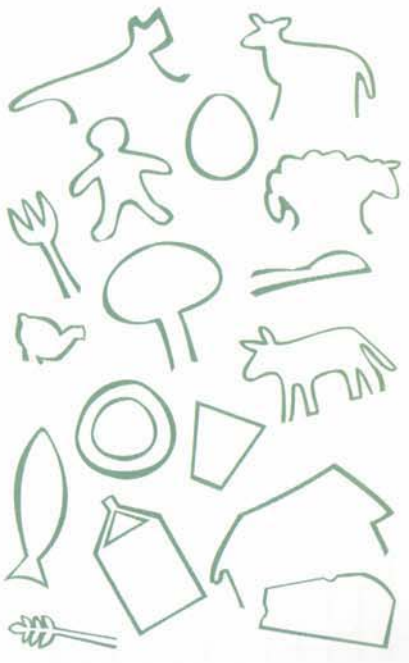

NORWAY

TRENDS AND SOURCES OF ZOONOSES AND ZOONOTIC AGENTS IN HUMANS, FOODSTUFFS ANIMALS AND FEEDINGSTUFF
- including information on foodborne outbreaks, antimicrobial resistance in zoonotic agents and some pathogenic microbiological agents in 2007

Annual report according to Council Directive 2003/99/EC

Norway

Trends and sources of zoonoses and zoonotic agents in humans, foodstuffs, animals and feedingstuffs

- including information on foodborne outbreaks, antimicrobial resistance in zoonotic agents and some pathogenic microbiological agents in 2007

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

Information on the reporting and monitoring system

Country: Norway
Reporting Year: 2007

Institutions and laboratories involved in reporting and monitoring:

The Norwegian Food Safety Authority (NFSA)
The Norwegian Food Safety Authority (NFSA) is the competent authority for the purpose of Directive 2003/99/EC of the European Parliament and of the Council.
Contributing with data and text.

The National Veterinary Institute (NVI)
The National Veterinary Institute (NVI) is a governmental agency funded by the Ministry of Agriculture and Food, Ministry of Fisheries and Coastal Affairs and the Norwegian Research Council. The primary function is supply of independent research based advisory support to the governing authorities regarding animal health, fish health and food safety.
Contributing with data and text. The reporting officer is employed at the Zoonosis Centre at NVI.

The National Institute of Nutrition and Seafood Research (NIFES)
The National Institute of Nutrition and Seafood Research (NIFES) is a research institute with administrative tasks. The institute is linked directly to the Ministry of Fisheries and
Coastal Affairs and act as an advisor to the Ministry in matters concerning the "fjord to fork" production chain of seafood (both wild and farmed). NIFES also provides independent and research based advisory support to other governmental bodies and to the Norwegian fisheries and aquaculture industries.
Contributing with data and text.

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

Suggested citation: Hofshagen M, Nygård K, Hauge K: Norway 2007 - Trends and source of zoonoses and zoonotic agents in humans foodstuffs, animals and feedingstuffs.

Preface

This report is submitted to the European Commission in accordance with Article 9 of Council Directive 2003/99/EC[1]. The information has also been forwarded to the European Food Safety Authority (EFSA) and to the EFTA Surveillance Authority (ESA).

The report contains information on trends and sources of zoonoses and zoonotic agents in Norway during the year 2007. The information covers the occurrence of these diseases and agents in humans, animals, foodstuffs and in some cases also in feedingstuffs. In addition the report includes data on antimicrobial resistance in some zoonotic agents and commensal bacteria as well as information on epidemiological investigations of foodborne outbreaks. Complementary data on susceptible animal populations in the country is also given.

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

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

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

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

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

List of contents

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.

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

Dates the figures relate to and the content of the figures
Data on herds and animals: As of 31 July 2007.
Data on slaughtered animals: Slaughtered in 2007.

Definitions used for different types of animals, herds, flocks and holdings as well as the types covered by the information
Herd means an animal or group of animals kept on a holding as an epidemiological unit (article 2.3(a) of Regulation (EC) No 2160/2003). In Norway, there is generally only one herd of the same animal species per holding.

A flock (poultry) is defined as all poultry of the same health status kept on the same premises or in the same enclosure and constituting a single epidemiological unit; in the case of housed poultry, this includes all birds sharing the same airspace (article 2.3(b) of Regulation (EC) No 2160/2003).

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

Geographical distribution and size distribution of the herds, flocks and holdings
Cattle: Most of the cattle herds are dairy herds, the average herd size being 18.2 cows. There are also a number of specialized beef herds with an average number of suckling cows of 13.0. A few herds are combined dairy and beef herds. The cattle herds are distributed throughout Norway with the main part being in the western and middle parts of Norway.

Swine: The Norwegian swine population is relatively small with products destinated for the national market. A national breeding program is organized by the industry. Approximately 150 approved elite and multiplier breeding herds house 5% of the live sows in the population, while more than 95% of the sows purchased on the national market are raised in these herds. The swine population is denser in some counties and about 50% of the swine production is concentrated in four counties in the southern and middle part of Norway.

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

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

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

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

Table Susceptible animal population

	Number of holdings/flocks	Livestock numbers (live animals)[5]	Number of slaughtered animals[5]
Cattle			
Dairy cows and heifers	12 600	229 700	
Mixed herds	1 100	30 800	
Meat production animals	4 100	53 100	
In total	19 300	902 000	319 000
Deer[1]	62	2 000	1 400
Gallus gallus (fowl)			
Grandparent breeding flocks – egg production line	2		
Parent breeding flocks – egg production line	12		
Parent breeding flocks – meat production line	140		
Laying hens[2]	710	3 412 700	907 900
Broilers	550 / 4 100		54 423 900
Goats			
Milk goats	490	41 000	
In total	1 300	71 500	19 500
Pigs			
Breeding animals	1 700	59 300	
Fattening pigs	2 500	449 000	
In total	2 800	815 400	1 470 100
Reindeers – farmed in total			46 800
Sheep			
Animals over 1 years	15 100	854 000	
In total	15 400	2 243 400	1 139 700
Turkeys[3]	46	333 800	

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

[1] Data on holdings and animals are from the Norwegian Red Deer Centre, data on slaughtered animals are from the Norwegian Food Safety Authority.
[2] Only flocks >250 birds, except for slaughtered animals. Data are number of holdings, not flocks.
[3] Numbers includes small amounts of ducks and geese. Data includes only flocks >25 birds, except for slaughtered animals. Data are number of holdings, not flocks.

Salmonellosis

General evaluation of the national situation

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

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

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
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.

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 mid1980s 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 mid1990s. No increase of similar magnitude has been observed for any other serovar. The proportion of imported cases of *S*. Enteritidis infections is particularly high (approximately 90% among patients with known place of acquisition) as this pathogen is not established in the Norwegian poultry production. Among domestic cases, *S*. Typhimurium is the most common serovar. This serovar, although not established among food producing animals in Norway, does occur in the Norwegian environment such as in wild birds and hedgehogs.

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

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

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

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

Table Cases of salmonellosis according to place of infection

Serovar	Place of infection					
	Norway		Abroad		Unknown	Total
S. Enteritidis	85	22%	614	52%	20	719
S. Typhimurium	174	45%	146	12%	19	339
DT 104	*7*		*8*		*1*	*16*
S. Stanley	8	2%	70	6%	2	80
S. Newport	8	2%	27	2%	2	37
S. Virchow	6	2%	30	3%	1	37
S. Agona	16	4%	12	1%	5	33
S. Weltevreden	22	6%	8	1%	3	33
S. Java	10	3%	20	2%	1	31
S. Saintpaul	4	1%	13	1%	6	23
S. Infantis	4	1%	14	1%	3	21
S. Schwarzengrund	3	1%	17	1%		20
Others	48	12%	215	18%	13	276
Total	**388**	**100%**	**1186**	**100%**	**75**	**1649**

Salmonella *in foodstuffs*

A. *Salmonella* spp. in eggs and egg products
Eggs and egg products are monitored indirectly by monitoring of the layer population, see chapter on *Salmonella* spp. in animals. Additional testing of egg products is carried out by the food business operators as an integral part of their own check procedures.

B. *Salmonella* spp. in poultry meat and products thereof
Poultry meat and products thereof are monitored indirectly by testing all poultry flocks before slaughter see chapter on *Salmonella* in animals. Additional testing at the slaughterhouses or cutting plants is not required. Occasionally, surveys are performed.

C. *Salmonella* spp. in red meat (pig, cattle, sheep) and products thereof

Monitoring system
At slaughterhouse and cutting plant: The Norwegian *Salmonella* Control Programme: Each year, a number of carcass swabs (pig, cattle, sheep) and lymph node samples (pig, cattle) are collected randomly from the animal population at slaughterhouse according to the slaughter volume. The sampling of carcass swabs is described in this chapter, the sampling of lymph nodes is described in the chapter on *Salmonella* in animals. Samples of crushed meat are each year collected according to production capacity of cutting plants.
At meat processing plant: Samples are taken according to Council Directive 94/65/EC.

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

Type of specimen taken
At slaughterhouse: Surface of carcass.
At cutting plant: Crushed meat from equipment or trimmings.
At meat processing plant: Samples are taken according to Council Directive 94/65/EC.

Methods of sampling (description of sampling techniques)
At slaughterhouse: The upper inner part of the hind legs/pelvic entrance and the cut surface area of the abdomen and chest are swabbed, covering an area of approximately 1400 cm^2 of each carcass.
At cutting plant: Each sample consists of 25 grams of meat.
At meat processing plant: Samples are taken according to Council Directive 94/65/EC.

Definition of positive finding
A positive sample is a sample from which *Salmonella* has been isolated.

Diagnostic/analytical methods used
Bacteriological method: NMKL No 71:1999

Control program/mechanisms/notification system in place
The Norwegian *Salmonella* Control Programme is mandatory. Detection of *Salmonella*, irrespective of serovar, is notifiable.

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

When *Salmonella* is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed, 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.

Results of the investigation

Pig

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

Cattle

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

Sheep

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

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

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

Relevance of the findings in animals to findings in foodstuffs and to human cases

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

Table *Salmonella* in foodstuffs

	Source of information	Sample weight	Units tested	Total units positive for *Salmonella* spp.	S. Typhimurium	S. *diarizonae* (61:k:1,5,7)	S. *enterica* subsp. *enterica* O:9	S. Infantis
Pig - carcass swabs	NSCP[1]	swab	3472	5	5			
Cattle - carcass swabs	NSCP	swab	2096	1	1			
Sheep - carcass swabs	NSCP	swab	2496	2		2		
Crushed red meat (pig, cattle, sheep)	NSCP	25g	1466	2	1		1	
Live bivalve molluscs	NIFES	25g	380	1				1
Fish - wild catch	NIFES	25g	18	0				
Fish - farmed - at processing plant	NIFES	25g	27	0				
Fish processing plant - environment	NIFES	swab	58	0				

[1]NSCP = Norwegian *Salmonella* Control Programme

Salmonella *in animals*

A. *Salmonella* spp. in poultry (*Gallus gallus*, turkeys, ducks, geese)

Monitoring system

Breeding flocks

The Norwegian *Salmonella* Control Programme includes all poultry breeding flocks. Sampling of breeding flocks of *Gallus gallus* is established pursuant to Article 5 of Regulation (EC) 2160/2003 and approved by the EFTA Surveillance Authority (ESA) (364/07/COL). The Norwegian Food Safety Authority is responsible for the sampling. The Norwegian *Salmonella* Control Programmes also include all breeder flocks of ducks, geese and turkeys.
Other strategies: Animals are tested in relation to clinical surveillance and import. Norway is also granted additional guaranties according to Commission decision 2003/644/EC.

Laying hens flocks

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

Meat producing flocks (broilers, turkeys, ducks, geese)

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

Frequency of the sampling

Breeding flocks

Day-old chicks: Every flock is sampled
Rearing period: At the age of 4 weeks and 2 weeks before transfer
Production period: Every 2 weeks

Laying hens

Day-old chicks: Every flock is sampled
Rearing period: 2 weeks before transfer
Production period: Every 15 weeks
Before slaughter at farm: Every flock is sampled

Meat producing flocks (broilers, turkeys, ducks, geese)

Before slaughter at farm: Every flock is sampled

Type of specimen taken

Breeding flocks and laying hens

Day-old chicks: Internal linings of delivery boxes
Rearing period, production period: Sock samples or faeces (cage birds)
Before slaughter at farm: Sock samples or faeces (cage birds)

Meat producing flocks (broilers, turkeys, ducks, geese)

Before slaughter at farm: Socks/boot swabs

Methods of sampling (description of sampling techniques)

Breeding flocks

Day-old chicks: Crate liners from 5 transport crates from one delivery (>1m^2 in total) are sampled and pooled to one sample in the laboratory.
Rearing period: 2 pairs of sock samples are pooled to one sample.
Production period: 5 pairs of sock samples are pooled to two samples. Alternatively, if birds are kept in cages, two samples consisting of at least 150 g faeces each are analysed separately.

Laying hens

Day-old chicks: Crate liners from 5 transport crates from one delivery (>1m^2 in total) are sampled and pooled to one sample in the laboratory.
Rearing period: 2 pairs of sock samples are pooled to one sample. Cage birds: faecal samples >150 g.
Production period: 2 pairs of sock samples are pooled to one sample. Cage birds: faecal samples >150 g.
Before slaughter: 2 pairs of sock samples are pooled to one sample. Cage birds: faecal samples >150 g.

Meat producing flocks (broilers, turkeys, ducks, geese)

Before slaughter at farm: 2 pairs of sock samples are pooled to one sample.

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

Diagnostic/analytical methods used
Bacteriological method: ISO 6579:2002

Vaccination policy
Vaccination against *Salmonella* is prohibited in Norway.

Control program/mechanisms/notification system in place
The Norwegian *Salmonella* Control Programme is mandatory. Detection of *Salmonella*, irrespective of serovar, has been notifiable since 1965.

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

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

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

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

National evaluation of the recent situation, the trends and sources of infection
The favourable *Salmonella* situation in Norwegian poultry is partly dependant upon an efficient control of breeding flocks. Due to extensive surveillance during many years, stringent measures in case of positive findings, and restricted import, poultry breeding flocks in Norway are virtually free from *Salmonella*. *S.* Agona was found in a broiler parent flock in 2001. *S.* Enteritidis was from the first time detected in Norwegian poultry production in a broiler flock in 2007. *S.* Enteritidis has never been detected in Norwegian breeding flocks or in laying hens. The duck, geese and turkey population in Norway is small. A few times, positive commercial flocks have been found, the last time two turkey flocks in 2000 positive for *S.* Aberdeen and *S.* Typhimurium, respectively.

Table *Salmonella* in poultry and other birds

	Source of information	Sampling unit	Units tested	Total units positive for *Salmonella* spp.	*S.* Enteritidis	*S.* Typhimurium	*S.* Heidelberg	*S. diarizonae* (61:k:1,5,7)	*S.* Gallinarum	*Salmonella* spp. unspecified
***Gallus gallus* (fowl)**										
Grandparents - egg line – rearing period	NSCP[1]	flock	2	1[2]			1			
Grandparents - egg line – production period	NSCP	flock	2	0						
Parents - egg line – rearing period	NSCP	flock	12	0						
Parents - egg line – production period	NSCP	flock	12	0						
Parents - meat line – rearing period	NSCP	flock	87	0						
Parents - meat line – production period	NSCP	flock	135	1				1		
Laying hens – rearing period	NSCP	holding	20	0						
Laying hens – production period	NSCP	holding	676	0						
Broilers	NSCP	flock	4419	1	1					
Unspecified[3]	NVI	holding	58	3	1		1		1	
Ducks										
Breeding flocks	NSCP	flock	3	0						
Meat production flocks	NSCP	flock	85	0						
Unspecified	NVI	holding	3	0						
Turkeys										
Breeding flocks	NSCP	flock	15	0						
Meat production flocks	NSCP	flock	424	0						
Baseline survey – breeding flocks	NVI	flock	5	0						
Baseline survey – meat production flocks	NVI	flock	72	0						
Unspecified	NVI	holding	9	0						
Poultry - unspecified	NSCP	single	1561	0						
Pigeons	NVI	animal	7	0						
Quails	NVI	animal	1	0						
Ostriches	NVI	animal	1	0						
Pet birds (mainly psittacine birds)	NVI	animal	18	0						
Wild birds[4]	NVI	animal	106	82		72				10

[1] NSCP = Norwegian *Salmonella* Control Programme
[2] The flock was imported and was detected positive while in the rearing stage in quarantine. The flock was destroyed before production of hatching eggs started.
[3] A total of 226 samples from 58 holdings (mainly commercial, but also hobby flocks). A total of 9 samples were positive, coming from 3 holdings. The S. Enteritidis finding was an environmental sample from the same holding as the broiler flock positive for S. Enteritidis in the Norwegian *Salmonella* Control Programme.
[4] The 10 positive birds listed under *Salmonella* spp. unspecified were birds with pathological findings typical of salmonellosis. However, cultivation was not performed on samples from these birds.

B. *Salmonella* spp. in pigs and cattle

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

Frequency of the sampling
Breeding herds: Once a year
Animals at slaughter (herd based approach): Detection of an animal prevalence level of 0.1% by 95% confidence

Type of specimen taken
Breeding herds: Faeces
Animals at slaughter (herd based approach): Lymph nodes

Methods of sampling (description of sampling techniques)
Animals at farm: If there are clinical problems with diarrhoea, faecal samples will be taken.
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.
Animals at slaughter (herd based approach): From each carcass at least five ileocaecal lymph nodes are aseptically removed and pooled in a plastic bag. All samples are kept refrigerated during the period of sampling and sent to the laboratory the same day.

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

Diagnostic/analytical methods used
Bacteriological method: NMKL No 71:1999

Vaccination policy
Vaccination against *Salmonella* is prohibited in Norway.

Control program/mechanisms/notification system in place
The Norwegian *Salmonella* Control Programme is mandatory. Detection of *Salmonella*, irrespective of serovar, has been notifiable since 1965.

Measures in case of the positive findings or single cases
Whenever *Salmonella* is detected, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread. Also, slaughterhouses 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 cattle 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.

Results of the investigation

Pigs

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

Cattle

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

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

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

C. *Salmonella* spp. in other animals

Monitoring system

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

Case definition

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

Vaccination policy

Vaccination against *Salmonella* is prohibited in Norway.

Measures in case of the positive findings or single cases

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

Notification system in place

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

Results of the investigation

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

Relevance of the findings in animals to findings in foodstuffs and to human cases

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

Table *Salmonella* in animals other than birds

	Source of information	Sampling unit	Units tested	Total units positive for *Salmonella* spp.	*S.* Typhimurium	*S.* Dublin	*S.* Paratyphi C	*S. diarizonae* (61:(k):1,5,(7))	*Salmonella*. spp.
Cattle									
At slaughterhouse, lymph nodes	NSCP[1]	animal	2218	1			1		
Clinical investigations[2]	NVI	holding	206	6	5	1			
Sheep									
Clinical investigations[3]	NVI	holding	47	13				12	1
Goats	NVI	animal	18	0					
Pigs									
Breeding animals – at farm	NSCP	herd	122	0					
Breeding animals – lymph nodes	NSCP	animal	1012	0					
Fattening pigs – lymph nodes	NSCP	animal	2542	0					
Baseline survey	NVI	animal	408	1	1				
Clinical investigations[4]	NVI	holding	62	3	3				
Solipeds, domestic[5]	NVI	holding	52	6	6				
Alpacas and lamas	NVI	animal	23	0					
Deer - farmed	NVI	animal	5	0					
Cats	NVI	animal	57	2	2				
Dogs[6]	NVI	animal	170	11	6				5
Fur animals - farmed	NVI	animal	16	0					
Pets (guinea pig, rabbit, chinchilla)	NVI	animal	28	0					
Wild animals[7]	NVI	animal	22	2	1				1
Zoo animals[8]	NVI	animal	28	9					9

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

Salmonella *in feedingstuffs*

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

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

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

Recent actions taken to control the zoonoses
Detection of *Salmonella* is notifiable. If *Salmonella* is detected in feedingstuffs, equipment, or production plants the authorities must be informed without delay. The establishment must take action according to a defined procedure to prevent the distribution of contaminated feed. Contaminated feed will be destroyed or heat-treated.
In general, complete feedingstuffs and protein concentrates (supplementary feedingstuffs) intended for poultry, pigs, and cattle that are distributed must be subject to heat treatment until a core temperature of at least 81 degrees Celsius is reached. The entire batch must be heat-treated, and the production has to be performed in a production line where all the other feedingstuffs are subject to heat treatment.
According to the regulations for production of feedingstuffs, feed mills are required to have an internal (process) control programme implemented. This includes a sampling scheme for *Salmonella* of minimum 3 samples per 14 days. Samples include raw materials and scrapings from control points. The national production of meat and bone meal is subject to a continuous process control that includes analyses for *Salmonella*. Establishments preparing feed for fur animals are required to analyse a minimum of one sample for *Salmonella* per month.
Through an official surveillance programme (sampling according to Council Directive 76/371/EEC) random samples of feedingstuffs for terrestrial animals are collected and analysed for the presence of *Salmonella*.
Imported feed materials of vegetable origin must be subjected to control for *Salmonella* before distribution or use. The number of samples depends on the size of the load and whether the feedingstuffs are classified as high-risk (soy beans, maize, cotton seed, etc.) or low-risk materials. Imported feed of animal origin, predominantly pet feed, is controlled at one of the Border Inspection Posts according to Council Directives 97/78/EEC and 89/662/EEC. Dog treats made from hides that are imported from third countries must be accompanied with a certificate that documents that the lot has been controlled for *Salmonella*. At the Border Inspection Posts, sampling is done according to a specific scheme.
Establishments producing fish feed are required to establish and maintain an internal (process) control based on the HACCP-system according to the regulation for fish feed. A minimum of four samples per 14 days should be examined with respect to *Salmonella*. If *Salmonella* is detected, the Norwegian Food Safety Authority must be notified immediately. Through an official surveillance programme described in the regulation for feedingstuffs for fish, random samples of feedingstuffs for fish are collected at the establishments and analysed for the presence of *Salmonella*. Feed materials, including fish meal, imported from third countries must be subjected to control for *Salmonella* according to a specified plan before distribution or use. A minimum of one sample per 50 tons must be tested for the presence of *Salmonella*.
Establishments producing fish meal or fish oil are required to establish and maintain an internal (process) control based on the HACCP-system according to the regulation for fish meal and fish oil. This control includes analyses for *Salmonella*. A minimum of one sample per 50 tons must be tested for the presence of *Salmonella*. In addition to the surveillance run by the government or the industry itself, feedingstuffs are also subjected to analyses for *Salmonella* in relation to epidemiological investigations and specific surveys and studies.

Table *Salmonella* in feedingstuffs

	Source of information	Sampling unit	Sample weight	Total units tested	Units tested in official controls	Units tested in surveillance by industry	Total units positive for *Salmonella* spp.
Feed matter							
Barley derived	NFSA	batch	25g	7		7	0
Wheat derived	NFSA	batch	25g	118	13	105	0
Oat derived	NFSA	batch	25g	5		5	0
Maize (including maize derived)	NFSA	batch	25g	662	10	652	19
Rape seed derived	NFSA	batch	25g	34	2	32	0
Soya(bean) derived	NFSA	batch	25g	2665	29	2636	1
Soya(bean) derived – process control	NFSA	single	25g	1039		1039	13
Soya(bean) derived – sampled on ships	NFSA	single	25g	384		384	114
Sunflower seed derived	NFSA	batch	25g	56	8	48	1
Faba beans	NFSA	batch	25g	4		4	0
Legume seeds and similar products	NFSA	batch	25g	56		56	0
Tubers, roots and similar products	NFSA	batch	25g	4	4		0
Fish meal	NFSA	batch	25g	264	36	228	3
Fish oil	NFSA	batch	25g	4		4	0
Fish silage	NFSA	batch	25g	45	1	44	0
Compound feedingstuffs for							
cattle - final product	NFSA	batch	25g	19	5	14	0
pigs - final product	NFSA	batch	25g	82	79[1]	3	0
poultry - final product	NFSA	batch	25g	193	190	3	0
cattle, pigs and poultry - final product	NFSA	batch	25g	54		54	0
cattle, pigs and poultry - process control	NFSA	single	25g	9817	159	9658	32
horses - final product	NFSA	batch	25g	2	2		0
fish - final product	NFSA	batch	25g	6119	226	5893	13
fish - process control (25g or swabs)	NFSA	single		1618		1618	70
fur animals - final product	NFSA	batch	25g	5	5		0
fur animals – process control	NFSA	batch	25g	1	1		0
pets	NVI	single	25g	104			3
pets - dog snacks	NFSA	single	25g	13	13		0

[1] Including 6 samples of “wet feed”.

Table *Salmonella* serovars in feedingstuffs

Serovars	Maize (including maize derived)	Soya(bean) derived	Sunflower seed derived	Fish meal	Compound feedingstuffs for cattle, pigs and poultry - process control	Compound feedingstuffs for fish - final product	Compound feedingstuffs for fish - process control	Compound feedingstuffs for pets
Number of isolates serotyped	19	128	1	3	32	13	70	3
S. Adelaide		2						
S. Agona		1			10			
S. Altona	1				1			
S. Anatum		2						
S. Bredeney					1			
S. Cerro	1	3						
S. Coeln					2			
S. Corvallis		1						
S. Cubana		4						
S. Enteritidis		3						
S. Havana	1	5			2			
S. Indiana	1							
S. Infantis	1	5			2			2
S. Lexington		2						
S. Liverpool					2			
S. Mbandaka	1	14					7	
S. Miami		5						
S. Minnesota		1			1			
S. Montevideo				1			3	
S. Morehead		1						
S. Newport					1			
S. Oranienburg		2						
S. Poona				1				
S. Rissen		1						
S. Saintpaul		2						
S. Sandiego		1						
S. Schwarzengrund	6			1	7			
S. Senftenberg		39			1	13		
S. Soerenga		1						
S. Tennessee		16						
S. Thompson		2						
S. Typhimurium	4	4	1		2			1
Other serotypes	3							
Salmonella spp., unspecified		11					60	

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.

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

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

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

Procedures for the selection of isolates for antimicrobial testing
Only one isolate per herd is selected for antimicrobial testing.

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

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

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

Breakpoints used in testing
For interpretation of results epidemiological cut-off values recommended by EFSA were applied.

Control program/mechanisms
The 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.

Results
The qualitative data are presented in the table. Quantitative data as well as data on breakpoints and range of testing are presented in the NORM/NORM-VET 2007 report.

Table Antimicrobial susceptibility testing of *Salmonella* spp. – qualitative data

	S. Dublin – cattle	*S.* Enteritidis – *Gallus gallus*	*S.* Gallinarum – *Gallus gallus*	*S.* Heidelberg – *Gallus gallus*	*S.* Infantis – dogs	*S.* Minnesota – dogs	*S.* Montevideo – dogs	*S.* Typhimurium – cattle	*S.* Typhimurium – pigs	*S.* Typhimurium – horses	*S.* Typhimurium – cats	*S.* Typhimurium – dogs
Number of isolates tested	1	1	1	1	1	1	1	5	4	4	2	3
Number of isolates resistant to												
Tetracycline	0	0	0	0	0	0	0	1	0	0	0	1
Chloramphenicol	0	0	0	0	0	0	0	1	0	0	0	1
Florfenicol	0	0	0	0	0	0	0	1	0	0	0	1
Cefotaxim	0	0	0	0	0	0	0	0	0	0	0	0
Ceftiofur	0	0	0	0	0	0	0	0	0	0	0	0
Ciprofloxacin	0	0	0	0	0	0	0	0	0	0	0	0
Nalidixic acid	0	0	0	0	0	0	0	0	0	0	0	0
Sulfamethoxazol	0	0	0	0	1	0	0	1	0	0	0	1
Trimethoprim	0	0	0	0	1	0	0	0	0	0	0	0
Streptomycin	0	0	0	0	0	0	0	1	0	0	0	1
Gentamicin	0	0	0	0	0	0	0	0	0	0	0	0
Kanamycin	0	0	0	0	0	0	0	0	0	0	0	0
Ampicillin	0	0	0	0	0	0	0	1	0	0	0	1
Numbers of isolates												
fully sensitive	1	1	1	1	0	1	1	4	4	4	4	2
resistant to 1 antimicrobial	0	0	0	0	0	0	0	0	0	0	0	0
resistant to 2 antimicrobials	0	0	0	0	1	0	0	0	0	0	0	0
resistant to 3 antimicrobials	0	0	0	0	0	0	0	0	0	0	0	0
resistant to 4 antimicrobials	0	0	0	0	0	0	0	0	0	0	0	0
resistant to >4 antimicrobials	0	0	0	0	0	0	0	1	0	0	0	1
pentaresistant *S*. Typh. DT104								1	0	0	0	1

Campylobacteriosis

General evaluation of the national situation

History of the disease and/or infection in the country
Norwegian studies have shown that many species of wild birds, especially crows and seagulls, are frequent carriers of thermophilic *Campylobacter* spp. Thermophilic *Campylobacter* spp. have also been isolated from poultry, dogs, cats, pigs, sheep, cattle, and flies, and sporadically from wild mammals. Before 2001, when the surveillance programme in broilers was implemented, the prevalence of thermophilic *Campylobacter* spp. in Norwegian broiler flocks had been studied twice. In 1990, 18% of the flocks tested were infected, whereas this proportion in 1997-1998 had decreased to 4%. This reduction was attributed to an increased focus on the importance of biosecurity. The Action Plan against *Campylobacter* in broilers that started in 2001 has shown that the yearly incidence of broiler flocks being positive for *Campylobacter* has been 6.3%, 4.9%, 3.3%, 3.6%, 4.9% and 5.7% in 2002, 2003, 2004, 2005, 2006 and 2007, respectively. The number of flocks going positive out on the market has been reduced from 127 in 2002 to 58 in 2007.

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

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

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

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

Campylobacteriosis in humans

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

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

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

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

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

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

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

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

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

Table Campylobacteriosis cases infected in Norway 2003 – 2007. Incidence rate (IR) per 100.000 inhabitants 2007

County	2003	2004	2005	2006	2007	Change from 2007	IR 2007
Østfold	36	25	52	31	37	19%	13.9
Akershus	81	64	94	90	92	2%	17.7
Oslo	90	79	108	80	93	16%	16.6
Hedmark	47	32	31	42	31	-26%	16.4
Oppland	43	26	48	57	39	-32%	21.2
Buskerud	62	30	58	58	47	-19%	18.7
Vestfold	42	42	28	43	36	-16%	15.9
Telemark	32	21	35	32	36	13%	21.6
Aust-Agder	18	16	27	33	16	-52%	15.1
Vest-Agder	25	43	40	32	27	-16%	16.3
Rogaland	124	184	164	170	198	16%	48.0
Hordaland	135	160	225	159	154	-3%	33.3
Sogn & Fjordane	18	19	36	28	26	-7%	24.5
Møre & Romsdal	41	38	55	50	53	6%	21.5
Sør-Trøndelag	63	69	93	87	114	31%	40.3
Nord-Trøndelag	19	17	17	20	39	95%	30.0
Nordland	29	31	37	33	50	52%	21.3
Troms	11	17	43	42	50	19%	32.3
Finnmark	6	5	14	10	15	50%	20.7
Total	**922**	**918**	**1205**	**1097**	**1153**	**5%**	**24.3**

Campylobacter *in foodstuffs*

Thermophilic *Campylobacter* in broiler meat and products thereof

Monitoring system
See chapter on *Campylobacter* in *Gallus gallus*.

Diagnostic/analytical methods used
Bacteriological method: NMKL no 119, 2007

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

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

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

Measures in case of the positive findings or single cases
See chapter on *Campylobacter* in *Gallus gallus*.

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

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

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

Table *Campylobacter* in foodstuffs

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for *Campylobacter* spp.	*C. jejuni*	*C. lari*	*C.* spp., unspecified
Meat from broilers	NVI	single	25g	305	29	26	1	2
Meat from turkey	NVI	single	25g	121	7	7		
Minced poultry meat	NVI	single	25g	70	3	3		

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

Campylobacter *in animals*

Thermophilic *Campylobacter* in *Gallus gallus*

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

Frequency of the sampling
Before slaughter at farm: Every flock is sampled
At slaughter: Every slaughter batch is sampled

Type of specimen taken
Before slaughter at farm: Faeces
At slaughter: Caecum

Methods of sampling (description of sampling techniques)
Before slaughter at farm: 10 swabs from fresh faecal droppings are taken by the owner maximum four days before slaughter. They are transported dry as one pooled sample to the laboratory.
At slaughter: 10 caecae are sampled at the slaughter line. The 10 samples are pooled to one at the laboratory.

Case definition
Before slaughter at farm: A flock where *Campylobacter* spp. is found.
At slaughter: A slaughter batch where *Campylobacter* spp. is found.

Diagnostic/analytical methods used
Before slaughter at farm: PCR Real Time PCR
At slaughter: NMKL no 119:1990 with modification (no enrichment)

Vaccination policy
There is no vaccination against *Campylobacter* in Norway.

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

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

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

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

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

Results of the investigation
In 2007, a total of 4145 flocks were slaughtered in Norway and 237 flocks (5.7%) were positive for *Campylobacter* spp. either at farm before slaughter or at slaughter. A total of 4109 of these flocks were sampled at farm before slaughter, and 179 of these flocks (4.4%) were positive, and thereby subject to heat treatment or freezing for at least 3 weeks. The flocks were slaughtered in 4268 slaughter batches, and 220 (5.2%) of these were positive at slaughter.

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

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

Table *Campylobacter* in animals

	Source of information	Sampling unit	Units tested	Total units positive for *Campylobacter* spp.	*C. jejuni*	*C. coli*	*C. lari*	*C. upsaliensis*	*C.* spp., unspecified[7]
***Gallus gallus* (fowl)**									
Broilers – at farm	NACB[1]	flock	4109	179					179
Broilers – at slaughter	NACB	slaughter batch	4268	220	161	23	2		34
Turkeys	NVI[2]	flock	107	10					10
Cattle	NVI	animal	53	16	12	1	1		2
Dogs	NVI	animal	115	27	4			21	2
Cats	NVI	animal	34	4	2			1	1

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

Antimicrobial resistance in Campylobacter *isolates*

A. Antimicrobial resistance in *Campylobacter jejuni* and *coli* in poultry

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

Type of specimen taken
See Thermophilic *Campylobacter* in *Gallus gallus*. The turkey flocks were sampled the same way as flocks of *Gallus gallus*.

Methods of sampling (description of sampling techniques)
See Thermophilic *Campylobacter* in *Gallus gallus*. The turkey flocks were sampled the same way as flocks of *Gallus gallus*.

Procedures for the selection of isolates for antimicrobial testing
One isolate of *Campylobacter jejuni* from each positive holding was selected for antimicrobial testing.

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

Laboratory methodology used for identification of the microbial isolates
NMKL No 119 without enrichment.

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

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

Control program/mechanisms
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.

Results
The qualitative data are presented in the table. Quantitative data as well as data on breakpoints and range of testing are presented in the NORM/NORM-VET 2007 report.

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

Sampling strategy used in monitoring
Isolates were obtained from a research project regarding the occurrence of *Campylobacter* spp. in broiler and turkey meat from November 2006 November 2007.

Type of specimen taken
Meat products taken at processing plants.

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

Procedures for the selection of isolates for antimicrobial testing
One isolate of *Campylobacter jejuni* from each positive product was selected for antimicrobial testing.

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

Laboratory methodology used for identification of the microbial isolates
NMKL No 119.

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

Breakpoints used in testing
For interpretation of results epidemiological cut-off values recommended by EFSA were applied.

Results
The qualitative data are presented in the table. Quantitative data as well as data on breakpoints and range of testing are presented in the NORM/NORM-VET 2007 report.

Table Antimicrobial susceptibility testing of *Campylobacter jejuni* – qualitative data

	Meat from *Gallus gallus*	*Gallus gallus*	Turkeys
Number of isolates tested	29	99	14
Number of isolates resistant to			
Tetracycline	0	1	1
Ciprofloxacin	0	1	1
Nalidixic acid	0	1	1
Streptomycin	0	2	0
Gentamicin	0	0	0
Erythromycin	0	0	0
Numbers of isolates			
fully sensitive	29	96	13
resistant to 1 antimicrobial	0	1	0
resistant to 2 antimicrobials	0	2	0
resistant to 3 antimicrobials	0	0	1
resistant to 4 antimicrobials	0	0	0
resistant to >4 antimicrobials	0	0	0

Listeriosis

General evaluation of the national situation

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

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

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

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 have been notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) since 1975.

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

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

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

Relevance as zoonotic disease
Listeriosis in humans is a relatively rare disease in Norway.

Listeria *in foodstuffs*

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

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

Diagnostic/analytical methods used
At the production plant: Bacteriological method: NMKL No 136:2007
At retail: Bacteriological method: NMKL No 136:2007 for qualitative analyses, direct plating on Rapid mono Listeria agar for quantitative analyses

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

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

Results of the investigation
In 2007, a total of 106 samples of sushi sampled at retail or in restaurants were investigated, 50 of them also quantitatively. All samples were negative for *L. monocytogenes*. All 70 samples of smoked fish and 26 samples from pelagic fish were negative. A total of 14 out of 48 investigated samples from farmed fish were positive for *L. monocytogenes*. A total of 84 environmental samples from fish processing environment were investigated, four samples were positive.

National evaluation of the recent situation, the trends and sources of infection
In general, the occurrence of *L. monocytogenes* in food products is low.

Listeria *in animals*

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

Frequency of the sampling
When there is a suspected case.

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

Diagnostic/analytical methods used
Bacteriology, histopathology and immunohistochemistry.

Measures in case of the positive findings or single cases
Normally none.

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

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

Relevance of the findings in animals to findings in foodstuffs and to human cases
Listeria spp. is present in the environment and also in food producing animals. However, there is no epidemiological evidence that listeriosis in humans are linked to listeriosis in animals.

E. coli infections

General evaluation of the national situation

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

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

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

E. coli *infections in humans*

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

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

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

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

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

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

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

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

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

Verotoxigenic E. coli *(VTEC) in animals*

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

Type of specimen taken
Animals at farm: Faeces

Case definition
An animal or herd from which VTEC is isolated.

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

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

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

National evaluation of the recent situation, the trends and sources of infection
The prevalence of human pathogenic VTEC O157, O103, O26, O45 and O111 is still considered low in Norwegian cattle, sheep and goats.

Tuberculosis, mycobacterial diseases

General evaluation of the national situation

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

National evaluation of the recent situation, the trends and sources of infection
As Norway is officially free from bovine tuberculosis, the probability of contracting *M. bovis* infection from Norwegian animals or animal products of Norwegian origin is close to zero.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
There have been no findings of *M. bovis* in animals or foodstuffs. The probability of contracting *M. bovis* infection from Norwegian animals or animal products of Norwegian origin is close to zero.

Tuberculosis due to Mycobacterium bovis *in humans*

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

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

Diagnostic/analytical methods used
Clinical indications: Bacteriology, X-ray, pathology. Screening: Miniature X-ray, tuberculin skin testing, Interferongamma release assays.

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

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

Results of the investigation
In 2007, no cases with tuberculosis caused by *M. bovis* were notified.

National evaluation of the recent situation, the trends and sources of infection
Tuberculosis caused by *M. bovis* is only sporadically recorded in Norway, and except for a case of reactivation in 1994, the few recorded cases reported since 1977 have been imported.

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

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

Mycobacterium *in animals*

A. *Mycobacterium bovis* in bovine animals

Status as officially free of bovine tuberculosis during the reporting year: The entire country free
Norway has been granted the officially tuberculosis free status of bovine herds by the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 28/07/COL) as Norway fulfils the requirements laid down in Council Directive 64/432/EEC as amended.

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

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

Type of specimen taken
Animals for slaughter: Lymph nodes. Breeding animals and imported animals: Tuberculin testing.

Methods of sampling (description of sampling techniques)
Slaughtered animals: Meat inspection at the slaughterhouse; lymph node examination. Imported animals and breeding animals: Tuberculin testing. Clinical indications: Methods vary depending on the problem.

Case definition
A single animal from which *M. bovis* or *M. tuberculosis* has been isolated. Herd is the epidemiological unit.

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

Vaccination policy
Vaccination of animals against tuberculosis is prohibited in Norway.

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

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

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

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

National evaluation of the recent situation, the trends and sources of infection
Bovine tuberculosis was declared eliminated in cattle in 1963.

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

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

Type of specimen taken
Animals for slaughter: Lymph nodes. Imported animals: Tuberculin testing.

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

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

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

Vaccination policy
Vaccination of animals against tuberculosis is prohibited in Norway.

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

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

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

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

National evaluation of the recent situation, the trends and sources of infection
Bovine tuberculosis has not been diagnosed in farmed deer in Norway. The population of farmed deer is very small in Norway.

Relevance of the findings in animals to findings in foodstuffs and to human cases
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 other animal

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

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

Type of specimen taken
Animals for slaughter: Lymph nodes. Imported animals: Tuberculin testing.

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

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

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

Vaccination policy
Vaccination of animals against tuberculosis is prohibited.

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

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

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

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

National evaluation of the recent situation, the trends and sources of infection
Bovine tuberculosis was declared eliminated in cattle in 1963, and has since then not been recorded in other animal species.

Relevance of the findings in animals to findings in foodstuffs and to human cases
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.

Brucellosis

General evaluation of the national situation

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

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

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
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.

Brucellosis in humans

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

Case definition
A clinically compatible case that is laboratory confirmed.

Diagnostic/analytical methods used
Serology (serum antibody test or antigen test of clinical specimen) and bacteriology (isolation).

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

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

Results of the investigation
No cases were reported.

National evaluation of the recent situation, the trends and sources of infection
Brucellosis is rarely recorded in Norway. Since 1983, only 18 cases have been recorded. Two of these are known to be infected in Norway, both laboratory contracted.

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

Brucella *in animals*

A. *Brucella abortus* in bovine animals

Status as officially free of bovine brucellosis during the reporting year: The entire country free
Norway is regarded as officially free from bovine brucellosis according to the EFTA Surveillance Authority (ESA) (EFTA Surveillance Authority Decision No 28/07/COL).

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

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

Type of specimen taken
Blood or foetus.

Methods of sampling (description of sampling techniques)
Surveillance programme: Foetus and the foetal membranes and paired blood samples from the mother are collected. Other monitoring systems: Blood samples. All samples are collected at farm.

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

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

Vaccination policy
Vaccination of animals against brucellosis is prohibited in Norway.

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

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

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

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

National evaluation of the recent situation, the trends and sources of infection
Bovine brucellosis was eliminated from Norway in 1953. No positive cases have been found since then.

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

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

Type of specimen taken
Blood

Methods of sampling (description of sampling techniques)
Individual blood samples are collected at the farms. Surveillance programme: In flocks with less than 30 animals, all animals are sampled; in herds with 30 100 animals, 30 are sampled; in herds with 100 200 animals, 35 are sampled; in herds with more than 200 animals, 40 animals are sampled.

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

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

Vaccination policy
Vaccination of animals against brucellosis is prohibited.

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

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

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

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

National evaluation of the recent situation, the trends and sources of infection
Ovine brucellosis has never been recorded in Norway.

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

C. *Brucella melitensis* in goats

Status as officially free of caprine brucellosis during the reporting year: The entire country free
Due to its history in regard to *Brucella melitensis*, Norway has been granted an officially brucellosis free status for small ruminants.

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

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

Type of specimen taken
Blood

Methods of sampling (description of sampling techniques)
Individual blood samples are collected at farm. Surveillance programme: In flocks with less than 30 animals, all animals are sampled; in herds with 30 100 animals, 30 are sampled; in herds with 100 200 animals, 35 are sampled; in herds with more than 200 animals, 40 animals are sampled.

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

Diagnostic/analytical methods used
Rose bengal plate agglutination test was used for initial screening. A competitive ELISA (CELISA, 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 national surveillance programme and the control of imported animals are run by the Norwegian Food Safety Authority.

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

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

Results of the investigation
In 2007, in the surveillance programme, 5734 animals from 183 herds were tested for antibodies against *B. melitensis*. All were negative.

National evaluation of the recent situation, the trends and sources of infection
Caprine brucellosis has never been recorded in Norway.

Relevance of the findings in animals to findings in foodstuffs and to human cases
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 pigs

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

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

Type of specimen taken
Blood

Methods of sampling (description of sampling techniques)
Blood samples are taken at the farms. **Case definition** An animal which is seropositive for *Brucella* spp. or an animal from which *Brucella* spp. has been isolated. The herd is the epidemiological unit.

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

Vaccination policy
Vaccination of animals against brucellosis is prohibited in Norway.

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

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

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

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

National evaluation of the recent situation, the trends and sources of infection
Porcine brucellosis has never been recorded in Norway.

Relevance of the findings in animals to findings in foodstuffs and to human cases
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 *Brucella* spp. in animals other than cattle, sheep and goats

	Source of information	Sampling unit	Units tested	Total units positive for *Brucella* spp.
Pigs	Breeding company	Animal	1450	0
Dogs[1]	NVI	Animal	25	0

[1] Mainly tested in relation to export.

Yersiniosis

General evaluation of the national situation

History of the disease and/or infection in the country
In the years 1982-1994, the number of notified cases in humans varied between 154 and 274 (mean 187). From 1994 there was a steady decline in the reported incidence of yersiniosis. The decline was interrupted in 1998, and since then the incidence has been between 71 and 150 notified cases per year. Studies conducted during the 1980s revealed that a large proportion of Norwegian pigs were carriers of *Y. enterocolitica* serogroup O:3 and that the same variant frequently could be isolated from pig carcasses. In 1995-1996 a serological survey of all multiplier herds (n=66) belonging to the cooperative slaughterhouse organisation showed that 35.5% of the fattening pigs had antibodies against *Y. enterocolitica* O:3, and 80% of the herds had at least one pig (of 40 pigs tested per herd) with antibodies against *Y. enterocolitica* O:3. In another survey where blood samples from 5 fatteners in each of 326 randomly selected herds were analysed for antibodies against *Y. enterocolitica* O:3, 53% of the pigs and 64% of the herds tested positive. In 1997-1998, 300 samples of raw pork products were analyzed. *Y. enterocolitica* O:3 was isolated from 2% of the samples by a culturing method (NMKL method no. 117), while use of a PCR method indicated the presence of pathogenic *Y. enterocolitica* in 17%. This was lower than in a similar survey conducted in 1988-1989.

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

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
Pork products are generally considered the most important source of yersiniosis in humans. A Norwegian case control study conducted in the period 19881990 identified consumption of such products as an important risk factor in addition to consumption of untreated drinking water and a general preference for undercooked meat. In 2006 two smaller outbreaks of yersiniosis both linked to a traditional cold cuts pork product were reported.

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

Yersiniosis in humans

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

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

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

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

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

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

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

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

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

Yersinia *in animals*

Monitoring system
There are no official monitoring programmes for *Y. enterocolitica* in live animals or in animals at slaughter.

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

Measures in case of the positive findings or single cases
None.

Trichinellosis

General evaluation of the national situation

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

National evaluation of the recent situation, the trends and sources of infection
Trichinellosis was last detected in food producing animals in 1994, in two pig herds. Trichinellosis occurs endemically among wildlife.

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

Trichinellosis in humans

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

Case definition
A clinically compatible case that is laboratory confirmed.

Diagnostic/analytical methods used
Muscle biopsy and histopathology (demonstration of *Trichinella* larvae in tissue) and serology.

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

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

Results of the investigation
No cases of human trichinellosis were reported.

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

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

Trichinella *in animals*

A. *Trichinella* in pigs

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

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

Diagnostic/analytical methods used
Artificial digestion method of pooled samples.

Preventive measures in place
It is prohibited to feed pigs with unsterilized household offal.

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

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

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

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

National evaluation of the recent situation, the trends and sources of infection
Trichinellosis was last detected in two pig herds in 1994.

Relevance of the findings in animals to findings in foodstuffs and to human cases
There have not been any findings of *Trichinella* in pigs or pig meat for many years. The risk of obtaining trichinellosis from Norwegian pig meat is negligible.

B. *Trichinella* in horses

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

Frequency of the sampling
Every slaughtered animal is sampled.

Type of specimen taken
Tongue or masseter muscle.

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

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

Diagnostic/analytical methods used
Artificial digestion method of pooled samples.

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

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

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

Relevance of the findings in animals to findings in foodstuffs and to human cases
There have not been any findings of *Trichinella* in horses or horse meat. The risk of obtaining trichinellosis from Norwegian horse meat is negligible.

C. *Trichinella* spp. in wild animals

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

Frequency of the sampling
Depending on the situation and animal species.

Type of specimen taken
Diaphragm, tongue or masseter muscles.

Methods of sampling (description of sampling techniques)
Depending on the situation and animal species.

Case definition
An animal with a positive test result.

Diagnostic/analytical methods used
Digestion methods or compression method.

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

Notification system in place
Trichinellosis has been a notifiable disease according to the Animal Diseases Act since 1965.

Results of the investigation
In 2007, one Raccoon dog (*Nyctereutes procyonoides*) was investigated for *Trichinella* and was found negative.

National evaluation of the recent situation, the trends and sources of infection
Trichinellosis occurs endemically among wildlife.

Echinococcosis

General evaluation of the national situation

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 antihelmintic treatment of herd dogs and reduced use of raw slaughter offal to herd dogs. In 2003, one reindeer had pathological findings compatible with *E. granulosus* infestation. *E. granulosus* was last diagnosed in cattle in 1987.

E. multilocularis has never been detected in mainland Norway in any animal species. In 1999, in a research project on echinococcosis in the archipelago of Svalbard, *E. multilocularis* was detected in 16 % of 172 sibling voles tested. Pathological examinations revealed liver cysts. In a follow-up study, faecal samples from polar foxes, dogs, and cats were collected. The parasite was diagnosed in three of six faecal samples from polar foxes, in one of 48 dogs, and in none of two cats. The methods used were coproantigen ELISA, flotation (egg detection), and PCR. Of the wintered voles tested in 2000-2006, between 19% and 96% were positive each year. Human echinococcosis has never been a public health problem in Norway.

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

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

Echinococcosis in humans

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

Case definition
A clinical compatible case that is laboratory confirmed.

Diagnostic/analytical methods used
Serology and histopathology.

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

History of the disease and/or infection in the country
Human echinococcosis has never been a public health problem in Norway and the incidence is considered to be at most very low.

Results of the investigation
In 2007, no cases were reported.

Relevance as zoonotic disease
The risk of acquiring echinococcosis in Norway is considered very low. The pathological finding compatible with *E. granulosus* infestation in a reindeer in 2003 is a reminder that this parasite still is around and that this requires alertness in reindeer environments, especially as regard the importance of regular treatment of herd dogs with an antihelmintic 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.

Echinococcus *in animals*

A. *E. granulosus* in animals

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

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

Methods of sampling (description of sampling techniques)
Inspection for hydatid cysts at the abattoir.

Case definition
An animal with a positive test result.

Diagnostic/analytical methods used
Macroscopic (visual) examination of organs

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

Control program/mechanisms
Mandatory official meat control.

Measures in case of the positive findings or single cases
An animal with cystic echinococcosis will be condemned. Epidemiological data will be collected in order to find the source of infection and measures will be introduced to prevent further spread.

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

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

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

B. *E. multilocularis* in animals

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

Methods of sampling (description of sampling techniques)
Foxes: Faecal samples. Intermediate hosts: Autopsy.

Case definition
An animal with a positive test result.

Diagnostic/analytical methods used
Isolation of eggs and multiplex PCR

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

Recent actions taken to control the zoonoses
The findings of *E. multilocularis* in the archipelago of Svalbard in 1999 resulted in follow-up studies, requirements regarding antihelmintic treatment of dogs and cats in regard to export, and an information campaign directed to the inhabitants of Svalbard.

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

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

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

Toxoplasmosis

General evaluation of the national situation

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

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

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
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.

Toxoplasmosis in humans

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

Case definition
A clinically compatible case that is laboratory confirmed.

Diagnostic/analytical methods used
Serology (antibody detection) and parasitological examination (identification of parasite in clinical specimens).

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

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

Results of the investigation
In 2007, no cases were reported.

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

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

Toxoplasma *in animals*

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

Frequency of the sampling
In cases of clinical suspicion.

Case definition
An animal with a positive test result.

Diagnostic/analytical methods used
Serology (direct agglutination test) or pathology.

Measures in case of the positive findings or single cases
Normally none.

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

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

National evaluation of the recent situation, the trends and sources of infection
Toxoplasma gondii is endemic in Norway. There are no data indicating recent developments in the prevalence of the infection in various species.

Relevance of the findings in animals to findings in foodstuffs and to human cases
A risk for humans of contracting toxoplasmosis in Norway does exist. However, the relevance of clinical toxoplasmosis is most important in immunosuppressed persons and in pregnant women.

Rabies

General evaluation of the national situation

History of the disease and/or infection in the country
Rabies in animals has not been recorded in mainland Norway. The disease has sporadically been diagnosed in polar fox, reindeer, and seal in the archipelago of Svalbard, the last time in a fox found dead in 1999 (25 animal cases were diagnosed during the period 19802007). However, transmission of rabies to humans has never been recorded in the archipelago of Svalbard.

National evaluation of the recent situation, the trends and sources of infection
The situation in mainland Norway regarding rabies is stable. However, there are concerns about the risk of introducing rabies through illegally imported dogs.

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

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 cerebrospinal fluid from an unvaccinated person.

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

History of the disease and/or infection in the country
Human rabies was last described in Norway in 1815.

Results of the investigation
In 2007, no human cases were reported.

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

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

Lyssavirus (rabies) in animals

A. Rabies in dogs

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

Frequency of the sampling
On clinical suspicion.

Type of specimen taken
Brain

Methods of sampling (description of sampling techniques)
The brain is removed at autopsy, and samples are taken according the procedures described in the OIE manual.

Case definition
A case that is laboratory confirmed.

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

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

Other preventive measures than vaccination in place
Infected animals will be destroyed and measures taken to prevent further cases.

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

Measures in case of the positive findings or single cases
Infected animals will be destroyed and measures taken to prevent further cases.

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

Results of the investigation
In 2007 no cases were reported. Two dogs were investigated, but were found negative.

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

B. Rabies virus in wildlife

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

Frequency of the sampling
On clinical suspicion.

Type of specimen taken
Brain, in bats also oral swabs.

Methods of sampling (description of sampling techniques)
The brain is removed at autopsy, and samples are taken according the procedures described in the OIE manual.

Case definition
A case that is laboratory confirmed.

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

Measures in case of the positive findings or single cases
Infected animals will be destroyed and measures taken to prevent further cases.

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

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

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

Information on specific indicators of antimicrobial resistance

Enterococcus, *nonpathogenic*

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

A. Antimicrobial resistance in *Enterococcus* spp. isolated from animals

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

Type of specimen taken
Faecal material taken at farm.

Methods of sampling (description of sampling techniques)
The samples from pigs were systematically selected throughout the year from faecal samples taken in the *Salmonella* surveillance programme. For turkeys, samples collected in the baseline survey were used.

Procedures for the selection of isolates for antimicrobial testing
Only one isolate from each flock or herd was included.

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

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

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

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

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

Results of the investigation
No vancomycin resistance was observed in the isolates obtained by a random selection. Five (3.9 %) of the strains obtained by a selective isolation procedure were vanA positive with MIC-values >128mg/L. All of these isolates were *E. faecium* from faecal samples. The qualitative data are presented in the table. Quantitative data as well as data on breakpoints and range of testing are presented in the NORM/NORM-VET 2007 report.

B. Antimicrobial resistance of *Enterococcus* spp. isolated from food

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

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

Procedures for the selection of isolates for antimicrobial testing
Only one isolate from each sample was included.

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

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

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

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

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

Results of the investigation
The qualitative data are presented in the table. Quantitative data as well as data on breakpoints and range of testing are presented in the NORM/NORM-VET 2007 report.

Table Antimicrobial susceptibility testing of *Enterococcus* spp. – qualitative data

	E. faecalis – meat from turkey	*E. faecalis* – turkeys	*E. faecalis* – pigs	*E. faecium* – meat from turkey	*E. faecium* – turkeys	*E. faecium* – pigs
Number of isolates tested	25	1	19	47	55	67
Number of isolates resistant to						
Tetracycline	13	1	15	8	13	13
Chloramphenicol	0	0	1	0	0	0
Streptomycin	1	0	4	0	1	8
Gentamicin	0	0	1	0	0	0
Erythromycin	6	1	2	18	11	20
Vancomycin	0	0	0	0	0	0
Ampicillin	0	0	0	2	6	0
Virginiamycin				1	2	1
Numbers of isolates						
fully sensitive	9	0	5	23	37	34
resistant to 1 antimicrobial	12	0	12	22	11	25
resistant to 2 antimicrobials	4	1	0	2	4	6
resistant to 3 antimicrobials	0	0	0	0	3	1
resistant to 4 antimicrobials	0	0	2	0	0	1
resistant to >4 antimicrobials	0	0	0	0	0	0

Escherichia coli, *nonpathogenic*

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

A. Antimicrobial resistance of *E.coli* in animals

Sampling strategy used in monitoring
The sampling of animals for isolation of indicator *E. coli* to be included in resistance monitoring is a part of the Norwegian monitoring programme for antimicrobial resistance in feed, food and animals, NORM-VET. The sampling is spread throughout the year and each year one or several animal species are included. In 2007, sheep, turkey and swine were monitored. Only one sample from each herd or flock was included in NORM-VET.

The samples from sheep, turkey and swine were collected within the frame of other surveillance programmes. The number of samples from swine and sheep were organised to obtain approximately 200 isolates, whereas from turkey, all flocks in the turkey baseline survey were sampled.

Type of specimen taken
Faecal material taken at farm.

Methods of sampling (description of sampling techniques)
The samples from sheep and pigs were systematically selected throughout the year from faecal samples taken in the *Salmonella* surveillance programme. For turkey, samples collected in the baseline survey were used.

Procedures for the selection of isolates for antimicrobial testing
Only one isolate from each flock or herd was included.

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

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

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

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

Control program/mechanisms
The 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.

Results
The qualitative data are presented in the table. Quantitative data as well as data on breakpoints and range of testing are presented in the NORM/NORM-VET 2007 report.

B. Antimicrobial resistance of *E.coli* in food

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

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

Procedures for the selection of isolates for antimicrobial testing
Only one isolate from each sample was included.

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

Laboratory methodology used for identification of the microbial isolates
Five grams of the meat samples were incubated in 45 ml of MacConkey broth (Oxoid). After incubation at 44 C for 24 h, a small amount (approx. 10 microlitres) of broth was plated onto the surface of lactose-saccarose-bromthymol blue agar. After incubation of the agar plates at 37 C for 24h, 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 methods used for detection for resistance
The VetMIC microdilution method (Dept. of Antibiotics, National Veterinary Institute, Sweden) was used for the susceptibility testing of all isolates. The antimicrobials included are listed in the tables.

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

Control program/mechanisms
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.

Results
The qualitative data are presented in the table. Quantitative data as well as data on breakpoints and range of testing are presented in the NORM/NORM-VET 2007 report.

Table Antimicrobial susceptibility testing of *E. coli* – qualitative data

	Meat from turkey	Turkeys	Pigs	Sheep
Number of isolates tested	97	53	198	207
Number of isolates resistant to				
Tetracycline	10	7	18	0
Chloramphenicol	1	1	0	0
Florfenicol	0	0	0	0
Cefotaxim	0	0	1	0
Ceftiofur	0	0	1	0
Ciprofloxacin	0	1	1	0
Nalidixic acid	0	1	1	0
Sulfamethoxazol	3	3	25	2
Trimethoprim	0	0	14	1
Streptomycin	6	5	48	2
Gentamicin	1	0	0	0
Kanamycin	0	2	2	0
Ampicillin	13	8	20	2
Numbers of isolates				
fully sensitive	73	38	141	203
resistant to 1 antimicrobial	17	9	23	2
resistant to 2 antimicrobials	4	1	15	0
resistant to 3 antimicrobials	3	4	6	1
resistant to 4 antimicrobials	0	0	8	1
resistant to >4 antimicrobials	0	1	5	0

Information on specific microbiological agents

Histamine in foodstuffs

Monitoring system
Regular testing of selected species is required as an internal part of food business operator's quality assurance system. Occasionally surveys are performed.

Definition of positive finding
Histamine values above 100 mg/kg.

Diagnostic/analytical methods used
Reverse phase HPLC/UV

Table Histamine in foodstuffs

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

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.

System in place for identification, epidemiological investigations and reporting of foodborne outbreaks
Health personnel are required to report suspected foodborne outbreaks to the Municipal Health Officer, who is required to report to the County Governor (Fylkesmannen) and to the Norwegian Institute of Public Health. Suspected outbreaks are reported immediately to the Municipal Medical Officer who notifies the Norwegian Institute of Public Health the same day. If a domestic food or animal source is suspected, the Municipal Medical Officer also informs the local Food Safety Authority. The Norwegian Food Safety Authority has voluntary reporting where the District Offices report foodborne outbreaks. Norway has since 2005 a web-based reporting system called Vesuv where all outbreaks in humans are to be reported and stored in a database at the Norwegian Institute of Public Health. If an indigenous outbreak is suspected, epidemiological investigations will be initiated in order to identify the source and prevent further cases. For imported cases, the country of acquisition will be recorded. If information through international networks indicates that a case belongs to an outbreak, epidemiological investigations will be initiated.

Description of the types of outbreaks covered by the reporting
All suspected foodborne outbreaks are notifiable. The definition of a foodborne outbreak is two or more human cases with the same infection where the cases are linked or are probably linked to the same food source, or when observed number of human cases exceeds the expected number of cases during the same time period and place, and food is a likely vehicle.

Trends in numbers of outbreaks and numbers of human cases involved
The number of reported foodborne outbreaks has increased in Norway since the web-based reporting system was established in 2005 (42 in 2005, 65 in 2006 and approx. 80 in 2007). We believe that this increasing trend is due to a higher reporting frequency rather than a real higher number of outbreaks.

Relevance of the different causative agents, food categories and the agent/food category combinations
Traditionally, the most common cause of foodborne outbreaks in Norway has been bacterial intoxication (*Clostridium perfringens*, *Bacillus cereus* and *Staphylococcus aureus*). Recently, foodborne outbreaks of norovirus caused by infected food handlers have become more common. Reported domestic outbreaks of salmonellosis and campylobacteriosis have been relatively rare.

Relevance of the different type of places of food production and preparation in outbreaks
Traditionally, outbreaks have mainly been associated with inadequate handling and temperature abuse, causing food intoxication. In addition, untreated water has caused several outbreaks.

Evaluation of the severity and clinical picture of the human cases
In 2007 there was one severe outbreak of listeriosis due to contamination of a locally produced soft cheese, and 5 people with underlying diseases died. We also had a large waterborne outbreak in one municipality where more than 1000 out of 5000 citizens got infected with *Campylobacter*. The other outbreaks were not so severe.

Descriptions of single outbreaks of special interest
The severe outbreak of listeriosis in two hospitals in Oslo was caused by a soft cheese produced in a small private dairy on a farm with milk production. The Food Safety Authority found a very high number of *Listeria monocytogenes* both in the cheese and in the production facilities. The cheese had been sold to the hospitals and also on small markets. Nineteen patients were infected in the hospitals and two people bought the cheese on a local market.

A large outbreak of salmonellosis with 27 verified cases was caused by S. Weltevreden. The source was Alfalfa sprouts which were produced in Norway and the seeds were imported from Italy.

A large waterborne outbreak took place in Røros municipality and more than 1000 people were infected with *Campylobacter jejuni*. A case control study was conducted and the results showed that tap water was the source. The agent was not isolated from water samples after the outbreak.

Table Reported foodborne outbreaks in Norway 2007

Agent	Total number of outbreaks	Number of possible outbreaks	Number of verified outbreaks	Number of patients in verified outbreaks	Implicated food in verified outbreaks
Norovirus	14	12	2	19	Sushi, unknown
Salmonella spp.	4	0	4	95	Baby spinach,alfalfa sprouts, buffet meal, unknown
Campylobacter spp.	6	0	6	1040	Water, lamb meat, turkey meat, unknown
Staphylococcus aureus	6	4	2	21	Soft cheese, pizza
Bacillus cereus	5	4	1	70	Fish soup
Clostridium perfringens	5	2	3	47	Bovine meat, broiler meat
Francisella tularensis	3	0	3	10	Water
Escherichia coli	2	0	2	6	Unknown
Listeria monocytogenes	1	0	1	21	Soft cheese
Yersinia enterocolitica	2	0	2	9	Travel abroad, unknown
Shigella sonnei	1	0	1	6	Travel abroad
Cryptosporidium spp.	1	0	1	33	Water
Giardia intestinalis	1	0	1	5	Travel abroad
Unknown	31	31	0		
Total	**82**	**53**	**29**	**1382**	