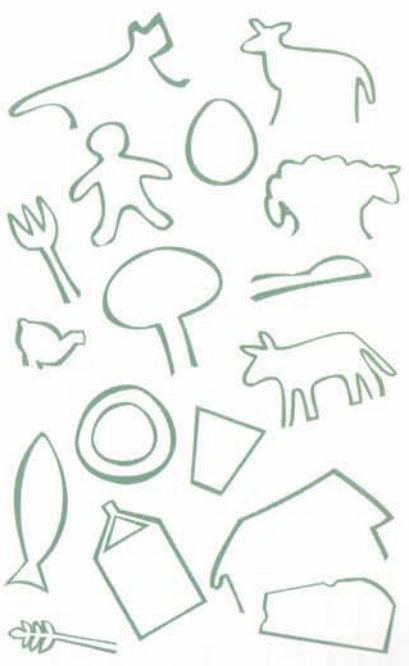

NORWAY

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 2012

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 2012

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

Information on the reporting and monitoring system

Country: Norway
Reporting Year: 2012

Institutions and laboratories involved in reporting:

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.

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

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.

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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 2012. The information covers the occurrence of these diseases and agents in humans, animals, foodstuffs and for *Salmonella* also 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 others national requirements are applied.

The report presents the results of the examinations carried out in 2012. A national evaluation of the epidemiological situation, with special reference to trends and sources of zoonotic infections, is given. Whenever possible, the relevance of findings in foodstuffs and animals to zoonoses cases in humans is evaluated.

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

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

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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 2012.

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

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

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

Geographical distribution and size distribution of the herds, flocks and holdings
Cattle: Most of the cattle herds are dairy herds, the average herd size being 23.4 cows. There are also a number of specialized beef herds with an average number of suckling cows of 15.4. A few herds are combined dairy and beef herds. The cattle herds are distributed throughout Norway with the main part being in the western and middle parts of Norway.

Swine: In Norway there are about 2200 swine herds which produce about 1.6 million fattening pigs per year. The swine herds are scattered all over the country, but most of the pig production (about 60%) are located in four of the 20 counties. The pig population is organized in a breeding pyramide with 120 approved nucleus and multiplier herds. More than 95% of the marketed breeding animals are purchased from these herds.

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 has a hierarchical structure and is strictly regulated. Egg and broiler meat production are the most important branches, but the number of holdings keeping turkey and other species is increasing. The Norwegian layer population consists of two strains (Lohmann white and Shaver white). The layer population is located throughout Norway. The commercial broiler production consists of one strain (Ross). The broiler production is mainly located in five counties in the southern and middle part of Norway.

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

Table Susceptible animal population

	Number of holdings/herds (flocks)[1]	Livestock numbers (live animals)[1]	Number of slaughtered animals[2]
Cattle			
Dairy cows and heifers	9,100	209,000	
Mixed herds	870	33,100	
Meat production animals	4,200	64,700	
In total	15,500	861,000	293,000
Deer	91	5,700	
Gallus gallus (fowl)			
Grandparent breeding flocks – egg production line[3]	(3)		
Parent breeding flocks – egg production line[3]	(20)		
Parent breeding flocks – meat production line[3]	(130)		
Laying hens[4]	540 (740)	3,884,000	814,000
Broilers	590 (4700)		63,997,000
Goats			
Milk goats	350	35,000	
In total	1,300	65,400	21,200
Pigs			
Breeding animals	1,200	56,000	
Fattening pigs	2,000	464,000	
In total	2,200	839,000	1,602,000
Sheep			
Animals over 1 years	14,300	867,000	
In total	14,400	2,215,000	1,129,000
Horses			590
Turkeys, ducks and geese			
Parent breeding flocks[3]	(18)		
In total[4]	57	496,000	1,353,000

Numbers are rounded to the nearest ten, hundred and thousand for figures between 100 and 1000, 1000 to 100,000 and > 100,000, respectively.

[1] Register of Production Subsidies as of 31.07.2012
[2] Register of Slaughtered Animals.
[3] Only production flocks.
[4] Only flocks >250 birds.

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

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

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
The Norwegian *Salmonella* Control Programmes have documented that 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 clinically compatible case with an epidemiological link to a laboratory confirmed case OR a case in which *Salmonella* other than *S.* Typhi and *S.* Paratyphi has been isolated.

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. Identification to serovar level is based on biochemical and serological analyses. Strain differentiation of S. Typhimurium is performed by multiple-locus variable-number tandem repeats analysis (MLVA).

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

History of the disease and/or infection in the country
The recorded incidence of salmonellosis in Norway has increased during the last three decades with a sharp rise in the early 1980s due to the emergence of S. Enteritidis. In the majority of cases of salmonellosis (approximately 80%), the patients have acquired the disease abroad. The number of reported cases of salmonellosis corresponds well with charter tourism to foreign countries; in years with an increased charter tourism, such as in the mid-1980s and in the period 1992-1998, the incidence of salmonellosis also increased, whereas in years with a lower charter tourism activity due to economical depression, such as in the period 1988-1991, the incidence of salmonellosis dropped.

Since 1998, the incidence of salmonellosis has levelled off. However, an increase was noted during 2001, mostly due to a few large outbreaks. Since 1984, S. Enteritidis has become the most common serovar reported, except in 1987 when it was surpassed by S. Typhimurium due to a domestic outbreak traced to contaminated chocolate bars. While S. Typhimurium predominated in earlier years, S. Enteritidis has increased substantially from a low level in 1975-1982 to a higher level from the mid-1990s. No increase of similar magnitude has been observed for any other serovar. The proportion of imported cases of

S. Enteritidis infections is particularly high (approximately 90% among patients with known place of acquisition) as this pathogen 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 2012, a total of 1371 cases of salmonellosis were reported (incidence rate 27,5 per 100 000), of which 259 (19%) were infected in Norway. Altogether 521 (38%) of the cases were due to *S*. Enteritidis, of which 39 (7,5%) were infected in Norway. Altogether, 183 (13%) of the cases were due to *S*. Typhimurium, of which 79 (43%) were domestic cases. During the past years monophasic *S*.Typhimurium has been increasingly implicated in human disease. In 2012 a total of 143 cases of monophasic *S*.Typhimurium were reported, of which 32 (22%) were infected in Norway.

In 2012 only one outbreak of salmonellosis was recorded in Norway due to *S*. Mikawashima. No source of the outbreak was found.

National evaluation of the recent situation, the trends and sources of infection
There was an increase in the overall number of Salmonella-infections in 2012. Most of the increase is in the number of patients who have contracted the infection abroad. Domestically acquired infections decreased slightly in 2012 compared to 2011.

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

Relevance as zoonotic disease
The Norwegian Salmonella Control Programmes have documented that 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 work as long as they have 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 Most common Salmonella serovars according to place of infection, data from MSIS 2012.

Serovar	Place of infection					
	Norway		Abroad		Unknown	Total
S. Enteritidis	39	15%	439	45%	43	521
S. Typhimurium	79	31%	87	9%	17	183
S. Sp Ssp I Gr O:4 monofasic variant	32	12%	94	10%	17	143
S. Stanley	5	2%	52	5%	9	66
S. Newport	7	3%	32	3%	2	41
S. Java	9	3%	19	2%	4	32
S. Virchow	2	1%	20	2%	3	25
S. Heidelberg	4	2%	14	1%	1	19
S. Saintpaul	3	1%	13	1%	1	17
S. Mikawasima	14	5%	1	1%	1	16
Others	65	25%	203	21%	40	308
Total	**259**	**100%**	**974**	**100%**	**138**	**1371**

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 and according to Commission Regulation (EC) 2073/2005.

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 by pooled samples of neck skin is carried out according to 2073/2005 by the food business operators. Surveys are performed occasionally.

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

Monitoring system

At slaughterhouse and cutting plant: The Norwegian *Salmonella* Control Programme: Each year, a number of carcass swabs and lymph node samples are collected randomly from the animal population (pig, cattle) by slaughter and proportional to the slaughterhouses' throughput. The sampling of carcass swabs is described in this chapter, while 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: Sampling by the food business operator according to Commission Regulation (EC) No 2073/2005 and Regulation (EC) No 853/2004 of the European Parliament and of the Council.

Frequency of the sampling

At slaughterhouse: Detection of an annual prevalence of 0.1% by 95% confidence level.
At cutting plant: According to production capacity: less than 2 tons: twice a year, 2-20 tons: once a month, greater than 20 tons: once a week.
At meat processing plant: Sampling by the food business operator according to Regulation 2073/2005. The sampling is reduced to once per month as the Norwegian national control program demonstrates that the salmonella prevalence is low in Norwegian animals.

Type of specimen taken

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

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: Each sample consists of 25 grams of minced meat or meat preparations.

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 or, exceptionally, submitted to processing by a treatment eliminating the hazard. Investigation into the source of the contamination is initiated if relevant. If *Salmonella* is detected in food controls at the Border Inspection Posts, the consignments will be either rejected or destroyed or, exceptionally, submitted to processing by a treatment eliminating the hazard.

Results of the investigation

Pig meat

In 2012, a total of 3066 carcasses were swabbed, all were negative.

Cattle meat

In 2012, a total of 2857 carcasses were swabbed, all were negative

Crushed red meat

In 2012, one out of 2914 samples of crushed red meat (cattle, pigs, sheep) was positive (*S.* Dublin).

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.
Pig - carcass swabs	NSCP[1]	swab	3066	0
Cattle - carcass swabs	NSCP	swab	2857	0
Crushed red meat (pig, cattle, sheep)	NSCP	25g	2914	1*
Fish - wild catch	NIFES	25g	20	0
Fish – imported products	NIFES	25g	130	1**
Molluscan shellfish - raw	NIFES	25g	48	0

[1]NSCP = Norwegian *Salmonella* Control Programme

* *S.* Dublin in crushed meat from cattle

** *S.* Weltevreden in scampi from Vietnam

Salmonella *in animals*

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

Monitoring system

Breeding flocks

The Norwegian *Salmonella* Control Programme established pursuant to Article 5 of Regulation (EC) 2160/2003 and approved by the EFTA Surveillance Authority (ESA) (364/07/COL) includes all poultry breeding flocks. Sampling takes place at the initiative of the food business operator and by the Competent Authority according to Regulation (EC) 200/2010. The Norwegian *Salmonella* Control Programmes also include all breeder flocks of ducks, geese, turkeys and guinea fowl.
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. Sampling takes place at the initiative of the food business operator and by the Competent Authority according to Regulation (EC) 1168/2006 and Regulation (EC) 517/2011 (replaced 1168/2006 in February 2012).
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, guinea fowl)

The Norwegian *Salmonella* Control Programme: All poultry flocks are tested before slaughter. Sampling takes place at the initiative of the food business operator and once a year by the Competent Authority according to Regulation (EC) 646/2007 and Regulation (EC) 200/2012 (replaced 646/2007 in October 2012). 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: Every flock is sampled twice.
Production period: Every second week.

Laying hens

Day-old chicks: Every flock is sampled.
Rearing period: 2 weeks prior to moving.
Production period: Every 15 weeks.
Before slaughter at farm: Every flock for slaughter is sampled.

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

Before slaughter at farm: Every flock is sampled

Type of specimen taken

Breeding flocks

Day-old chicks: Internal linings of delivery boxes.
Rearing period: Socks/boot swabs.
Production period: Socks/boot swabs or faeces (caged birds) and dust swabs.
Before slaughter at farm: Socks/boot swabs or faeces (caged birds) and dust swabs.

Laying hens

Day-old chicks: Internal linings of delivery boxes.
Rearing period, production period: Socks/boot swabs or faeces (caged birds).
Before slaughter at farm: Socks/boot swabs or faeces (caged birds).

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

Before slaughter at farm: Socks/boot swabs and dust swabs.

Methods of sampling (description of sampling techniques)

Breeding flocks

Day-old chicks: All flocks: Transport crates are tested (crate liners or swabs).
Rearing period: All flocks: Tested at 4 weeks of age and 2 weeks before moving by two pairs of socks.
Production period: All flocks: Tested every 2nd week by one pair of socks (caged birds: faecal samples) and one dust sample.

Laying hens
Day-old chicks: All flocks: Transport crates are tested (crate liners or swabs).
Rearing period: All flocks: Tested two weeks before moving by 2 pair of socks (caged birds: faeces).
Production period: All flocks: Tested every 15 weeks by two pairs of socks (caged birds: faeces).
Before slaughter: All flocks for slaughter: Tested before slaughter by 2 pair of socks (caged birds: faeces).

Meat producing flocks (broilers, turkeys, ducks, geese, guinea fowls)
Before slaughter at farm: Every flock is sampled by one pair of socks and one dust 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/Amd. 1:2007 (E) Amendment 1 Annex D.

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

Results of the investigation
Gallus gallus breeding flocks
In 2012, a total of 131 rearing flocks and 156 production flocks were tested, all were negative.

Gallus gallus laying hen flocks
In 2012, a total of 139 rearing and 738 adult flocks were tested, all were negative.

Gallus gallus broiler flocks
In 2012, 4720 broiler flocks were investigated, all were negative.

Other poultry (turkeys, ducks, geese)
In 2012, all samples from poultry in the Norwegian *Salmonella* Control Prorgamme were negative.

In addition to the Control Programme, samples have been taken in relation to clinical problems, follow up or various projects. For details, see table.

National evaluation of the recent situation, the trends and sources of infection
The favourable *Salmonella* situation in Norwegian poultry is partly dependent upon an efficient control of breeding flocks. Due to extensive surveillance during many years, stringent measures in case of positive findings, and restricted import, poultry breeding flocks in Norway are virtually free from *Salmonella*. *S.* Agona was found in a broiler parent flock in 2001. *S.* Enteritidis was for 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, turkey and guinea fowl populations in Norway are small. Since 2000, positive commercial flocks have been found sporadically; in

2000, two turkey flocks were positive for *S*. Aberdeen and *S*. Typhimurium, respectively and in 2011 one geese breeder flock (*S*. Typhimurium) and one turkey production flock (*S*. Rissen) were positive.

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

Table *Salmonella* **in poultry and other birds**

	Source of information	Sampling unit	Total units tested (official and industry sampling)	Total units positive for *Salmonella* spp.
***Gallus gallus* (fowl)**				
Grandparents - egg line – production period	NSCP[1]	flock	3	0
Parents - egg line – rearing period	NSCP	flock	27	0
Parents - egg line – production period	NSCP	flock	20	0
Parents - meat line – rearing period	NSCP	flock	104	0
Parents - meat line – production period	NSCP	flock	133	0
Laying hens – rearing period	NSCP	flock	139	0
Laying hens – production period	NSCP	flock	738	0
Broilers	NSCP	batch	4720	0
Unspecified	NVI	holding	15	0
Ducks				
Breeding flocks	NSCP	flock	4	0
Meat production flocks	NSCP	flock	68	0
Unspecified	NVI	holding	3	0
Geese				
Breeding flocks	NSCP	flock	1	0
Meat production flocks	NSCP	flock	10	0
Turkeys				
Breeding flocks	NSCP	flock	13	0
Meat production flocks	NSCP	flock	216	0
Unspecified	NVI	holding	6	0
Quails	NVI	holding	6	0
Ostrich	NVI	animal	1	0
Other domestic birds (mainly pet psittacine birds)[2]	NVI	animal	10	2
Birds in zoological gardens	NVI	animal	3	0
Wild birds[3]	NVI	animal	137	16

[1] NSCP = Norwegian *Salmonella* Control Programme
[2] Two pet pidgeons with *S*. Typhimurium.
[3] Six birds with *S*. Typhimurium, five with *S*. Infantis, four with *S*. Kedougou and one with *S*. Stanley.

Footnote: The samples reported from NVI (Norwegian Veterinary Institute) are mainly from clinical investigations, but might also represent import controls and other reasons for sampling.

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 by slaughter and proportionally distributed according to the slaughterhouses' capacities. The sampling of lymph nodes is described in this chapter, while 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
Pig 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
Pig 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.
Pig breeding herds: Faecal samples.
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
Faeces: Annex D of ISO 6579/Amd. 1:2007 (E) Amendment 1 Annex D.
Lymph nodes: 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 2012, lymph node samples from a total of 3059 animals were tested in the Norwegian *Salmonella* Control Programme. One sample was positive (*S.* Typhimurium). None of the 94 herds tested with faecal samples were positive.

In addition, approximately 700 samples from 43 different herds were investigated due to clinical problems, various controls and follow up of positive findings. All samples were negative.

Cattle

In 2012, a total of 2849 animals were sampled (lymph node samples) in the Norwegian *Salmonella* Control Programme. One sample was positive (*S.* Typhimurium)

In addition, more than 900 samples from 158 herds were investigated due to clinical problems, various controls and follow up of positive findings. One herd was positive (S. *enterica* subsp. *enterica* 4,[5],12:i:- - a follow up sample from a farm positive in 2011).

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

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

C. *Salmonella* spp. in other animals

Monitoring system

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

Case definition

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.

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. enterica* subsp. *enterica* 4,[5],12:i:-	*S.* Bredeney	*S.* Bovismorbificans	*S. diarizonae* (61:k:1,5,(7))	*Salmonella* spp.
Cattle										
Slaughtered animals - lymph nodes	NSCP[1]	animal	2849	1	1					
Other investigations[2]	NVI	herd	158	1		1				
Sheep	NVI	herd	46	17					17	
Pigs										
Breeding animals – at farm	NSCP	herd	94	0						
Slaughtered animals – lymph nodes	NSCP	animal	3059	1	1					
Other investigations	NVI	herd	43	0						
Horses[3]	NVI	herd	45	6	5	1				
Goat	NVI	herd	5	0						
Alpacas and llamas[4]	NVI	herd	2	0						
Cats[5]	NVI	animal	95	5	3					2
Dogs[6]	NVI	animal	490	17	3	2				12
Pets (guinea pig, ferret, rabbit)	NVI	animal	3	0						
Turtles	NVI	animal	3	0						
Wild animals	NVI	animal	16	0						
Zoo animals[7]	NVI	animal	48	23						23

[1] NSCP = Norwegian *Salmonella* Control Programme.
[2] Due to follow up from findings in 2011 a herd was sampled with a total of 134 animal and environmental samples. One of the environmental sample from this herd was positive.
[3] The majority of tested and positive horses belonged to one outbreak in a horse clinic.
[4] A total of 2 alpacas and 10 llamas.
[5] The 2 cats reported in column *Salmonella* spp. were positive for *S.* Kedougou and had contact with *S.* Kedougou positive dogs.
[6] Of the 17 positive dogs, 4 had two serovars. The 12 dogs reported in column *Salmonella* spp. were positive for *S.* Kedougou (6),*S.* Virchow (2), *S.* Livingstone (1), *S.* Liverpool (1), *S.* London (1), *S.* Kapemba(1), *S.* Enteritidis (1), *S.* Dublin (2) and *S.* Brandenburg (1).
[7] Animals from two zoos and similar holdings. The 23 positive animals were snakes and reptiles and a total of 9 different serovars were isolated from these animals.

Footnote: The samples reported from NVI (Norwegian Veterinary Institute) include clinical investigations, follow up of positive findings, import controls and other reasons for sampling.

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 compound feedingstuffs has also been restricted for many years. The result is that the feedingstuffs given to Norwegian livestock for many years have virtually been free from *Salmonella*.

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

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

Recent actions taken to control the zoonoses
According to the regulation, establishments are required to prevent the introduction of *Salmonella* and carry out monitoring. Detection of *Salmonella* is notifiable and the establishment must take immediate actions to prevent the distribution of contaminated feed. Contaminated feed will either be destroyed or decontaminated if feasible.

Establishments producing feedingstuffs and protein concentrates (supplementary feedingstuffs) intended for poultry, pigs, and cattle are exposed to heat treatment of at least 81 degrees Celsius core temperature and the production has to take place in a production line where all the other feedingstuffs are heat treated. As for *Salmonella* the monitoring of the acceptability of the process includes sampling of minimum three samples every fortnight or, as far as pig and ruminant animal feed mills with a capacity below 10,000 tons are concerned, every fourth week.The sampling includes samples of raw materials, scrapings from control points and environment.

Establishments producing fish feed are required to establish individual designed *Salmonella* control programmes based on HACCP.

Establishments preparing feed for fur animals are required to test each batch for the presence of *Salmonella*. The national production of meat and bone meal is subject to a continuous process control that includes analyses for *Salmonella*.

Official control is based on random sampling at the establishments.

Imported feed materials must be subjected to control for *Salmonella* before distribution or use. The number of samples depends on the amount and whether the feedingstuffs are classified as high-risk (such as soy beans, cotton seed and maize) or low-risk materials. Imported feed of animal origin, predominantly petfood and dogchews, must be accompanied with a certificate that documents that the lot has been controlled for *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	Total units[1] tested	Units tested in official controls	Units tested in surveillance by industry	Total units positive for *Salmonella* spp.[2]
Feed matter					
Barley derived	NFSA	112	0	112	0
Oat derived	NFSA	80	0	80	2
Wheat derived	NFSA	249	2	247	2
Maize (including maize derived)	NFSA	390	9	381	1
Rape seed derived	NFSA	145	0	145	0
Soya(bean) derived	NFSA	3315	18	3297	37
Sunflower seed derived	NFSA	75	0	75	2
Legume seeds and similar products	NFSA	64	0	64	0
Groundnut derived	NFSA	10	1	9	0
Rice derived	NFSA	8	0	8	0
Meat and bone meal and animal fat	NFSA	251	0	251	3
Fish meal and other fish products	NFSA	119	0	119	3
Compound feedingstuffs for					
cattle, swine, poultry	NFSA	519	32	487	0
fish	NFSA/NIFES	827	48	779	16
fur animals	NFSA	434	0	434	0
Environmental samples including process control samples – not specified to production	NFSA	11070	4	11066	228

[1] Units = partly batches and partly single samples.
[2] The positive samples were mainly imported feed material or environmental samples.

Antimicrobial resistance in Salmonella *isolates*

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.

Type of specimen taken
Salmonella isolates collected through the Norwegian *Salmonella* Control programmes, which include those animal species required by the Commission Decision No 2007/407/EC on the harmonised monitoring of antimicrobial resistance in *Salmonella*. Isolates from other samples 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 selection of isolates for antimicrobial testing and methods used for collecting data
One isolate per herd is selected for antimicrobial testing. *Salmonella* is isolated at various laboratories and sent to the Norwegian Veterinary Institute in Oslo for 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.

Cut-off values 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 2012 report.

Table Antimicrobial susceptibility testing of *Salmonella* spp.

	Salmonella spp.
Number of isolates tested	25
Number of isolates resistant to	
Tetracycline	4
Chloramphenicol	0
Cefotaxime	0
Ciprofloxacin	2
Nalidixic acid	2
Sulfamethoxazole	4
Trimethoprim	1
Streptomycin	3
Gentamicin	0
Ampicillin	3

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 varied between 3.3% and 6.3% in the years 2002-2007. The data from 2008 - 2012 are not directly comparable to previous years because the sampling was reduced in 2008 to sampling prior to slaughter only and in 2009 the surveillance was altered from full year surveillance to the period between 1st May to the end of October when the incidence is highest. The estimated full year prevalence of positive flocks in 2008 – 2012 has varied between 3.7% and 5.5%.

The number of flocks going positive out on the market has been reduced from 127 in 2002 to 58 in 2007.The estimated number of positive flocks out on the market in 2008 and 2012 has varied between 64 and 93. The number of slaughtered flocks has increased from approx. 3600 in 2002 to 4800 in 2012.

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, 50-55% of the cases are imported.

National evaluation of the recent situation, the trends and sources of infection
The reported human incidence in 2012 was slightly lower than the incidence reported in 2011. The data on prevalence in broiler flocks in 2012 were not as complete as from the period 2002 – 2007, but we assume that there is no major change in the prevalence. We also assume that in 2012, as in earlier years, the majority of the positive flocks were detected before slaughter, and were therefore treated (i.e. frozen or heat treated) before they went on the market. The use of untreated water is considered an important source of campylobacteriosis in Norway.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
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 clinically compatible case with an epidemiological link to a laboratory confirmed case OR a case in which *Campylobacter* sp. has been isolated.

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. Identification to subspecies level is determined by growth requirements of culture, PCR and sequencing. Markers for *C. jejuni*, *C. coli, C. lari, C. fetus* ssp. *fetus* and *C. upsalensis* are identified by PCR, and strain differentiation by SNP, bineric and crispr analyses.

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

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. In 1998, campylobacteriosis for the first time surpassed salmonellosis as the most frequently reported bacterial cause of acute gastroenteritis, and since then the reported incidence of campylobacteriosis has been above that of salmonellosis. Usually, 50-55% of the cases are imported. 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 2012, a total of 2933 cases (incidence rate 58,8 per 100 000) were reported of which 1412 (48%) were known to be imported, 1098 (37%) were domestic and 423 (14%) had an unknown place of infection. Two outbreaks of campylobacteriosis was registered in 2012.

National evaluation of the recent situation, the trends and sources of infection
The number of reported domestic cases decreased in 2012 compared to 2011. The incidence of domestic human campylobacteriosis has been relatively stable around 1100 cases annually during the last five years. As the overall occurrence of positive broiler flocks is low, there must be other important sources to human campylobacteriosis apart from poultry products in Norway, untreated drinking water probably being the most important one.

Relevance as zoonotic disease
Campylobacter is the most frequently reported cause of bacterial gastroenteritis in Norway. Every year, approximately 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 2006 – 2012. Incidence rate (IR) per 100.000 inhabitants 2012.

County	2006	2007	2008	2009	2010	2011	2012	IR 2012
Østfold	31	37	62	52	34	63	52	18.1
Akershus	90	92	99	88	89	91	108	19.4
Oslo	80	93	86	129	108	113	135	22.0
Hedmark	42	31	43	53	38	38	27	14.0
Oppland	57	39	62	45	31	68	67	35.8
Buskerud	58	47	47	65	42	48	61	23.0
Vestfold	43	36	69	47	57	42	50	21.1
Telemark	32	36	33	41	25	37	36	21.2
Aust-Agder	33	16	20	13	9	17	18	16.1
Vest-Agder	32	27	20	22	27	43	33	18.9
Rogaland	170	198	157	162	145	174	122	27.5
Hordaland	159	154	125	174	127	135	128	26.1
Sogn & Fjordane	28	26	20	44	24	45	24	22.2
Møre & Romsdal	50	53	39	64	55	54	35	13.6
Sør-Trøndelag	87	114	107	120	92	85	114	38.3
Nord-Trøndelag	20	39	36	40	39	27	31	23.2
Nordland	33	50	33	40	30	47	30	12.6
Troms	42	50	33	34	14	25	20	12.6
Finnmark	10	15	11	22	12	13	6	8.1
Total	**1097**	**1153**	**1102**	**1255**	**998**	**1165**	**1097**	**22.0**

Campylobacter *in foodstuffs*

Thermophilic *Campylobacter* **in broiler meat and products thereof**

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

Methods of sampling/definition of positive finding
See chapter on *Campylobacter* in *Gallus gallus*.

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

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

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

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

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

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

National evaluation of the recent situation, the trends and sources of infection
The Norwegian campylobacteriosis situation is a concern for the authorities. The establishment of the Norwegian action plan against *Campylobacter* sp. in broilers in 2001 was a response to the urgent situation. This action plan has since it was established and through 2012 prevented millions of *Campylobacter* positive broiler carcasses from entering the market raw.

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: Between 1 May and 31 October, which corresponds with the high season for *Campylobacter* positive flocks, every flock is sampled.
At slaughter: Flocks where the result from the pre slaughter sample is lacking at the time of slaughter are sampled by staff from the Norwegian Food Safety Authority.

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

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

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

Diagnostic/analytical methods used
Before slaughter at farm: PCR Real Time PCR
At slaughter: ISO 10272-1:2006.

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. 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 2012, in the period 1 May – 31 October, a total of 2417 samples (representing approx the same number of flocks, and covering virtually all slaughtered flocks in Norway in that period) were taken approximately four days before slaughter. In addition, two samples were taken at slaughter due to lack of results from the pre-slaughter sample. A total of 106 samples (4.4%) were positive for *Campylobacter* spp.

National evaluation of the recent situation, the trends and sources of infection
The poultry production has increased in Norway during the last years. The yearly prevalence of flocks being positive for *Campylobacter* from 2002 to 2007 was between 3.3 and 6.3%. The results from 2008 - 2012 are not directly comparable to previous years, but the annual prevalence has been estimated to vary between 3.7% and 5.5%.

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

Table *Campylobacter* **in animals**

	Source of information	Sampling unit	Units tested	Total units positive for *Campylobacter* spp.	*C. jejuni*	*C. coli*	*C. upsaliensis*	*C.* spp., unspecified
***Gallus gallus* (fowl)**								
Broilers – at farm	NACB[1]	flock	2417	106				106
Cattle	NVI[2]	animal	156	59	49		2	8
Sheep	NVI[2]	animal	54	19	14			5
Goats	NVI[2]	animal	2	0				
Horses	NVI[2]	animal	6	0				
Dogs	NVI[2]	animal	390	88	16		70	2
Cats	NVI[2]	animal	88	2			1	1

[1] NACB = Norwegian Action plan against *Campylobacter* in Broilers. Only covering the peak season 1 May – 31 October. Samples are taken by owner 4 days before slaughter. There is no data available on the *Campylobacter* species because the method used is a Real time PCR method where no isolates are obtained.
[2] NVI = Norwegian Veterinary Institute: Diagnostic samples.

Antimicrobial resistance in Campylobacter *isolates*

Antimicrobial resistance in *Campylobacter* sp.

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 are collected at slaughter plants. One isolate per positive flock is to be included for susceptibility testing. Currently, the monitoring of poultry isolates is not carried out every year, and no testing occurred in 2012.

Type of specimen taken
See Thermophilic *Campylobacter* in *Gallus gallus*.

Methods of sampling (description of sampling techniques)
See Thermophilic *Campylobacter* in *Gallus gallus*.

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

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

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

Cut-off values used in testing
Epidemiological cut-off values recommended by EFSA are 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
Because of monitoring every second year instead of continuous monitoring, no data are available for 2012.

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 2-50. The incidence rate has varied from 0.05-1.07 per 100 000. Most of the cases are sporadic, occurring in old people or persons with an underlying disease. 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 three 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 hospital outbreak with 21 verified cases occurred and was caused by contaminated pasteurized soft cheese.

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

In a survey conducted in 1995 involving ready-to-eat poultry products, the prevalence of *L. monocytogenes* was 0.4%.

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

Fermented trout is a traditional food product in Norway that is consumed without heat treatment. Studies have shown that fermented trout frequently is contaminated with *L. monocytogenes*, sometimes in high concentrations (up to 2000 CFU per gram). Former guidelines issued by the Food Safety Authority recommended a maximum level of 1000 CFU per gram for this particular product combined with information about risk products to vulnerable consumers. Recent studies have 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. Ready-to-eat products have been identified as a source for human listeriosis.

Recent actions taken to control the zoonoses
The requirements of the Regulation (EC) No 2073/2005 apply, i.e., monitoring of the production process, shelf-life studies when deemed appropriate, withdrawal from the market when unsatisfactory results and taking measures to prevent the recurrence of the contamination, such as reviewing the 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 clinically compatible case with an epidemiological link to a laboratory confirmed case OR a mother with confirmed listeriosis in the fetus, stillborn or newborn OR laboratory confirmation through isolation of *L. monocytogenes* in *either* a normally sterile site *or* a non-sterile site in a foetus, stillborn, newborn or the mother within 24 hours of birth.

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. Identification of Listeria is performed by Gram staining and biochemical reactions, serovar assignment is performed by use of PCR and phenotypic characterization and strain differentiation by MLVA.

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

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

Results of the investigation
In 2012, a total of 30 confirmed cases of listeriosis were notified (incidence rate 0.6 per 100 000), 26 cases were infected in Norway, and four had an unknown place of infection. Five deaths were recorded.

National evaluation of the recent situation, the trends and sources of infection
Listeriosis in humans is a relatively rare disease in Norway and has been so for many years. Most of the cases are sporadic, occurring in elderly individuals or persons with underlying diseases. There is, however, an increasing trend if we look at the number of recorded cases over a twenty year period. The increase is not seen in pregnancy-associated cases. The reason for this increasing trend is unknown, but could be related both to an increase in the number of elderly individuals and persons with other underlying diseases, and to increased exposure to *L. monocytogenes* in consumed food.

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

Listeria *in foodstuffs*

Monitoring system
No continuous monitoring of foodstuffs takes place. Surveys are occasionally performed. Norway follows the EU requirements regarding testing for *L. monocytogenes* in ready-to-eat foods (Regulation (EC) NO 2073/2005). 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: NMKL No 136:2007, ISO 11290-1:1996/Amd 2004, ISO 11290-2/Amd 2004, alternative methods including Rapid L'mono and molecular methods.
At retail: NMKL No 136:2007, ISO 11290-1:1996/Amd 2004, ISO 11290-2:1998 PSV, alternative methods including Rapid L'mono and molecular methods.

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
The requirements of the Regulation (EC) No 2073/2005 apply, i.e., monitoring of the production process, shelf-life studies when deemed appropriate, withdrawal from the market by unsatisfactory results and taking measures to prevent the recurrence of the contamination, such as reviewing the production routines and shelf life of the product.

Results of the investigation
In 2012, a total of 92 samples of imported fishery products and 20 samples from Norwegian raw fish were investigated. Only two samples of imported origin were found positive. In a survey, a total of 392 cheeses imported from EU were investigated, all were negative.

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

Listeria *in animals*

Monitoring system
Listeriosis is a notifiable disease in animals. There are no active surveillance regarding *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 by 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 2012, at the Norwegian Veterinary Institute, 39 sheep, six goats, four cattle and one horse were found positive.

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 been increasing during the last years, but is still relatively low. The increase is probably partly, but not fully, explained by better diagnostics tools and increased awareness due to two severe outbreaks; In 2006 there was a severe outbreak caused by VTEC O103:H25 with 17 patients, out of which 10 developed HUS and one died. In 2009 there was another outbreak, caused by sorbitol fermenting *E. coli* O157:H-. There were 19 cases, out of which 9 developed HUS and one died. In 2010, a smaller outbreak occurred, with 3 cases infected with the same strain as in the 2009-outbreak. Approximately half of the total reported cases are acquired domestically.

A study conducted in 1995 revealed a low prevalence of VTEC O157 among Norwegian dairy cattle; animal prevalence 0.3% and herd prevalence 1.0%. In a survey conducted in 1998-1999, one out of 574 dairy cattle herds were positive for VTEC O157 (herd prevalence 0.2%, animal prevalence between 0.02 and 0.06%). In 2000, none of the tested 1435 beef cattle from 165 herds were positive for VTEC O157. A survey in 2002, in which 453 pooled faecal samples from 155 beef cattle herds were tested for the presence of VTEC O26, O103, O111, O145 and O157, revealed five pooled samples from five herds positive for VTEC O103, all *eae* negative.

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

In a national survey of *E. coli* in sheep conducted in 2006-2007, samples from 585 flocks were analysed, 94 flocks from 2006 and 491 flocks from 2007. VTEC O103:H2 (stx_1 and *eae* positives) were detected in 0.7% and VTEC O157:H7 (stx_2 and *eae* positives – one was also stx_1 positive) in 0.9% of the flocks. Only the 2007 samples were analysed for *E. coli* O26, and VTEC O26 were detected in 0.8% of the flocks. In addition *stx* negative and *eae* positive *E. coli* O26 were detected in 16.1%, *stx* negative and *eae* positive *E. coli* O103:H2 in 3.1%, and *stx* negative and *eae* positive *E. coli* O103:H25 in 5.8% of the flocks.

National evaluation of the recent situation, the trends and sources of infection
Although the annual incidence in humans in Norway up to 2006 was low and predominantly involved sporadic cases, the fear that the incidence might increase in the future, and that outbreaks may occur proved valid in 2006. Data show that VTEC O157 is present in the cattle and sheep populations, and although the prevalences seem to be low, this reservoir represents a source of possible human infection. The 2006 outbreak caused by VTEC O103:H25 showed that other VTEC than the "high five" (VTEC O26, O103:H2, O111, O145 and O157) may be of potential danger to 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
Clinical microbiological laboratories use plating on selective media (such as SMAC) in order to detect presumptive VTEC O157 and/or genetic methods directed towards detection of Shiga toxin genes followed by isolation of VTEC and confirmation at the National Reference Laboratory. Confirmation includes examination for the presence of Shiga toxin genes and other virulence factors. Identification of pathogenic *E. coli* to serotype level is performed by Biochemical, serological and PCR analyses. VTEC is identified by PCR detection of stx1, stx2, eae, ehxA and subtyping of stx1 ans stx2 is also routine. EPEC, EIEC, ETEC, EAEC are identified by PCR analyses and O26:H11 by PCR and SNP. Strain differentiation is performed by MLVA.

Notification system in place
Human cases have been notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS) in children since 1975, and for all ages since 1989. Haemolytic uremic syndrome (HUS) became a notifiable disease in December 2006.

History of the disease and/or infection in the country
The reported incidence of VTEC infections in humans in Norway has traditionally been low, but has increased during the last years. The number of cases has varied between 0-51 per year, except in 2009 with 108 reported cases. Approximately half of the cases are acquired domestically. Most reported cases are usually caused by VTEC O157.

The first foodborne VTEC outbreak in Norway occurred in 1999 and involved four culture positive patients (O157). Epidemiological investigations incriminated domestically produced lettuce as the most likely source of infection. A severe outbreak caused by VTEC O103:H25 in 2006 involved 17 patients of which 10 developed HUS and one died. In 2009, an outbreak caused by sorbitol fermenting O157:H- occurred. Thirteen children got ill, and of these nine developed HUS and one child died. The source of the outbreak was not found.

Results of the investigation
In 2012, 75 cases (incidence rate 1.5 per 100.000) of VTEC and HUS were reported. A total of 4 cases of HUS were reported; O145:H28 was isolated from one patient, and no VTEC could be isolatet from the other three patients. Of the 75 cases of VTEC infections reported, the most commonly isolated serotypes were O103 (17 cases), O157 (12 cases) and O145 (8 cases). A total of 15 of the 75 cases reported contracting the infection abroad. One outbreak of O103 was reported from a kindergarden.

National evaluation of the recent situation, the trends and sources of infection
The number of cases reported in 2012 is higher than in 2011, but lower than in 2009. In 2012, one outbreak of O103 associated with a kindergarden was reported. Some of the increase in cases can be explained due to increased attention and testing because of the outbreak. One outbreak counting three HUS cases was reported in 2010, as opposed to the seven outbreaks reported in 2009. Many of the notified cases in 2009 were detected because of increased attention and testing due to the outbreaks. The laboratory methods have probably improved since the O103 outbreak Norway experienced in 2006. Even though there is a small decrease from 2010 to 2011, the 75 cases of VTEC reported in 2012 reflects an increasing trend for EHEC in Norway. The reason for this increase is unknown.

Relevance as zoonotic disease
Data show that VTEC is present in the cattle and sheep populations, although the prevalences seem to be low. However, there is also a reservoir of *E. coli* with *eae*, but *stx* negative, that may be of concern as human pathogenics (aEPEC) or as precursors for VTEC. 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., people working with food production, children in day-care and health care personell, are advised to stay away from work while they have 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 food and animals*

Monitoring system
Prevalence surveys in cattle, sheep and goats have been conducted occasionally since 1998. In 2006-2007 a survey regarding *E. coli* in sheep was conducted, with a total of 593 flocks sampled. Single faecal samples were collected from the 50 youngest animals in each flock.

Type of specimen taken
Animals at farm: Faeces

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

Diagnostic/analytical methods used
ISO/TS 13136 (Draft method) Microbiology of food and animal feed – Real-time polymerase chain reaction (PCR)-based method for the detection of food-borne pathogens – Horizontal method for the detection of Shiga toxin-producing *Escherichia coli* (STEC) belonging to O157, O111, O26, O103 and O145 serogroups. If positive by PCR, isolation is attempted using a modified NMKL no. 164:1999 with AIMS (or AIMS-ELISA) followed by virulence characterization by PCR.

Measures in case of the positive findings or single cases
If VTEC O157 or other VTEC that can pose a health risk for humans is detected in an official survey among live animals, the Norwegian Food Safety Authority and Municipal Medical Officer are notified. Restrictions may be imposed on livestock holdings where such VTEC is detected. The holdings sampled in the survey of sheep flocks in 2006-2007 were anonymized.

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

Results of the investigation
In 2012 a total of four samples from bovine faeces were investigated at the Norwegian Veterinary Institute as a follow up of a human case of EHEC infection. Non-toxinogenic *E. coli* O157 (*eae* +), *E. coli* O103 and *E. coli* O145 (*eae* +) were detected but could not be linked to the patient strain.

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 clinician's judgment based on clinical and/or radiological signs and/or symptoms consistent with active tuberculosis and decision to treat patient with full tuberculosis treatment OR a clinician's judgment that post-mortem microbiological and pathological findings are consistent with tuberculosis and would have indicated treatment for tuberculosis if the patient was still alive OR a clinician's judgment that a patient has latent tuberculosis and decision to start preventative treatment OR laboratory confirmation of Mycobacterium tuberculosis (with the exception of M. bovis BCG) by isolation or nucleic acid detection or detection of granular infection with tuberculosis as likely cause.

Diagnostic/analytical methods used
Clinical indications: Bacteriology, X-ray, pathology.
Screening: Chest X-ray, tuberculin skin testing, IGRA blood test kits.

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 85% in 2012). 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 2010 in one patient from Africa, in 2005 in two patients from Somalia and Afghanistan, respectively, in 2002 in one patient from Somalia, in 2001 in one patient from Tanzania, in 2000 in two patients from Somalia and Morocco, respectively, in 1999 in one patient from Sri Lanka, in 1998 in one patient from Somalia, and in 1994 in one patient infected in India.

Results of the investigation
In 2012, two cases with tuberculosis caused by *M. bovis* was notified. One patient was infected in Pakistan and the other patient was an asylum seeker with unknown place of infection.

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 included vaccination against tuberculosis from 1947 to 2009/2010. The BCG vaccine (live attenuated *M. bovis*) is now offered to unvaccinated and tuberculin negative persons belonging to certain risk groups; immigrants from countries with high prevalence of tuberculosis, persons travelling to high endemic areas for a prolonged time period, teachers, health personnel, personnel on ships and in offshore industry, and military personnel. Screening for tuberculosis is mandatory for immigrants coming to Norway from high prevalence countries. 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) according to Regulation (EC) No 854/2004. 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 or organs with suspicious lesions. 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 indication: Methods vary depending on the problem.

Case definition
An 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) according to Regulation (EC) No 854/2004. 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) according to Regulation (EC) No 854/2004.

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.

Results of the investigation
In 2012, no samples from slaughtered bovine animal had findings at slaughter indicating tuberculosis. A total of 354 bulls owned by a breeding company all had negative tuberculin tests.

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

Relevance of the findings in animals to findings in foodstuffs and to human cases
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 Regulation (EC) No 854/2004. Farmed deer over 12 months of age which have died or been killed and wild deer received for routine necropsy are examined. If suspicion arises whether an animal may have tuberculosis, relevant tests will be carried out. Imported deer are to be tuberculin tested.

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 and fallen stock: Lymph nodes or organs with suspicious lesions. 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
An 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 Regulation (EC) No 854/2004. 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 Regulation (EC) No 854/2004. 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.

Results of the investigation
In 2012, no farmed deer had suspect findings at slaughter.

National evaluation of the recent situation, the trends and sources of infection
Bovine tuberculosis has never been diagnosed in farmed or wild deer in Norway. The Norwegian population of farmed deer is small.

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 animals

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 Regulation (EC) No 854/2004. Imported animals are tuberculin tested if considered relevant based upon individual assessment. Boars selected for export of semen to USA are tuberculin tested. If suspicion arises whether an animal may have tuberculosis (sick or dead animal), relevant tests will be done.

Frequency of the sampling
All slaughtered animals are subject to meat inspection. Imported animals: Sheep and goats are tested during week 23 of the two years long isolation period. Llamas and alpacas are tested during week 22 of the six months long isolation period. Pigs are tested during week 7 of the two months long isolation period if considered relevant based upon individual assessment.

Type of specimen taken
Animals for slaughter: Lymph nodes or organs with suspicious lesions.
Imported or exported 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 Regulation (EC) No 854/2004. 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 Regulation (EC) No 854/2004.

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 2012, tuberculin tests were performed on 132 breeding boars at AI stations, all were negative. Samples from threre pigs and one dog were analyzed for the presence of *Mycobacterium* species. All were negative.

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

Relevance of the findings in animals to findings in foodstuffs and to human cases
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). Also regarding *Brucella melitensis*, Norway fulfils the requirements for an officially free status for the disease in sheep and goats, however, a formal decision has not been adopted. 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 with an epidemiological link to a laboratory confirmed case OR laboratory confirmation of Brucella sp in clinical material by isolation or direct detection by immunofluorescence or Brucella serology (IgM or IgG seroconversion, significant antibody increase in paired serum samples or elevated antibody level in single serum sample).

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, and mainly sporadic imported cases are reported (0-3 cases annually). During the period 1978-2012, only 32 cases of brucellosis were reported, mostly infections acquired in the middle east.

Results of the investigation
In 2012 four cases were reported. Three cases were infected abroad and one case had unknown place of infection.

National evaluation of the recent situation, the trends and sources of infection
Brucellosis is rarely recorded in Norway. Since 1978, only 32 cases have been recorded and only 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 warrants 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 2012, 22 herds were investigated in the surveillance programme (blood samples, aborted fetuses). A total of 468 bulls owned by one breeding company and 18 bulls from another company were tested for brucellosis. All samples were negative.

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

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

Table *Brucella* spp. in animals

	Source of information[1]	Sampling unit	Units tested	Total units positive for *Brucella* spp.
Cattle	Surveillance programme	Herd	22	0
	BC/NVI	Animal	486	0
	NVI	Animal	5	0
Sheep	Surveillance programme	Herd	479	0
breeding animals	NVI	Animal	91	0
	NVI	Animal	4	0
Goats	Surveillance programme	Herd	86	0
Pigs	BC	Animal	1095	0
Dogs	NVI	Animal	37	0
Alpacas	NVI	Animal	36	0
Polar fox	NVI	Animal	2	0
Reindeer	NVI	Animal	2	0
Llamas	NVI	Animal	5	0

[1] BC = Breeding Company, NVI=Norwegian Veterinary Institute (mainly tested in relation to export or import)

B. *Brucella melitensis* **in sheep and goats**

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 fulfils the requirements for an officially free status for the disease.

Monitoring system
Surveillance programme : Randomly selected sheep and goat herds are tested.
Imported sheep and 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 sheep and goats 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 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 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) is 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 or 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
Sheep: In 2012, in the surveillance programme, 13989 animals from 479 herds were tested for antibodies against *B. melitensis*. All were negative. All 91 rams tested for brucellosis were negative. A total of 4 animals tested in relation to import or trade were negative.
Goats: In 2012, in the surveillance programme, 2562 animals from 86 herds were tested for antibodies against *B. melitensis*. All were negative.

National evaluation of the recent situation, the trends and sources of infection
Ovine or 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 sheep or goats or foodstuffs from sheep or goats. The probability of contracting brucellosis from Norwegian animals or animal products of Norwegian origin is close to zero.

C. *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 latest edition of the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, 2.8.5 Swine.

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 2012, all 1095 investigated pigs belonging to a breeding company tested negative. Two 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.

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 50 and 150 notified cases per year.

Studies conducted during the 1980s revealed that a large proportion of Norwegian pigs were carriers of *Y. enterocolitica* serogroup O:3, and that the same variant frequently could be isolated from pig carcasses. In 1995-1996 a serological survey of all multiplier herds (n=66) belonging to the cooperative slaughterhouse organisation showed that 35.5% of the fattening pigs had antibodies against *Y. enterocolitica* O:3, and 80% of the herds had at least one pig (of 40 pigs tested per herd) with antibodies against *Y. enterocolitica* O:3. In 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% of the samples. This was lower than in a similar survey conducted in 1988-1989.

National evaluation of the recent situation, the trends and sources of infection
From 1994 to 1998, a reduction in the incidence of yersiniosis in humans was observed. 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 1988-1990 identified consumption of such products as an important risk factor in addition to consumption of untreated drinking water and a general preference for undercooked meat. In 2006 two smaller outbreaks of yersiniosis both linked to a traditional cold cuts pork product were reported.

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

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 clinically compatible case with an epidemiological link to a laboratory confirmed case OR a case in which *Y. enterocolitica* or *Y. pseudotuberculosis* has been isolated.

Diagnostic/analytical methods used
Bacteriology (isolation of *Yersinia* species) followed by voluntary confirmation (species identification and serotyping) at the National Reference Laboratory. Identification to serotype level is obtained by biochemical and serological/biotype analyses. Isolates are analysed for various pathogenicity markers and strains are differentiated by MLVA.

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

Results of the investigation
In 2012, a total of 43 cases of yersiniosis were reported (incidence rate 0.9 per 100 000). One case was caused by *Y.pseudotuberculosis*, and the rest were all caused by *Y. enterocolitica*. A total of 22 (51%) cases were domestic. No outbreak was reported.

National evaluation of the recent situation, the trends and sources of infection
Although the incidence of yersiniosis has decreased in recent years and the number of registered cases is moderate, the disease is still the fourth most commonly recorded foodborne zoonotic infection in Norway. Moreover, the majority of the cases have acquired the infection within Norway. The vast majority of cases are sporadic. The most common serogroup is O:3. The number of cases reported in 2012 is lower than what has been reported in the previous three years, between 50-60 cases.

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 work as long as they have 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 *Y. 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.

Results of the investigation
In 2012, one cattle, one goat and one dog were diagnosed with *Y. enterocolitica.* One sheep was diagnosed with *Y. pseudotuberculosis*.

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. *T. spiralis* and *T. pseudospiralis* were not found in these studies. *T. nativa* is the most commonly found species in Norwegian foxes. Trichinellosis has also been diagnosed in farmed foxes. Human trichinellosis acquired in Norway has not been reported since 1980. The two last reported cases of human trichinellosis, in 1996, were both imported.

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

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
As 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 with an epidemiological link to a laboratory confirmed case OR a case in which *Trichinella* larvae has been demonstrated in muscle biopsy OR by *Trichinella*-specific antibody response.

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

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

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

Results of the investigation
In 2012, 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 the production is intensive and takes place under 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 and horses

Monitoring system
All pigs and horses are controlled for *Trichinella* at slaughter according to Regulation (EC) No 2075/2005.

Frequency of the sampling
Every slaughtered animal is sampled.

Type of specimen taken
Pigs: Diaphragm muscle.
Horses: Tongue or masseter muscle.

Methods of sampling (description of sampling techniques)
Methods used are according to Regulation (EC) No 2075/2005.
Pigs: Up to 100 samples, each of 1 gram, can be analysed as a pooled sample.
Horses: 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.

Preventive measures in place
It is prohibited to feed pigs with swills. Most pig herds have implemented programs for combating of rodents (rats and mice).

Control program/mechanisms
All pigs must be controlled for *Trichinella* at slaughter according to Regulation (EC) No 2075/2005.

Measures in case of the positive findings or single cases
Detection of *Trichinella* must be reported immediately. In accordance with Regulation No 732 of 27 June 2002 on measures against contagious animal diseases, measures, such as movement restrictions and investigations into the source of the disease and any spread, are imposed on holdings with positive findings of *Trichinella*.

Farms delivering positive carcasses will be identified. Animals from such farms will be given special attention at slaughter the following six months. The sample size for the digestion method will be increased to 2 grams.

Notification system in place
Trichinellosis has been a notifiable disease (List B) since 1965.

Results of the investigation
In 2012, no cases of trichinellosis among slaughtered pigs or horses 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. There have not been any findings of *Trichinella* in horses or horse meat. The risk of obtaining trichinellosis from Norwegian pig or horse meat is negligible.

B. *Trichinella* **spp. in wild animals**

Monitoring system
All wild boars and bears must be controlled for *Trichinella* at slaughter according to Regulation (EC) No 2075/2005. This control is compulsory. Wild and farmed foxes and other species of wildlife are occasionally sampled.

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

Type of specimen taken
Diaphragm, tongue, masseter or occasionally other muscles.

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

Case definition
An animal with a positive test result.

Diagnostic/analytical methods used
Digestion methods.

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 and epidemiological investigation of the source and any spread of the infection).

Notification system in place
Trichinellosis has been a notifiable disease since 1965.

Results of the investigation
In 2012, one marten (*Martes martes*) and one wild boar were examined for *Trichinella* sp., both were 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 semi-domesticated reindeer in North Norway until the 1950s (approx. 10% prevalence in the 1950s). Today the parasite has virtually been eliminated as a result of systematic antihelmintic treatment of herder dogs and a reduction in the feeding of raw offal from slaughter to the herder dogs. In 2003, one reindeer had pathological findings compatible with *E. granulosus* infestation. *E. granulosus* was last reported in cattle in 1987.

E. multilocularis has never been detected in mainland Norway in any animal species. In 1999, a research project on echinococcosis in the archipelago of Svalbard detected *E. multilocularis* cysts in the liver of 16% of 172 sibling voles tested. In a follow-up study, faecal samples from polar foxes, dogs, and cats were collected. The parasite was diagnosed in three of six polar foxes, in one of 48 dogs, but not in the two cats that were examined. The methods used were coproantigen ELISA, egg isolation and PCR. The number of voles from Svalbard that annually tested positive between 2000-2006, varied between 19% and 96%. In mainland Norway in the period 2002-2005, a total of 314 red foxes were investigated using coproantigen ELISA, egg isolation and PCR, all were negative for *E. multilocularis*. An ongoing national surveillance program for *E. multilocularis* was implemented in red foxes in 2006. Since 2002, 2780 foxes have been examined using egg isolation and PCR. All of the foxes have tested negative for *E. multilocularis*.

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

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

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 awareness in the reindeer industry.

As *E. multilocularis* has never been detected in mainland Norway in any animal species, the risk to humans of contracting *E. multilocularis* infection in mainland Norway is probably very low, even if *E. multilocularis* was detected in foxes in Sweden for the first time in 2011. The occurrence of *E. multilocularis* among animals in the archipelago of Svalbard requires alertness among health personnel 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. The surveillance system does not follow individual patients over time to record further disease development and final outcome.

Case definition
A case that is laboratory confirmed by typical histopathoglogical, parasitological finding (e.g. demonstration of protoscolex by microscopy of 'cyst fluid') consistent with *Echinococcus multilocularis* or *granulosus* OR *E. granulosis* 'pathognomonic macroscopic morphology' in surgical material OR *Echinococcus spp*. serology OR *E. mulitilocularis* or *granulosis* nucleic acid detection.

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 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. The majority of cases have acquired the infection abroad.

Results of the investigation
In 2012, one case of infection with *E. granulosus* and one with *E.* ina. was reported. One patient was infected abroad and the other had unknown place of infection.

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 present and that this requires awareness in the reindeer industry, 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 presence of *E. multilocularis* among animals in the archipelago of Svalbard requires vigilance amongst health personnel 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 subject to meat inspection procedure according to Regulation (EC) No 2075/2005. An exception to this is wild ruminants in which there is no obligatory control if they are shot for private consumption.

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 and parasitology.

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 anthelmintic drug the last ten days before entering Norway and again within one week after arrival. Treatment with an anthelmintic 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 2012, 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: Egg isolation (flotation) and PCR.

B. *E. multilocularis* **in animals**

Monitoring system
In 2006 a National surveillance programme regarding *E. multilocularis* in red foxes was started. The program also included the examination of samples from hunted foxes collected for parasitological research purposes in the period 2002-2005. There are no official monitoring programmes for *E. multilocularis* in other animals.

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

Case definition
An animal with a positive test result.

Diagnostic/analytical methods used
Faecal samples: Taeniid egg isolation and multiplex PCR techniques.

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

Recent actions taken to control the zoonoses
The surveillance programme for red foxes was intensified, especially in areas close to the Swedish border, after the findings in Sweden in 2011. The findings of *E. multilocularis* in the archipelago of Svalbard in 1999 resulted in follow-up studies, requirements regarding anti-helmintic treatment of dogs and cats in regard to export, and an information campaign directed to the inhabitants of Svalbard.

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

Results of the investigation
In 2012, in the surveillance programme for red foxes, a total of 614 animals hunted in the hunting season 2011-2012 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. The main host of *E. multilocularis*, the red fox, has been investigated by examining a total of 2780 foxes killed during hunting from 2002-2012. All foxes have been negative. Thus, there are so far no indications that this parasite has established in Norway. 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 one dog. Of the 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. In 2008, a survey using goat sera collected in the period 2002-2008 were tested. A total of 18.5% of the animals were positive. Also wild ruminants (cervids) can be infected; a survey carried out among 4300 cervids killed during hunting in 1992-2000, revealed 34% seropositive roe deer, 13% seropositive moose, 8% seropositive red deer and 1% seropositive reindeer.

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

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
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 are not reported to the Norwegian Surveillance System for Communicable Diseases (MSIS).

Case definition
A clinically compatible case that is laboratory confirmed.

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

Notification system in place
Since 1995, human toxoplasmosis has not been a notifiable disease in Norway.

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

Results of the investigation
The disease is not notifiable.

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 or specific surveys.

Case definition
An animal with a positive test result.

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

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 2012, several animal species were investigated for *Toxoplasma* at the Norwegian Veterinary Institute. A total of 48 sheep, one goat, one cattle, three dogs, one cat, two hares and one rabbit were investigated as part of clinical investigations. Thirteen sheep, one goat and two hares were positive. In addition, 50 sheep and three cats were investigated by serology. A total of 26 sheep were positive.

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

Relevance of the findings in animals to findings in foodstuffs and to human cases
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. An epidemic occurred in the arctic fox population in the archipelago of Svalbard in 1980, with confirmed cases also in reindeer and one seal. Since then, sporadic cases occurred in arctic foxes, the last case in 1999. During the period 1980 – 2010, 25 animal cases were diagnosed. In 2011 and 2012 an outbreak of rabies occurred in the Svalbard area in both reindeers and arctic foxes. 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 favourable situation in mainland Norway regarding rabies has not changed. However, there are concerns about the risk of introducing rabies with illegally imported dogs from endemic countries. The reintroduction of rabies into the Svalbard area warrants intensified passive surveillance of the wildlife population. The general public in this area are informed through campaigns and mass vaccination has aslo been implemented.

Relevance of the findings in animals, feedingstuffs and foodstuffs to human cases
Rabies occur sporadically in wild animals in the archipelago of Svalbard. 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 and vaccination is reccomended. In mainland Norway, the possible introduction of rabies with illegally imported animals is a concern.

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 clinically compatible case OR laboratory confirmation of Lyssa virus by isolation, antigen tests or nucleic acid detection OR identification of a Lyssa virus antibody titre in serum or cerebrospinal fluid from an unvaccinated person.

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 2012, 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, and an outbreak affecting foxes and reindeer occurred in 2011 and 2012. A mass vaccination campaign among the inhabitants of Svalbard was initiated because of this outbreak.. Although no transmission of rabies to humans has been recorded in Svalbard, the outbreak underlined that people being in contact with wild animals in Svalbard should be aware of the risk and vaccination of this group is recommended.

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 isno active surveillance programme 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
The Fluorescent antibody test (FAT) is the OIE prescribed test for rabiesvirus antigen and is performed according to the OIE Terrestrial Manual 2010. In addition, molecular methods (real time RT-PCR, RT-PCR and gene sequencing) are used.

Vaccination policy
Vaccines containing inactivated rabies virus antigen are available for dog, cat and ferret. Vaccination is required for international transport of these animal species in compliance with national regulations. For dogs living in Svalbard vaccination is a mandatory requirement. Otherwise, vaccination against rabies is not done on a routine basis in mainland Norway.

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

Control program/mechanisms
There is no longer quarantine requirements for pets from not listed third countries. What is needed in addition to microchip, healt certificate and tapeworm treatment is rabies vaccine and blood sample for control of antibodies after 30 days (and wait 90 days after the blood-testing before entering Norway). However, dogs, cats and ferrets from EU, EEA countries and listed third countries are permitted into Norway without bloodsample, provided they have been vaccinated agains rabies. Dogs coming from Sweeden do not need to be vaccinated.

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

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

Results of the investigation
In 2012 no cases were reported. No dogs were investigated. One cat was investigated due to suspicion but was found negative.

National evaluation of the recent situation, the trends and sources of infection
Mainland Norway is recognized as rabies free. However, there are concerns regarding a possible increase in the number of illegally imported dogs. Rabies was in 2011 and 2012 found again among wild animals in the archipelago of Svalbard, the first time since 1999. Although no transmission of rabies to dogs has been recorded in Svalbard, owners must respect and follow up the mandatory vaccination programme.

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. In Svalbard, dead foxes and other animals should be secured for laboratory examination.

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

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

Case definition
A case that is laboratory confirmed.

Diagnostic/analytical methods used
The Fluorescent antibody test (FAT) is the OIE prescribed test for rabiesvirus antigen and is performed according to the OIE terrestrial Manual 2010. In addition, molecular methods (real time RT_PCR, RT-PCR and gene sequencing) are 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 movement, import and export of certain animals [FOR 2004-07-01 No 1105 and FOR 2004-02-20 No 464].

Results of the investigation
In 2012, one red fox from the mainland Norway was investigated and found negative. From the Svalbard area, five reindeer, and 119 arctic foxes (*Vulpes lagopus*) were investigated. One polar fox was found positive.

National evaluation of the recent situation, the trends and sources of infection
Mainland Norway is considered rabies free. Rabies was in 2011 and 2012 found in wild animals in the archipelago of Svalbard, the first time since 1999. People in Svalbard are informed about the risk. There is a continuous passive surveillance in the Svalbard area.

Q-fever

General evaluation of the national situation

History of the disease and/or infection in the country
Q-fever has not been diagnosed in animals in Norway. In a survey in 2008, bulk milk samples from 460 dairy herds and 550 blood samples from 55 suckling cattle herds were sampled in six cattle dense counties (Rogaland, Sør-Trøndelag, Nord-Trøndelag, Hedmark, Oppland and Østfold). In surveys performed in 2009, samples from 349 goat herds (mainly bulk milk samples), samples from 121 sheep herds and 45 cattle herds were tested. In a survey in 2010, a total of 3289 herds (bulk milk samples) were tested. All samples were negative.

National evaluation of the recent situation, the trends and sources of infection
C. burnetii has never been detected in animals in Norway.

C. burnetii in animals

Sampling strategy
Surveys are performed occasionally.

Case definition
Sample positive for antibodies against *C. burnetii.*

Diagnostic/analytical methods used
Detection of antibodies to *C. burnetii* in milk or serum by ELISA.

Results of the investigation
In 2012, a total of 55 cattle (of these 4 regarding export control) , 25 sheep, 19 swine (from a breeding company – export control), 60 alpacas (import control) and 10 llamas (import control) were tested for Q-fever. All samples were negative.

Information on specific indicators of antimicrobial resistance

Escherichia coli *and* Enterococcus *spp., non-pathogenic*

National evaluation of the recent situation, the trends and sources of infection
Data from the monitoring programme NORM-VET indicate a low to moderate prevalence of resistance in indicator *E. coli* and *Enterococcus* spp. 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. Fluoroquinolone resistance is rarely detected, which is a reflection of a very low use of such antimicrobials in food producing animals in Norway.

Sampling strategy used in monitoring
The sampling of animals for isolation of indicator bacteria 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.

Type of specimen taken
Faecal material or food samples.

Methods of sampling (description of sampling techniques)
The samples were taken as part of different surveillance programmes.

Procedures for the selection of isolates for antimicrobial testing
Only one isolate from each herd, flock, batch is included.

Methods used for collecting data
Identification and antimicrobial susceptibility testing is peformed at the Norwegian Veterinary Institute.

Laboratory methodology used for identification of the microbial isolates
E. coli: Sample material is plated directly onto the surface of lactose-bromthymol blue agar without broth enrichment and incubated at 37°C for 24 h. Typical colonies are plated onto blood agar (Heart infusion agar (Difco) containing 5% bovine blood) and incubated at 35-37°C for 24 h. Colonies are identified as *E. coli* by typical appearance, lactose fermentation, a positive indole reaction and negative citrate and oxidase reactions.
Enterococcus spp.: Sample material is plated onto the surface of Slanetz & Bartley agar (Oxoid) with 32 mg/L vancomycin and incubated at 44°C for 48 h. Colonies from each positive sample are selected, and the isolates confirmed as *Enterococcus* spp. by phenotypic characterization. The isolates are further identified to the 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) is used for the susceptibility testing of all isolates. The antimicrobials included are listed in the tables.

Cut-off values used in testing
For interpretation of results epidemiological cut-off values recommended by EFSA are applied. When no cut-off value is recommended, a cut-off value is defined on basis of the actual MIC distributions obtained in the NORM-VET programme.

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. In 2012, only *E. coli* were included. Quantitative data as well as data on breakpoints and range of testing are presented in the NORM/NORM-VET 2012 report.

Table Antimicrobial susceptibility testing of *E. coli* from broiler meat, broiler breeders and wild reindeer.

	Broiler meat	Broiler breeders	Wild reindeer
Number of isolates tested	197	113	107
Percentage of isolates resistant to			
Tetracycline	3.0	5.3	2.8
Chloramphenicol	0.0	0.0	0.0
Cefotaxime	0.5	0.9	0.9
Nalidixic acid	2.0	0.9	0.0
Sulfamethoxazole	8.1	8.8	2.8
Trimethoprim	3.0	4.4	0.0
Streptomycin	3.0	1.8	6.5
Gentamicin	0.0	0.0	2.8
Ampicillin	6.1	15.0	1.9

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. Surveys are performed occasionally.

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

Diagnostic/analytical methods used
Reverse phase HPLC/UV

Table Histamine in foodstuffs

	Source of information	Sampling unit	Sample weight	Units tested	Total units in non-conformity	<=100 mg/kg	>100 - <=200 mg/kg	>200 - <=400 mg/kg	>400 mg/kg
Fishery products from species associated with a high amount of histidine	NIFES	single	5 g	52	1	0	0	0	1*
Fish – farmed - salmon	NIFES	single	5 g	3	0				

* Positive sample: Imported tuna - histamine concentration 5800 mg/kg

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. Vesuv came in a new version i 2010.

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 increased in Norway the first years afterthe web-based reporting system was established in 2005 (42 in 2005, 65 in 2006 and 80 in 2007). We believe that this increasing trend was due to a higher reporting frequency rather than a real higher number of outbreaks. The number of reported outbreaks decreased again in 2008 (71) and 2009 (53) and was stable in 2010 (50), 2011 (49) and 2012 (44).

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 and imported food items 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 2012, no severe outbreak was reported. No deaths were related to foodborne outbreaks.

Descriptions of single outbreaks of special interest
In December 2012 a large outbreak of gastroenteritis was investigated following a Christmas buffet in a hotel. Around 300 persons were sick. Illness was associated with consumption of scrambled eggs. Chives were the suspected ingredient and were added to the eggs just before serving. This fresh herb was imported but not available for testing. After extensive testing for routine gastrointestinal pathogens, Enterotoxigenic *Escherichia coli* (ETEC), was confirmed in 40 hotel guests.

Table
Reported foodborne outbreaks in Norway 2012 – summarized data

Agent	Total number of outbreaks (verified outbreaks)	Human cases	Implicated food in verified outbreaks
Foodborne viruses	13 (1)	404	Oysters
Campylobacter spp.	2	5	
Clostridium perfringens	2 (1)	81	Beef stew
Salmonella spp.	4	25	
Enterotoxigenic *E. coli* (ETEC)	1 (1)	300	Chives
Other agents[1]	4	28	
Unknown	18	199	

[1]Histamine, *Bacillus cereus*, *Listeria monocytogenes* , copper.