NORWAY

TRENDS AND SOURCES OF ZOONOSES AND ZOONOTIC AGENTS IN HUMANS, FOODSTUFFS ANIMALS AND FEEDINGSTUFF
- including information on foodborne outbreaks and antimicrobial resistance in zoonotic agents in 2006

Annual report according to Council Directive 2003/99/EC

Norway

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Information on the reporting and monitoring system

Country: Norway
Reporting Year: 2006

Institutions and laboratories involved in reporting and monitoring:

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

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

The 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. See the report: Surveillance of Communicable Diseases and Nosocomial Infections in Norway 2006: http://www.fhi.no/dav/d652bc9f9d.pdf
Contributing with data and text.

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

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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).

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

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

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

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

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

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

List of contents

Animal populations

The relevance of the findings on zoonoses and zoonotic agents has to be related to the size and nature of the animal population in the country.

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

Dates the figures relate to and the content of the figures:
Data on herds and animals: As of 31 July 2006.
Data on slaughtered animals: Slaughtered in 2006.

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

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

Geographical distribution and size distribution of the herds, flocks and holdings
Cattle: Most of the cattle herds are dairy herds, the average herd size being 17.6 cows. There are also a number of specialized beef herds with an average number of suckling cows being 11.0. A few herds are combined dairy and beef herds. The cattle herds are distributed throughout Norway with the main part being in the western and middle parts of Norway.

Swine: The Norwegian swine population is relatively small with products destined for the national market. A national breeding program is organized by the industry. Approximately 160 approved elite and multiplier breeding heards house 5% of the live sows in the population, while more than 95% of the sows purchased on the national market are raised in these herds. The swine population is denser in some counties and about 50% of the swine production is concentrated in four counties in the southern and middle part of Norway.

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

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

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

Additional information
The livestock production in Norway is targeted for the national market. Until 1994 there was a general ban on the import of live animals and animal products to Norway. As a consequence of the European Economic Area (EEA) agreement which came into force in 1994, the general ban on the import of these animals and animal products to Norway was lifted. But the import of live animals since 1994 has been very restricted. In 2006, eight live cattle, one live swine, 71 live sheep and 20 live goats were imported. Regarding poultry, grandparents are imported day old, mainly from Sweden.

Table Susceptible animal population

	Number of holdings[4, 5]	Livestock numbers (live animals)[5]	Number of slaughtered animals[5]
Cattle			
Mixed herds	1 300	33 300	
Dairy cows and heifers	13 500	233 700	
Meat production animals	4 100	50 800	
In total	20 500	918 200	332 100
Deer[1]	62	2 000	1 300
Gallus gallus (fowl)			
Laying hens[2]	740	3 235 800	1 764 300
Broilers	520		49 167 500
Goats			
Milk goats	510	42 500	
In total	1 300	72 100	21 100
Pigs			
Breeding animals	1 800	62 200	
Fattening pigs	2 700	432 000	
In total	3 000	813 800	1 527 500
Sheep			
Animals over 1 years	15 800	894 100	
In total	16 000	2 334 200	1 211 300
Horses			1 600
Turkeys[3]	51	250 400	1 025 200

[1] Data on holdings and animals are from the Norwegian Red Deer Centre in 2005, data on slaughtered animals are from the Norwegian Food Safety Authority.
[2] Only flocks >250 birds, except for slaughtered animals.
[3] Numbers includes small amounts of ducks and geese. Data includes only flocks >25 birds, except for slaughtered animals.
[4] For poultry the numbers are reported either as number of holdings or number of flocks.
[5] Numbers >100 are rounded to the nearest ten, numbers >1000 are rounded to the nearest hundred.

Salmonellosis

General evaluation of the national situation

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

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

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

Salmonellosis in humans

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

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

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

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

History of the disease and/or infection in the country
The recorded incidence of salmonellosis in Norway has increased during the last three decades with a sharp rise in the early 1980s due to the emergence of S. Enteritidis. In the majority of cases of salmonellosis (approximately 80%), the patients have acquired the disease abroad. The number of reported cases of salmonellosis corresponds well with charter tourism to foreign countries; in years with an increased charter tourism, such as in the mid 1980s and in the period 1992-1998, the incidence of salmonellosis also increased, whereas in years with a lower charter tourism activity due to economical depression, such as in the period 1988-1991, the incidence of salmonellosis dropped. Since 1998, the incidence of salmonellosis has leveled off. However, an increase was noted during 2001, mostly due to a few large outbreaks.
Since 1984, S. Enteritidis has become the most common serovar reported, except in 1987 when it was surpassed by S. Typhimurium due to a domestic outbreak traced to contaminated chocolate bars. While

S. Typhimurium predominated in earlier years, *S.* Enteritidis has increased substantially from a low level in 19751982 to a higher level from the mid1990s. No increase of similar magnitude has been observed for any other serovar.
The proportion of imported cases of *S.* Enteritidis infections is particularly high (approximately 90% among patients with known place of acquisition) as this pathogen does not occur in Norwegian poultry production. Among domestic cases, *S.* Typhimurium is the most common serovar. This serovar, although not established among food animals in Norway, does occur in the Norwegian environment such as in wild birds and hedgehogs.

Results of the investigation
In 2006, a total of 1813 cases of salmonellosis were reported (incidence rate 39.4 per 100 000), of which 384 (21%) were infected in Norway. Altogether 895 (49%) of the cases were due to *S.* Enteritidis, of which 85 (9%) were infected in Norway, while 295 (16%) of the cases were due to *S.* Typhimurium, of which 135 (46%) were infected in Norway. The outbreaks are described in the chapter on foodborne outbreaks.

National evaluation of the recent situation, the trends and sources of infection
The overall situation seems to have been quite stable the last five years. The number of reported cases infected in Norway in 2006 was the highest since 1987, this can mainly be ascribed to one large outbreak caused by *S.* Kedougou. There has been an increase in the incidence of multiresistant *S.* Typhimurium DT104 infection acquired in Norway the last few years. In 2006 a total number of 18 domestic cases and 21 imported cases were reported. This is a reduction compared with 2005 (27 domestic and 26 imported). Domestic outbreaks of salmonellosis recorded in recent years illustrate that many kinds of foods may be involved in outbreaks, also those of nonanimal origin, including imported foods.

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

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

Table Cases of salmonellosis according to place of infection

Serovar	Place of infection					
	Norway		Abroad		Unknown	Total
S. Enteritidis	85	22%	779	58%	31	895
S. Typhimurium	135	35%	145	11%	15	295
DT 104	18		21		2	41
S. Stanley	13	3%	81	6%	3	97
S. Kedougou	60	16%	3	0%	14	77
S. Virchow	2	1%	29	2%	1	32
S. Agona	9	2%	21	2%		30
S. Java	6	2%	15	1%	1	22
S. Heidelberg	6	2%	15	1%		21
S. Newport	3	1%	16	1%	1	20
S. Saintpaul	3	1%	11	1%	2	16
Others	62	15%	225	16%	21	308
Total	**384**	**100%**	**1340**	**100%**	**89**	**1813**

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 *Gallus gallus* - breeding flocks for egg production and flocks of laying hens.

B. *Salmonella* spp. in broiler meat and products thereof

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

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

Type of specimen taken
At slaughterhouse: Neck skin. *At cutting plant:* Crushed meat from equipment or trimmings.

Methods of sampling (description of sampling techniques)
At slaughterhouse: All slaughter batches of poultry are sampled by taking neck skin at the end of the slaughter line. *At cutting plant:* Each sample consists of 25 grams of meat.

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.
When *Salmonella* is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed, and investigation into the source of the contamination initiated if relevant. If *Salmonella* is detected in food controls at the Border Inspection Posts, the consignments will be either rejected or destroyed.

Results of the investigation
One out of 5420 neck skin samples from poultry was found positive (*S.* Anatum). The positive sample was a pooled sample with neck skins from three different broiler flocks. None of the crushed meat samples taken at meat production facilities were positive.
For details, see tables.

National evaluation of the recent situation, the trends and sources of infection
The Norwegian *Salmonella* Control Programmes document that domestically produced food products of animal origin are virtually free from *Salmonella*. The surveillance data indicate that the overall prevalence is below 0.1%.

Relevance of the findings in animals to findings in foodstuffs and to human cases
Red and white meat produced in Norway is virtually free from *Salmonella*, and the risk of contracting *Salmonella* from domestically produced animal products is small.

C. *Salmonella* spp. in turkey meat and products thereof

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

Frequency of the sampling
At slaughterhouse: Every batch is sampled.
At cutting plant: Production less than 2 tons; twice a year. Production 220 tons; once a month. Production greater than 20 tons; once a week.

Type of specimen taken
At slaughterhouse: Neck skin. *At cutting plant:* Crushed meat from equipment or from trimmings.

Methods of sampling (description of sampling techniques)
At slaughterhouse: All slaughter batches of poultry are sampled by taking neck skin at the end of the slaughter line. *At cutting plant:* Each sample consists of 25 grams of meat.

Definition of positive finding
A positive sample is a sample from where *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.
When *Salmonella* is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed, and investigation into the source of the contamination initiated if relevant. If *Salmonella* is detected in food controls at the Border Inspection Posts, the consignments will be either rejected or destroyed.

Results of the investigation
No neck skins from turkey were found positive for *Salmonella*. None of the crushed meat samples taken at meat production facilities were positive.
For details, see tables.

National evaluation of the recent situation, the trends and sources of infection
The Norwegian *Salmonella* Control Programme document that domestically produced food products of animal origin is virtually free from *Salmonella*. The surveillance data indicate that the overall prevalence is below 0.1%.

Relevance of the findings in animals to findings in foodstuffs and to human cases
Red and white meat produced in Norway is virtually free from *Salmonella*, and the risk of contracting *Salmonella* from domestically produced animal products is small.

D. *Salmonella* spp. in pig meat and products thereof

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

Frequency of the sampling
At slaughterhouse: 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, 220 tons; once a month, greater than 20 tons; once a week.
At meat processing plant: Samples are taken according to Council Directive 94/65/EC.

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

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

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.
When *Salmonella* is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed, and investigation into the source of the contamination initiated if relevant. If *Salmonella* is detected in food controls at the Border Inspection Posts, the consignments will be either rejected or destroyed.

Results of the investigation
A total of 3122 carcasses were swabbed, and none were positive. One of the crushed pig meat samples taken at meat production facilities was positive (S. Dublin).
For details, see tables.

National evaluation of the recent situation, the trends and sources of infection
The Norwegian *Salmonella* Control Programmes document that domestically produced food products of animal origin are virtually free from *Salmonella*. The surveillance data indicate that the overall prevalence is below 0.1%.

Relevance of the findings in animals to findings in foodstuffs and to human cases
Red and white meat produced in Norway is virtually free from *Salmonella*, and the risk of contracting *Salmonella* from domestically produced animal products is small.

E. *Salmonella* spp. in bovine meat and products thereof

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

Frequency of the sampling
At slaughterhouse: 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, 220 tons; once a month, greater than 20 tons; once a week.
At meat processing plant: Samples are taken according to Council Directive 94/65/EC.

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

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

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.
When *Salmonella* is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed, and investigation into the source of the contamination initiated if relevant. If *Salmonella* is detected in food controls at the Border Inspection Posts, the consignments will be either rejected or destroyed.

Results of the investigation
A total of 2035 carcasses were swabbed, all were negative.
The samples of crushed bovine meat samples taken at meat production facilities were negative.
For details, see tables.

National evaluation of the recent situation, the trends and sources of infection
The Norwegian *Salmonella* Control Programmes document that domestically produced food products of animal origin are virtually free from *Salmonella*. The surveillance data indicate that the overall prevalence is below 0.1%.

Relevance of the findings in animals to findings in foodstuffs and to human cases
Red and white meat produced in Norway is virtually free from *Salmonella*, and the risk of contracting *Salmonella* from domestically produced animal products is small.

F. *Salmonella* spp. in meat from sheep

Monitoring system
At slaughterhouse and cutting plant: The Norwegian *Salmonella* Control Programme. A number of samples each year is collected randomly from the sheep population at slaughterhouse according to the slaughter volume. Samples of crushed meat are each year collected according to production capacity of cutting plants.
At meat processing plant: Samples are taken according to Council Directive 94/65/EC.

Frequency of the sampling
At slaughterhouse: Detection of an annual prevalence of 0.1% by 95% confidence level.
At cutting plant: According to production capacity; less than 2 tons; twice a year, 220 tons; once a month, greater than 20 tons; once a week.
At meat processing plant: Samples are taken according to Council Directive 94/65/EC.

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

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

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

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

Control program/mechanisms/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.
When *Salmonella* is detected in food already on the market, contaminated food will be withdrawn from the market and destroyed, and investigation into the source of the contamination initiated if relevant. If *Salmonella* is detected in food controls at the Border Inspection Posts, the consignments will be either rejected or destroyed.

Results of the investigation
A total of 2538 carcasses were swabbed, and one was positive (*S.* diarizonae). The samples of crushed sheep meat samples taken at meat production facilities were negative.
For details, see tables.

National evaluation of the recent situation, the trends and sources of infection
The Norwegian *Salmonella* Control Programmes document that domestically produced food products of animal origin are virtually free from *Salmonella*. The surveillance data indicate that the overall prevalence is below 0.1%.

Table *Salmonella* in foodstuffs

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for *Salmonella* spp.	*S.* Anatum	*S. diarizonae* (61:k:1,5,7)	*S.* Dublin
Meat from poultry								
At slaughterhouse – neck skin[1]	NSCP[3]	batch	>10 g	5420	1	1		
At cutting plant – crushed meat	NSCP	single	25g	170	0			
Meat from pig								
At slaughterhouse – carcass swabs	NSCP	animal	swab	3122	0			
Meat from bovine animals								
At slaughterhouse – carcass swabs	NSCP	animal	swab	2035	0			
Meat from sheep								
At slaughterhouse – carcass swabs	NSCP	animal	swab	2538	1		1	
Meat, red meat								
At cutting plant – crushed meat[2]	NSCP	single	25g	1235	1			1
Live bivalve molluscs	NIFES	single	25g	45	0			

[1] The majority of samples are from broiler flocks. S. Anatum was isolated from one pooled sample consisting of neck skins from three broiler flocks.
[2] Crushed meat from cattle, pigs and sheep. The positive sample was crushed pig meat.
[3] NSCP = Norwegian *Salmonella* Control Programme

Salmonella in animals

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

Monitoring system
Breeding flocks
The Norwegian *Salmonella* Control Programmes include all poultry breeding flocks. Sampling of breeding flocks of Gallus gallus is carried out in accordance with the programme laid down in Annex III of Council Directive 92/117/EEC. The Norwegian Food Safety Authority is responsible for the sampling. *Other strategies:* Animals are tested in relation to clinical surveillance and import.
Laying hens flocks
The Norwegian Salmonella *Control Programme:* All laying hen flocks are tested at farm and at slaughter. *Other strategies:* Animals are tested in relation to clinical surveillance and import.

Frequency of the sampling
Breeding flocks
Day-old chicks: Every flock is sampled
Rearing period, Grandparents: At the age of 1-2, 4, 9-11 and 13-14 weeks.
Rearing period, Parents: At the age of 4 weeks and 2 weeks before transfer.
Production period, Grandparents: At hatchery: Every 2 weeks, At farm: Every 4 weeks.
Production period, Parents: At hatchery: Every 2 weeks.
Laying hens
Rearing period: At the age of 4 weeks and 2 weeks before transfer.
Production period: At the age of 25-30 and 48-52 weeks.
Before slaughter at farm: Every flock is sampled
At slaughter: Every flock is sampled

Type of specimen taken
Breeding flocks
Day-old chicks: Internal linings of delivery boxes
Rearing period: Faeces
Production period: At hatchery: Internal linings of hatching baskets.
At farm: Faeces.
Laying hens
Rearing period: Faeces
Production period: Faeces
Before slaughter at farm: Faeces
At slaughter: Neck skin

Methods of sampling (description of sampling techniques)
Breeding flocks
Day-old chicks: 30 internal lining of delivery boxes are sampled and pooled 5 and 5 in the laboratory. In some instances dead chickens is sampled, and the caecae from 10 birds are pooled to one sample.
Rearing period: 60 faecal samples are pooled to one sample.
Production period: At hatchery: Meconium from at least 250 birds from the internal linings of hatching baskets is pooled to one sample. At farm: 60 faecal samples are pooled to one sample.
Laying hens
Rearing period: 60 faecal samples are pooled to one sample.
Production period: 60 faecal samples are pooled to one sample.
Before slaughter at farm: 60 faecal samples are pooled to one sample.
At slaughter: At least one neck skin sample from each flock is sampled.

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: 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, is notifiable.

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

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

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

B. *Salmonella* spp. in *Gallus gallus* - Breeding flocks for meat production and broiler flocks

Monitoring system
Breeding flocks
The Norwegian *Salmonella* Control Programmes include all poultry breeding flocks. Sampling of breeding flocks of Gallus gallus is carried out in accordance with the programme laid down in Annex III of Council Directive 92/117/EEC. The Norwegian Food Safety Authority is responsible for the sampling. *Other strategies:* Animals are tested in relation to clinical surveillance and import.
Broiler flocks
The Norwegian Salmonella Control Programmes: All broiler flocks are tested at slaughter.
The baseline survey in broilers (Commission Decision 2005/636/EC) was performed according to instructions.

Frequency of the sampling
Breeding flocks
Day-old chicks: Every flock is sampled
Rearing period, Grandparents: At the age of 1-2, 4, 9-11 and 13-14 weeks.
Rearing period, Parents: At the age of 4 weeks and 2 weeks before transfer.
Production period, Grandparents: At hatchery: Every 2 weeks, At farm: Every 4 weeks.

Production period, Parents: At hatchery: Every 2 weeks.
Broiler flocks
Before slaughter at farm: Every flock is sampled
At slaughter (flock based approach): Every flock is sampled

Type of specimen taken
Breeding flocks
Day-old chicks: Internal linings of delivery boxes
Rearing period: Faeces
Production period: At hatchery: internal linings of hatching baskets. At farm: Faeces.
Broiler flocks
Before slaughter at farm: Faeces
At slaughter (flock based approach): Neck skin

Methods of sampling (description of sampling techniques)
Breeding flocks
Day-old chicks: 30 internal lining of delivery boxes are sampled and pooled 5 and 5 in the laboratory. In some instances dead chickens is sampled, and the caecae from 10 birds are pooled to one sample.
Rearing period: 60 faecal samples are pooled to one sample.
Production period: At hatchery: Meconium from at least 250 birds from the internal linings of hatching baskets is pooled to one sample. At farm: 60 faecal samples are pooled to one sample.
Broiler flocks
Before slaughter at farm: 60 faecal samples are pooled to one sample. Baseline study (Commission Decision 2005/636/EC): Sampled and analyzed according to instructions.
At slaughter (flock based approach): At least one neck skin sample from each flock is sampled.

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: 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, is notifiable.

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

Results of the investigation
None of the Norwegian breeding flocks or broiler flocks were positive.
At slaughter, one pooled neck skin sample was positive for *S.* Anatum (see text and table on *Salmonella* in foodstuffs).
Regarding the baseline study in broilers (Commission Decision 2005/636/EC), a total of 320 flocks were sampled (October 2005 September 2006). One flock was positive (*S.* Typhimurium). The isolate was phagetyped (protocol defined by Colindale), but was characterized as nontypable. The isolate was also typed by MLVA, and the profile has never been seen in Norway before (or after), neither in isolates from humans nor in isolates from nonhuman sources. The strain was multi resistant, but the resistance profile is not a common one in Norway.
For details, see table. In addition to the results presented above and in the tables, animals/flocks may have been sampled due to clinical problems, follow up or various projects. None of these samples have been positive.

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

C. *Salmonella* spp. in other poultry (Ducks, Geese and Turkeys)

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

Frequency of the sampling
See the description of the programme in *Gallus gallus*.

Type of specimen taken
See the description of the programme in *Gallus gallus*.

Methods of sampling (description of sampling techniques)
See the description of the programme in *Gallus gallus*.

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: 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. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding. Infected animals must be isolated from other animals. Whenever *Salmonella* is detected, epidemiological investigations also including the feed suppliers will be initiated in order to identify and eliminate the

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

Results of the investigation
None of the Norwegian breeder flocks were positive. None of the production flocks sampled in the Control Programme were positive on farm or at slaughter. In addition to the results presented above and in the tables, animals/flocks may have been sampled due to clinical problems, follow up or various projects. One back yard flock of ducks was found positive for *S.* Typhimurium when investigated as part of a follow up for another problem (in horses) at the farm. For details, see table.

National evaluation of the recent situation, the trends and sources of infection
The duck, geese and turkey population in Norway is small. A few times, positive flocks have been found, the last time *S.* Muenchen in a turkey flock in 1999. *S.* Enteritidis has never been detected in Norwegian poultry production.

Table *Salmonella* in poultry and other birds

	Source of information	Sampling unit	Units tested	Total units positive for *Salmonella* spp.	*S.* Typhimurium	*S.* spp., unspecified
***Gallus gallus* (fowl)**						
Grandparents, unspecified	NSCP[3]	holding	2	0		
Parents, unspecified	NSCP	holding	70	0		
Laying hens	NSCP	holding	641	0		
Broilers	NSCP	flock	4051	0		
Broilers – baseline survey[1]		flock	320	1	1	
Ducks						
Breeding flocks	NSCP	holding	2	0		
Meat production flocks	NSCP	flock	50	0		
Unspecified[2]	NVI	flock		1	1	
Turkeys						
Breeding flocks	NSCP	holding	3	0		
Meat production flocks	NSCP	flock	345	0		
Pigeons	NVI	animal	16	3	3	
Quails	NVI	animal	3	0		
Pheasants	NVI	animal	4	0		
Ostriches	NVI	animal	2	0		
Wild birds	NVI	animal	67	23	22	1

[1] The data covers the whole survey (October 2005 – September 2006).
[2] As a follow up of another problem, a flock of ducks was found positive for S. Typhimurium.
[3] NSCP = Norwegian *Salmonella* Control Programme

D. *Salmonella* spp. in pigs

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

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

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

Methods of sampling (description of sampling techniques)
Breeding herds: At lest 10 grams of faecal material is taken from single animals. From pens with growers/finisher pigs, pooled faecal samples of at least 50 grams are taken. The samples are sent to the laboratory the same day.
Fattening herds at slaughterhouse (herd based approach): From each carcass at least five ileocaecal lymph nodes will be aseptically removed and pooled in a plastic bag. All samples will be kept refrigerated during the period of sampling and sent to the laboratory the same day.

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

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

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

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

Measures in case of the positive findings or single cases
Whenever *Salmonella* is detected, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread. Also, slaughterhouses and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding.
Infected animals must be isolated from other animals. Animals are not allowed to be sent to slaughter without permission from the Food Safety Authority and if sent to slaughter, the slaughterhouse must be notified so that sanitation slaughtering can be conducted.
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
All of the 3484 lymph nodes taken in the Norwegian *Salmonella* Control Programme were negative. None of the 143 breeding herds were positive.
In addition to the results presented above and in the tables, animals/flocks may have been sampled due to clinical problems, follow up or various projects. None of these samples have been positive.

National evaluation of the recent situation, the trends and sources of infection
The Norwegian *Salmonella* Control Programmes document that Norwegian food producing animals are virtually free from *Salmonella*. The surveillance data indicate that the overall prevalence is below 0.1%.

E. *Salmonella* spp. in bovine animals

Monitoring system
The Norwegian Salmonella Control Programme: A number of samples each year are collected randomly from the cattle population at slaughterhouse according to the slaughter volume, both carcass swabs and lymph nodes. The sampling of lymph nodes is described in this chapter, the sampling of carcass swabs is described in the chapter on *Salmonella* in foodstuffs. *Other strategies:* Animals are tested in relation to clinical surveillance and import.

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

Type of specimen taken
Lymph nodes

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

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

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

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

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

Measures in case of the positive findings or single cases
Whenever *Salmonella* is detected, the competent authorities must be notified without delay. Actions will be taken to identify and eliminate the source of the contamination in order to prevent further spread. Also, slaughterhouses, dairies, and food production facilities receiving animals or animal products from an infected animal holding must be informed. Stringent restrictions including cleaning and disinfection, control of animal movement and control of person admission will be imposed on an infected animal holding.
Infected animals must be isolated from other animals. Animals are not allowed to be sent to slaughter without permission from the Food Safety Authority and if sent to slaughter, the slaughterhouse must be notified so that sanitation slaughtering can be conducted. Milk from infected herds must be pasteurised.

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

Results of the investigation
None of the 2317 animals tested in the Norwegian *Salmonella* Control Programme was positive. One herd of cattle was positive for S. Typhimurium.
In addition to the results presented above and in the tables, animals may have been sampled due to

National evaluation of the recent situation, the trends and sources of infection
The Norwegian *Salmonella* Control Programmes document that Norwegian food producing animals are virtually free from *Salmonella*. The surveillance data indicate that the overall prevalence is below 0.1%.

F. *Salmonella* spp. in other animals

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

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

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

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

Notification system in place
Detection of *Salmonella*, irrespective of serovar, has been notifiable since 1965.

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

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

Table *Salmonella* in animals other than birds

	Source of information	Sampling unit	Units tested	Total units positive for *Salmonella* spp.	*S.* Typhimurium	*S.* Montevideo	*S. diarizonae (61:(k):1,5,(7))*	*S.* spp., unspecified
Cattle								
At slaughterhouse, lymph nodes	NSCP[5]	animal	2317	0				
Clinical investigations[1]	NVI	animal	281	2	2			
Sheep								
Clinical investigations	NVI	herd	84	15			15	
Goats	NVI	herd	10	0				
Pigs								
Breeding animals – at farm	NSCP	herd	143	0				
Breeding animals – lymph nodes	NSCP	animal	1073	0				
Fattening pigs – lymph nodes	NSCP	animal	2411	0				
Clinical investigations	NVI	animal	105	0				
Solipeds, domestic[2]	NVI	holding	69	3	2			2
Cats	NVI	animal	41	1	1			
Dogs	NVI	animal	137	3	2	1		
Wild animals[3]	NVI	animal	7	1	1			
Zoo animals[4]	NVI	animal	39	13				13

[1] Both animals came from the same farm.
[2] Three holdings were positive: One with *S.* Kedougou and *S. diarizonae* (38:r:z), one with *S.* Typhimurium, and one with *S.* Typhimurium and *S.* Mikawasima.
[3] One positive fox.
[1] Samples from four different zoos. The isolated serotypes are: *S.* Poona (3), *S.* Tennessee (2), *S.* Glostrup, *S.* Lome, *S.* Agbeni, *S.* Paratyphi var. Java, *S. enterica* subsp. *enterica* (4,12:-:e,n,x), *S. enterica* subsp. *enterica* serogroup 4, *S. houtenae* (44:z4z23:-), *S. salamae* (47:a:1,5).
[5] NSCP = Norwegian *Salmonella* Control Programme

Salmonella in feedingstuffs

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

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

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

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

Feed materials, including fish meal, imported from third countries must be subjected to control for *Salmonella* according to a specified plan before distribution or use. A minimum of one sample per 50 tons must be tested for the presence of *Salmonella*.
Establishments producing fish meal or fish oil are required to establish and maintain an internal (process) control based on the HACCPsystem according to the regulation for fish meal and fish oil. This control includes analyses for *Salmonella*. A minimum of one sample per 50 tons must be tested for the presence of *Salmonella*. In addition to the surveillance run by the government or the industry itself, feedingstuffs are also subjected to analyses for *Salmonella* in relation to epidemiological investigations and specific surveys and studies.

Table *Salmonella* in feedingstuffs

	Source of information	Sampling unit	Sample weight	Units tested	Total units positive for *Salmonella* spp.	*S.* Typhimurium	*S.* Agona	*S.* spp., unspecified[7]
Feed matter								
Maize (including maize derived)	NFSA[6]	single	25g	31	0			
Soya(bean) derived	NFSA	single	25g	27	0			
Soya(bean) derived – industry data	NFSA	single	25g	4036	160			160
Meat and bone meal – industry data	NFSA	single	25g	625	8			8
Fish meal[1]	NFSA	single	25g	43	0			
Fish oil	NFSA	single	25g	3	0			
Compound feedingstuffs								
For cattle – final product	NFSA	single	25g	3	0			
For pigs – final product[2]	NFSA	single	25g	60	0			
For poultry – final product	NFSA	single	25g	61	0			
For fish – final product	NFSA	single	25g	800	0			
For fur animals[3]	NFSA	single	25g	720	1			1
For pets	NFSA	single	25g	2	0			
For pets – dog snacks[4]	NFSA	single	25g	39	4	1	2	1
All feedingstuffs – feed mill- environment[5]	NFSA	single	25g	11117	30	1		29

[1] A total of 24 samples from feed mills producing fish feed and 19 samples from feed mills producing feed for land animals.
[2] Including 8 samples of "wet feed".
[3] Data from Norwegian Fur Breeders Association, Compulsory Surveillance Programme.
[4] The Salmonella spp. was a 4,5,12:i:-.
[5] Environmental surveillance samples from, including HACCP or own checks by industry. From feed mills producing feed for food producing land animals. Includes imported feedingstuffs. A total of 117 of the reported samples (all negative) are from the NFSA's Compulsory Surveillance Programme.
[6] NFSA = Norwegian Food Safety Authority. Data from the Compulsory Surveillance Programme unless stated otherwise.
[7] Unless stated otherwise, the data on serotypes are currently not available.

Salmonella serovars and phagetype distribution

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