

ANNUAL REPORT
ON
ZOONOSES IN NORWAY

1998

(According to Article 5 Paragraph 1 of Council Directive 92/117/EEC)

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SUMMARY

This report presents incidence, annual prevalence data, information on place of acquisition and source of infection concerning zoonotic diseases and zoonotic agents in Norway during 1998. The report deals with the four zoonoses listed in the Council Directive 92/117/EEC, annex I list I; salmonellosis, trichinosis, brucellosis and tuberculosis due to *Mycobacterium bovis* and two of the zoonoses listed in annex I list II; campylobacteriosis and rabies. In addition infections with *Escherichia coli* O157 are included in the report. The report gives an overview of the samples examined, the agents isolated during 1998 and the disease incidence during recent years.

Extensive monitoring and control of *Salmonella* is carried out in Norway. The monitoring confirms the low prevalence of *Salmonella* (all serovars) infections in live animals and low levels of contamination in feed stuff and food produced in Norway. The figures from 1998 are approximately at the same level as in 1997. Registrations also show that the majority (approximately 80%) of people infected with *Salmonella* acquires the infection abroad.

Trichinosis (*Trichinella spiralis*) is found only sporadically in pigs in Norway. All pigs slaughtered in abattoirs are checked for the *Trichinella* sp. Trichinosis was last detected in pigs from two different herds in 1994. No human indigenous cases have been recorded since 1980.

Bovine brucellosis (*Brucella abortus*) has been eradicated in Norway since 1953. Porcine brucellosis (*B. suis*), ovine and caprine brucellosis (*B. melitensis*) and *B. ovis* have never been recorded in Norway.

Bovine tuberculosis (*Mycobacterium bovis*) was deemed to have been eradicated in Norway in 1963. However the disease was again detected in 1984 and 1986 in three herds. The outbreaks in these three herds were connected and one person may have been the source of the infection. One human case of tuberculosis due to *M. bovis* was registered in Norway in 1998. 200 - 250 human cases of tuberculosis occur every year, but there is no indication that animals are the source of infection.

Human campylobacteriosis has been recorded in increasing numbers over the last ten years. Last year 1700 cases were recorded, of which approximately 50% acquired the infection abroad. A case-control study performed in 1989-1990 on domestically infected cases revealed that important risk-factors for those acquiring infections in Norway were daily contact with dogs or cats, use of non-disinfected drinking water, and eating grilled food and poultry meat.

Rabies has never been recorded in mainland Norway. The disease has sporadically been diagnosed in fox, reindeer and seal in the archipelago of Svalbard, the last time being in 1992. No human cases has been notified.

A survey for carriage of *E. coli* O157 in Norwegian cattle in 1995 gave a herd prevalence of 1%. A national surveillance program for shigatoxinogenic *E. coli* O157 in domestic produced fresh cattle meat was launched in 1998. *E. coli* O157 was detected in 0.2% of the samples and only in one out of five positive samples *E. coli* O157 carrying genes encoding for shigatoxin was detected. A new survey comprising 600 cattle herds is currently being performed. *E. coli* O157 infection in man is negligible in Norway, and the last three years the incidence has been 0-10 cases. In 1998 six cases of human EHEC-infection were recorded.

INTRODUCTION

This report presents data on incidence and prevalence, information on the place of acquisition and source of infection for some zoonotic diseases in Norway during 1998, in accordance with Article 5 paragraph 1 of Council Directive 92/117/EEC. The report deals with the zoonotic diseases mentioned in Annex I Point 1 of the Directive, namely salmonellosis and the agents thereof, trichinosis, brucellosis and the agents thereof and tuberculosis due to *Mycobacterium bovis*. Additionally, the report deals with campylobacteriosis and rabies of the diseases mentioned in Annex I Point 2 of the directive. Infections with *E. coli* O157, which is not explicitly mentioned in the Directive, are also mentioned in the report.

The report has been compiled by the Norwegian Advisory Committee on Zoonoses in co-operation with the National Institute of Public Health, the National Veterinary Institute, the Norwegian Agricultural Inspection Service, the Norwegian Animal Health Authority, the Norwegian Food Control Authority and the Norwegian Board of Health. This is the fourth report from Norway according to Council Directive 92/117/EEC, the first covering 1995.

RESPONSIBLE AGENCIES

Regulations concerning zoonoses in Norway are the responsibility of the Ministry of Agriculture, the Ministry of Health and Social Affairs and, with regard to the control of fish meal for salmonellosis, the Ministry of Fisheries.

Animal feed

The Norwegian Agricultural Inspection Service and the Directorate of Fisheries are responsible for the control of feed stuff for terrestrial animals and fish. Samples of animal feed examined for *Salmonella* are primarily analysed by the National Veterinary Institute, but also by others laboratories authorised by the Norwegian Agricultural Inspection Service. Fish meal is analysed by the Norwegian Herring-meal Control. Findings of *Salmonella* in animal feed is compulsory reported to the Norwegian Agricultural Inspection Service.

Live animals

The Norwegian Animal Health Authority, of which the District Veterinary Officer is the local representative, is responsible for surveillance and control of animal diseases and the regulations concerning processing and use of animal waste. Among the notifiable diseases mentioned in this report are the list A diseases brucellosis and rabies and the list B diseases salmonellosis irrespective of serovar, trichinosis and tuberculosis. Nearly all samples from animals examined for these five zoonotic agents are analysed either by the National Veterinary Institute (brucellosis, tuberculosis, salmonellosis and rabies) or by the municipal food control authorities (salmonellosis and trichinosis). When a zoonotic disease is suspected or confirmed, the District Veterinary Officer informs the local health authority and the municipal food control authority.

Food

The Norwegian Food Control Authority co-ordinates all public food control activities. Samples of food or food products are analysed by the municipal food control authorities or at various research institutes. Whenever a zoonotic agent is detected, the municipal food control authority concerned and the Norwegian Food Control Authority take action to prevent contaminated food products from posing a human health risk and to identify the source of the contamination. The District Veterinary Officer is informed whenever there is a possibility that livestock is the source of the contamination.

Man

The medical microbiological laboratories analyse specimens from humans. All doctors in Norway are required by law to notify cases of certain diseases to the central unit of the Norwegian Notification System for Infectious Diseases (MSIS) at the National Institute of Public Health. The notifiable conditions are classified according to reporting procedure and 44 diseases including salmonellosis, trichinosis, brucellosis, tuberculosis, campylobacteriosis, rabies and enteropathogenic *Escherichia coli* infections have to be reported by identity of the infected person. When a case is confirmed by the microbiological laboratory, the medical practitioner is asked to fill in a questionnaire with epidemiological information such as residence, place of acquisition, suspected source of infection etc.

POPULATION AND PRODUCTION DATA

Norway covers an area of 323.895 square km and has a population of 4.4 million people of which about 0.8 million live in and around the capital Oslo. The livestock population and the number of animals slaughtered in 1998 are presented in Table 1. The domestic production and import of feed materials and compound feed stuff in 1998 are presented in Table 2.

Table 1. Livestock population in Norway as of July 31, 1998 (June 1, 1998 as regards sheep) and the number of animals slaughtered during 1998. The animal numbers are rounded to the nearest hundred.

Animal category	No. Animals ¹⁾	No. Herds ¹⁾	No. Slaughtered animals ³⁾
Cattle	1 035 000	30 877 ²⁾	355 700
Dairy cows (incl. in above total)	313 800	23 770	
Goats	81 400	1 504 ²⁾	25 200
Dairy goats (incl. in above total)	55 100	864	
Sheep	2 391 600	-	1 165 600
Breeding sheep >1 year (incl. in above total)	962 700	24 054	
Swine	-	6 275	1 345 600
Breeding animals > 6 months	90 200	3 880	
Fattening pigs for slaughter until July 31 st	748 500	5 695	
Egg laying hens (>20 weeks of age)	3 127 200	3 845	2 265 537
Broilers, total no. for slaughter Jan 1 st -July 31 st	12 975 900	434	26 347 182
Turkeys, total no. for slaughter Jan 1 st -July 31 st	386 500 ²⁾	140 ²⁾	579 614
Ducks and geese, total no. for slaughter Jan 1 st -July 31 st	37 400 ²⁾	approx. 200 ²⁾	56 146

¹⁾ Statistics Norway, preliminary figures ²⁾ Register of Production Subsidies ³⁾ Register of Slaughtered Animals

Table 2. The domestic production and import of feed materials and compound feed stuff in 1998. Combined totals in tons, figures are rounded to nearest thousand.

Category	Domestic production ¹⁾	Import ¹⁾
<i>Straight feed and raw materials</i>		
Straight feed of vegetable origin		490 000
Soy meal	80 000	
Fish meal	300 000	99 000 ²⁾
Destruction fat	23 000	0
Meat-bone meal	42 000	0
Fish silage	45 000	0
<i>Feed stuff</i>		
Compound feed for ruminants and pigs	1 446 000	0
Compound feed for poultry incl. Ostriches	242 000	1 000 ²⁾
Compound feed for fish		27 000 ²⁾
Moist feed for fur animals	77 000	0
Others (compounds for pet animals and horses)	13 000	39 000

¹⁾ The Norwegian Agricultural Inspection Service. ²⁾ Statistics Norway, Division for external trade, energy and industrial production statistics.

SALMONELLOSIS AND THE AGENTS THEREOF

Monitoring of *Salmonella* in animal feed, live animals and food has been carried out for many years. A nation-wide surveillance and control programme for *Salmonella* was launched in 1995. The programme covers both live animals (cattle, swine and poultry) and meat products (cattle, swine, sheep and poultry). The aim of the programme is to provide reliable documentation on *Salmonella* prevalence and to detect any increased occurrence of *Salmonella*-infections in Norway. When *Salmonella* is found, action is taken to prevent spread of the bacteria and an investigation is started to find the source of the infection or contamination. Nearly all isolations of *Salmonella* sp. from animal feed, live animals, food and man are referred for confirmation at National Institute of Health, Department of Bacteriology.

In Norway the prevalence of *Salmonella* (all serovars) infections in live animals and levels of contamination in domestically produced food and feed stuff is low. Epidemiological data collected by the National Institute of Public Health show that approximately 80% of the Norwegians infected with *Salmonella* acquired the infection abroad.

Animal feed

Figures concerning the domestic production and import of feed materials and compound feed stuff in 1998 are presented in Table 2.

The national production of meal originating from fish and animal waste are subject to a continuous process control, while straight feed and compounds are checked by random sampling. Imported feed materials are controlled continuously according to specific rules which classify the feed stuff into high and low risk materials. All compounds for animal use are heat treated at minimum 81°C according to Norwegian regulations. When *Salmonella* is found, action is taken to prevent spread of the bacteria and investigations are carried out to identify the source of contamination.

The results from the *Salmonella* analyses are presented in two tables. Table 3 presents the results from authority control analyses of domestically produced and imported feed materials and compound feed stuff, while Table 4 presents analyses performed at local laboratories and

processing plants, of which most samples are analysed as part of the "internal supervision system" of the factories. This "internal supervision system" is compulsory and described in "Least requirements for internal control regarding *Salmonella*" ("Minstekrav til egenkontroll for *Salmonella*." Rundskriv FØR 5/96) authorised in "Act concerning inspection of feedingstuffs" of March 23, 1973.

Chewing bones (dried hide, used for pets) of different brands and sold in different parts of Norway have been checked for *Salmonella*, and have been found to have a high prevalence of *Salmonella*. All lots of chewing bones imported into Norway from third countries are now checked for *Salmonella*. The different *Salmonella* isolated at the National Veterinary Institute are presented in the fifth row in Table 4.

Table 3. Authority control analyses for *Salmonella* in feed materials and compound feed stuff 1998.

Category	1998		1997
	Number of positive/samples	Serovars of <i>Salmonella</i>	Number of positive/samples
<i>Domestic produced</i>			
Feed material of vegetable origin			0 / 146
Fish meal (from processing plants)	23 / 8571	<i>S. Lexington</i> <i>S. Montevideo</i> <i>S. Senftenberg</i>	84 / 6128
Fish meal (from compound plants)	0 / 48		0 / 36
Meat-and-bone meal	0 / 44		0 / 36
Compound feed for mammals and poultry	0 / 189		0 / 244
Moist feed for fur animals	0 / 842		1 / 909
Compound feed for fish	7 / 1704	<i>S. Agona</i>	5 / 646
<i>Imported</i>			
Feed material of vegetable origin	4 / 1648	<i>S. Cerro</i> <i>S. Enterica</i> <i>S. Havana</i> <i>S. Worthington</i>	3 / 1414
Fish meal	3 / 70	<i>S. Senftenberg</i> <i>S. Oranienburg</i>	15 / 220

Table 4. Results of *Salmonella* analyses of feed stuff performed at local laboratories and processing plants, survey programmes and samples from customers in 1998. NA= Not available.

Category	1998		1997
	Number of positive/samples	Serovars of <i>Salmonella</i>	Number of positive/samples
Feed material of vegetable origin	0 / 1357		0 / 1185
Fish meal	30 / 8821		4 / 869
Meat-and-bone meal	0 / 1698		4 ¹⁾ / 1210
Compound feed (pig, ruminants and poultry)	0 / 189		0 / 413
Chewing bones for pet animals made from hides	1 / 88	<i>S. Mbandaka</i> <i>S. Montevideo</i> <i>S. Ohio</i>	approx. 27/ NA
Company survey samples from production lines	15 / 10100	<i>S. Abony</i> <i>S. Agona</i> <i>S. Bandalia</i> <i>S. Cerro</i> <i>S. Havana</i> <i>S. Isangi</i> <i>S. Senftenberg</i> <i>S. Schwartzgrund</i> <i>S. Stanleyville</i> <i>S. Thomson</i> <i>S. Typhimurium</i>	15 ²⁾ / 9700

¹⁾ incl. 3 positive samples from imported poultry meat meal.

²⁾ *Salmonella* was demonstrated in 15 cases during company survey from production lines. Each case resulted in several positive samples.

Live animals

Live animals are tested for *Salmonella* both on clinical indications and in connection with control procedures such as the national surveillance and control programme for *Salmonella*, investigation of contact herds and import control. When *Salmonella* is found, restrictions are imposed on the movement of animals from the farm, and investigations to identify the source of the infection are started. When invasive serovars of *Salmonella* are found in poultry, the entire flock is destroyed.

The sampling of domestic live animals in the Norwegian surveillance programme, except for poultry breeders, is described in Table 5. Annually the necessary total of samples to detect *Salmonella* at an animal prevalence level of 0.1% (with 95% confidence level) is collected from the cattle and swine population at slaughter. In addition, all elite breeding pig herds and all poultry flocks exceeding a certain size, are surveyed at herd level. Sampling of breeder flocks of *Gallus gallus* is carried out in accordance with the programme laid down in Annex III of Council Directive 92/117/EEC.

Surveillance results (Table 6) document a low prevalence of *Salmonella* in live cattle, swine and poultry in Norway. In addition to the *Salmonella*-positive herds detected in the surveillance programme, *Salmonella* has also been found in the course of routine control of healthy animals for other reasons, disease evaluation and follow ups of earlier isolations in previous years (Table 7).

The sampling scheme for *Salmonella* in imported animals is presented in Table 8 and the results in Table 9. As can be seen, *Salmonella* has not been detected during inspection of live, imported farm-animals in 1998.

The numbers of positive samples in production animals and poultry during 1998 are at the same extremely low level as was experienced in 1997.

Following sporadic isolations of *S. enterica diarizonae*, a prevalence study was carried out on 970 healthy rams in 1993/94. *S. enterica diarizonae* was found in 5.1% of the rams. The prevalence varied strongly geographically and being considerably higher in rams older than 1 year (11.3%) than in rams younger than 1 year (1.9%). The demonstration of *S. enterica diarizonae* in healthy sheep implemented new slaughter instructions in Norwegian abattoirs. Carcasses found positive for *S. enterica diarizonae* are not used for human consumption, although the bacterium has not been found to cause human infections.

The numbers of new cattle, pigs and poultry herds subjected to restrictions due to *Salmonella* during 1966 - 1998 are presented in Figure 1. The increase in poultry herds subjected to restrictions in 1974, 1976, 1981 and 1995 is explained by the spread of *Salmonella* spp. to poultry producers when *Salmonella* was temporarily established in a hatchery.

Table 5. Description of the sampling scheme for live animals in the *Salmonella* surveillance programme, breeder flocks of poultry not included - these sampled according to Annex III of Council Directive 92/117/EEC.

Animal category (size of herd)	Time of sampling	Material
<i>Animals</i>		
Slaughtered pigs	random sample (3000 a year)	ileo-caecal lymph nodes
Slaughtered cattle	random sample (3000 a year)	ileo-caecal lymph nodes
Elite breeder pig herds	all herds once a year	faecal samples
<i>Poultry, table egg production</i>		
Pullets (>250)	4 weeks of age and 2 weeks before transfer	60 faecal samples
Layers (>1000 birds)	25-30 and 48-52 weeks of age	60 faecal samples
Layers (250-999 birds)	25-30 weeks of age	60 faecal samples
<i>Poultry, meat production</i>		
Broilers	1-3 weeks before slaughter	60 faecal samples
Turkeys, ducks and geese (>50 birds)	1-3 weeks before slaughter	60 faecal samples

Table 6. Results from the sampling of live animals in the surveillance programme for *Salmonella* 1998.

Category	Unit	1998		1997
		Number of positive units/ units examined	Serovars of <i>Salmonella</i>	Number of positive units/ units examined
<i>Farmed animals</i>				
Slaughtered pigs	individuals	0 / 3104 (0)		0 / 2905 (0)
Slaughtered cattle	individuals	1 / 2725 (<0.01)	<i>S. diarizonae</i> 61:-:1,5	2 / 2653 (<0.01)
Elite breeder pig herds	herds	0 / 176 (0)		0 / 147 (0)
<i>Poultry, breeders</i>				
Parents and grandparents	herds	0 / 79 (0)		0 / 80 (0)
<i>Poultry, table egg production</i>				
Pullets (>250)	herds	0 / 52 (0)		0 / 49 (0)
Layers (>250)	herds	1 / 847 (<0.01)	<i>S. diarizonae</i> 38:k:z35	0 / 739 (0)
<i>Poultry, meat production</i>				
Broilers	flocks	1 / 2639 (<0.01)	<i>S. Livingstone</i>	0 / 2551 (0)
Turkeys, duck and geese (>50 birds)	flocks	0 / 272 (0)		0 / 300 (0)

Table 7. Number of herds positive for *Salmonella* grouped according to reason for sampling, i.e. disease evaluation, routine control of healthy animals (the *Salmonella* surveillance programme and import control not included) and follow ups of earlier isolations in previous years.

Species	1998				Serovars of <i>Salmonella</i>	1997
	Disease evaluation	Routine control	Follow ups	Total		Total
<i>Production animals</i>						
Pigs	-	-	-	0		0
Cattle	-	-	-	0		3
Sheep	3	-	-	3	<i>S. Typhimurium</i> <i>S. diarizonae</i> 61:-:1,5	5
Horse	1	-	-	1	<i>S. diarizonae</i> 61:-:1,5	0
Hen	-	-	-	0		1
<i>Sport, Pet and Zoo animals</i>						
Dog	1	-	-	1	<i>S. Heidelberg</i>	1
Cat	2	-	-	2	<i>S. Typhimurium</i>	0
Turtles	1	-	-	1	<i>S. Newport</i>	4
Lizards	3	-	-	3	<i>S. Poona</i> <i>S. houtenae</i> (3 serotypes)	0
Snakes	1	-	-	1	<i>S. Adelaide</i> <i>S. Cerro</i> <i>S. Oranienburg</i> <i>S. Paratyphi B</i> <i>S. diarizonae</i> (3 serotypes)	1
<i>Wild animals</i>						
Wild birds	9	-	-	9	<i>S. Typhimurium</i> <i>S. sp. (not serotyped)</i>	7
Hedgehog	1	-	-	1	<i>S. Typhimurium</i>	0

Table 8. Description of the sampling scheme for *Salmonella* in imported animals each week after arrival to Norway. The table starts with sampling on arrival to Norway (or at hatching for hatching eggs) and describes the sampling for every week after arrival (or hatching).

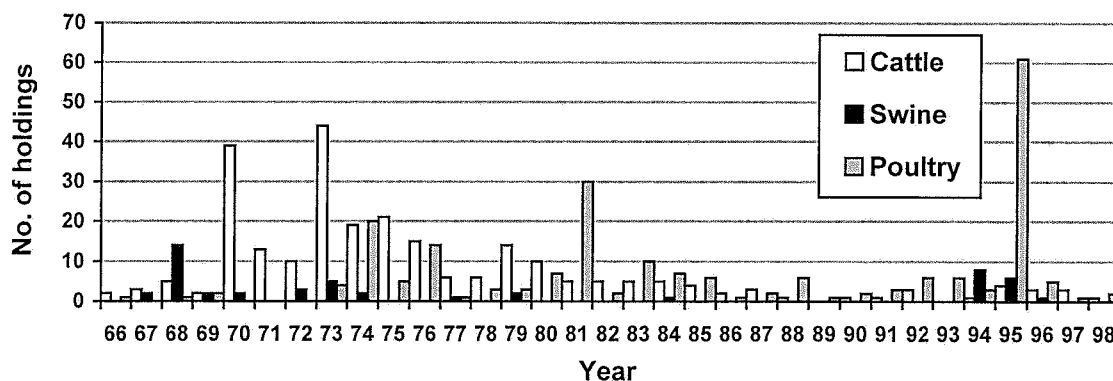
Species	At arrival /	2 w	3 w	4 w	5 w	6 w	7 w	8 w	9 w
	hatching								
Cattle	F	-	F	-	F	-	-	-	-
Swine	F	-	F & B	-	F	-	-	-	-
Poultry (live animals)	D & L	D	F	-	-	-	-	-	F
Poultry (hatch eggs)	MD	-	-	-	-	-	-	-	-

w = week, F = Faecal samples, at least 10g from each imported cattle and swine, and one pooled sample consisting of 60 faecal samples from poultry. B = Blood for serologic testing. D = Every carcass of dead chicks. L = Internal lining of boxes for hatching. MD = Pooled sample of meconium taken from 250 chicks, or 50 carcasses of dead or diseased chicken and 25 environmental samples from the hatchery.

Table 9. Number of importations and number of imported animals in 1998 and the number of samples tested for *Salmonella* and the result of these. NA = Not available.

Species	1998			Serovars of <i>Salmonella</i>	1997
	No. importations imports (animals)	No. samples bact. /ser.	No. positive imports (animals)		No. positive imports (animals)
Cattle	2 (13)	4	0 (0)		0 (0)
Swine	1 (8)	0	0 (0)		0 (0)
Llama	4 (105)	217	0 (0)		0 (0)
Poultry	24 (105009)	1192	0 (0)		0 (0)
Ostriches	4 (167)	33	0 (0)		0 (0)
Pigeon	2 (2)	1	0 (0)		0 (0)
Cage birds	NA	6	0 (0)		0 (0)
Turtle	NA	0	-		1 (2)

Figure 1. Number of herds of cattle, pigs and poultry on which restrictions were imposed due to *Salmonella* during 1966 - 1998. Source: Ministry of Agriculture/ Norwegian Animal Health Authority. Veterinary statistics 1966 to 1998.



Food

Food products and food processing plants are tested for *Salmonella* when investigating possible human food-borne infections and as a part of different control measures such as hygiene control, import control and the national surveillance and control programme for *Salmonella*. Whenever *Salmonella* is detected, action is taken to prevent people from being infected by contaminated food products and to identify the source of the contamination.

The sampling of animal products in the national surveillance programme is described in Table 10. Annually, a number of samples sufficient to detect *Salmonella* at a prevalence level of 0.1% (with 95% confidence level) is collected from carcasses of cattle, swine and sheep. Extensive monitoring of cutting plants and poultry slaughterhouses is also carried out.

The results of the surveillance document the extremely low prevalence of *Salmonella* in domestically produced food products of animal origin (Table 11).

In the autumn of 1997 a survey was performed on meat from game ruminants. 332 carcasses were examined (swabs and samples of meat) for *Salmonella*. *Salmonella* was not demonstrated in any of the samples, indicating a low prevalence of *Salmonella* in meat from Norwegian game.

A survey concerning *Salmonella* in imported and domestic grain has been carried out in 1996/97. Of 1399 samples of grain only one proved to be positive. 54 samples of dust from Norwegian grain mills were also examined, resulting in 2 positive samples; *S. Montevideo* and *S. enterica diarizonae*.

Table 10. Description of the sampling scheme for food products of animal origin in the national *Salmonella* surveillance programme. Samples were pooled 5 and 5 for analysis.

Category	Time of sampling	Material
<i>Carcasses</i>		
Carcasses of pigs	random sample (3000 a year)	swabs
Carcasses of cattle	random sample (3000 a year)	swabs
Carcasses of sheep	random sample (3000 a year)	swabs
Carcasses of poultry	1 sample from every slaughter flock and at least 5 samples a day in each slaughterhouse	neck skin
<i>Cutting plants and cold stores for fresh meat and poultry meat</i>		
Production capacity <2 tons	twice a year	crushed meat
Production capacity 2-20 tons	once a month	collected at
Production capacity >20 tons	once a week	different locations

Table 11. Results from the analyses of food products of animal origin in the national *Salmonella* surveillance programme in 1998.

Category	Unit	1998		1997
		Number of positive/samples	Serovars of <i>Salmonella</i>	Number of positive/samples
Carcasses of pigs	carcass	0 / 3084 (0)		0 / 2864 (0)
Carcasses of cattle	carcass	0 / 2701 (0)		0 / 2616 (0)
Carcasses of sheep	carcass	2 / 3067 (<0.01)	<i>S. diarizonae</i> 61:-:1,5	0 / 2728 (0)
Carcasses of poultry	neck skin	0 / 7112 (0)		0 / 7591 (0)
Crushed meat	25 gram crushed meat	0 / 2201 (0)		0 / 2103 (0)

During the autumn of 1998 a total of 253 samples of imported seafood, predominantly shellfish, were analysed for the presence of *Salmonella* spp., and 221 samples of imported cheese were analysed for the presence of *Salmonella* spp. and *Listeria monocytogenes*. No *Salmonella* spp. were isolated from the seafood samples, and no *Salmonella* spp. or *L. monocytogenes* were isolated from the cheese samples.

During the summer and autumn of 1998 a total of 293 samples of milk products produced from unpasteurized milk were examined. None of the samples were shown to contain *L. monocytogenes* or *Salmonella* spp.

Man

Salmonellosis was diagnosed in 1494 persons in 1998 (Table 12). Of these, 174 (12%) were domestic cases, 1228 (82%) had acquired the infection abroad and in 85 (6%) cases the place of acquisition of the infection was unknown. The incidence data for salmonellosis in man in Norway during 1975 - 1998 are presented in Figure 2.

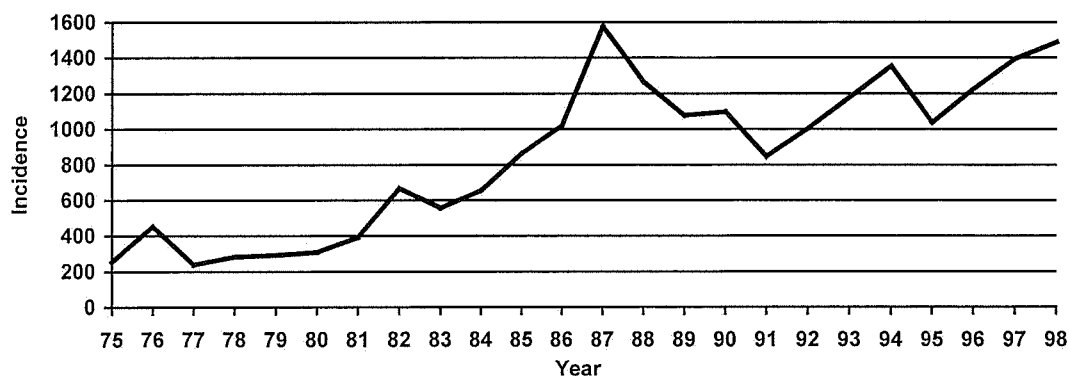
Table 12. Incidence of human cases of salmonellosis, trichinosis, brucellosis, bovine tuberculosis and *E. coli* O157 infection during the last 8 years.

Zoonoses / zoonotic agent	1991	1992	1993	1994	1995	1996	1997	1998
Salmonellosis	860	1001	1178	1352	1035	1225	1391	1487
Trichinosis	0	0	0	0	0	2	0	0
Brucellosis	0	0	0	0	0	0	1 ³⁾	0
Tuberculosis with <i>M. Bovis</i>	0	0	1	2	0	0	0	1 ¹⁾
Rabies	0	0	0	0	0	0	0	0
Campylobacteriosis	631	611	877	1050	1046	1145	1178	1700
<i>E. coli</i> O157 infection	0	0	0	1	0	10	8 ⁴⁾	6 ²⁾

¹⁾ In an immigrant. ²⁾ 2 indigenous cases, 2 infected in China, 1 in Russia and 1 in Tunisia. ³⁾ Infected in Turkey.

⁴⁾ 7 indigenous cases and one case infected in Morocco.

Figure 2. Salmonellosis in man by year, Norway, 1975-1998. Cases notified to MSIS



The high incidence in 1982 was due to a domestic pepper-associated epidemic caused by *S. Oranienburg*. The peak in 1987 was due to a chocolate-associated epidemic caused by *S. Typhimurium*. The increasing annual incidence is correlated to people increasingly travelling abroad. In 1997 between 30 and 40 people were infected by *S. Enteritidis* on an air-flight from The Canary Islands to Norway. At least 10 out of the 194 domestic cases were infections acquired through ingestion of a certain brand diet-powder. There were no major outbreaks in 1998.

The most common serovars of *Salmonella* isolated are given in Table 13 and, for domestic cases only, in Table 14. Of the serovars also isolated from mammals and poultry (import control not included) and which are not included in Table 14, there are no human cases of domestic acquisition involving *S. enterica diarizonae* 61:-:1,5, *S. enterica diarizonae* 38:k:z35, *S. Adabraka* and *S. Heidelberg*, and one case caused by *S. Livingstone* in 1998.

Table 13. The serovars of *Salmonella* with a human incidence higher than 10 in 1998 irrespective of place of acquisition.

Serovars	No.	
	1998	1997
<i>S. Enteritidis</i>	827	783
<i>S. Typhimurium</i>	203	221
<i>S. Virchow</i>	45	54
<i>S. Hadar</i>	42	27
<i>S. Stanley</i>	34	14
<i>S. Agona</i>	28	19
<i>S. Java</i>	19	12
<i>S. Blockley</i>	17	8
<i>S. Infantis</i>	16	11
<i>S. Braenderup</i>	14	6
<i>S. Saint-Paul</i>	13	8
<i>S. Panama</i>	12	5
<i>S. Heidelberg</i>	12	13

Table 14. The most common serovars of *Salmonella* isolated from domestic human cases of salmonellosis in 1998.

Serovars	No.	
	1998	1997
<i>S. Typhimurium</i>	71	77
<i>S. Enteritidis</i>	46	62
<i>S. Java</i>	5	7
<i>S. Ohio</i>	5	0
<i>S. Virchow</i>	5	0
<i>S. Stanley</i>	5	2
<i>S. Braenderup</i>	3	1
<i>S. Derby</i>	3	0
<i>S. Javiana</i>	3	1
<i>S. Brandenburg</i>	2	0
<i>S. Schwartzengrund</i>	2	0
<i>S. Saint-Paul</i>	2	1
<i>S. Weltevreden</i>	2	1

TRICHINOSIS

Live animals and food

There is an extensive control for trichinosis (*Trichinella spiralis*) in farmed animals at slaughtering. All pigs, all horses after November 1995 and all individual animals of other susceptible species, are examined. Trichinosis is only found sporadically in farmed animals and was last found in two pig herds in 1994. This was the first report of trichinosis in pigs since 1981. Trichinosis is sporadically diagnosed in farmed foxes in the northern parts of Norway. By the end of 1998, three fox farms were under official restrictions due to trichinosis.

Man

In 1996 two cases of trichinosis were reported (Table 12). Both were infected in ex-Yugoslavia. Before that, the last reported case of trichinosis in man was in 1980. The place of acquisition was unknown. No cases of trichinosis were reported in 1998.

BRUCELLOSIS AND THE AGENTS THEREOF

Live animals

Bovine brucellosis (*Brucella abortus*) has been eradicated from Norway since 1953. Today some hundred blood samples are tested annually. All bulls are tested routinely before transfer to a semen collection centre and subsequently once a year. Tests are also carried out in connection with special breeding schemes, on clinical indications and in connection with import and export.

Porcine brucellosis (*B. suis*), *B. ovis* and caprine and ovine brucellosis (*B. melitensis*) have never been recorded in Norway. All breeding boars selected for semen collection centres are examined serologically for brucellosis.

Man

In 1997 one case of brucellosis in man was recorded. The patient had been infected in Turkey. Before this the last case of brucellosis in man was recorded in 1987, and the person who was infected with *B. melitensis*, had acquired the infection abroad (Mediterranean area). No cases of brucellosis were reported in 1998.

TUBERCULOSIS DUE TO *Mycobacterium Bovis*

Live animals and food

Bovine tuberculosis (*Mycobacterium bovis*) was deemed to have been eradicated in Norway in 1963. The disease was demonstrated again in 1984 in two herds and 1986 in one herd. The herds were in the same geographical area and the origin of the infection was probably a man diagnosed with tuberculosis.

The last case of human tuberculosis (*M. tuberculosis*) in farmed animals was in a pig in 1991. It was found in a dog in 1989. The source of infection in both these cases was probably human.

All slaughtered animals except poultry are subjected to meat inspection regarding tuberculosis (lymph node examination). If findings suggestive of tuberculosis are made, samples are submitted to the National Veterinary Institute for cultivation. In 1998 the Institute received 270 samples from 193 various sites; of which 263 samples were from pigs. *M. avium*

was isolated from 228 (87 %), while in 1997 *M. avium* were isolated from 145 out of 159 samples. In addition, all breeding bulls and boars are tested routinely prior to being used as semen donors and annually thereafter at the semen collection centres.

Man

Epidemiological information is collected and measures are taken to identify the source of infection whenever a case of tuberculosis is registered. The last two cases of human infection with tuberculosis due to *M. bovis* were registered in 1994 (Table 12). One of these cases involved a 100-year old woman infected in her youth, while the other case involved a patient infected in India. The case reported in 1993 was in a foreigner. Apart from these no new domestic cases of bovine tuberculosis in man has been reported since 1977.

CAMPYLOBACTERIOSIS

Live animals and food

A yearly national project has tested cooled Norwegian produced poultry for *Campylobacter coli* and *Campylobacter jejuni* since 1996. In 1996 and 1997 the percentage of positive samples was 7.5% and 5.9%, respectively. The results for 1998 show a reduction in the number of positive findings as 4.5% of the samples from raw poultry meat were found positive.

Man

Human campylobacteriosis has been recorded in increasing numbers the last ten years. Last year 1700 cases were recorded (Table 12), of which approximately 50% acquired the infection abroad. A case-control study performed in 1989-1990 on domestically infected cases revealed that important risk factors for those acquiring infections in Norway were daily contact with dogs or cats, use of non-disinfected drinking water and eating grilled food and poultry.

RABIES

Live animals

Rabies has never been recorded in mainland Norway. The disease has sporadically been diagnosed in fox, reindeer and seal in the archipelago of Svalbard since it was diagnosed for the first time in 1980; the last time being in 1992.

Dogs and cats entering Norway from countries not considered rabies free, are subject to four months in an officially approved quarantine station, followed by a two month period of private isolation. However dogs and cats from EEA countries not considered free of rabies are permitted to enter Norway without quarantine if they are vaccinated against rabies and provided they have a sufficient antibody titre.

Man

No cases of rabies were reported in 1998 (Table 12). There has been no diagnosed case of rabies ever.

ESCHERICHIA COLI O157 INFECTION

Live animals

In 1995 a survey in the Norwegian cattle population for shigatoxinogenic *E. coli* O157 was carried out. During July to November 1995, 1,980 faecal samples were collected from 198 herds located in three high density cattle regions in Norway. The samples were analysed by immunogenic separation of *E. coli* O157. Six animals originating from 2 herds were positive for *E. coli* O157/H-, giving a herd prevalence of 1%. A new survey of the occurrence of *E. coli* O157 in live cattle comprising 600 herds was initiated in the autumn of 1998 and will continue through the spring of 1999. Preliminary results suggest that the herd prevalence has not increased since 1995.

Food

In 1998 a national surveillance program for shigatoxinogenic *E. coli* O157 in domestic produced fresh cattle meat was launched. Samples from every 150th slaughtered cattle during the year are examined.

In 1998 *E. coli* O157 was detected in 5 out of 2253 (0.2%) samples. Only in one of the five positive samples *E. coli* O157 carrying genes encoding for shigatoxin was detected. At the moment is all isolations of both *E. coli* O157 H7 and *E. coli* O157 H- considered as EHEC. Detection of EHEC implies that the carcass is destroyed.

During the summer and fall of 1998 a total of 293 samples of milk products produced from unpasteurized milk were examined for the presence of *E. coli* O157:H7. *E. coli* O157:H7 were isolated from three samples (1%). The strains did not harbour genes encoding shigatoxin, but are still considered to belong to the EHEC-group

Man

E. coli O157 infection is negligible in Norway (Table 12). Domestic acquired infections only accounted for two of six cases in 1998, while seven out of eight cases were domestic acquired infections in 1997.