Salmonella Control Programme: A number of samples each year is collected randomly from the pig population at slaughterhouse according to the slaughter volume. Samples of crushed meat are each year collected according to production capacity of cutting plants.

At meat processing plant

Samples are taken according to Council Directive 95/65/EC.
Import: Samples are taken at border inspection for food imported from third countries, and randomly on the market for food entering Norway from the EEA area.

Frequency of the sampling

At slaughterhouse and cutting plant

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

At meat processing plant

Other: Samples are taken according to Council Directive 95/65/EC. Import: From the EEA area, approx. 20% of the consignments are sampled. From third countries, all consignments are sampled.

Type of specimen taken

At slaughterhouse and cutting plant

Other: At slaughterhouse: Surface of carcass. At cutting plant: Crushed meat.

At meat processing plant

Other: Samples are taken according to Council Directive 95/65/EC. Import: Meat.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

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

At meat processing plant

Each sample consists of 25 grams of meat (crushed meat, from the equipment or from trimmings).

Definition of positive finding

At slaughterhouse and cutting plant

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

At meat processing plant

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

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL No 71:1999

At meat processing plant

Bacteriological method: NMKL No 71:1999

Control program/mechanisms

The control program/strategies in place

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

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

A total of 2456 carcasses were swabbed, and none were positive.
Of 51 tested samples of pig meat imported from the EEA area, two were positive for S. Typhimurium.
None of the crushed meat samples taken at meat production facilities were positive.
For details, see tables.

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

The Norwegian Salmonella Control Programmes document that domestically produced food products of animal origin are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.1%.
Domestic outbreaks of salmonellosis recorded in recent years, illustrate that many kinds of food may be involved in outbreaks, also those of non-animal origin, including imported foods.

D. Salmonella spp in bovine meat and products thereof

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant

The Norwegian Salmonella Control Programme: A number of samples each year is collected randomly from the pig population at slaughterhouse according to the slaughter volume. Samples of crushed meat are each year collected according to production capacity of cutting plants.

At meat processing plant

Samples are taken according to Council Directive 95/65/EC.
Import: Samples are taken at border inspection for food imported from third

countries, and randomly on the market for food entering Norway from the EEA area.

Frequency of the sampling

At slaughterhouse and cutting plant

Other: At slaughterhouse: Detection of an annual prevalence of 0.1% by 95% confidence level.

At meat processing plant

Other: Samples are taken according to Council Directive 95/65/EC. Import: From the EEA area, approx. 20% of the consignments are sampled. From third countries, all consignments are sampled.

Type of specimen taken

At slaughterhouse and cutting plant

Other: At slaughterhouse: Surface of carcass. At cutting plant: Crushed meat.

At meat processing plant

Other: Samples are taken according to Council Directive 95/65/EC. Import: Meat.

Methods of sampling (description of sampling techniques)

At slaughterhouse and cutting plant

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

At meat processing plant

Each sample consists of 25 grams of meat (crushed meat, from the equipment or from trimmings).

Definition of positive finding

At slaughterhouse and cutting plant

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

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

Diagnostic/analytical methods used

At slaughterhouse and cutting plant

Bacteriological method: NMKL No 71:1999

At meat processing plant

Bacteriological method: NMKL No 71:1999

Control program/mechanisms

The control program/strategies in place

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

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

A total of 2136 carcasses were swabbed, and none were positive.
A total of 12295 samples of meat from cattle imported from the EEA area were tested, 22 pooled samples were positive with various serovars.
None of the crushed meat samples taken at meat production facilities were positive.
For details, see tables.

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

The Norwegian Salmonella Control Programmes document that domestically produced food products of animal origin are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.1%.
Domestic outbreaks of salmonellosis recorded in recent years, illustrate that many kinds of food may be involved in outbreaks, also those of non-animal origin, including imported foods.

E. Salmonella spp. in food - Meat from sheep

Monitoring system

Sampling strategy

At slaughterhouse and cutting plant: The Norwegian Salmonella Control Programme: A number of samples each year is collected randomly from the sheep population at

slaughterhouse according to the slaughter volume. Samples of crushed meat are each year collected according to production capacity of cutting plants.
At meat processing plant: Samples are taken according to Council Directive 95/65/EC.
Import: Samples are taken at border inspection for food imported from third countries, and randomly on the market for food entering Norway from the EEA area.

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: <2 tons; twice a year, 2-20 tons: once a month, >20 tons: once a week.
At meat processing plant: Samples are taken according to Council Directive 95/65/EC.
Import: From the EEA area, approx. 20% of the consignments are sampled. From third countries, all consignments are sampled.

Type of specimen taken

Other: At slaughterhouse: Surface of carcass. At cutting plant: Crushed meat. At meat processing plant: Samples are taken according to Council Directive 95/65/EC. Import: Meat.

Methods of sampling (description of sampling techniques)

At slaughterhouse: The upper inner part of the hind legs/pelvic entrance and the cut surface area of the abdomen and chest are swabbed, covering an area of approximately 1400 cm2 of each carcass.
At cutting plant: Each sample consists of 25 grams of meat (crushed meat, from the equipment or from trimmings).
At meat processing plant: Samples are taken according to Council Directive 95/65/EC.
Import: A number of single samples from each consignment sufficient to detect 5% prevalence with 95% confidence is taken. Five single samples are pooled to one before analysis.

Definition of positive finding

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

Diagnostic/analytical methods used

Bacteriological method: NMKL No 71:1999

Control program/mechanisms

The control program/strategies in place

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

Measures in case of the positive findings or single cases

Whenever Salmonella is detected in samples taken in the National Control Programmes, the

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

Notification system in place

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

Results of the investigation

A total of 2264 carcasses were swabbed, and four were positive, all S. diarizonae.
None of the crushed meat samples taken at meat production facilities were positive.
For details, see tables.

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

The Norwegian Salmonella Control Programmes document that domestically produced food products of animal origin are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.1%.
Domestic outbreaks of salmonellosis recorded in recent years, illustrate that many kinds of food may be involved in outbreaks, also those of non-animal origin, including imported foods.

F. Salmonella spp. in food - Poultry meat (Poultry other than Gallus gallus)

Monitoring system

Sampling strategy

At slaughterhose and cutting plant: The Norwegian Salmonella Control Programme: All flocks are sampled at slaughterhouse. Samples of crushed meat are each year collected according to production capacity of cutting plants.
At processing plant: Samples are taken at border inspection for food imported from third countries, and randomly on the market for food entering Norway from the EEA area.

Frequency of the sampling

At slaughterhouse: All flocks are sampled.
At cutting plant: According to production capacity: <2 tons; twice a year, 2-20 tons: once a month, >20 tons: once a week.
At meat processing plant: Import: From the EEA area, approx. 20% of the consignments are sampled. From third countries, all consignments are sampled.

Type of specimen taken

Other: At slaughterhouse: Neck skin. At cutting plant: Crushed meat. At meat processing plant: Import: Meat.

Methods of sampling (description of sampling techniques)

At slaughterhouse: All slaughter batches of poultry are sampled by taking neck skin at the end of the slaughter line.
At cutting plant: Each sample consists of 25 grams of meat (crushed meat, from the equipment or from trimmings).
At meat processing plant: Samples are taken according to Council Directive 95/65/EC.
Import: A number of single samples from each consignment sufficient to detect 5% prevalence with 95% confidence is taken. Five single samples are pooled to one before analysis.

Definition of positive finding

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

Diagnostic/analytical methods used

Bacteriological method: NMKL No 71:1999

Control program/mechanisms

The control program/strategies in place

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

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

None of the poultry flocks were positive.
None of the crushed meat samples taken at meat production facilities were positive.
Of a total of 2243 tested samples of poultry meat imported from the EEA area, 22 pooled samples were positive with various serotypes.
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 3.3.1 Salmonella sp. in meat and meat products

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium	S. Senftenberg	S. enterica subsp. diarizonae
Bovine meat										
fresh										
- at slaughter	NSCP		Animal	Swabs	2136	0				
- at retail (1)	NFSA		Sample	25g	12295	22	0	0	0	0
Pig meat										
fresh										
- at slaughter	NSCP		Animal	Swabs	2456	0				
- at retail (2)	NFSA		Sample	25g	51	2	0	2	0	0
Other meat										
fresh										
- at slaughter (3)	NSCP		Animal	Swab	2264	4	0	0	0	4
- at retail (4)	NFSA		Sample	25g	699	19	0	13	0	0
Mixed meat										
minced meat										
- at processing plant (5)	NSCP		Sample	25g	1791	0				
Poultry meat										
- at processing plant (6)	NSCP		Flock	>10g	7239	1	0	0	1	0
- at retail (7)	NFSA		Sample	25g	2243	22	0	2	0	0

(1) : Survey of products entering Norway from the EEA area. Samples are pooled 5 and 5, there were 22 positive pooled samples, various serotypes.
(2) : Survey of products entering Norway from the EEA area. Samples are pooled 5 and 5, there were 2 positive pooled samples.
(3) : Mutton
(4) : Game meat, both wild and farmed birds and mammals. Survey of products entering Norway from the EEA area. Samples are pooled 5 and 5, there were 19 positive pooled samples, various serotypes.
(5) : Crushed meat from various animal species
(6) : Neck skin
(7) : Survey of products entering Norway from the EEA area. Samples are pooled 5 and 5, there were 22 positive samples, various serotypes.

Footnote

NSCP = Norwegian Salmonella Control Programme

Table 3.3.2 Salmonella sp. in other food

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium
Dairy products								
ready-to-eat	Industry		Sample	25g	400	0		
Raw material (liquid egg) for egg products (1)	NFSA		Sample	25g	480	0		

(1) : Survey of products entering Norway from the EEA area

2.1.4. Salmonella in animals

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

Monitoring system

Sampling strategy

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

The Norwegian Salmonella Control Programmes include all poultry breeding flocks. Sampling of breeding flocks of Gallus gallus is carried out in accordance with the programme laid down in Annex III of Council Directive 92/117/EEC. The Norwegian Food Safety Authority is responsible for the sampling.
Other strategies: Animals are tested in relation to clinical surveillance and import.

Laying hens flocks

The Norwegian Salmonella Control Programme: All laying hen flocks are tested at farm and at slaughter.
Other strategies: Animals are tested in relation to clinical surveillance and import.
The baseline study in laying hens (Commission Descicion 2004/665/EC) was performed according to instructions.

Frequency of the sampling

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

Every flock is sampled

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

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

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

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

Laying hens: Rearing period

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

Laying hens: Production period

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

Laying hens: Before slaughter at farm

Every flock is sampled

Laying hens: At slaughter

Every flock is sampled

Type of specimen taken

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

Internal linings of delivery boxes

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

Faeces

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

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

Laying hens: Rearing period

Faeces

Laying hens: Production period

Faeces

Laying hens: Before slaughter at farm

Faeces

Laying hens: At slaughter

Neck skin

Methods of sampling (description of sampling techniques)

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

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

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

60 faecal samples are pooled to one sample.

Breeding flocks: Production period

At hatchery: Meconium from at least 250 birds from the internal linings of hatching baskets are pooled to one sample.
At farm: 60 faecal samples are pooled to one sample.

Laying hens: Rearing period

60 faecal samples are pooled to one sample.

Laying hens: Production period

60 faecal samples are pooled to one sample.

Laying hens: Before slaughter at farm

60 faecal samples are pooled to one sample.
Baseline study (Commission Descicion 2004/665/EC): Sampled according to instructions.

Laying hens: At slaughter

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

Case definition

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

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

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

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

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

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

Laying hens: Day-old chicks

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

Laying hens: Rearing period

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

Laying hens: Production period

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

Laying hens: Before slaughter at farm

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

Laying hens: At slaughter

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

Diagnostic/analytical methods used

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Laying hens: Day-old chicks

Bacteriological method: NMKL No 71:1999

Laying hens: Rearing period

Bacteriological method: NMKL No 71:1999

Laying hens: Production period

Bacteriological method: NMKL No 71:1999

Laying hens: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Laying hens: At slaughter

Bacteriological method: NMKL No 71:1999

Vaccination policy

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

Vaccination against Salmonella is prohibited in Norway.

Laying hens flocks

Vaccination against Salmonella is prohibited in Norway.

Control program/mechanisms

The control program/strategies in place

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

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

Laying hens flocks

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

Measures in case of the positive findings or single cases

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

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If invasive Salmonella serovars (S. Gallinarum, S. Pullorum, S. Enteritidis, S. Berta, S. Typhimurium, S. Thompson, S. Infantis) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be destroyed. Eggs from hatcheries where non-invasive Salmonella serovars have been detected must be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well. Restrictions will be lifted when infected rooms have been cleaned and disinfected,

bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

Laying hens flocks

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If invasive Salmonella serovars (S. Gallinarum, S. Pullorum, S. Enteritidis, S. Berta, S. Typhimurium, S. Thompson, S. Infantis) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be destroyed. Eggs from hatcheries where non-invasive Salmonella serovars have been detected must be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well. Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing has given 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, is notifiable.

Results of the investigation

None of the Norwegian breeding flocks were positive. None of the layer flocks were positive on farm. One neck skin sample taken at the slaughter of a layer flock was positive for S. Senftenberg. For details, see the tables.
Regarding the Baseline study in laying flocks (Commission Descicion 2004/665/EC), 49 flocks were sampled in 2004, all were negative.

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

The favourable salmonella situation in Norwegian poultry is partly dependant upon an efficient control of breeding flocks. Due to extensive surveillance during many years, stringent measures in case of positive findings, and restricted import, poultry breeding flocks in Norway are virtually free from Salmonella. S. Enteritidis has never been detected in Norwegian poultry production. However, Salmonella was in 2001 for the first time since the surveillance and control programme was implemented in 1995, detected in a breeding flock (S. Agona in a broiler parent flock).

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

and broiler flocks

Monitoring system

Sampling strategy

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

The Norwegian Salmonella Control Programmes include all poultry breeding flocks. Sampling of breeding flocks of Gallus gallus is carried out in accordance with the programme laid down in Annex III of Council Directive 92/117/EEC. The Norwegian Food Safety Authority is responsible for the sampling.
Other strategies: Animals are tested in relation to clinical surveillance and import.

Broiler flocks

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

Frequency of the sampling

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

Every flock is sampled

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

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

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

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

Broiler flocks: Before slaughter at farm

Every flock is sampled

Broiler flocks: At slaughter (flock based approach)

Every flock is sampled

Type of specimen taken

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

Internal linings of delivery boxes

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

Faeces

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

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

Broiler flocks: Before slaughter at farm

Faeces

Broiler flocks: At slaughter (flock based approach)

Neck skin

Methods of sampling (description of sampling techniques)

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

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

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

60 faecal samples are pooled to one sample.

Breeding flocks: Production period

At hatchery: Meconium from at least 250 birds from the internal linings of hatching baskets are pooled to one sample.
At farm: 60 faecal samples are pooled to one sample.

Broiler flocks: Before slaughter at farm

60 faecal samples are pooled to one sample.

Broiler flocks: At slaughter (flock based approach)

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

Case definition

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

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

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

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

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

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

Broiler flocks: Day-old chicks

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

Broiler flocks: Rearing period

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

Broiler flocks: Before slaughter at farm

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

Broiler flocks: At slaughter (flock based approach)

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

Diagnostic/analytical methods used

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

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

Bacteriological method: NMKL No 71:1999

Broiler flocks: Day-old chicks

Bacteriological method: NMKL No 71:1999

Broiler flocks: Rearing period

Bacteriological method: NMKL No 71:1999

Broiler flocks: Before slaughter at farm

Bacteriological method: NMKL No 71:1999

Broiler flocks: At slaughter (flock based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

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

Vaccination against Salmonella is prohibited in Norway.

Broiler flocks

Vaccination against Salmonella is prohibited in Norway.

Control program/mechanisms

The control program/strategies in place

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

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

Broiler flocks

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

Measures in case of the positive findings or single cases

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

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

investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If invasive Salmonella serovars (S. Gallinarum, S. Pullorum, S. Enteritidis, S. Berta, S. Typhimurium, S. Thompson, S. Infantis) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be destroyed. Eggs from hatcheries where non-invasive Salmonella serovars have been detected must be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well. Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

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

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

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

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

Pullorum, S. Enteritidis, S. Berta, S. Typhimurium, S. Thompson, S. Infantis) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be destroyed. Eggs from hatcheries where non-invasive Salmonella serovars have been detected must be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well. Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

Broiler flocks: Day-old chicks

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

Broiler flocks: Rearing period

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If invasive Salmonella serovars (S. Gallinarum, S. Pullorum, S. Enteritidis, S. Berta, S. Typhimurium, S. Thompson, S. Infantis) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be

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

Broiler flocks: Before slaughter at farm

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

Broiler flocks: At slaughter (flock based approach)

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If invasive Salmonella serovars (S. Gallinarum, S. Pullorum, S. Enteritidis, S. Berta, S. Typhimurium, S. Thompson, S. Infantis) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be destroyed. Eggs from hatcheries where non-invasive Salmonella serovars have been detected must be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well.

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

Notification system in place

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

Results of the investigation

None of the Norwegian breeding flocks were positive. None of the broiler flocks were positive on farm or at slaughter. For details, see the tables.

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

The favourable salmonella situation in Norwegian poultry is partly dependant upon an efficient control of breeding flocks. Due to extensive surveillance during many years, stringent measures in case of positive findings, and restricted import, poultry breeding flocks in Norway are virtually free from Salmonella. S. Enteritidis has never been detected in Norwegian poultry production. However, Salmonella was in 2001 for the first time since the surveillance and control programme was implemented in 1995, detected in a breeding flock (S. Agona in a broiler parent flock).

C. Salmonella spp in pigs

Monitoring system

Sampling strategy

Breeding herds

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

Multiplying herds

The Norwegian Salmonella Control Programme: A number of sows are sampled randomly from the pig population at slaughterhouse according to the slaughter volume.
Other strategies: Animals are tested in relation to clinical surveillance and import.

Fattening herds

The Norwegian Salmonella Control Programme: A number of fattening pigs are sampled randomly from the pig population at slaughterhouse according to the slaughter volume.
Other strategies: Animals are tested in relation to clinical surveillance and

import.

Frequency of the sampling

Breeding herds

Once a year

Fattening herds at slaughterhouse (herd based approach)

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

Type of specimen taken

Breeding herds

Faeces

Fattening herds at slaughterhouse (herd based approach)

Organs:Lymph nodes

Methods of sampling (description of sampling techniques)

Breeding herds

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

Fattening herds at slaughterhouse (herd based approach)

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

Case definition

Breeding herds

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

Multiplying herds

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

Fattening herds at farm

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

Fattening herds at slaughterhouse (herd based approach)

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

Diagnostic/analytical methods used

Breeding herds

Bacteriological method: NMKL No 71:1999

Multiplying herds

Bacteriological method: NMKL No 71:1999

Fattening herds at farm

Bacteriological method: NMKL No 71:1999

Fattening herds at slaughterhouse (herd based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Breeding herds

Vaccination against Salmonella is prohibited in Norway.

Multiplying herds

Vaccination against Salmonella is prohibited in Norway.

Fattening herds

Vaccination against Salmonella is prohibited in Norway.

Control program/mechanisms

The control program/strategies in place

Breeding herds

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

Multiplying herds

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

Fattening herds

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, 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, is notifiable.

Results of the investigation

Of the 2662 lymph nodes taken in the Norwegian Salmonella Control Programme, one was positive for S. Typhimurium. None of the 164 breeding herds were positive. Of 113 clinical samples from 53 herds and 735 samples from 24 herds taken due to control or follow up purposes, 10 samples from 3 herds were found positive for S. Typhimurium, one of these herds being the herd found positive in the Norwegian Salmonella Control Programme.

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

The Norwegian Salmonella Control Programmes document that Norwegian food producing animals are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.1%.

D. Salmonella spp. in bovine animals

Monitoring system

Sampling strategy

The Norwegian Salmonella Control Programme: A number of samples each year is collected randomly from the cattle population at slaughterhouse according to the slaughter volume.
Other strategies: Animals are tested in relation to clinical surveillance and import.

Frequency of the sampling

Animals at slaughter (herd based approach)

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

Type of specimen taken

Animals at slaughter (herd based approach)

Organs:Lymph nodes

Methods of sampling (description of sampling techniques)

Animals at farm

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

Animals at slaughter (herd based approach)

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

Case definition

Animals at farm

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

Animals at slaughter (herd based approach)

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

Diagnostic/analytical methods used

Animals at farm

Bacteriological method: NMKL No 71:1999

Animals at slaughter (herd based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Vaccination against Salmonella is prohibited in Norway.

Control program/mechanisms

The control program/strategies in place

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

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, is notifiable.

Results of the investigation

Two of the 2302 animals tested in the Norwegian Salmonella Control Programme were positive, both with S. Typhimurium. Apart from these two, no other positive cattle were reported in Norway.

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

The Norwegian Salmonella Control Programmes document that Norwegian food producing animals are virtually free from Salmonella. The surveillance data indicate that the overall prevalence is below 0.1%.

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

Monitoring system

Sampling strategy

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

Frequency of the sampling

Animals at farm

Other: See the description of the programme in Gallus gallus

Animals at slaughter (herd based approach)

Other: Every flock is sampled.

Type of specimen taken

Animals at farm

Other: See the description of the programme in Gallus gallus

Animals at slaughter (herd based approach)

Other: Neck skin

Methods of sampling (description of sampling techniques)

Animals at farm

See the description of the programme in Gallus gallus.

Animals at slaughter (herd based approach)

See the description of the programme in Gallus gallus.

Case definition

Animals at farm

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

Animals at slaughter (herd based approach)

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

Diagnostic/analytical methods used

Animals at farm

Bacteriological method: NMKL No 71:1999

Animals at slaughter (herd based approach)

Bacteriological method: NMKL No 71:1999

Vaccination policy

Vaccination against Salmonella is prohibited in Norway.

Control program/mechanisms

The control program/strategies in place

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

Measures in case of the positive findings or single cases

Whenever Salmonella is detected, the competent authorities must be notified without delay. Also, slaughterhouses and food production facilities receiving animals or animal products from

an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever Salmonella is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the source of infection. If invasive Salmonella serovars (S. Gallinarum, S. Pullorum, S. Enteritidis, S. Berta, S. Typhimurium, S. Thompson, S. Infantis) are detected, the whole animal holding will be destroyed. If non-invasive serovars are detected, birds from the infected animal holding may be subjected to sanitation slaughter. Eggs from hatcheries where invasive Salmonella serovars have been detected will be destroyed. Eggs from hatcheries where non-invasive Salmonella serovars have been detected must be destroyed or pasteurised. If Salmonella is detected in chicks, all chicks from the same hatchery machine must be destroyed. Farms that have received infected chicks will be considered infected and restrictions will be imposed on these farms as well.
Restrictions will be lifted when infected rooms have been cleaned and disinfected, bacteriological testing gives a negative test result, and the rooms have been empty for at least 30 days following cleaning and disinfection.

Notification system in place

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

Results of the investigation

None of the Norwegian breeder flocks were positive. None of the production flocks were positive on farm or at slaughter. For details, see the tables.

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

The duck, geese and turkey population in Norway is small. A few times, positive flocks have been found, the last time S. Muenchen in a turkey flock in 1999. S. Enteritidis has never been detected in Norwegian poultry production.

Table 3.2.1 Salmonella sp. in Poultry breeding flocks (Gallus gallus)

	Source of information	Remarks	Epidemiological unit	Flocks tested	Flocks positive	S. Enteritidis	S. Typhimurium
Gallus gallus							
grandparent breeding flocks for egg production line (1)			Flock	4	0		
parent breeding flocks for egg production line							
- during production period			Flock	11	0		
- during rearing period			Flock	16	0		
grandparent breeding flocks for meat production line (2)			Flock	10	0		
parent breeding flocks for meat production line							
- during rearing period			Flock	65	0		
- during production period			Flock	107	0		

(1) : 2 rearing flocks and 2 productive flocks
(2) : 3 rearing flocks and 7 productive flocks

Footnote

All data are from the Norwegian Salmonella Control Programme. There are no elite flocks in Norway.

Table 3.2.2 Salmonella sp. in other commercial poultry

	Source of information	Remarks	Epidemiological unit	Flocks tested	Flocks positive	S. Enteritidis	S. Typhimurium
Gallus gallus							
laying hens							
- during rearing period	NSCP		Flock	254	0		
- during production period	NSCP		Holding	836	0		
- at farm - survey (Baseline survey)			Flock	49	0		
broilers							
- during rearing period (1)	NSCP		Flock	3772	0		
Ducks							
breeding flocks, unspecified (2)	NSCP		Holding	1	0		
unspecified (3)	NSCP		Flock	48	0		
Geese							
unspecified (4)	NSCP		FLock	3	0		
Turkeys							
breeding flocks, unspecified (5)	NSCP		Holding	5	0		
unspecified (6)	NSCP		Flock	347	0		

(1) : Before slaughter
(2) : A total of 5 samples tested
(3) : Before slaughter
(4) : Before slaughter
(5) : A total of 143 samples from 5 holdings
(6) : Before slaughter

Footnote

NSCP = Norwegian Salmonella Control Programme

Table 3.2.3 Salmonella sp. in non-commercial poultry and birds

	Source of information	Remarks	Epidemiological unit	Flocks tested	Flocks positive	S. Enteritidis	S. Typhimurium
Pigeons (1)	NVI		Animal	8	2	0	2
Ostriches	NVI		Animal	1	0		
Pet animals							
birds	NVI		Animal	18	0		
Wildlife							
wild birds	NVI		Animal	26	5	0	5

(1) : Both wild and racing pigeons

Footnote

NVI: National Veterinary Institute, diagnostic submissions

Table 3.2.4 Salmonella sp. in animals (non poultry)

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	S. Enteritidis	S. Typhimurium	S. enterica subsp. diarizonae
Cattle (bovine animals)	NVI		Animal	153	0			
- Control programme (5)	NSCP		Animal	2302	2	0	2	
Sheep	NVI		Animal	95	10	0	0	10
Goats	NVI		Animal	7	1	0	0	1
Pigs								
breeding animals (1)	NSCP		Animal	893	1	0	1	
- Control programme	NSCP		Herd	164	0			
fattening pigs (2)	NSCP		Animal	1769	0			
unspecified (3)	NVI		Animal	848	10	0	10	
Solipeds	NVI		Animal	20	0			
Pet animals								
cats	NVI		Animal	41	0			
dogs	NVI		Animal	79	0			
other								
(Small pets (rabbits, guinea pigs, ferrets, etc.))	NVI		Animal	13	0			
Wildlife (4)	NVI		Animal	33	2	0	2	
Reptiles (6)	NVI		Animal	11	7	0	0	5

(1) : Lymph node samples
(2) : Lymph node samples
(3) : 113 samples from clinical cases and 735 samples from 24 herds taken due to control or follow-up purposes. The positive samples were from 3 herds, of which one was the herd positive in NSCP.
(4) : 2 positive; 1 badger, 1 pine marten (Martes martes)
(5) : Lymph node samples
(6) : Positive samples also included one S. Kottbus and one S. Newport. The S. diarizonae were different serovars, not the same as frequently found in sheep in Norway.

Footnote

NVI: National Veterinary Institute, mostly diagnostic submissions
NSCP: Norwegian Salmonella Control Programme

2.1.5. Salmonella in feedstuffs

A. Salmonella spp. in feed

History of the disease and/or infection in the country

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

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

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

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

Norways favourable salmonella situation in animals and humans is partly dependant upon the efficient control of animal feedingstuffs. The number of animals infected from feedingstuffs is probably very low, and feedingstuffs thereby represents a negligible risk to humans.

Recent actions taken to control the zoonoses

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

collected and analysed for the presence of Salmonella.

Imported feed materials of vegetable origin must be subjected to control for Salmonella before distribution or use. The number of samples depends on the size of the load and whether the feedingstuffs are classified as high-risk (soy beans, maize, cotton seed, etc.) or low-risk materials.

Imported feed of animal origin, predominantly pet feed, is controlled at one of the Border Inspection Posts according to Council Directives 97/78/EEC and 89/662/EEC. Dog treats made from hides that are imported from third countries must be accompanied with a certificate that documents that the lot has been controlled for Salmonella. At the Border Inspection Posts, sampling is done according to a specific scheme.

Establishments producing fish feed are required to establish and maintain an internal (process) control based on the HACCP-system according to the regulation for fish feed. A minimum of four samples per 14 days should be examined with respect to Salmonella. If Salmonella is detected, the Directorate of Fisheries 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 3.1.1 Salmonella sp. in feed material of animal origin

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium
Feed material of land animal origin								
Meat and bone meal (1)	NFSA		Sample	25g	611	1		
Feed material of marine animal origin								
Fish meal	NFSA/ NIFES		Sample	25g	49	0		
Fish oil	NIFES		Sample	25g	6	0		
Fish silage	NIFES		Sample	25g	1	0		

(1) : The positive sample was not serotyped

Table 3.1.2 Salmonella sp. in feed of vegetable origin

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium
Feed material of cereal grain origin								
Barley derived	NFSA		Sample	25g	11	0		
Wheat derived	NFSA/ NIFES		Sample	25g	144	0		
Maize derived	NFSA/ NIFES		Sample	25g	82	0		
	NFSA		Sample	25g	846	0		
Feed material of oil seed or fruit origin								
Rape seed derived	NFSA/ NIFES		Sample	25g	752	0		
Soya (bean) derived	NFSA/ NIFES		Sample	25g	513	0		
- HACPP or own checks by industry (2)	NFSA		Sample	25g	2629	14	0	0
Sunflower seed derived (1)	NFSA/ NIFES		Sample	25g	33	1	0	0
other feed material								
Legume seeds and similar products	NFSA		Sample	25g	77	0		
Tubers, roots and similar products	NFSA		Sample	25g	36	0		

(1) : The positive sample was S. Isangi
(2) : The 14 positive samples were S. Cubana (7), S. Mbandaka (6) and S. Lexington (1)

Footnote

The data from the two authorities, the Norwegian Food Safety Authority (NFSA) and the National Institute of Nutrition and Seafood Research (NIFES), are from compulsory surveillance programmes, except from the 2629 soya (bean) derived samples which were part of the surveillance programme in the industry. All samples were imported.

Table 3.1.3 Salmonella sp. in compound feedingstuff

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	S. Enteritidis	S. Typhimurium	S. Agona
Compound feedingstuffs for pigs									
Final product (1)	NFSA		Sample	25g	44	0			
Compound feedingstuffs for poultry (non specified)									
Final product	NFSA		Sample	25g	28	0			
Compound feedingstuffs for fur animal	NFSA		Sample	25g	570	0			
Compound feedingstuffs for fish	NIFES		Sample	25g	619	0			
all feedingstuffs									
- at feed mill - HACPP or own checks by industry (Including environmental samples as well as samples of feed material, including imported feed material) (2)	NFSA		Sample	25g	9500	33	0	1	10

(1) : Including 12 samples of "wet feed"
(2) : The positive samples also included S. Senftenberg (3), S. Meleagridis (3), S. Mbandaka (2), one each of 12 different serotypes, and two not typed

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.

2.1.7. Antimicrobial resistance in *Salmonella* isolates

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

A. Antimicrobial resistance of Salmonella spp. in animal

Sampling strategy used in monitoring

Frequency of the sampling

All Salmonella found in production animals, irrespective if they are found in the Norwegian Salmonella Control Programmes or in connection with clinical problems, surveys or other investigations, are included in the resistance monitoring (only one isolate per herd). Salmonella isolated from other animals may be resistance tested as well.
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 varies depending on the situation.

Methods of sampling (description of sampling techniques)

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

Procedures for the selection of isolates for antimicrobial testing

Only one isolate per herd is selected for antimicrobial testing.

Methods used for collecting data

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

Laboratory methodology used for identification of the microbial isolates

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

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute,

Sweden) is used for the susceptibility testing of all isolates. The antimicrobials included are listed in the tables.

Breakpoints used in testing

Microbiological cut-off values are used to classify the isolates as resistant or susceptible. A microbiological cut-off value is defined as the highest MIC-value of isolates that belong to the original genetically unchanged population (wild-type). It classifies the isolates with a MIC-value greater than the microbiological cut-off value as resistant.

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 3.2.7.6 Antimicrobial susceptibility testing of S. Enteritidis in humans - qualitative data

	S. Enteritidis	
	humans	
Isolates out of a monitoring program	yes	
Number of isolates available in the laboratory	750	
Antimicrobials:	**N**	**%R**
Tetracycline	750	2.8%
Amphenicols		
Chloramphenicol	750	0.3%
Fluoroquinolones		
Ciprofloxacin	750	0.1%
Quinolones		
Nalidixic acid	750	26.4%
Trimethoprim + sulfonamides	750	2.0%
Penicillins		
Ampicillin	750	5.6%
Number of multiresistant isolates		
fully sensitives		69.7%
resistant to 1 antimicrobial		25.2%
resistant to 2 antimicrobials		3.3%
resistant to 3 antimicrobials		1.6%
resistant to 4 antimicrobials		0.1%
resistant to >4 antimicrobials		0.0%

Footnote

Of the 750 cases, 54 were known to be infected in Norway.

Table 3.2.5.3 Antimicrobial susceptibility testing of S.Typhimurium in animals

	S. Typhimurium									
	Cattle (bovine animals)		**Pigs**		**Gallus gallus**		**Turkeys**		**all animals (Animals other than Cattle, Pigs, Poultry and Turkey)**	
Isolates out of a monitoring program	yes								no	
Number of isolates available in the laboratory	2		3		0		0		17	
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**
Tetracycline	2	0.0%	3	0.0%					17	0.0%
Amphenicols										
Chloramphenicol	2	0.0%	3	0.0%					17	0.0%
Florfenicol	2	0.0%	3	0.0%					17	0.0%
Cephalosporin										
Ceftiofur	2	0.0%	3	0.0%					17	0.0%
Fluoroquinolones										
Enrofloxacin	2	0.0%	3	0.0%					17	0.0%
Quinolones										
Nalidixic acid	2	0.0%	3	0.0%					17	0.0%
Trimethoprim	2	0.0%	3	0.0%					17	0.0%
Sulfonamides										
Sulfonamide	2	0.0%	3	0.0%					17	0.0%
Aminoglycosides										
Streptomycin	2	0.0%	3	0.0%					17	0.0%
Gentamicin	2	0.0%	3	0.0%					17	0.0%
Neomycin	2	0.0%	3	0.0%					17	0.0%
Penicillins										
Ampicillin	2	0.0%	3	0.0%					17	0.0%
Number of multiresistant isolates										
fully sensitives	2	100%	3	100%					17	100%

Footnote

Animal species other than Cattle, Pig, Poultry and Turkey: Dog (1), Pigeons (2), Wild animals (9) and Wild birds (5).
The isolates are both from the Norwegian Salmonella Control Programme (2 cattle, 1 pig) and from other investigations and surveys.

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

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	S. Typhimurium all animals																					
Isolates out of a monitoring program																						
Number of isolates available in the laboratory	22																					
Antimicrobials:	**N**	**%R**	**<=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**
Tetracycline	22	0.0%						50.0	50.0												0.5	64
Amphenicols																						
Chloramphenicol	22	0.0							9.1	90.9											1	128
Florfenicol	22	0.0								95.5	4.5										4	32
Fluoroquinolones																						
Enrofloxacin	22	0.0		18.2	72.7	9.1															0.03	4
Quinolones																						
Nalidixic acid	22	0.0								95.5	4.5										1	128
Trimethoprim	22	0.0%				31.8	63.6	4.5													0.25	32
Sulfonamides																						
Sulfonamide	22	0.0										9.1	4.5	72.7	9.1	4.5					2	512
Aminoglycosides																						
Streptomycin	22	0.0									40.9	54.5	4.5								2	256
Gentamicin	22	0.0					54.5	45.5													0.5	64
Neomycin	22	0.0							100												2	16
Cephalosporin																						
Ceftiofur	22	0.0						95.5	4.5												0.12	16
Penicillins																						
Ampicillin	22	0.0						68.2	31.8												0.25	32

Footnote

Animal species: Cattle (2), Pig (3), Dog (1), Pigeons (2), Wild animals (9) and Wild birds (5).
The isolates are both from the Norwegian Salmonella Control Programme (2 cattle, 1 pig) and from other investigations and surveys.

Table 3.2.7.7 Antimicrobial susceptibility testing of S. Typhimurium in humans - qualitative data

	S. Typhimurium	
	humans	
Isolates out of a monitoring program	yes	
Number of isolates available in the laboratory	78	
Antimicrobials:	**N**	**%R**
Tetracycline	78	20.5%
Amphenicols		
Chloramphenicol	78	7.7%
Fluoroquinolones		
Ciprofloxacin	78	0.0%
Quinolones		
Nalidixic acid	78	2.6%
Trimethoprim + sulfonamides	78	6.4%
Penicillins		
Ampicillin	78	17.9%
Number of multiresistant isolates		
fully sensitives		79.5%
resistant to 1 antimicrobial		2.6%
resistant to 2 antimicrobials		3.9%
resistant to 3 antimicrobials		11.5%
resistant to 4 antimicrobials		2.6%
resistant to >4 antimicrobials		0.0%

Footnote

The data in the table are from patients infected in Norway. The corresponding data from patients infected with S. Typhimurium abroad (n=100, including 11 cases with DT104): Tetracycline: 45%, Chloramphenicol: 29%, Ampicillin: 37%, Trimethoprim/sulphonamides: 10%, Ciprofloxacin: 0% and Nalidixic acid: 24%.

Table 3.2.5.1 Antimicrobial susceptibility testing of Salmonella spp. in animals

	Salmonella spp.									
	Cattle (bovine animals)		**Pigs**		**Gallus gallus**		**Turkeys**		**all animals (Animals other than Cattle, Pigs, Poultry and Turkey)**	
Isolates out of a monitoring program										
Number of isolates available in the laboratory	0		0		1		0		24	
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**
Tetracycline					1	0.0%			24	0.0%
Amphenicols										
Chloramphenicol					1	0.0%			24	0.0%
Florfenicol					1	0.0%			24	0.0%
Cephalosporin										
Ceftiofur					1	0.0%			24	0.0%
Fluoroquinolones										
Enrofloxacin					1	0.0%			24	4.2%
Quinolones										
Nalidixic acid					1	0.0%			24	4.2%
Trimethoprim					1	0.0%			24	0.0%
Sulfonamides										
Sulfonamide					1	0.0%			24	0.0%
Aminoglycosides										
Streptomycin					1	0.0%			24	0.0%
Gentamicin					1	0.0%			24	0.0%
Neomycin					1	0.0%			24	0.0%
Penicillins										
Ampicillin					1	0.0%			24	0.0%
Number of multiresistant isolates										
fully sensitives					1	100%			23	95.8%
resistant to 2 antimicrobials									1	4.2%

Footnote

This table gives the data on Salmonella other than S. Typhimurium.
Animal species other than Gallus gallus: Sheep (10), Goat (1), Pet bird (1), Reptiles from zoo (8) and Wild animals (4).
The isolates are both from the Norwegian Salmonella Control Programme (1 poultry) and from other investigations and surveys.
The poultry isolate was S. Senftenberg, the sheep and goat isolates were S. diarizonae (61:k:1,5,7), the remaining serovars were: S. Kottbus, S. Newport, S. Hessarek, S. Paratyphi B var Java, and various S. diarizonae.
One isolate was resistant to both Enrofloxacin and Nalidixic acid; S. Newport from a snake from a zoo.

Table Antimicrobial susceptibility testing of Salmonella spp. in all animals (Salmonella other than S. Typhimurium) - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	Salmonella spp. all animals (Salmonella other than S. Typhimurium)
Isolates out of a monitoring program	
Number of isolates available in the laboratory	25

Antimicrobials:	**N**	**%R**	**<=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**
Tetracycline	25	0.0%						88.0	12.0												0.5	64
Amphenicols																						
Chloramphenicol	25	0.0							28.0	68.0	4.0										1	128
Florfenicol	25	0.0								88.0	12.0										4	32
Fluoroquinolones																						
Enrofloxacin	25	4.0		48.0	48.0		4.0														0.03	4
Quinolones																						
Nalidixic acid	25	4.0							12.0	84.0				4.0							1	128
Trimethoprim	25	0.0%				40.0	48.0	12.0													0.25	32
Sulfonamides																						
Sulfonamide	25	0.0										28.0	20.0	44.0	8.0						2	512
Aminoglycosides																						
Streptomycin	25	0.0								4.0	8.0	52.0	36.0								2	256
Gentamicin	25	0.0					68.0	32.0													0.5	64
Neomycin	25	0.0							100												2	16
Cephalosporin																						
Ceftiofur	25	0.0					52.0	48.0													0.12	16
Penicillins																						
Ampicillin	25	0.0					12.0	80.0	4.0	4.0											0.25	32

Footnote

Animal species: Poultry (1), Sheep (10), Goat (1), Pet bird (1), Reptiles from zoo (8) and Wild animals (4).

The isolates are both from the Norwegian Salmonella Control Programme (1 poultry) and from other investigations and surveys.
The poultry isolate was S. Senftenberg, the sheep and goat isolates were S. diarizonae (61:k:1,5,7), the remaining serovars were: S. Kottbus, S. Newport, S. Hessarek, S. Paratyphi B var Java, and various S. diarizonae.
One isolate was resistant to both Enrofloxacin and Nalidixic acid; S. Newport from a snake from a zoo.

Table 3.2.6 Breakpoints for antibiotic resistance of Salmonella in Animals

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Salmonella	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline	M	8		8	0.5	64				
Amphenicols										
Chloramphenicol	M	16		16	1	128				
Florfenicol	M	16		16	4	32				
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	M	0.25		0.25	0.03	4				
Quinolones										
Nalidixic acid	M	16		16	1	128				
Trimethoprim	M	4		4	0.25	32				
Sulfonamides										
Sulfonamide	M	256		256	16	2048				
Aminoglycosides										
Streptomycin	M	8		8	2	256				
Gentamicin	M	4		4	0.5	64				
Neomycin	M	4		4	2	16				
Kanamycin										
Trimethoprim + sulfonamides										
Cephalosporin										
Ceftiofur	M	2		2	0.125	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	M	8		8	0.25	32				

Footnote

Standard for breakpoint: M = Microbiological cut-off values. These are based on the distribution of MIC values of a large number of strains and set as to divide the susceptible bacterial population from the resistant population.

Table 3.2.6 Breakpoints for antibiotic resistance of Salmonella in Food

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

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

Table 3.2.6 Breakpoints for antibiotic resistance of Salmonella in Humans

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Salmonella	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline	AFA						30	20		16
Amphenicols										
Chloramphenicol	AFA						30	20		19
Florfenicol										
Fluoroquinolones										
Ciprofloxacin	AFA						10	27		18
Enrofloxacin										
Quinolones										
Nalidixic acid	AFA						30	17		16
Trimethoprim										
Sulfonamides										
Sulfonamide										
Aminoglycosides										
Streptomycin										
Gentamicin										
Neomycin										
Kanamycin										
Trimethoprim + sulfonamides(1)	AFA							20		12
Cephalosporin										
Ceftiofur										
3rd generation cephalosporins										
Penicillins										
Ampicillin	AFA						10	32		12

(1) : Disk content Trim/sulfa: 1.2/23.8 microgram

Footnote

AFA: Norwegian Reference Group on Antibiotic Susceptibility Testing. Population based breakpoints are used. Breakpoints are modified for disc diffusion test.

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 the surveillance programme in broilers was implemented in 2001, the prevalence of thermophilic Campylobacter spp. in Norwegian broiler flocks has been studied twice. In 1990, 18% of the flocks tested were infected, whereas this proportion in 1997-1998 had decreased to 4%. This reduction was attributed to an increased focus on the importance of bio security.
In 1998, campylobacteriosis for the first time surpassed salmonellosis as the most frequently reported bacterial cause of acute gastroenteritis in Norway, and since then the reported incidence of campylobacteriosis has been above that of salmonellosis. Since the beginning of the 1990s and until it peaked in 2001, there was a major increase in the incidence of campylobacteriosis in Norway, both in domestic and imported cases. Usually, 50-60% of the cases are imported. Since 2002 the number of reported cases has been relatively stable.

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

The number of reported human cases, both domestic and imported, seems to have stabilized since 2002, after a significant increase during the 1990s and up to 2001.
The prevalence in broiler flocks have been declining significantly from 2002 to 2004, most probably due to the Norwegian action plan against Campylobacter in broilers.

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

Even if the Norwegian action plan against Campylobacter in broilers have largely reduced the number of Campylobacter positive broiler carcasses going out on 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, either in private homes or cottages or when camping or hiking.

Recent actions taken to control the zoonoses

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

2.2.2. Campylobacteriosis in humans

A. Thermophilic Campylobacter in humans

Reporting system in place for the human cases

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

Case definition

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

Diagnostic/analytical methods used

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

Notification system in place

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

History of the disease and/or infection in the country

Since the beginning of the 1990s and until it peaked in 2001, there was a significant increase in the incidence of campylobacteriosis in Norway. From 1997 to 2000, the incidence increased by ~100% (from 26.7 cases per 100.000 inhabitants in 1997 to 51.9 cases per 100.000 inhabitants in 2000). 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.
Most cases are sporadic. A case-control study conducted in Norway during 1999-2000 identified consumption of untreated drinking water, consumption of poultry meat purchased fresh, consumption of barbecued meat, and professional contact with animals as significant risk factors in regard to campylobacteriosis. Daily contact with dogs/cats was identified as a risk factor in case-control studies conducted during the early 1990s, but was not identified as a risk factor in the 1999-2000 study.
Studies indicate that the vast majority (~95%) of reported cases are due to C. jejuni, and that C. coli is the cause of most of the remaining cases.

Results of the investigation

A total of 2275 cases (incidence rate 49.7 per 100 000) were reported of which 1111 (49%)

were known to be imported. No deaths due to campylobacteriosis were reported.

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

The number of reported cases, both domestic and imported, seems to have stabilized since the peak in 2001 and a decline in 2002. The reduction in the number of Campylobacter positive poultry products at the same time have probably contributed to this stabilization. There must, however, be other important sources to human campylobacteriosis apart from poultry in Norway, untreated drinking water probably being the most important one.

Relevance as zoonotic disease

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

Additional information

Patients whose work represent 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.

Table 6.3.A Campylobacteriosis in man - species/serotype distribution

	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc	unknown status
Campylobacter	2275	49.8	907	19.82	1111	24.32	257
C. coli	35	0.8	6	0.1	26	0.6	3
C. jejuni	689	15.1	307	6.7	316	6.9	66
C. upsaliensis	3	0.1	1	0.02	1	0.02	1
Campylobacter spp.(1)	1548	33.8	593	13.0	768	16.8	187

(1) : Species identification not known.

Table 6.3.B Campylobacteriosis in man - age distribution

Age Distribution	C. coli			C. jejuni			Campylobacter spp.		
	All	M	F	All	M	F	All	M	F
<1 year				2	1	1	16	9	7
1 to 4 years(1)	1	1		50	28	21	147	81	65
5 to 14 years(2)	3		3	43	25	16	139	83	54
15 to 24 years(3)	3	1	2	117	54	63	350	162	187
25 to 44 years	9	7	2	237	118	119	859	458	401
45 to 64 years	14	8	6	184	119	65	597	354	243
65 years and older	5	4	1	56	25	31	167	78	89
Age unknown									
Total :	35	21	14	689	370	316	2275	1225	1046

(1) : Includes one C. jejuni case with uknown sex.
(2) : Includes two C. jejuni cases with uknown sex.
(3) : Includes one C. spp. case with uknown sex.

Footnote

The column Campylobacter spp. includes all cases, including the C. jejuni and C. coli cases

Table 6.3.C Campylobacteriosis in man - seasonal distribution

Month	C. coli	C. jejuni	C. upsaliensis	Campylobacter spp.
	Cases	Cases	Cases	Cases
January	2	22	1	82
February	2	20	1	77
March	3	19		86
April	4	24		131
May	3	25		178
June	5	26		303
July	1	34		422
August	2	73		310
September	3	125		213
October	5	143		208
November	3	117		167
December	2	61	1	98
not known				
Total :	35	689	3	2275

Footnote

The column Campylobacter spp. includes all cases, including the C. jejuni, C. coli and C. upsaliensis cases

2.2.3. Campylobacter in foodstuffs

A. Thermophilic Campylobacter in Broiler meat and products thereof

Monitoring system

Sampling strategy

At retail

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

Frequency of the sampling

At retail

Other: 100 samples each month

Type of specimen taken

At retail

Fresh meat

Methods of sampling (description of sampling techniques)

At retail

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

Definition of positive finding

At retail

A product where Campylobacter spp. is found.

Diagnostic/analytical methods used

At retail

Bacteriological method: NMKL no 119, 1990

Preventive measures in place

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

Control program/mechanisms

The control program/strategies in place

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

Recent actions taken to control the zoonoses

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

Measures in case of the positive findings or single cases

The broiler flocks found positive in the surveillance programme before slaughter are subject to freezing for at least 3 weeks, or to heat treatment.
No measures are taken upon positive findings at retail level.

Notification system in place

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

Results of the investigation

A total of 1067 fresh products were investigated, 54 (5.1%) were positive.

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

The Norwegian campylobacteriosis situation is a concern for the government. The establishment of the Norwegian action plan against Campylobacter sp. in broilers in 2001 was a response to the urgent situation. This action plan has since it was established and through 2004 prevented more than 4 million Campylobacter positive broiler carcasses from entering the market raw. It is, however, too early to evaluate to which degree the action plan has had an effect on the incidence of domestically acquired campylobacteriosis.

Table 6.2 Thermophilic Campylobacter spp. in food

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	C. coli	C. lari	C. upsaliensis	C. jejuni	Campylobacter spp.
Poultry meat										
fresh										
- at retail (1)			Sample	10	1067				54	

(1) : The Norwegian Action Plan against Campylobacter in Broilers

2.2.4. Campylobacter in animals

A. Thermophilic Campylobacter in Gallus gallus

Monitoring system

Sampling strategy

A surveillance programme in broilers (slaughtered before 50 days of age) was implemented in May 2001 (part of the Norwegian action plan against Campylobacter in broilers). The surveillance programme covers all broiler flocks slaughtered before 50 day of age (virtually all Norwegian broiler flocks).

Frequency of the sampling

Before slaughter at farm

Every flock is sampled

At slaughter

Other: Every slaughter batch is sampled

Type of specimen taken

Before slaughter at farm

Faeces

At slaughter

Organs:Caecum

Methods of sampling (description of sampling techniques)

Before slaughter at farm

10 swabs from fresh faecal droppings are taken by the owner and pooled to two samples. They are transported in Cary Blair medium to the laboratory.

At slaughter

10 caeca are sampled at the slaughter line. Before 1 May 2004, ten cloackal swabs were taken instead of caeca. 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 flock where Campylobacter spp. is found.

Diagnostic/analytical methods used

Before slaughter at farm

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

At slaughter

Other: NMKL no 119:1990 with modifications (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.

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

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

Notification system in place

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

Results of the investigation

Of the 3626 flocks slaughtered in Norway in 2004, 118 flocks (3.3%) were positive for Campylobacter spp. At farm, approximately 1 week before slaughter, a total of 60 positive flocks were discovered, and thereby subject to heat treatment or freezing for at least 3 weeks. At slaughter, all flocks (in fact all slaughter batches) were again sampled, and out of the 3824 slaughter batches, 120 were positive.

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

There has been a significant reduction in the prevalence of positive flocks from 2002 (6.3%) to 2004 (3.3%).

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

The overall occurrence of positive broiler flocks is low, but there is a large seasonal variation, the highest weekly incidence during the summer 2004 being 16.2%. With such amounts of positive flocks, of which approximately 50% is being undetected before slaughter and therefore not subject to compulsory freezing or heat treatment, the number of Campylobacter positive broiler carcasses on the market during the summer can be considerable.

Table 6.1.1 Thermophilic Campylobacter spp. in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	C. jejuni	C. coli	C. lari	C. upsaliensis	Campylobacter spp.
Gallus gallus										
broilers										
- at farm (1)			Flock	3626	60	57	2	1		
- at slaughter (2)			Slaughter batch	3842	120	96	5	1		18

(1) : The Norwegian Action Plan against Campylobacter in Broilers
(2) : The Norwegian Action Plan against Campylobacter in Broilers

Footnote

Campylobacter spp.: Identified as Campylobacter spp. but not identified to species level.

2.2.5. Antimicrobial resistance in *Campylobacter* isolates

A. Antimicrobial resistance in Campylobacter jejuni and coli in poultry

Sampling strategy used in monitoring

Frequency of the sampling

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

Type of specimen taken

See Thermophilic Campylobacter in Gallus gallus.

Methods of sampling (description of sampling techniques)

See Thermophilic Campylobacter in Gallus gallus.

Procedures for the selection of isolates for antimicrobial testing

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

Methods used for collecting data

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

Laboratory methodology used for identification of the microbial isolates

NMKL No 119 without enrichment.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

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

Breakpoints used in testing

Microbiological cut-off values are used to classify the isolates as resistant or susceptible. A microbiological cut-off value is defined as the highest MIC-value of isolates that belong to the original genetically unchanged population (wild-type). It classifies the isolates with a MIC-value greater than the microbiological cut-off value as resistant.

Control program/mechanisms

The control program/strategies in place

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

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

Sampling strategy used in monitoring

Frequency of the sampling

The isolates of Campylobacter being included in the monitoring of antimicrobial resistance are isolated in connection with the Norwegian action plan against Campylobacter in broilers. For description of the action plan, see Thermophilic Campylobacter in broiler meat and products thereof.

Type of specimen taken

See Thermophilic Campylobacter in broiler meat and products thereof.

Methods of sampling (description of sampling techniques)

See Thermophilic Campylobacter in broiler meat and products thereof.

Procedures for the selection of isolates for antimicrobial testing

Only one isolate of Campylobacter jejuni per positive batch of products is tested for antimicrobial resistance.

Methods used for collecting data

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

Laboratory methodology used for identification of the microbial isolates

NMKL No 119.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

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

Breakpoints used in testing

Microbiological cut-off values are used to classify the isolates as resistant or susceptible. A microbiological cut-off value is defined as the highest MIC-value of isolates that

belong to the original genetically unchanged population (wild-type). It classifies the isolates with a MIC-value greater than the microbiological cut-off value as resistant.

Control program/mechanisms

The control program/strategies in place

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

Table Antimicrobial susceptibility testing of C. jejuni in Gallus gallus - broilers - monitoring programme - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	C. jejuni Gallus gallus - broilers - monitoring programme
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	75

Antimicrobials:	**N**	**%R**	**<=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**
Fluoroquinolones																						
Enrofloxacin	75	0.0	2.7	38.7	52.0	6.7																
Quinolones																						
Nalidixic acid	75	0.0							1.3	57.3	41.3											
Aminoglycosides																						
Gentamicin	75	0.0				4.0	62.7	33.3														
Macrolides																						
Erythromycin	75	0.0				9.3	57.3	32.0	1.3													
Penicillins																						
Ampicillin	75	4.0						14.7	32.0	38.7	8.0	2.7	1.3	1.3	1.3							

Table Antimicrobial susceptibility testing of C. jejuni in Broiler meat - at retail - monitoring programme - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	C. jejuni
	Broiler meat - at retail - monitoring programme
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	33

Antimicrobials:	**N**	**%R**	**<=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**
Fluoroquinolones																						
Enrofloxacin	33	0.0		30.3	54.5	15.2																
Quinolones																						
Nalidixic acid	33	0.0							3.0	24.2	69.7	3.0										
Aminoglycosides																						
Gentamicin	33	0.0				9.1	42.4	39.4	9.1													
Macrolides																						
Erythromycin	33	0.0					42.4	45.5	12.1													
Penicillins																						
Ampicillin	33	9.1						9.1	30.3	39.4	9.1	3.0	3.0	3.0	3.0							

Table 6.1.2 Antimicrobial susceptibility testing of Campylobacter in animals

	Campylobacter spp.					
	Cattle (bovine animals)		**Pigs**		**Poultry**	
Isolates out of a monitoring program					yes	
Number of isolates available in the laboratory					75	
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**
Fluoroquinolones						
Enrofloxacin					75	0.0%
Quinolones						
Nalidixic acid					75	0.0%
Aminoglycosides						
Gentamicin					75	0.0%
Macrolides						
Erythromycin					75	0.0%
Penicillins						
Ampicillin					75	4.0%
Number of multiresistant isolates						
fully sensitives					71	94.7%
resistant to 1 antimicrobial					4	5.3%
resistant to 2 antimicrobials					0	0.0%
resistant to 3 antimicrobials					0	0.0%
resistant to 4 antimicrobials					0	0.0%
resistant to >4 antimicrobials					0	0.0%

Footnote

All isolates were C. jejuni

Table 6.1.4 Antimicrobial susceptibility testing of Campylobacter in food

	Campylobacter spp.							
	Broiler meat		**Other poultry meat**		**Pig meat**		**Bovine meat**	
Isolates out of a monitoring program	yes							
Number of isolates available in the laboratory	33							
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**
Fluoroquinolones								
Enrofloxacin	33	0.0%						
Quinolones								
Nalidixic acid	33	0.0%						
Aminoglycosides								
Gentamicin	33	0.0%						
Macrolides								
Erythromycin	33	0.0%						
Penicillins								
Ampicillin	33	9.1%						
Number of multiresistant isolates								
fully sensitives	30	90.9%						
resistant to 1 antimicrobial	3	9.1%						
resistant to 2 antimicrobials	0	0.0%						
resistant to 3 antimicrobials	0	0.0%						
resistant to 4 antimicrobials	0	0.0%						
resistant to >4 antimicrobials	0	0.0%						

Table 6.1.3 Antimicrobial susceptibility testing of Campylobacter in humans

	Campylobacter spp.	
	humans	
Isolates out of a monitoring program	yes	
Number of isolates available in the laboratory	104	
Antimicrobials:	**N**	**%R**
Tetracycline		
Doxycyclin	104	5.8%
Fluoroquinolones		
Ciprofloxacin	104	8.7%
Quinolones		
Nalidixic acid	104	9.6%
Aminoglycosides		
Gentamicin	104	2.9%
Macrolides		
Erythromycin	104	3.8%
Number of multiresistant isolates		
fully sensitives	92	88.5%
resistant to 1 antimicrobial	2	1.9%
resistant to 2 antimicrobials	3	2.9%
resistant to 3 antimicrobials	5	4.8%
resistant to 4 antimicrobials	1	1.0%
resistant to >4 antimicrobials	1	1.0%

Footnote

The above table gives the data on C. jejuni isolated from campylobacteriosis cases infected in Norway. The corresponding figures for cases infected by C. jejuni abroad (n=128) are: Doxycycline: 59.4%R, Ciprofloxacin: 68.8%R, Nalidixic acid: 68.8%R, Gentamicin: 3.1%R, Erythromycin: 3.9%R. Fully sensitive: 19.5%, resistant to 1: 11.7%, resistant to 2: 17.2%, resistant to 3: 43.0%, resistant to 4: 7.0%, resistant to >4: 1.6%.

Table 6.1.6 Breakpoints used for antimicrobial susceptibility testing of Campylobacter in Animals

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline										
Doxycyclin										
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	M	0.5		0.5	0.03	4				
Quinolones										
Nalidixic acid	M	16		16	1	128				
Aminoglycosides										
Gentamicin	M	4		4	0.25	8				
Macrolides										
Erythromycin	M	8		8	0.125	16				
Penicillins										
Ampicillin	M	16		16	0.5	64				

Footnote

Standard for breakpoint: M = Microbiological cut-off values. These are based on the distribution of MIC values of a large number of strains and set as to divide the susceptible bacterial population from the resistant population.

Table 6.1.6 Breakpoints used for antimicrobial susceptibility testing of Campylobacter in Food

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline										
Doxycyclin										
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	M	0.5		0.5	0.03	4				
Quinolones										
Nalidixic acid	M	16		16	1	128				
Aminoglycosides										
Gentamicin	M	4		4	0.25	8				
Macrolides										
Erythromycin	M	8		8	0.125	16				
Penicillins										
Ampicillin	M	16		16	0.5	64				

Footnote

Standard for breakpoint: M = Microbiological cut-off values. These are based on the distribution of MIC values of a large number of strains and set as to divide the susceptible bacterial population from the resistant population.

Table 6.1.6 Breakpoints used for antimicrobial susceptibility testing of Campylobacter in Humans

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Campylobacter	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline										
Doxycyclin	P	2		2						
Fluoroquinolones										
Ciprofloxacin	P	1		2						
Enrofloxacin										
Quinolones										
Nalidixic acid	P	16		16						
Aminoglycosides										
Gentamicin	P	4		4						
Macrolides										
Erythromycin	P	0.5		4						
Penicillins										
Ampicillin										

Footnote

P: Population based breakpoints were used

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 clinical cases sporadically occurring in humans and in animals, especially among sheep.
Only one foodborne outbreak of listeriosis has been registered in Norway. In 1992, an outbreak involving six reported cases was traced to contaminated, vacuum packed cold cuts from a Norwegian meat producer.
In a survey conducted in 1994, the prevalence of L. monocytogenes in samples of vacuum packed cold cuts and smoked salmon was 1.7% and 7.8%, respectively. The prevalence in smoked salmon had decreased to 3.4% in a survey conducted in 1996-1997. In 2002, out of 703 samples of domestically produced fish and fish products, mostly unprocessed and smoked salmon, 4.3% were positive for L. monocytogenes. In a survey conducted in 1995 involving ready-to-eat poultry products, the prevalence was 0.4%.
A survey of domestically produced raw milk products conducted in 1999 revealed that one (0.4%) out of 282 samples 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 4% of 100 samples from goat bulk milk were positive for L. monocytogenes. This illustrates that raw milk and raw milk products might be risk products in 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 together with information to consumers belonging to risk populations. A recent study has shown that it is possible to produce fermented trout without L. monocytogenes if hygienic precautions, 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 clinical cases sporadically occurring in animals, especially among sheep. However, listeriosis is not a common disease in humans in Norway. Most cases are sporadic and seen in elderly or in patients with underlying disease.
Processed ready-to-eat products have been identified as a source of listeriosis in the Nordic countries. Data indicate that the occurrence of L. monocytogenes in ready-to-eat products seems to be caused by cross-contamination rather than insufficient heat processing.

Recent actions taken to control the zoonoses

Listeriosis is a List C disease according to the Animal Diseases Act. There are no monitoring programmes in regard to L. monocytogenes in animals. Information is achieved through clinical and laboratory reports.

The Norwegian Food Safety Authority recommend that findings of L. monocytogenes in ready-to-eat food products with a shelf life longer than 15 days and in which the bacteria easily can grow, should result in recall from the market of the corresponding lot. The producer is recommended to review production routines and shelf-life of the product. Findings of L. monocytogenes in some specified heat-treated products (e.g., soft cheeses) would result in recall of the whole lot. 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.
Dietary advice is given to pregnant women.

2.3.2. Listeriosis in humans

A. Listeriosis in humans

Reporting system in place for the human cases

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

Case definition

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

Diagnostic/analytical methods used

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

Notification system in place

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

History of the disease and/or infection in the country

Since 1982, the number of notified cases has varied from 2-21. The incidence rate has varied from 0.05-0.5 per 100 000. Most of the cases are sporadic, occurring in elderly individuals or persons with underlying disease. A few congenital cases are also being reported. The last outbreak occurred in 1992. This outbreak involved six reported cases and was traced to contaminated, vacuum packed cold cuts from a Norwegian meat producer.

Results of the investigation

A total of 21 confirmed cases of listeriosis were notified (incidence rate 0.5 per 100 000), one being a congenital case. All cases were sporadic. Three deaths had been recorded at the time of notification, all in patient with underlying disease.

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

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

Relevance as zoonotic disease

Listeriosis in humans is a relatively rare disease in Norway.

Table 7.2.A Listeriosis in man - species/serotype distribution

Listeria	Cases	Cases Inc
	21	0.5
Listeria spp.	21	0.5
congenital cases	1	0.02
deaths	3	0.07

Table 7.2.B Listeriosis in man - age distribution

Age Distribution	L. monocytogenes			Listeria spp.		
	All	M	F	All	M	F
<1 year	1	1		1	1	
1 to 4 years						
5 to 14 years						
15 to 24 years						
25 to 44 years	1		1	1		1
45 to 64 years	9	3	6	9	3	6
65 years and older	10	5	5	10	5	5
Age unknown						
Total :	21	9	12	21	9	12

Footnote

All listeriosis cases were due to L. monocytogenes.

2.3.3. Listeria in foodstuffs

A. Listeria spp. in food

Monitoring system

Sampling strategy

Norway follows the EU requirements regarding testing for L. monocytogenes in milk products.
The Norwegian Food Safety Authority has an ongoing survey regarding milk products entering Norway from the EEA area. The samples are taken at the place of import (close to retail).
Internal control in the industry: Samples are taken as part of the internal programmes.

Frequency of the sampling

At retail

Other: Every 20 batch is sampled

Type of specimen taken

At retail

Soft cheeses and fresh milk cheeses.

Methods of sampling (description of sampling techniques)

At retail

From every sampled batch, 12 single samples of at least 25 grams are sampled and analysed.

Definition of positive finding

At the production plant

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

At retail

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

Diagnostic/analytical methods used

At the production plant

Bacteriological method: NMKL 136

At retail

Bacteriological method: NMKL 136

Control program/mechanisms

The control program/strategies in place

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

Measures in case of the positive findings

Surveys/food control: The Norwegian Food Safety Authority recommend that findings of L. monocytogenes in ready-to-eat food products with a shelf life longer than 15 days and in which the bacteria easily can grow, should result in recall from the market of the corresponding lot. The producer is recommended to review production routines and shelf-life of the product. Findings of L. monocytogenes in some specified heat-treated products (e.g., soft cheeses) would result in recall of the whole lot.
Internal control: Corrective actions will be taken according to the frequency of positive findings, product type, step of process at which the isolation was done, and whether the product is a ready-to-eat-product or special dietary product.

Results of the investigation

Three (0.2%) out of 1875 samples of Norwegian cheese were positive for L. monocytogenes. The positive samples were all from the same production plant.
Six (0.3%) out of 1856 samples of imported cheeses were positive for L. monocytogenes.

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

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

Table 7.1 Listeria monocytogenes in food

	Source of information	Remarks	Epidemiological unit	Sample weight	Definition used	Units tested	<100 cfu/g	>100 cfu/g	L. monocytogenes
Cheeses									
- at processing plant (1)	Industry		Sample	25 g		1875			3
- at retail (2)	NFCA		Sample	25 g		1856			6
Dairy products									
other products									
ready-to-eat									
- at processing plant	Industry		Sample	25 g		190			0
ready-to-eat									
- at processing plant - environmental sample	Industry		Sample	Swab		650			0

(1) : The positive samples were all from the same processing plant
(2) : Survey of products from the EEA area
(3) : Survey of products entering Norway from the EEA area

Footnote

The detection limit for the method is >100 CFU/g

2.4. VEROCYTOTOXIC ESCHERICHIA COLI

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 (0-17 cases per year, incidence rate 0-0.4 per 100 000 inhabitants). Approximately half of the cases are acquired domestically. During the time period 1992-2003, there were seven cases of haemolytic uremic syndrome (HUS). No deaths attributable to VTEC infection were reported in this period. The first and so far only registered 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 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%). No VTEC O157 was detected in a survey in 2002 regarding the prevalence of VTEC O157 in dairy cattle in the Central Eastern part of Norway, in which 15 individual faecal samples from each of 50 herds were tested. In 2000, none of 1435 beef cattle representing 165 herds were positive for VTEC O157 by faecal sampling. In a survey in 2002 in which faecal samples from 453 beef cattle representing 155 farms were tested for the presence of VTEC O26, O103, O139, O145 and O157, five (1.1%) animals were positive for VTEC O103.
In July 2002, in a study involving one research farm regarding the safety of organically produced fresh produce, VTEC O157 (stx2) was found to be widespread (soil, cattle manure, faecal samples from cattle, sheep and poultry). Repetitive testing indicated a decreasing occurrence on the farm, and the stringent restrictions that had been imposed on the farm were lifted in November 2002.
In a PCR-screening conducted in 2001 regarding stx-genes in faecal samples from Norwegian cattle, all three cattle herds were positive with an animal prevalence of 65%. Various VTEC were isolated, but no VTEC O157.
In the surveillance programme for VTEC O157 in cattle, sheep, and goat carcasses programme, the total animal prevalence (including year 2004) has been 0.06% for cattle and 0.03% for sheep. None of 510 goats tested have been positive. Follow-up testing of herds that have been positive or suspected positive in this surveillance programme for carcasses did not reveal any positive ruminants until 2002, when two calves and one heifer on the farm that delivered four positive cattle, tested positive for VTEC O157 (stx2). In 2000, one out of 18 pigs on a farm that had delivered a positive cow for slaughter tested positive for VTEC O157:H7.

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

Although the annual incidence in humans in Norway so far has been low and predominantly involved sporadic cases, it is possible that the incidence may increase in the future, and that outbreaks may occur. Data show that VTEC O157 is present in the cattle and sheep populations, although the prevalence seems to be low, representing a possible source of contamination.

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 is still 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. Verocytotoxic Escherichia coli 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) is not a notifiable disease per se, but is 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) is not a notifiable disease per se.

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 (0-17 cases per year, incidence rate 0-0.4 per 100 000 inhabitants). Of the 96 cases that were registered in the period 1992-2003, approximately half of the cases were acquired domestically. Of the reported cases, 62 were due to VTEC O157, seven due to O26, three due to O145, three due to O103, and one due to each of O111, O113, O128 and O130. For the remaining cases, the serogroup was not identified. There were in total seven cases of haemolytic uremic syndrome (HUS) and no deaths attributable to VTEC infection reported in this period.
The first and so far only registered 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.

Results of the investigation

A total of 13 cases of VTEC infection were reported (incidence rate 0.3 per 100000 inhabitants),

including one HUS case. Seven of the cases were known to be indigenous, including the HUS case from which E. coli O86:H? was isolated. Seven of the cases were caused by VTEC O157, two of which were indigenous.

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

Although the annual incidence in Norway so far has been low and predominantly involved sporadic cases, it is possible that the incidence may increase in the future, and that outbreaks may occur. Data show that VTEC O157 is present in the cattle and sheep populations, although the prevalence seems to be low, representing a possible source of contamination. It is possible that the underreporting of non-O157 strains is significant due to the methods currently used.

Relevance as zoonotic disease

Data show that VTEC O157 is present in the cattle and sheep populations, although the prevalence seems to be low. Thus, there is a potential for contamination in the food chain or by direct animal contsct, 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 represent 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.

Table 11.3.A Verocytotoxic Escherichia coli infections in man - species/serotype distribution

Pathogenic Escherichia coli	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
HUS						
- clinical cases						
- lab. confirmed cases						
- caused by O157 (VT+)						
- caused by other VTEC(1)	1	0.02	1	0.02		
E.coli infect. (except HUS)						
- laboratory confirmed						
- caused by 0157 (VT+) (2)	7	0.2	2	0.04	3	0.07
- caused by other VTEC (3)	5	0.1	4	0.09	1	0.02

(1) : E. coli O86:H?
(2) : Including 2 cases with unknown place of infection
(3) : One case with E. coli O145 (infected in Norway) and 4 cases with unknown serotype

Table 11.3.B Verocytotoxic Escherichia coli infections in man - age distribution

Age Distribution	Verotoxigenic E. coli (VTEC)			VTEC O 157:H7			VTEC non-O 157		
	All	M	F	All	M	F	All	M	F
<1 year	1		1				1		1
1 to 4 years(1)	3		3				3		3
5 to 14 years	2	1	1	1	1		1		1
15 to 24 years(2)	2		2	1		1	1		1
25 to 44 years(3)	3		3	2		2	1		
45 to 64 years									
65 years and older(4)	2		2	2		2			
Age unknown									
Total :	13	1	12	6	1	5	7	0	6

(1) : Including the only HUS case
(2) : The O157 case was O157:H-
(3) : Both O157 were O157:H-
(4) : One O157 was O157:H-

Footnote

The column VTEC includes both VTEC O157:H7 and VTEC non-O157, including the HUS-case (a 1-4 year old female infected with E. coli O86:H?)

2.4.3. Pathogenic Escherichia coli in foodstuffs

A. Verotoxigenic E. coli (VTEC) in food - red meat - at slaughter (cattle, sheep and goat)

Monitoring system

Sampling strategy

An official surveillance programme started in 1998 for cattle. In 1999, the programme was extended to include sheep and goats. The programme was terminated on June 30, 2004.

Frequency of the sampling

Cattle and goat: Every 150 slaughtered animal is sampled.
Sheep: Every 1000 slaughtered animal is sampled.

Type of specimen taken

Other: Carcass swabs

Methods of sampling (description of sampling techniques)

The sample consists of abdominal muscle and skin from an area close to the abdominal incision.

Definition of positive finding

An animal from which VTEC O157 is isolated.

Diagnostic/analytical methods used

Bacteriological method: NMKL No 164:1999.

Control program/mechanisms

The control program/strategies in place

An official surveillance programme started in 1998 and was terminated on June 30, 2004.

Measures in case of the positive findings or single cases

If VTEC O157 is detected in an official survey among live animals or in the official carcass surveillance programme, the Norwegian Food Safety Authority and Municipal Medical Officer are notified. Restrictions may be imposed on livestock holdings where VTEC O157 is detected. Herds found positive for VTEC O157 are followed up with extensive testing four times the following year, or until two negative testing rounds. Follow-up testing will also be conducted in herds that have delivered animals testing positive in the carcass surveillance programme.

Notification system in place

Findings of VTEC O157 in carcasses lead to condemnation of the carcass and notification to the authorities.
Findings of VTEC O157 in samples from live animals are not notifiable as an animal disease, however, competent authorities have to be informed about positive findings.

Results of the investigation

A total of 1252 cattle carcasses, 243 sheep carcasses and 39 goat carcasses were tested, all negative.

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

The prevalence of VTEC O157:H7 is low in Norwgian cattle, sheep and goats.

Table 11.2 Verocytotoxic Escherchia coli in food

	Source of information	Remarks	Epidemiological unit	Sample weight	Units tested	Units positive	VTEC O 157	VTEC O 157:H7
Bovine meat								
fresh								
- at slaughter (1)	NFCA		Animal		1252	0		
Meat from sheep								
fresh								
- at slaughter (2)	NFCA		Animal		243	0		
Goat meat								
fresh								
- at slaughter (3)	NFCA		Animal		39	0		

(1) : Surveillance programme
(2) : Surveillance programme
(3) : Surveillance programme

2.4.4. Pathogenic Escherichia coli in animals

A. Verotoxigenic Escherichia coli in cattle (bovine animals)

Monitoring system

Sampling strategy

Prevalence surveys have been conducted at farm occasionally since 1998.
At slaughter, every 150 slaughtered animal is sampled (see VTEC in food).

Type of specimen taken

Animals at farm

Faeces

Methods of sampling (description of sampling techniques)

Animals at farm

Faecal samples are taken. In several of the surveys performed, a total of nine animals in each herd have been sampled, six adults and three less than 2 years old.

Case definition

Animals at farm

An animal/herd from which VTEC is isolated.

Diagnostic/analytical methods used

Animals at farm

Bacteriological method: NMKL No 164:1999

Measures in case of the positive findings or single cases

If VTEC O157 is detected in an official survey among live animals or in the official carcass surveillance programme, the Norwegian Food Safety Authority and Municipal Medical Officer are notified. Restrictions may be imposed on livestock holdings where VTEC O157 is detected. Herds found positive for VTEC O157 are followed up with extensive testing four times the following year, or until two negative testing rounds. Follow-up testing will also be conducted in herds that have delivered animals testing positive in the carcass surveillance programme.

Notification system in place

Findings of VTEC O157 in carcasses lead to condemnation of the carcass and notification to the authorities.
Findings of VTEC O157 in samples from live animals are not notifiable as an animal disease, however, competent authorities have to be informed about positive findings.

Results of the investigation

In the surveillance conducted at slaughterhouse, a total of 1252 cattle carcasses were tested, all negative (see VTEC in food).

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

The prevalence of VTEC O157:H7 is low in Norwegian cattle.

B. Verotoxigenic E. coli (VTEC) in animal - Sheep and goats

Monitoring system

Sampling strategy

At slaughter, every 150 slaughtered goat and every 1000 slaughtered sheep is sampled (see VTEC in food).

Type of specimen taken

Animals at farm

Faeces

Case definition

Animals at farm

An animal from which VTEC is isolated.

Diagnostic/analytical methods used

Animals at farm

Bacteriological method: NMKL No 164:1999

Measures in case of the positive findings or single cases

If VTEC O157 is detected in an official survey among live animals or in the official carcass surveillance programme, the Norwegian Food Safety Authority and Municipal Medical Officer are notified. Restrictions may be imposed on livestock holdings where VTEC O157 is detected. Herds found positive for VTEC O157 are followed up with extensive testing four times the following year, or until two negative testing rounds. Follow-up testing will also be conducted in herds that have delivered animals testing positive in the carcass surveillance programme.

Notification system in place

Findings of VTEC O157 in carcasses lead to condemnation of the carcass and notification to the authorities.
Findings of VTEC O157 in samples from live animals are not notifiable as an animal disease, however, competent authorities have to be informed about positive findings.

Results of the investigation

In a sheep herd, 17 live animals were sampled and found negative. The sampling was a follow-up of earlier positive findings.
At slaughterhouse, a total of 243 sheep carcasses and 39 goat carcasses were tested, all negative (see VTEC in food).

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

The prevalence of VTEC in sheep and goats seem to be low in Norway.

Table 11.1 Verocytotoxic Escherchia coli in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	VTEC O 157	VTEC O 157:H7
Sheep (1)	NVI		Herd	1	0		

(1) : 17 animals from one herd tested due to earlier positive findings.

2.5. TUBERCULOSIS

2.5.1. General evaluation of the national situation

A. Tuberculosis General evaluation

History of the disease and/or infection in the country

Bovine tuberculosis (M. bovis) was declared eliminated in cattle in Norway in 1963 as a result of an official campaign against the disease. During the period 1895-1896, 26% of 2195 tuberculin-tested herds were positive. In 1950, 18 herds were registered as being infected, while in the beginning of the 1960s only one or two infected herds were reported annually. Since bovine tuberculosis was declared eliminated, it has only been recorded three times; in 1984 in two cattle herds and in 1986 in one cattle herd. These herds were in the same geographical area and the origin of the infection in these herds was probably a man with tuberculosis. Tuberculosis caused by M. bovis in other animal species than cattle has not been recorded in Norway after the disease was eliminated from cattle in 1963.
Tuberculosis in humans caused by M. bovis is only sporadically recorded in Norway, and since 1977 the few recorded cases have been imported except for one case of reactivation in 1994.

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

As Norway is officially free from bovine tuberculosis, the probability of contracting M. bovis infection from Norwegian animals or animals 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.

2.5.2. Tuberculosis 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 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 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.

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 76% in 2002).
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 2002 one patient from Somalia, in 2001 one patient from Tanzania, in 2000 two patients from Somalia and Morocco, respectively, in 1999 one patient from Sri Lanka, in 1998 one patient from Somalia, and in 1994 one patient infected in India.

Results of the investigation

No cases of bacteriologically confirmed M. bovis infection was reported.

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

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

Relevance as zoonotic disease

As Norway is officially free from bovine tuberculosis, the probability of contracting M. bovis infection from Norwegian animals or animals 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 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 disease caused by M. tuberculosis and M. bovis.
In addition to school children, the BCG vaccine is also offered to unvaccinated and tuberculin negative persons belonging to certain risk groups; immigrants from countries with high prevalence of tuberculosis, persons travelling to high-endemic areas for a prolonged time-period, teachers, health personnel, personnel on ships and in off-shore industry, and military personnel.
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.

Table 1.2.A Tuberculosis in man - species/serotype distribution

Mycobacterium	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
	0	0	0	0	0	0
M. bovis	0	0				
M. tuberculosis reactivation of previous cases						

2.5.3. Mycobacterium in animals

A. Mycobacterium bovis in Bovine Animals

Status as officially free of bovine tuberculosis during the reporting year

The entire country free

Norway has been granted the officially tuberculosis-free status of bovine herds by the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 225/96/COL of December 4, 1996) as Norway fulfils the requirements laid down in Council Directive 64/432/EEC as amended.

Monitoring system

Sampling strategy

Animals for slaughter: Every slaughtered animal, except animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Community legislation (64/433/EEC).
Breeding animals: All breeding bulls are tuberculin tested several times.
Imported animals: Imported animals are tuberculin tested if considered relevant based upon individual assessment.
Clinical indications: If suspicion arises whether an animal may have tuberculosis (sick or dead animal), relevant tests will be carried out.

Frequency of the sampling

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

Type of specimen taken

Organs/ tissues: Animals for slaughter: Lymphnodes. 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 Community legislation (64/433/EEC). If indicated: bacteriology and histology.
Clinical indications: Tuberculin testing (intradermal comparative test), pathology, and/or bacteriology.
Breeding animals and imported animals: Tuberculin testing (intradermal comparative test).

Vaccination policy

Vaccination of animals against tuberculosis is prohibited in Norway.

Control program/mechanisms

The control program/strategies in place

Animals for slaughter: Mandatory control programme. Every slaughtered animal, except animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Community legislation (64/433/EEC).

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

Samples from four cattle were collected during post-mortem examinations at the slaughterhouses and analysed by culture for the presence of Mycobacterium species. Neither M. bovis nor M. tuberculosis were isolated, but M. avium subsp. avium was isolated from one of the animals.
Tuberculin tests were performed on 144 breeding bulls at AI stations, all were negative.

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

Bovine tuberculosis was declared eliminated in cattle in 1963.

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

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

B. Mycobacterium bovis in farmed deer

Monitoring system

Sampling strategy

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

Frequency of the sampling

Animals for slaughter: All are subject to meat inspection.
Imported deer: Tested during week 5 of the two months long isolation period.

Type of specimen taken

Organs/ tissues: Animals for slaughter: Lymphnodes. 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 Community legislation (64/433/EEC). If indicated: bacteriology and histology.
Clinical indications: Tuberculin testing (intradermal comparative test), pathology, and/or bacteriology.
Imported animals: Tuberculin testing (intradermal comparative test).

Vaccination policy

Vaccination of animals against tuberculosis is prohibited in Norway.

Control program/mechanisms

The control program/strategies in place

Animals for slaughter: Mandatory control programme. Every slaughtered animal, except animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Community legislation (64/433/EEC).

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

None of the slaughtered deer had findings at slaughter indicating tuberculosis.

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

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

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

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

C. Mycobacterium spp. in animal

Monitoring system

Sampling strategy

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

Frequency of the sampling

Animals for slaughter: All animals are subject to meat inspection.
Sheep and goats are tested during week 23 of the two years long isolation period. Pigs are

tested during week 7 of the two months long isolation period. Llamas are tested during week 22 of the six months long isolation period.

Type of specimen taken

Organs/ tissues: Animals for slaughter: Lymphnodes. 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 Community legislation (64/433/EEC). If indicated: bacteriology and histology.
Clinical indications: Tuberculin testing (intradermal comparative test), pathology, and/or bacteriology.
Tests of imports, exports: Tuberculin testing (intradermal comparative test).

Vaccination policy

Vaccination of animals against tuberculosis is prohibited.

Control program/mechanisms

The control program/strategies in place

Animals for slaughter: Mandatory control programme. Every slaughtered animal, except poultry and animals slaughtered for on-the-farm consumption, is subjected to meat inspection regarding tuberculosis (lymph node examination) by an official veterinarian according to Community legislation (64/433/EEC).

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

Tuberculin tests were performed on 100 breeding boars at AI stations, all were negative.
Samples from three pigs were collected during post-mortem examinations at the slaughterhouses and analysed for the presence of Mycobacterium species. Neither M. bovis nor M. tuberculosis were isolated, but M. avium subsp. avium was isolated from two of the pigs.
M. avium subsp. avium was also isolated from one roe deer and one wild goose (Anser brachyrhynchus). M. celatum was isolated from one ferret.

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 1.1.3 Tuberculosis in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	M. bovis	M. tuberculosis	M. celatum	M. avium subsp. avium
Pigs (1)	NVI		Animal	3	2	0	0	0	2
breeding animals									
- at AI station	BC		Animal	100	0				
Pet animals									
cats	NVI		Animal	1	0				
ferrets	NVI		Animal	1	1	0	0	1	0
Wildlife									
rat	NVI		Animal	1	0				
wild birds (2)	NVI		Animal	2	1	0	0	0	1
deer									
roe	NVI		Animal	1	1	0	0	0	1

(1) : Animals suspected in routine post-mortem examination at slaughterhouse
(2) : One positive wild goose (Anser brachyrhynchus)

Footnote

BC= Breeding company.

1.1.1 Bovine tuberculosis

MANDATORY	**CATTLE**		
Number of herds under official control:	22500	Number of animals under official control:	936600
	OTF bovine herds	**OTF bovine herds with status suspended**	**Bovine herds infected with tuberculosis**
Status of herds at year end (a):	22500	0	0
New cases notified during the year (b):		0	0
	Units tested	**Units suspected**	**Units positive**
Routine tuberculin test (c) - data concerning herds:	0	0	0
Routine tuberculin test (c) - data concerning animals:	0	0	0
	Animals slaughtered	**Animals suspected**	**Animals positive**
Routine post-mortem examination (d):(1)	334100	4	0
		Herds suspected	**Herds confirmed**
Follow up of suspected cases in post-mortem examination (e):		0	0
Follow-up investigation of suspected cases: trace, contacts (f):		0	0
	Animals tested	**Animals suspected**	**Animals positive**
Other routine investigations: exports (g):	0	0	0
Other routine investigations: tests at AI stations (h):	144	0	0
	All animals	**Positives**	**Contacts**
Animals destroyed (i):	0	0	0
Animals slaughtered (j):	0	0	0

VOLUNTARY	**CATTLE**		
	Animals tested	**Animals suspected**	**Animals positive**
Other investigations: imports (k):	0	0	0
	Herds tested	**Herds suspected**	**Herds positive**
Other investigations: farms at risk (l):	0	0	0
	Samples tested	***M. bovis*isolated**	
Bacteriological examination (m):	0	0	

(1) : One of the four suspected animals was positive for M. avium subsp. avium.

1.1.2 Tuberculosis in farmed deer

MANDATORY	**FARMED DEER**		
Number of herds under official control:(1)	67	Number of animals under official control:(2)	2000
	"OTF" herds	**"OTF" herds with status suspended**	**Herds infected with tuberculosis**
Status of herds at year end (a):	67	0	0
New cases notified during the year (b):	0	0	0
	Units tested	**Units suspected**	**Units positive**
Routine tuberculin test (c) - data concerning herds:			
Routine tuberculin test (c) - data concerning animals:			
	Animals slaughtered	**Animals suspected**	**Animals positive**
Routine post-mortem examination (d):	34	0	0
		Herds suspected	**Herds confirmed**
Follow up of suspected cases in post-mortem examination (e):			
Follow-up investigation of suspected cases: trace, contacts (f):			
	Herds tested	**Herds suspected**	**Herds positive**
Other routine investigations: exports (g):			
Other routine investigations: tests at AI stations (h):			
	All animals	**Positives**	**Contacts**
Animals destroyed (i):			
Animals slaughtered (j):			
VOLUNTARY	**FARMED DEER**		
	Animals tested	**Animals suspected**	**Animals positive**
Other investigations: imports (k):			
	Herds tested	**Herds suspected**	**Herds positive**
Other investigations: farms at risk (l):			
	Samples tested	***M. bovis*isolated**	
Bacteriological examination (m):			

(1) : Data from the Norwegian Red Deer Centre
(2) : Estimated number of animals in 2005, from the Norwegian Red Deer Centre

2.6. BRUCELLOSIS

2.6.1. General evaluation of the national situation

A. Brucellosis General evaluation

History of the disease and/or infection in the country

Bovine brucellosis has been a notifiable disease since 1903. An offensive campaign to eliminate the disease was launched in 1935, and Norway was declared free from bovine brucellosis in 1953. Ovine, caprine, or porcine brucellosis has never been recorded in Norway. Norway has been granted the officially brucellosis-free status of bovine herds by the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 227/96/COL of December 4, 1996). Due to its history in regard to Brucella melitensis, Norway has been granted an officially brucellosis free status for sheep and goats.
Human brucellosis has always been a rare disease in Norway, the majority of the cases being imported, a few cases due to laboratory infections.

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.
Recent research studies have shown that antibodies against Brucella can be detected in marine mammals (minke whales and hooded seals) from the North Atlantic Ocean, and in polar bears from the archipelago of Svalbard and the Barents Sea. Brucella sp. different from previously described species has also been isolated from hooded seals from the Greenland Sea. There is a need for more research to better understanding the epidemiology regarding Brucella species among marine mammals and to address possible public health implications.

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

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

2.6.2. Brucellosis in humans

A. Brucellosis in humans

Reporting system in place for the human cases

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

Case definition

A clinically compatible case that is laboratory confirmed.

Diagnostic/analytical methods used

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

Notification system in place

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

History of the disease and/or infection in the country

Human brucellosis has always been a rare disease in Norway. During the period 1983-2003, only 12 cases of brucellosis were reported; in 2003 two cases probably being infected in Ethiopia and one case probably acquiring the infection in a laboratory, in 2002 three cases from Spain, Iraq and Georgia, respectively, in 2001 two cases probably infected in Lebanon, in 2000 a woman infected in Turkey probably through milk, in 1999 a man contracting the disease from milk in Turkey, in 1997 a male immigrant from Turkey, and in 1987 a Norwegian UN soldier stationed in Lebanon (B. melitensis).

Results of the investigation

Two cases of brucellosis were reported. One was infected at work (health care/laboratory), the other had been infected in Cyprus.

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

Brucellosis is rarely recorded in Norway. Since 1983, only 14 cases, all imported but two (laboratory contracted), have been recorded.

Relevance as zoonotic disease

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

implications.

Table 2.3.A Brucellosis in man - species/serotype distribution

	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
Brucella	2	0.04	1	0.02	1	0.02
B. abortus						
B. melitensis(1)	2	0.04	1	0.02	1	0.02
B. suis						
occupational cases(2)	1	0.02	1	0.02		

(1) : The imported case: Place of infection: Cyprus.
(2) : Route of infection reported as wound/exposure to blood at laboratory/in health care.

Table 2.3.B Brucellosis in man - age distribution

Age Distribution	B. abortus			B. melitensis			Brucella spp.		
	All	M	F	All	M	F	All	M	F
<1 year									
1 to 4 years									
5 to 14 years									
15 to 24 years									
25 to 44 years				2		2			
45 to 64 years									
65 years and older									
Age unknown									
Total :	0	0	0	2	0	2	0	0	0

2.6.3. Brucella in foodstuffs

2.6.4. Brucella in animals

A. Brucella abortus in Bovine Animals

Status as officially free of bovine brucellosis during the reporting year

The entire country free

Norway has been granted the officially brucellosis-free status of bovine herds by the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 227/96/COL of December 4, 1996).

Monitoring system

Sampling strategy

Surveillance programme: Annually, 20% of all dairy herds and 20% of all beef breeding herds will be sampled. In addition, all abortions between the fifth month of pregnancy and 14 days before expected birth in a herd in which there has been at least two such abortions the last 12 months, will be sampled.
Breeding animals: All breeding bulls are tested.
Imported animals: Imported animals are serologically tested if considered relevant based upon an assessment of the health status in the country of origin.
Tests are also carried out in connection with clinical indications and export.

Frequency of the sampling

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

Type of specimen taken

Other: Blood, milk or foetuses.

Methods of sampling (description of sampling techniques)

Surveillance programme: Bulk milk samples are collected from dairy herds. In beef herds, blood samples from all animals older than two years are collected. In case of abortions, foetus and paired blood samples from the mother are collected.
Other monitoring systems: Blood samples.
All samples are colelcted at farm.

Case definition

An animal showing a significantly high antibody level to any Brucella species even after retesting after at least four weeks, or an animal from which Brucella spp. has been

isolated. The herd is the epidemiological unit.

Diagnostic/analytical methods used

Surveillance programme: Bulk milk samples and individual blood samples are tested for antibodies against Brucella in an indirect ELISA (Svanova). If the results are doubtful or positive, the sample is retested with a competitive ELISA (C-ELISA, Svanova). If still positive, a complement fixation test is used.
Abortions and other clinical indications: Bacteriology, histopathology, and serology (as above).
Breeding animals, imports, exports: Serology (Rose bengal plate agglutination test, serum agglutination test or complement fixation test depending on the customers demands).
All tests (except the ELISA tests) are 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

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

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

All 7986 blood samples representing 813 beef herds were negative. All bulk milk samples from 3138 dairy herds tested negative.
All fetuses from 25 mother cows from 23 herds as well as blood samples from these mother cows tested negative.
All 144 bulls that were tested for brucellosis prior to entry or at the AI stations were negative.
All 25 bulls tested in relation to export were negative.

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

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

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

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

B. Brucella melitensis in Sheep

Status as officially free of ovine brucellosis during the reporting year

The entire country free

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

Monitoring system

Sampling strategy

Surveillance programme: A large proportion of herds being part of the breeding system with ram circles are tested in addition to randomly selected flocks not being part of any ram circles.
Imported animals: Animals entering the Norwegian territory from abroad are serologically tested if considered relevant based upon an assessment of the health status in the country of origin.

Frequency of the sampling

Surveillance programme: Herds are tested once during the year.
Sheep are tested for brucellosis at week 2 and 23 during the two year isolation period.

Type of specimen taken

Blood

Methods of sampling (description of sampling techniques)

Individua 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, and in herds with more than 200 animals, 40 animals are sampled.

Case definition

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

Diagnostic/analytical methods used

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

Vaccination policy

Vaccination of animals against brucellosis is prohibited.

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 is a notifiable List A disease according to the Animal Diseases Act. Cases are to be notified to the Norwegian Food Safety Authority.

Results of the investigation

In the surveillance programme, 50501 animals from 1665 herds were tested for antibodies against B. melitensis, all were negative.
11 sheep were imported to Norway, all coming from Denmark. They all tested negative for antibodies to Brucella.

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

Ovine brucellosis has never been recorded in Norway.

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

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

C. Brucella melitensis in Goat

Status as officially free of caprine brucellosis during the reporting year

The entire country free

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

Monitoring system

Sampling strategy

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

Frequency of the sampling

Goats are tested for brucellosis in week 2 and 23 during the two year isolation period.

Type of specimen taken

Blood

Methods of sampling (description of sampling techniques)

Individual blood samples are collected at farm.

Case definition

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

Diagnostic/analytical methods used

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

Vaccination policy

Vaccination of animals against brucellosis is prohibited.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

24 imported goats and 22 other goats were tested for antibodies against B. melitensis, all were negative.

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

Caprine brucellosis has never been recorded in Norway.

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

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

D. Brucella spp. in animal - Pigs

Monitoring system

Sampling strategy

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

Frequency of the sampling

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

Type of specimen taken

Blood

Methods of sampling (description of sampling techniques)

Blood samples are taken at farm.

Case definition

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

Diagnostic/analytical methods used

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

Vaccination policy

Vaccination of animals against brucellosis is prohibited in Norway.

Control program/mechanisms

The control program/strategies in place

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

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

All 993 pigs belonging to a breeding company tested negative. 61 of these were tested in relation to export.

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 2.1.3 Brucellosis in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive	B. melitensis	B. abortus	B. suis
Pigs								
breeding animals								
- at AI station - Control programme (1)	BC		Animal	932	0			
- export	BC		Animal	61	0			
Pet animals								
dogs								
- export	NVI		Animal	30	0			
- import	NVI		Animal	37	0			

(1) : Includes boars before entering the AI station.

Footnote

BC: Breeding company.

2.1.1 Bovine brucellosis

MANDATORY	CATTLE		
Number of herds under official control:	22500	Number of animals under official control:	936600
	OBF bovine herds	**OBF bovine herds with status suspended**	**Bovine herds infected with brucellosis**
Status of herds at year end (a):	22500	0	0
New cases notified during the year (b):	0	0	0
	Animals tested	**Animals suspected**	**Animals positive**
Notification of clinical cases, including abortions (c):(3)	25	0	0
	Units tested	**Units suspected**	**Units positive**
Routine testing (d1) - data concerning herds:(1)	3138	0	0
Routine testing (d2) - number of animals tested:	0	0	0
Routine testing (d3) - number of animals tested individually:(2)	7986	0	0
		Herds suspected	**Herds confirmed**
Follow-up investigation of suspected cases: trace, contacts (e):		0	0
	Animals tested	**Animals suspected**	**Animals positive**
Other routine investigations: exports (f):	25	0	0
Other routine investigations: tests at AI stations (g):	144	0	0
	All animals	**Positives**	**Contacts**
Animals destroyed (h):	0	0	0
Animals slaughtered (i):	0	0	0
VOLUNTARY	**CATTLE**		
	Animals tested	**Animals suspected**	**Animals positive**
Other investigations: imports (k):	0	0	0
	Herds tested	**Herds suspected**	**Herds positive**
Other investigations: farms at risk (l):	0	0	0
	Samples tested	**Brucella isolated**	
Bacteriological examination (m):	0	0	

(1) : Bulk milk samples from 3138 herds.
(2) : Blood samples representing 813 beef herds.
(3) : Fetuses from 25 cows from 23 herds.

2.1.2 Ovine and caprine brucellosis

MANDATORY	SHEEP AND GOATS		
Number of holdings under official control:(5)	18007	Number of animals under official control:(4)	2457300
	OBF ovine and caprine holdings	**OBF ovine and caprine holdings with status suspended**	**OBF ovine and caprine holdings infected with brucellosis**
Status of herds at year end (a):	18007	0	0
New cases notified during the year (b):	0	0	0
	Animals tested	**Animals suspected**	**Animals positive**
Notification of clinical cases, including abortions (c):	0	0	0
	Units tested	**Units suspected**	**Units positive**
Routine testing (d) - data concerning holdings:(1)	1655	0	0
Routine testing (d) - data concerning animals:(2)	50501	0	0
		Holdings suspected	**Holdings confirmed**
Follow-up investigation of suspected cases: trace, contacts (e):		0	0
	Animals tested	**Animals suspected**	**Animals positive**
Other routine investigations: exports (f):	0	0	0
	All animals	**Positives**	**Contacts**
Animals destroyed (g):	0	0	0
Animals slaughtered (h):	0	0	0
VOLUNTARY	**SHEEP AND GOATS**		
	Animals tested	**Animals suspected**	**Animals positive**
Other investigations: imports (i):(3)	35	0	0
	Holdings tested	**Holdings suspected**	**Holdings positive**
Other investigations: farms at risk (j):	0	0	0
	Samples tested	**Brucella isolated**	
Bacteriological examination (k):	0	0	

(1) : Sheep holdings
(2) : Sheep
(3) : 11 imported sheep and 24 imported goats
(4) : 2412700 sheep and 44600 goats
(5) : 17439 sheep holdings and 568 goat holdings

2.7. YERSINIOSIS

2.7.1. General evaluation of the national situation

A. Yersinia entercolitica general evaluation

History of the disease and/or infection in the country

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 1997-1998, 300 samples of raw pork products from Norway were analysed. By use of a culturing method (NMKL method no. 117), Y. enterocolitica O:3 was isolated from 2% of the samples, while use of a PCR method indicated the presence of pathogenic Y. enterocolitica in 17%. This indicates that the prevalence of pathogenic Y. enterocolitica in Norwegian pork products have decreased since a similar survey was 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 the gradual introduction of improved routines when slaughtering pigs that aid in preventing carcasses from becoming contaminated with Y. enterocolitica.

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

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

Recent actions taken to control the zoonoses

During the mid 1990s, there was a gradual introduction of improved slaughtering routines in pigs that aid in preventing carcasses from being contaminated with Y. enterocolitica. Parallel to this action, a significant reduction inn the incidence of reported yersiniosis in humans was noted.

2.7.2. Yersiniosis in humans

A. Yersinosis in humans

Reporting system in place for the human cases

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

Case definition

A case from which Yersinia spp. has been isolated.

Diagnostic/analytical methods used

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

Notification system in place

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

History of the disease and/or infection in the country

In the years 1982-1994, the number of notified cases varied between 154 and 274 (mean 187, median 182). From 1994 a steady decline in yersiniosis reports began. This decline coincided with the gradual introduction of improved routines when slaughtering pigs, which resulted in reduced contamination with Y. enterocolitica on the surface of pig carcasses. The decline was interrupted in 1998, and since then the incidence has been between 85 and 150 notified cases per year.

Results of the investigation

A total of 101 cases of yersiniosis were reported (incidence rate 2.1 in 100 000). A total of 56 (55%) cases were indigenous.
For 90 of the cases, information about the serogroup of the isolate was available; 80 were identified as serogroup O:3, six were serogroup O:9, and four were other serogroups.

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

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

Relevance as zoonotic disease

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

Additional information

Patients whose work represent 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.

Table 8.3.A Yersiniosis in man - species/serotype distribution

	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
Yersinia	101	2.1	56	1.17	36	0.78
Y. enterocolitica(1)	10	0.2	6	0.1	2	0.04
Yersinia spp.(2)	5	0.1	3	0.07	1	0.02
Y. enterocolitica O:3(3)	80	1.7	42	0.9	32	0.7
Y. enterocolitica O:9	6	0.1	5	0.1	1	0.02

(1) : Those cases of yersiniosis where the isolated Y. enterocolitica did not belong to the serotypes O:3 or O:9. The number of cases includes 2 with unknown place of infection.
(2) : Those cases of yersiniosis where the isolated agent was not identified to species level. The number of cases includes 1 with unknown place of infection.
(3) : Number of cases includes 6 with unknown place of infection.

Table 8.3.B Yersiniosis in man - age distribution

Age Distribution	Y. enterocolitica			Yersinia spp.		
	All	M	F	All	M	F
<1 year	3		3	3		3
1 to 4 years	13	6	7	14	7	7
5 to 14 years	9	3	6	9	3	6
15 to 24 years	6	3	3	6	3	3
25 to 44 years	30	20	10	30	20	10
45 to 64 years	29	12	17	32	14	18
65 years and older	6	2	4	7	2	5
Age unknown						
Total :	96	46	50	101	49	52

Footnote

The column Yersinia spp. includes all Y. enterocolitica as well as five isolates that were not typed to species level.

Table 8.3.C Yersiniosis in man - seasonal distribution

Month	Y. enterocolitica	Yersinia spp.
	Cases	Cases
January	8	9
February	2	2
March	7	7
April	4	4
May	10	10
June	1	1
July	8	8
August	11	11
September	10	10
October	8	11
November	13	13
December	14	15
not known		
Total :	96	101

Footnote

The column Yersinia spp. includes all Y. enterocolitica as well as five isolates that were not typed to species level.

2.7.3. Yersinia in foodstuffs

2.7.4. Yersinia in animals

A. Yersinia entercolitica in pigs

Monitoring system

Sampling strategy

Animals at farm

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

Animals at slaughter (herd based approach)

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

Control program/mechanisms

The control program/strategies in place

There are no official monitoring programmes in regard to Y. enterocolitica in animals.

Recent actions taken to control the zoonoses

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

Measures in case of the positive findings or single cases

None.

2.8. TRICHINELLOSIS

2.8.1. General evaluation of the national situation

A. Trichinellosis General evaluation

History of the disease and/or infection in the country

Trichinellosis occurs endemically among wild red foxes in mainland Norway and among wild arctic foxes and polar bears in the archipelago of Svalbard. Trichinellosis has also been diagnosed in farmed foxes.
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.
Human trichinellosis acquired in Norway has not been reported since 1980. The two last reported cases of human trichinellosis, in 1996, were both imported.

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

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

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

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

2.8.2. Trichinellosis in humans

A. Trichinellosis in humans

Reporting system in place for the human cases

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

Case definition

A clinically compatible case that is laboratory confirmed.

Diagnostic/analytical methods used

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

Notification system in place

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

History of the disease and/or infection in the country

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

Results of the investigation

No cases of human trichinellosis were reported.

Relevance as zoonotic disease

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

Table 4.2.A Trichinellosis in man - species/serotype distribution

Trichinella	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
	0	0	0	0	0	0
Trichinella spp.	0	0				

2.8.3. Trichinella in animals

A. Trichinella in pigs

Monitoring system

Sampling strategy

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

Frequency of the sampling

Every slaughtered animal is sampled

Type of specimen taken

Diaphragm muscle

Methods of sampling (description of sampling techniques)

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

Case definition

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

Diagnostic/analytical methods used

Artificial digestion method of collective samples

Other preventive measures than vaccination in place

It is prohibited to feed pigs with unsterilized household offal.

Control program/mechanisms

The control program/strategies in place

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

Measures in case of the positive findings or single cases

Measures taken are according to Council Directive 64/433/EEC. Measures imposed on holdings with positive findings of Trichinella are in accordance with Regulations concerning measures against contagious animal diseases of 27.06.2002 no 732 (not allowed to sell animals, carcasses

must be incinerated, epidemiological investigations will be initiated). Detection of Trichinella must be reported immediately. Farms delivering positive carcasses will be identified. The following six months animals from such farms will be given special attention at slaughter. The sample size for the digestion method will be increased to 2 grams.

Notification system in place

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

Results of the investigation

No cases of trichinellosis among slaughtered pigs were reported.

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

Trichinellosis was last detected in two pig herds in 1994.

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

There have not been any findings of Trichinella in animals or foodstuffs.

B. Trichinella in horses

Monitoring system

Sampling strategy

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

Frequency of the sampling

Every slaughtered animal is sampled

Type of specimen taken

Other: Tongue or masseter muscle

Methods of sampling (description of sampling techniques)

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

Case definition

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

Diagnostic/analytical methods used

Artificial digestion method of collective samples

Control program/mechanisms

The control program/strategies in place

All horse carcasses that are included in a positive pooled sample will be retested individually (samples of 10 g).
Detection of Trichinella must be reported immediately. Positive carcasses are condemned.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

No cases of trichinellosis among slaughtered horses were reported.

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

There have not been any findings of Trichinella in animals or foodstuffs.

C. Trichinella spp. in animal - Wildlife

Monitoring system

Sampling strategy

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

Frequency of the sampling

Depending on the situation and animal species.

Type of specimen taken

Organs/ tissues: Diaphragm, tongue or masseter 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.

Control program/mechanisms

The control program/strategies in place

The control at slaughter according to Council Directive 64/433/EEC 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

If trichinellosis is diagnosed in a farmed fox, the animal holding will get official restrictions 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).

Notification system in place

Trichinellosis is a notifiable List B disease according to the Animal Diseases Act.

Results of the investigation

None of the three tested badgers were positive for Trichinella spp. The badgers were diseased.

Table 4.1 Trichinella in animals

	Source of information	Remarks	Epidemiological unit	Animals tested	Animals positive
Pigs (1)			Animal	1469200	0
Solipeds (2)			Animal	2000	0
Wildlife					
badgers	NVI		Animal	3	0

(1) : All slaughtered animals.
(2) : All slaughtered animals.

2.9. ECHINOCOCCOSIS

2.9.1. General evaluation of the national situation

A. Echinococcus spp general evaluation

History of the disease and/or infection in the country

E. granulosus used to be relatively common in reindeer in Northern Norway until the 1950s (approx. 10% prevalence in the 1950s). Today, the parasite is almost eliminated due to systematic anti-helmintic treatment of herd dogs and reduced use of raw slaughter offal to herd dogs. Pathological findings compatible with E. granulosus infestation was reported in a reindeer in 2003. E. granulosus was last diagnosed in cattle in 1987.
E. multilocularis has never been diagnosed in mainland Norway, but was in 1999 for the first time detected in the archipelago of Svalbard.

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

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

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

The pathological finding compatible with E. granulosus infestation in a reindeer in 2003 is a reminder that this parasite still may be present and that this requires alertness in reindeer environments, especially as regard the importance of regular treatment of herd dogs with an anti-helmintic drug.
As E. multilocularis has never been detected in mainland Norway in any animal species, the risk to humans of contracting echinococcosis caused by E. multilocularis in mainland Norway is probably very low. 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.

2.9.2. Echinococcosis in humans

A. Echinococcus spp in humans

Reporting system in place for the human cases

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

Case definition

A clinical compatible case that is laboratory confirmed.

Diagnostic/analytical methods used

Serology and histopathology.

Notification system in place

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

History of the disease and/or infection in the country

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

Results of the investigation

No cases has been reported.

Relevance as zoonotic disease

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

Table 9.2.A Echinococcosis in man - species/serotype distribution

	Cases	Cases Inc	Autochtone cases	Autochtone Inc	Imported cases	Imported Inc
Echinococcus	0	0	0	0	0	0
E. granulosus	0	0				
E. multilocularis	0	0				
Echinococcus spp.	0	0				

2.9.3. Echinococcus in animals

A. E. granulosus in animal

Monitoring system

Sampling strategy

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

Frequency of the sampling

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

Methods of sampling (description of sampling techniques)

Inspection for hydatid cysts at the abattoir.

Case definition

An animal with a positive test result.

Diagnostic/analytical methods used

Macroscopic (visual) examination of organs

Other preventive measures than vaccination in place

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

Control program/mechanisms

The control program/strategies in place

Mandatory official meat control.

Measures in case of the positive findings or single cases

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

Notification system in place

Echinococcosis is a notifiable List B disease according to the Animal Diseases Act.

Results of the investigation

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

Additional information

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

B. E. multilocularis in animal

Monitoring system

Sampling strategy

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

Methods of sampling (description of sampling techniques)

Intermediate hosts: Autopsy.

Case definition

An animal with a positive test result.

Other preventive measures than vaccination in place

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

Control program/mechanisms

Recent actions taken to control the zoonoses

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

Notification system in place

Echinococcosis is a notifiable List B disease according to the Animal Diseases Act.

Results of the investigation

A research project conducted in the archipelago of Svalbard identified E. multilocularis from three (14%) of 22 sibling voles tested. All positive animals were wintered voles, and in total 19% of the 16 wintered voles tested were positive.

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

In mainland Norway, E. multilocularis has never been detected in any animal species although no systematic investigation has been undertaken in wild animals. In a study, serum samples from 98 farmed foxes were free from circulating antibodies to Em2 antigen. In mainland Norway the main host of E. multilocularis, the fox, is not suspected to harbour this parasite, and the parasite is not likely to be present in dogs and cats either.
In 1999, in a research project on echinococcosis in the archipelago of Svalbard, E. multilocularis was detected in 16 % of 172 sibling voles tested. Pathological examinations revealed liver cysts. In a follow-up study, faecal samples from polar foxes, dogs, and cats were collected. The parasite was diagnosed in three of six faecal samples from polar foxes, in one of 48 dogs, and in none of two cats. The methods used were coproantigen ELISA, flotation (egg detection), and PCR. The findings has been followed up. Of the wintered voles tested in 2000, 2001, 2002 and 2003, 96%, 36%, 25% and 36% were positive, respectively.

Table 9.1 Echinococcus sp. in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Echinococcus spp.	E. multilocularis	E. granulosus
Cattle (bovine animals) (1)				334100	0		
Sheep (2)				1264200	0		
Goats (3)				18400	0		
Pigs (4)				1469200	0		
Solipeds (5)				2000	0		
Wildlife							
vole (7)	U			22	3	3	0
Farmed reindeers							
- at slaughter (6)				4000	0		

(1) : All slaughtered animals.
(2) : All slaughtered animals.
(3) : All slaughtered animals.
(4) : All slaughtered animals.
(5) : All slaughtered animals.
(6) : All slaughtered animals.
(7) : Survey in the archipelago of Svalbard.

Footnote

Number of slaughtered animals are obtained from Register of Slaughtered Animals
U: University of Tromsø

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

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; 18% of the lambs were seropositive in a survey conducted during the 1990s, and seropositive lambs were identified on 44% of the farms included. The parasite is assumed to be less common among Norwegian pigs. In the abovementioned survey, 2% of the slaughtering pigs tested were seropositive. Also wild ruminants (cervids) can be infected; a survey carried out among 4300 cervids killed during hunting in 1992-2000, revealed 34% seropositive roe-deer, 13% seropositive moose, 8% seropositive red deer and 1% seropositive reindeer.

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

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

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

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

2.10.2. Toxoplasmosis in humans

A. Toxoplasmosis in humans

Reporting system in place for the human cases

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

Case definition

A clinically compatible case that is laboratory confirmed.

Diagnostic/analytical methods used

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

Notification system in place

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

History of the disease and/or infection in the country

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

Results of the investigation

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.

Table 10.2.A Toxoplasmosis in man - species/serotype distribution

Toxoplasma	Cases	Cases Inc
	0	0
Toxoplasma spp.	0	0
congenital cases	0	0

2.10.3. Toxoplasma in animals

Table 10.1 Toxoplasma gondii in animals

	Source of information	Remarks	Epidemiological unit	Units tested	Units positive
Sheep (1)	NVI		Animal	47	16
Goats (2)	NVI		Animal	16	15
Pet animals					
cats	NVI		Animal	4	1

(1) : 16 animals from seven herds were Toxoplasma positive
(2) : 15 animals from two herds were Toxoplasma positive

Footnote

Laboratory reports (pathology and/or serology), mostly diagnostic submissions

2.11. RABIES

2.11.1. General evaluation of the national situation

A. Rabies General evaluation

History of the disease and/or infection in the country

Rabies in animals has not been recorded in mainland Norway since the beginning of the 19th century. The disease has sporadically been diagnosed in polar fox, reindeer, and seal in the archipelago of Svalbard, the last time in a fox found dead in 1999 (25 animal cases during the period 1980-2003). However, transmission of rabies to humans has never been recorded in the archipelago of Svalbard.

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 time 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.

2.11.2. Rabies in humans

A. Rabies in humans

Reporting system in place for the human cases

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

Case definition

A clinical case that is laboratory confirmed.

Diagnostic/analytical methods used

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

Notification system in place

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

History of the disease and/or infection in the country

Human rabies was last described in Norway in 1815.

Results of the investigation

No human cases were reported.

Relevance as zoonotic disease

As mainland Norway has been free from rabies for almost two centuries and stringent regulation regarding import of animals are in place, the risk of contracting rabies in mainland Norway is close to zero. Rabies has sporadically been diagnosed in wild animals in the archipelago of Svalbard, the last time 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 and 3) persons who are at frequent risk of bites from bats. Post-exposure prophylaxis to individuals presumably exposed to rabies virus abroad or in the archipelago of Svalbard, or who have been bitten by bats. The post-exposure prophylaxis includes specific antiserum in addition to the vaccine

2.11.3. Lyssavirus (rabies) in animals

A. Rabies in dogs

Monitoring system

Sampling strategy

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

Frequency of the sampling

On clinical suspicion.

Type of specimen taken

Organs/ tissues: Brain

Methods of sampling (description of sampling techniques)

The brain is removed at autopsy, and hippocampus is being processed for immunofluorescence testing, cell culture testing or mouse inoculation testing.

Case definition

A case that is laboratory confirmed.

Diagnostic/analytical methods used

Other: Fluorescent antibody test (FAT), cell culture test or mouse inoculation test. All performed according to the OIE manual, 5th ec. 2004.

Vaccination policy

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

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 in an officially approved quarantine station followed by a two months period in private 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 is a notifiable List A disease according to the Animal Diseases Act. Rabies is dealt with in Council Directive 92/65/EEC, which is implemented in Regulations on animal health conditions regarding import and export of certain animals of 31.12.98 no. 1478.

Results of the investigation

No cases were reported. One dog was investigated due to suspicion, but was 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 suspected increase in the number of illegally imported dogs.

B. Rabies virus in animal - Wildlife

Monitoring system

Sampling strategy

There are no active surveillance programmes regarding rabies. However, the disease must be reported immediately on clinical suspicion.
A survey regarding rabies in wildlife in Svalbard is ongoing.

Frequency of the sampling

On clinical suspicion.

Type of specimen taken

Organs/ tissues: Brain.

Methods of sampling (description of sampling techniques)

The brain is removed at autopsy, and hippocampus is being processed for immunofluorescence testing, cell culture testing or mouse inoculation testing.

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.

Control program/mechanisms

The control program/strategies in place

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

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

Results of the investigation

All tested animals were negative; 34 polar foxes from Svalbard, two red foxes from mainland Norway and three illegally imported animals from the racoon family (Procyonidae).

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 5.1 Rabies in animals

	Source of information	Remarks	Animals tested	Animals positive
Wildlife				
foxes (1)	NVI		36	0
other (2)	NVI		3	0
Pet animals				
dogs (3)	NVI		1	0

(1) : 34 polar foxes from the archipelago of Svalbard, 2 red foxes from mainland Norway.
(2) : Illegally imported animals of the racoon family (Procyonidae).
(3) : Clinical suspicion.

3. INFORMATION ON SPECIFIC INDICATORS OF ANTIMICROBIAL RESISTANCE

3.1. E. COLI INDICATORS

3.1.1. General evaluation of the national situation

A. E. 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, sulfonamides, 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* isolates

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

Sampling strategy used in monitoring

Frequency of the sampling

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

Type of specimen taken

Broilers: Faecal samples from the floor in the broiler house.
Pigs: Intestinal content (caecum) taken at the slaughterhouse.
Dogs: Intestinal content gathered on rectal swabs.

Methods of sampling (description of sampling techniques)

Broilers: Faecal samples from broiler flocks were systematically sampled from samples collected according to the Norwegian Salmonella Control programme for live animals. The first sample on a specific weekday during the sampling period was collected at each of the four involved laboratories. The number of samples from each laboratory was proportional to the number of samples from broilers obtained within the Norwegian Salmonella Control programme the previous year.
Pigs: Random months were given to each slaughterhouse (all slaughterhouses slaughtering more than 1% of the total volume in 2003 were included) for the collection of the samples. The sampling started on the first slaughter day in the week chosen by the local Food Safety Authority and were taken in a frequency chosen by the sampler until the requested number of samples were taken.
Dogs: Faecal samples from healthy dogs were collected at five selected small animal practises, geographically spread throughout Norway.

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 directly to the National Veterinary Institute in Oslo for identification and for antimicrobial susceptibility testing.

Laboratory methodology used for identification of the microbial isolates

Intestinal content was gathered on swabs and plated directly onto the surface of lactose-saccarose-bromthymol blue agar without broth enrichment.
After incubation of the agar plates at 37C for 24 h, a typical colony was plated onto blood agar

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

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) was used for the susceptibility testing of all isolates. All the testing was performed at one laboratory.

Breakpoints used in testing

Microbiological cut-off values were used to classify the isolates as resistant or susceptible. The microbiological cut-off value is defined as the highest MIC-value of isolates that belong to the original genetically unchanged population (wild-type). It classifies the isolates with a MIC-value greater than the microbiological cut-off value as resistant. However, NCCLS breakpoints were applied when available and appropriate.

Control program/mechanisms

The control program/strategies in place

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

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

Sampling strategy used in monitoring

Frequency of the sampling

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

Type of specimen taken

Broilers: Fresh broiler meat sampled at retail.
Pigs: Meat (snitzel meat) sampled at production plants.

Methods of sampling (description of sampling techniques)

Broiler meat: Small portions of some of the samples of fresh broiler meat collected in the Norwegian Action Plan against Campylobacter in broilers were transferred to the laboratory performing the susceptibility testing (Approx. 50 gram of each product were taken from the first five samples collected by each of the four local Food Safety Authorities during the months February, April, June, August and November).

Pigs: Random months were given to each slaughterhouse and its production plant (all slaughterhouses slaughtering more than 1% of the total volume in 2003 were included) for the collection of the samples. The sampling started on the first slaughter day in the week chosen by the local Food Safety Authority and were taken in a frequency chosen by the sampler until the requested number of samples were taken.

Procedures for the selection of isolates for antimicrobial testing

Only one isolate from each sample was included.

Methods used for collecting data

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

Laboratory methodology used for identification of the microbial isolates

Five grams of the meat samples were incubated in 45 ml of MacConkey broth (Oxoid). After incubation at 44C for 24 h, a small amount (approx. 10 microlitre) of broth was plated onto the surface of lactose-saccarose-bromthymol blue agar. After incubation of the agar plates at 37C for 24 h, a typical colony was plated onto blood agar (Heart infusion agar (Difco) containing 5% bovine blood). Colonies were identified as E. coli by typical appearance, lactose and/or saccarose fermentation and a positive indole reaction.

Laboratory used for detection for resistance

Antimicrobials included in monitoring

The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) was used for the susceptibility testing of all isolates. All testing was performed at one laboratory.

Breakpoints used in testing

Microbiological cut-off values were used to classify the isolates as resistant or susceptible. The microbiological cut-off value is defined as the highest MIC-value of isolates that belong to the original genetically unchanged population (wild-type). It classifies the isolates with a MIC-value greater than the microbiological cut-off value as resistant. However, NCCLS breakpoints were applied when available and appropriate.

Control program/mechanisms

The control program/strategies in place

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

Table 13.1 Antimicrobial susceptibility testing of E.coli in animals

	E.coli									
	Cattle (bovine animals)		**Pigs**		**Gallus gallus**		**Turkeys**		**Pet animals - dogs**	
Isolates out of a monitoring program			yes		yes				yes	
Number of isolates available in the laboratory			125		86				68	
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**
Tetracycline			125	9.6%	86	7.0%			68	2.9%
Amphenicols										
Chloramphenicol			125	0.8%	86	0.0%			68	0.0%
Florfenicol			125	0.0%	86	0.0%			68	0.0%
Cephalosporin										
Ceftiofur			125	0.0%	86	0.0%			68	0.0%
Fluoroquinolones										
Enrofloxacin			125	0.0%	86	0.0%			68	1.5%
Quinolones										
Nalidixic acid			125	0.0%	86	0.0%			68	1.5%
Trimethoprim			125	4.0%	86	2.3%			68	5.9%
Sulfonamides										
Sulfonamide			125	12.0%	86	14.0%			68	8.8%
Aminoglycosides										
Streptomycin			125	33.6%	86	9.3%			68	13.2%
Gentamicin			125	0.0%	86	0.0%			68	0.0%
Neomycin			125	0.8%	86	0.0%			68	0.0%
Penicillins										
Ampicillin			125	8.0%	86	17.4%			68	8.8%
Number of multiresistant isolates										
fully sensitives			75	60.0%	56	65.1%			58	85.3%
resistant to 1 antimicrobial			25	20.0%	21	24.4%			2	2.9%
resistant to 2 antimicrobials			18	14.4%	7	8.1%			2	2.9%
resistant to 3 antimicrobials			4	3.2%	1	1.2%			2	2.9%
resistant to 4 antimicrobials			2	1.6%	0	0.0%			3	4.4%
resistant to >4 antimicrobials			1	0.8%	1	1.2%			1	1.5%

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

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	E.coli
	Pigs - at slaughter - monitoring programme
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	125

Antimicrobials:	**N**	**%R**	**<=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**
Tetracycline	125	9.6%					5.6	70.4	14.4					0.8	8.8						0.5	64
Amphenicols																						
Chloramphenicol	125	0.8						0.8	7.2	54.4	36.8					0.8					1	128
Florfenicol	125	0.0								40.0	56.8	3.2									4	32
Fluoroquinolones																						
Enrofloxacin	125	0.0	16.8	78.4	4.8																0.03	4
Quinolones																						
Nalidixic acid	125	0.0						1.6	50.4	46.4	1.6										1	64
Trimethoprim	125	4.0%				27.2	57.6	10.4	0.8					4.0							0.25	32
Sulfonamides																						
Sulfonamide	125	12.0										76.0	12.0				12.0				16	512
Aminoglycosides																						
Streptomycin	125	33.6								21.6	44.8	6.4	1.6	8.8	9.6	1.6	5.6				2	256
Gentamicin	125	0.0					16.8	75.2	8.0												0.5	128
Neomycin	125	0.8							96.8	2.4			0.8								1	16
Cephalosporin																						
Ceftiofur	125	0.0				32.8	64.0	3.2														
Penicillins																						
Ampicillin	125	8.0						5.6	56.0	28.0	2.4	1.6		6.4							0.25	32

Table Antimicrobial susceptibility testing of E.coli in Gallus gallus - broilers - at farm - monitoring programme - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	E.coli
	Gallus gallus - broilers - at farm - monitoring programme
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	86

Antimicrobials:	**N**	**%R**	**<=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**
Tetracycline	86	7.0%					1.2	67.4	24.4						7.0						0.5	64
Amphenicols																						
Chloramphenicol	86	0.0							8.1	69.8	22.1										1	128
Florfenicol	86	0.0								51.2	47.7	1.2									4	32
Fluoroquinolones																						
Enrofloxacin	86	0.0	20.9	70.9	7.0	1.2															0.03	4
Quinolones																						
Nalidixic acid	86	0.0						3.5	62.8	33.7											1	64
Trimethoprim	86	2.3%				33.7	55.8	7.0	1.2			1.2		1.2							0.25	32
Sulfonamides																						
Sulfonamide	86	14.0										75.6	10.5				14.0				16	512
Aminoglycosides																						
Streptomycin	86	9.3								33.7	57.0	7.0	1.2		1.2						2	256
Gentamicin	86	0.0					16.3	76.7	7.0												0.5	128
Neomycin	86	0.0							96.5	3.5											1	16
Cephalosporin																						
Ceftiofur	86	0.0			3.5	39.5	52.3	4.7													0.12	16
Penicillins																						
Ampicillin	86	17.4					1.2	14.0	43.0	24.4				17.4							0.25	32

Table Antimicrobial susceptibility testing of E.coli in Pet animals - dogs - monitoring programme (healthy dogs) - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	E.coli																					
	Pet animals - dogs - monitoring programme (healthy dogs)																					
Isolates out of a monitoring program	yes																					
Number of isolates available in the laboratory	68																					
Antimicrobials:	**N**	**%R**	**<=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**
Tetracycline	68	2.9%					2.9	69.1	25.0						2.9						0.5	64
Amphenicols																						
Chloramphenicol	68	0.0						2.9	1.5	51.5	44.1										1	128
Florfenicol	68	0.0								25.0	72.1	2.9									4	32
Fluoroquinolones																						
Enrofloxacin	68	1.5	22.1	72.1	4.4		1.5														0.03	4
Quinolones																						
Nalidixic acid	68	1.5						2.9	45.6	50.0					1.5						1	128
Trimethoprim	68	5.9%				13.2	63.2	17.6						5.9							0.25	32
Sulfonamides																						
Sulfonamide	68	8.8										64.7	22.1	2.9	1.5		8.8				16	2048
Aminoglycosides																						
Streptomycin	68	13.2								20.6	66.2	2.9	2.9		4.4	2.9					2	256
Gentamicin	68	0.0					4.4	89.7	4.4	1.5											0.5	64
Neomycin	68	0.0							97.1	2.9											2	16
Cephalosporin																						
Ceftiofur	68	0.0			2.9	25.0	69.1	2.9													0.12	16
Penicillins																						
Ampicillin	68	8.8					1.5	1.5	41.2	45.6	1.5			8.8							0.25	32

Table 13.6 Antimicrobial susceptibility testing of E.coli in food

	E.coli							
	Broiler meat		**Other poultry meat**		**Pig meat**		**Bovine meat**	
Isolates out of a monitoring program	yes				yes			
Number of isolates available in the laboratory	87				97			
Antimicrobials:	**N**	**%R**	**N**	**%R**	**N**	**%R**	**N**	**%R**
Tetracycline	87	6.9%			97	8.3%		
Amphenicols								
Chloramphenicol	87	0.0%			97	1.0%		
Florfenicol	87	0.0%			97	0.0%		
Cephalosporin								
Ceftiofur	87	0.0%			97	0.0%		
Fluoroquinolones								
Enrofloxacin	87	3.4%			97	0.0%		
Quinolones								
Nalidixic acid	87	3.4%			97	0.0%		
Trimethoprim	87	2.3%			97	7.2%		
Sulfonamides								
Sulfonamide	87	12.6%			97	11.3%		
Aminoglycosides								
Streptomycin	87	16.1%			97	19.6%		
Gentamicin	87	0.0%			97	0.0%		
Neomycin	87	0.0%			97	1.0%		
Penicillins								
Ampicillin	87	23.3%			97	9.3%		
Number of multiresistant isolates								
fully sensitives	51	58.6%			75	77.3%		
resistant to 1 antimicrobial	26	29.9%			9	9.3%		
resistant to 2 antimicrobials	7	8.1%			3	3.1%		
resistant to 3 antimicrobials	1	1.2%			3	3.1%		
resistant to 4 antimicrobials	0	0.0%			3	3.1%		
resistant to >4 antimicrobials	2	2.3%			4	4.1%		

Table Antimicrobial susceptibility testing of E.coli in Broiler meat - fresh - at retail - monitoring programme - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	E.coli
	Broiler meat - fresh - at retail - monitoring programme
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	87

Antimicrobials:	**N**	**%R**	**<=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**
Tetracycline	87	6.9%					3.4	78.2	11.5						6.9						0.5	64
Amphenicols																						
Chloramphenicol	87	0.0							3.4	73.6	23.0										1	128
Florfenicol	87	0.0								49.4	48.3	2.3									4	32
Fluoroquinolones																						
Enrofloxacin	87	3.4	13.8	79.3	3.4		1.1	2.3													0.03	4
Quinolones																						
Nalidixic acid	87	3.4						2.3	57.5	36.8						3.4					1	128
Trimethoprim	87	2.3%				20.7	66.7	10.3						2.3							0.25	32
Sulfonamides																						
Sulfonamide	87	12.6										79.3	8.0				12.6				16	2048
Aminoglycosides																						
Streptomycin	87	16.1								19.5	64.4	10.3	3.4		2.3						2	128
Gentamicin	87	0.0					6.9	82.8	9.2	1.1											0.5	64
Neomycin	87	0.0							95.4	4.6											2	16
Cephalosporin																						
Ceftiofur	87	0.0				24.1	58.6	16.1	1.1												0.12	16
Penicillins																						
Ampicillin	87	23.3						5.8	34.9	36.0				23.3							0.25	32

Table Antimicrobial susceptibility testing of E.coli in Pig meat - at processing plant - monitoring programme - quantitative data [Dilution method]

Percentage of resistant isolates (R%) and percentage of isolates with the concentration (µl/ml) or zone (mm) of inhibition equal to

	E.coli
	Pig meat - at processing plant - monitoring programme
Isolates out of a monitoring program	yes
Number of isolates available in the laboratory	97

Antimicrobials:	**N**	**%R**	**<=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**
Tetracycline	97	8.3%					3.1	72.9	15.6						8.3						0.5	64
Amphenicols																						
Chloramphenicol	97	1.0							15.5	57.7	25.8					1.0					1	128
Florfenicol	97	0.0								46.4	52.6	1.0									4	32
Fluoroquinolones																						
Enrofloxacin	97	0.0	27.8	70.1	2.1																0.03	4
Quinolones																						
Nalidixic acid	97	0.0						7.2	44.3	47.4		1.0									1	128
Trimethoprim	97	7.2%				24.7	60.8	7.2						7.2							0.25	32
Sulfonamides																						
Sulfonamide	97	11.3										81.4	5.2	2.1			11.3				16	2048
Aminoglycosides																						
Streptomycin	97	19.6								29.2	51.0	3.1	1.0	4.2	4.2	4.2	3.1				2	128
Gentamicin	97	0.0					13.4	81.4	4.1	1.0											0.5	64
Neomycin	97	1.0							99.0				1.0								2	16
Cephalosporin																						
Ceftiofur	97	0.0			1.0	38.1	58.8	2.1													0.12	16
Penicillins																						
Ampicillin	97	9.3						7.2	47.4	36.1			1.0	8.2							0.25	32

Table 13.7 Breakpoints used for antibiotic resistance testing of E.coli in Animals

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Escherichia coli	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline	M	8		8	0.5	64				
Amphenicols										
Chloramphenicol	M	16		16	1	128				
Florfenicol	M	16		16	4	32				
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	M	0.25		0.25	0.03	4				
Quinolones										
Nalidixic acid	M	16		16	1	128				
Trimethoprim	M	4		4	0.25	32				
Sulfonamides										
Sulfonamide	M	256		256	16	2048				
Aminoglycosides										
Streptomycin	M	8		8	2	256				
Gentamicin	M	4		4	0.5	64				
Neomycin	M	4		4	2	16				
Kanamycin										
Trimethoprim + sulfonamides										
Cephalosporin										
Ceftiofur	M	2		2	0.125	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	M	8		8	0.25	32				

Footnote

Standard for breakpoint: M = Microbiological cut-off values. These are based on the distribution of MIC values of a large number of strains and set as to divide the susceptible bacterial population from the resistant population.

Table 13.7 Breakpoints used for antibiotic resistance testing of E.coli in Food

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Escherichia coli	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline	M	8		8	0.5	64				
Amphenicols										
Chloramphenicol	M	16		16	1	128				
Florfenicol	M	16		16	4	32				
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin	M	0.25		0.25	0.03	4				
Quinolones										
Nalidixic acid	M	16		16	1	128				
Trimethoprim	M	4		4	0.25	32				
Sulfonamides										
Sulfonamide	M	256		256	16	2048				
Aminoglycosides										
Streptomycin	M	8		8	2	256				
Gentamicin	M	4		4	0.5	64				
Neomycin	M	4		4	2	16				
Kanamycin										
Trimethoprim + sulfonamides										
Cephalosporin										
Ceftiofur	M	2		2	0.125	16				
3rd generation cephalosporins										
Penicillins										
Ampicillin	M	8		8	0.25	32				

Footnote

Standard for breakpoint: M = Microbiological cut-off values. These are based on the distribution of MIC values of a large number of strains and set as to divide the susceptible bacterial population from the resistant population.

Table 13.7 Breakpoints used for antibiotic resistance testing of E.coli in Feedingstuff

Test Method Used

Disc diffusion
Agar dilution
Broth dilution
E-test

Standards used for testing

NCCLS
CASFM

Subject to quality control

Escherichia coli	Standard for breakpoint	Breakpoint concentration (microg/ml)			Range tested concentration (microg/ml)		disk content	breakpoint Zone diameter (mm)		
		Susceptible <=	Intermediate	Resistant >	lowest	highest	microg	Susceptible >=	Intermediate	Resistant <=
Tetracycline										
Amphenicols										
Chloramphenicol										
Florfenicol										
Fluoroquinolones										
Ciprofloxacin										
Enrofloxacin										
Quinolones										
Nalidixic acid										
Trimethoprim										
Sulfonamides										
Sulfonamide										
Aminoglycosides										
Streptomycin										
Gentamicin										
Neomycin										
Kanamycin										
Trimethoprim + sulfonamides										
Cephalosporin										
Ceftiofur										
3rd generation cephalosporins										
Penicillins										
Ampicillin										

4. FOODBORNE OUTBREAKS

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

A. Foodborne outbreaks

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

Health personnel are required to report suspected foodborne outbreaks to the Municipal Health Officer, who is required to report to the County Governor (Fylkesmannen) and to the Norwegian Institute of Public Health. Suspected outbreaks are reported immediately to the Municipal Medical Officer who notifies the Norwegian Institute of Public Health the same day. If a domestic food or animal source is suspected, the Municipal Medical Officer also informs the local Food Safety Authority.
The Norwegian Food Safety Authority has a voluntary reporting system where the local Food Safety Authority report foodborne outbreaks to the Norwegian Food Safety Authority.
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 an outbreak is two or more human cases with the same disease of infection where the cases are linked or are probably linked to the same food source, or when observed number of human cases exceed the expected number of cases during the same time period and place, and food is a likely vehicle.

National evaluation of the reported outbreaks in the country:

Trends in numbers of outbreaks and numbers of human cases involved

In 2004 there were as in previous years several small outbreaks of salmonellosis related to travel abroad, in addition to a few domestic outbreaks which are described below.
There were 8 smaller outbreaks of campylobacteriosis, all infected in Norway. This is similar to previous years. The most common supected vehicles for domestic campylobacteriosis outbreaks were chicken and drinking water.

Relevance of the different causative agents, food categories and the agent/food category combinations

Traditionally, the most common cause of foodborne outbreaks in Norway has been due to bacterial intoxication (Clostridium perfringens, Bacillus cereus and Staphylococcus aureus). Recently, foodborne outbreaks of norovirus caused by infected foodhandlers have become more common. Reported domestic outbreaks of salmonellosis and

campylobacteriosis have been relatively rare.

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

No severe outbreaks were reported.

Descriptions of single outbreaks of special interest

There were six domestic outbreaks of salmonellosis of special interest:
One large nosocomial outbreak of Salmonella Infantis involving 68 patients was probably related to an infected foodhandler. Nosocomial salmonellosis outbreaks are extremely rare in Norway, and has only been reported twice during the last 60 years.
One international outbreak of Salmonella Thompson was traced to imported rocket lettuce, and 18 cases were diagnosed in Norway, in addition to cases in some other countries. RASSF messages reported later that different Salmonella serovars as well as Campylobacter was isolated from the product.
An outbreak of Salmonella Enteritidis among some factory employees was traced to homemade chocolate cake.
There were two outbreaks of Salmonella Typhimurium; one related to contact with hedgehogs on the western coast of Norway, one a family outbreak, probably involving secondary transmission.
An outbreak involving eight cases of Salmonella Uganda infection occurred among attendees in a cultural gathering, where traditional food from the Middle-east, with many different privately imported food items and spices, was served.
In 2004 the first waterborne outbreak of giardiasis was reported in Norway, with more than 1300 diagnosed cases. The probable source of contamination was leaking sewage pipes in a residential area close to the water source.

Table 12. Foodborne outbreaks in humans

Causative agent	General outbreak	Family outbreak	Total Number in persons			Source			Type of evidence	Location of exposure	Contributing factors
			ill	died	in hospital		Suspected	Confirmed			
1	2	3	4	5	6	7			8	9	10
Giardia	X		1300			Water		X	Epidemiology + laboratory	Community	Faecal contamination of drinking water and inadequat water treatment
Staphylococcus - S. aureus		X	2	0	0	Tandoori chicken		X	Found in left-overs	Private home	Deficiencies in preparation
Salmonella - S. Enteritidis(1)	X		15	0	7	Cake		X	Found in left-overs	Workplace	Deficiencies in food handling
Staphylococcus - S. aureus		X	5	0	0	Cheese, on-farm production		X	Found in left-overs	Farm	Too high pH during production
Bacillus - B. cereus(2)		X	19	0	0	Chicken, kept warm		X	Found in left-overs	Restaurant	Deficiencies in preparation
Salmonella - S. Enteritidis		X	7	0	0					Abroad (Spain)	
Salmonella - S. Enteritidis	X		5	0	0					Abroad (the Netherlands)	
Salmonella - S. Enteritidis			15	0	0					Abroad (Portugal)	
Salmonella - S. Enteritidis	X		10	0	0					Abroad (Czech Republic)	
Salmonella - S. Typhimurium	X		18	0	0	Pizza (take away)		X	Found in left-overs	Restaurant with take away	Deficiencies in preparation
Salmonella - S. Typhimurium	X		6	0	0	Hedgehogs	X		Laboratory	Environment	
Salmonella - S. Typhimurium		X	4			Secondary transmission	X		Descriptive	Private home	Index case infected abroad
Salmonella - S. Infantis	X		68			Food hadler, food	X		Descriptive	Hospital	
Salmonella - S. Uganda	X		8	0	0	Imported food	X		Descriptive	Local arrangement	
Salmonella - S. Thompson	X		21	0	0	Imported rocket salad		X	Epidemiological evidence	Private homes countrywide	
Salmonella - Salmonella spp.	X		13							Abroad (Spain)	
Campylobacter - C. jejuni		X	15	0	1	Drinking water		X	Found in water	Private home	Deficiencies in desinfecton
Campylobacter - C. jejuni		X	3	0	0	Chicken, barbeque		X	Found in left-overs	Private boat	Deficiencies in food handling

Campylobacter - Campylobacter spp.	X		4	0	0	Chicken	X		Descriptive	Course
Campylobacter - Campylobacter spp.	X		11	0	0	Wrap	X			School
Campylobacter - Campylobacter spp.	X		5	0	0	Water	X		Faecal indicatorbacteria found in water	Private homes
Campylobacter - Campylobacter spp.	X		10+	0	0	Water	X		Faecal indicatorbacteria found in water	Private homes
Campylobacter - Campylobacter spp.	X		4			Food	X			Institution
Campylobacter - Campylobacter spp.	X		4	0	0	Faecal material	X		Descriptive	Poultry slaughterhouse
Salmonella - S. Enteritidis - PT 21	X		7	0	0					Abroad (Greece)

(1) : 7 laboratory confirmed cases
(2) : Seven of the cases were laboratory confirmed