

ANNUAL REPORT
ON
ZOONOSES IN NORWAY

1996

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

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Summary

This report presents incidence and prevalence data, and information on place of acquisition and source of infection concerning zoonotic diseases in Norway during 1996. 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 in addition infections with *E. coli* O157. The report gives an overview of the samples examined, and the agents isolated during 1996, and the 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 1996 are roughly equal to what was found in 1995, except for the prevalence of *Salmonella* in broilers which has decreased. Registrations also show that the majority (80-90%) of people infected with *Salmonella* acquire 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. The two cases recorded in 1996 had acquired the infection abroad (ex-Yugoslavia).

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. The last case of brucellosis in man was recorded in 1987. The person concerned, infected with *B. melitensis*, had acquired the infection abroad.

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. The last human case in Norway of tuberculosis due to *M. bovis* was registered in 1994. 200 - 300 human cases of tuberculosis due to *M. tuberculosis* occur every year, but there is no indication that animals are the source of infection.

A survey for infection with *E. coli* O157 in Norwegian cattle in 1995, gave a herd prevalence of 1%. In a survey in minced meat in 1996, no shigatoxinogenic producing strains of *E. coli* O157 was found indicating a prevalence of less than 0.3%. *E. coli* O157 infection in man is negligible in Norway, and the last three years the incidence has been 0-10 cases. In 1996 only 2 out of 10 were domestic cases.

Introduction

This report presents incidence and prevalence data, and information on the place of acquisition and source of infection for zoonotic diseases in Norway during 1996, in accordance with Article 5 paragraph 1 of. 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* and in addition is reported infections with *E. coli* O157 which is not explicit mentioned in the Directive.

This is the second report from Norway according to Council Directive 92/117/EEC. A few changes have been made since the first report in 1995. Infections with *E. coli* O157 are now included in the report. Some of the tables have been split into two according to the reason for sampling, and the tables have also been simplified to make the information more easily accessible.

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 Board of Health and the Norwegian Food Control Authority.

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 feeds

The Norwegian Agricultural Inspection Service and the Directorate of Fisheries are responsible for the control of feed stuff for terrestrial animals and fish, respectively. Samples of animal feeds examined for *Salmonella* are primarily analysed by the National Veterinary Institute and partly by the municipal food control authorities. Fish meal is analysed by the Norwegian Herring-meal Control. Until 1st July 1995 the Norwegian Grain Co-operation had a monopoly on imports of grain, and according to an agreement with the Norwegian Agricultural Inspection Service, all results of *Salmonella* controls were reported. After the monopoly was abolished, it became compulsory to report findings of *Salmonella* in animal feed 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 processing of animal waste. Among the notifiable diseases are the list A disease; brucellosis and the list B diseases; salmonellosis, irrespective of serovar, trichinosis, and tuberculosis. Nearly all animal samples examined for these four zoonotic agents are analysed either by the National Veterinary Institute (brucellosis, tuberculosis and salmonellosis) or by the municipal food control authorities (salmonellosis and trichinosis).

Food

Samples of food or food products are analysed by the municipal food control authorities. Whenever a zoonotic agent is detected, the municipal food control authority concerned and the Norwegian Food Control Authority takes 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 are the source of the contamination.

Man

The medical laboratories analyse specimens from humans, and 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 at the National Institute of Public Health. The notifiable conditions are classified according to reporting procedure and 44 diseases including salmonellosis, trichinosis, brucellosis, tuberculosis and enteropathogenic *Escherichia coli* 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 and place of acquisition.

Population and production data

Norway covers an area of 323.895 square km and has a population of 4.3 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 1996 are presented in Table 1. The domestic production and import of feed materials, and compound feed stuff in 1996 are presented in Table 2.

Table 1. Total livestock population in Norway as of 31st July 1996 (December 31, 1995 as regards sheep) and the number of animals slaughtered during 1996. The figures are rounded down to the nearest hundred. Source: Register of Production Dependent Support (Norwegian National Grain Administration) and The Register of Slaughtered Animals.

	No. animals	No. herds	No. slaughtered animals	
Cattle	1 000 900	32 100	Cattle	338 800
Dairy cows (included in above total)	317 700	25 100		
Goats	84 800	1 600	Goats	25 900
Dairy goats (included in above total)	57 000	800		
Winter feed sheep (breeding animals)	1 051 300	24 200	Sheep, lamb	1 283 900
Sows	66 200	4 200	Pigs	1 268 300
Layers (>20 weeks of age)	3 345 100	4 200	Hens	2 394 900
Broilers	12 415 200	400	Broilers	26 361 400
Turkeys for slaughter	501 000	160	Turkeys	877 800
Ducks and geese	26 100	210	Ducks and geese	30 800

Table 2. The domestic production and import of feed materials, and compound feed stuff in 1996. Combined totals in tons. NA = data not available. ¹ Source: Statistic Norway, Division for external trade, energy and industrial production statistics.

Category	Domestic production	Import ¹
<i>Straight feed and raw materials</i>		
Straight feed of vegetable origin	approx. 975 000	approx. 460 000
Fish meal	212 000	NA
Meat-bone meal	NA	0
<i>Feed stuff</i>		
Compound feed for ruminants and pigs	1 391 080	0
Compound feed for poultry	253 460	0
Compound feed for fish	455 264	6 044
Moist feed for fur animals	76 820	0
Others (compounds for pet animals, horses etc.)	37 152	42 836

Salmonellosis and the agents thereof

Monitoring of *Salmonella* in animal feeds, 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 cattle, swine and poultry and meal products of animal origin, including sheep. The aim of the programme is to provide reliable documentation of *Salmonella* prevalence, and to prevent any increased occurrence of *Salmonella*-infections in Norway. When *Salmonella* is found, action is taken to prevent spread of the bacterium, and an investigation is started to find the source of the infection or contamination.

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 shows that of the Norwegians infected with *Salmonella*, between 80% and 90% are infected abroad.

Animal feeds

Figures concerning the domestic production and import of feed materials, and compound feed stuff in 1996 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. 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 of the *Salmonella* analyses are presented in three tables. Table 3 presents the results from analyses of domestic produced feed materials and compound feed stuff, while Table 4 presents the authority control analyses of imported feed materials. Table 5 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.

In domestic produced feed materials and compound feed stuff, *Salmonella* was only found in fish meal and compound feed for fish. The 33 positive samples from fish meal were derived from ten batches and from two different plants. At the plant where *S. Stanley* was found, the same serovar was also found in 1995. When *Salmonella* is found, the batch is heat-moist treated and new samples are analysed before delivery.

The problem with *Salmonella* in meat-and-bone meal which was experienced in 1995, was not repeated in 1996 and is now considered to be controlled.

Organic household waste material is allowed to be used as feed stuff for pigs after heat treatment, and samples have been collected both before and after heat treatment. One sample which was collected before treatment was positive, but none of the samples were positive after heat treatment.

The eight positive samples of *Salmonella* in imported feed material of vegetable origin, were from four different batches of grains. The batches were either treated by acid or heat before use or used exclusively in expanded compound feed for ruminants.

The 16 positive samples in imported fish meal were derived from 3 different batches originating from one country. Batches where *Salmonella* is isolated, is either reexported or heat-treated.

In the autumn of 1996, *Salmonella* was found in a chewing bone (dried hide used for pet animals) related to investigation of a case of salmonellosis in a dog. As a consequence "chewing bones" 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*. Altogether *Salmonella* has been found in six different brands of chewing bone. The different *Salmonella* isolated at the National Veterinary Institute are presented in Table 5. *Salmonella* found at municipal food hygiene laboratories is not included in the table. All chewing bones imported to Norway from third countries are now checked for *Salmonella*.

Table 3. Authority control analyses of *Salmonella* of domestic produced feed materials and compound feed stuff. *Se text for comments.

Category	No. samples	No. pos. samples	Serovars of <i>Salmonella</i>
Feed material of vegetable origin	155	0	
Fish meal (from processing plants)	5577	33*	<i>S. Senftenberg</i> , <i>S. Stanley</i>
Fish meal (samples from compound plants)	42	0	
Meat-and-bone meal	34	0	
Protein concentrates of vegetable origin	82	0	
Mixed protein concentrates for further mixing	61	0	
Compound feed for mammals and poultry	102	0	
Moist feed for fur animals	827	0	
Compound feed for fish	571	5	<i>S. Montevideo</i> (4), <i>S. Livingstone</i> (1)

Table 4. Authority control analyses of *Salmonella* of imported feed materials. Meat-and-bone meal and protein concentrates were not imported. *Se text for comments.

Category	No. samples	No. pos. samples	Serovars of <i>Salmonella</i>
Feed material of vegetable origin	1120	8*	<i>S. Lexington</i> (1), <i>S. Blockley</i> (1), <i>S. Albany</i> (1), <i>S. Mbandaka</i> (1), <i>S. Muenster</i> (1), <i>S. Cubana</i> (1), <i>S. Montivideo</i> (1), <i>S. Alachua</i> (1),
Fish meal	413	16*	<i>S. Anatum</i> (1), <i>S. Montevideo</i> (11), <i>S. enterica enterica</i> 3-15:y:- (4)

Table 5. Results of *Salmonella* analysis of feed stuff performed at local laboratories and processing plants, survey programmes and samples from customers. *See text for comments.

Category	No. samples	No. pos. samples	Serovars of <i>Salmonella</i>
Feed material of vegetable origin	66	0	
Fish meal	315	0	
Meat-and-bone meal	809	0	
Compound feed (pig, ruminants and poultry)	340	0	
Organic household waste material	394	1*	<i>S. Mbandaka</i> (1)
Moist feed for fur animals	58	0	
Chewing bones made of hides for pet animals	44	25	<i>S. Havana</i> (7), <i>S. Newport</i> (1), <i>S. Livingstone</i> (1), <i>S. Mbandaka</i> (1), <i>S. Ramatgan</i> (2), <i>S. Rissen</i> (1), <i>S. Braendrup</i> (1), <i>S. Montevideo</i> (7), <i>S. Ohio</i> (9), <i>S. Senftenberg</i> (1), <i>S. Tennessee</i> (1), <i>S. Cerro</i> (3), <i>S. Orion</i> (4), <i>S. enterica enterica</i> 3,15:y:- (1), <i>S. enterica enterica</i> 6,7:-:- (1), <i>S. Worthington</i> (1)
Company survey samples from production lines	2639	7	<i>S. Mbandaka</i> (1), <i>S. Infantes</i> (1), <i>S. Bredeney</i> (1), <i>S. Montivideo</i> (2), <i>S. Livingstone</i> (1), <i>S. Tennessee</i> (1)

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 movement of animals on 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 live animals in the Norwegian surveillance programme, except for poultry breeders, is described in Table 6. 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 poultry is carried out in accordance with the programme laid down in Annex III of Council Directive 92/117/EEC.

The sampling scheme for *Salmonella* in imported animals is presented in Table 7.

Surveillance results (Table 8) document the 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 import control (Table 9), routine control of healthy animals for other reasons, disease evaluation and follow ups of earlier isolations in previous years (Table 10).

The numbers of positive samples in cattle and swine during 1996 are roughly equal to what were experienced in 1995. Except for one isolation of *salmonella enterica diarizonae* from a sheep with enteritis, none of the findings of *Salmonella* in farmed animals have been associated with clinical signs in the herds in question.

The prevalence of *Salmonella* in broilers has decreased since 1995. This is explained by the fact that the spread of *Salmonella* infection from breeder units, which was experienced during 1995, has been controlled. Of the five broiler flocks positive for *Salmonella* in 1996, the three

flocks which had *S. Newport* and *S. Livingstone* probably got the infection from breeder units during 1995. The source of *Salmonella* infection in the two other flocks are not known.

Figure 1 presents the number of new herds of cattle, pigs and poultry subjected to restrictions due to *Salmonella* during 1966 - 1996 according to the veterinary statistics. 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 6. 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.

Category of animal (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 7. 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). 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.

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

Table 8. Results from the sampling of live animals in the surveillance programme for *Salmonella*.

Category of animal	Unit	No. tested	No. pos.	Prev. (%)	Serovars of <i>Salmonella</i>
<i>Farmed animals</i>					
Slaughter pigs	individuals	2818	0	0	
Slaughter cattle	individuals	2558	3	0.12	<i>S. Typhimurium</i> (2), <i>S. Konstanz</i> (1)
Elite breeder pig herds	herds	185	0	0	
<i>Poultry, breeders</i>					
Parents and grandparents	herds	97	0	0	
<i>Poultry, table egg production</i>					
Pullets (>250)	herds	28	0	0	
Layers (>250)	herds	1077	0	0	
<i>Poultry, meat production</i>					
Broilers	flocks	2879	5	0.17	<i>S. Livingstone</i> (2), <i>S. Newport</i> (1),

Turkeys, duck and geese (>50 birds)	flocks	473	0	0	<i>S. Bredney</i> (1), <i>S. Schwartzengrund</i> (1)
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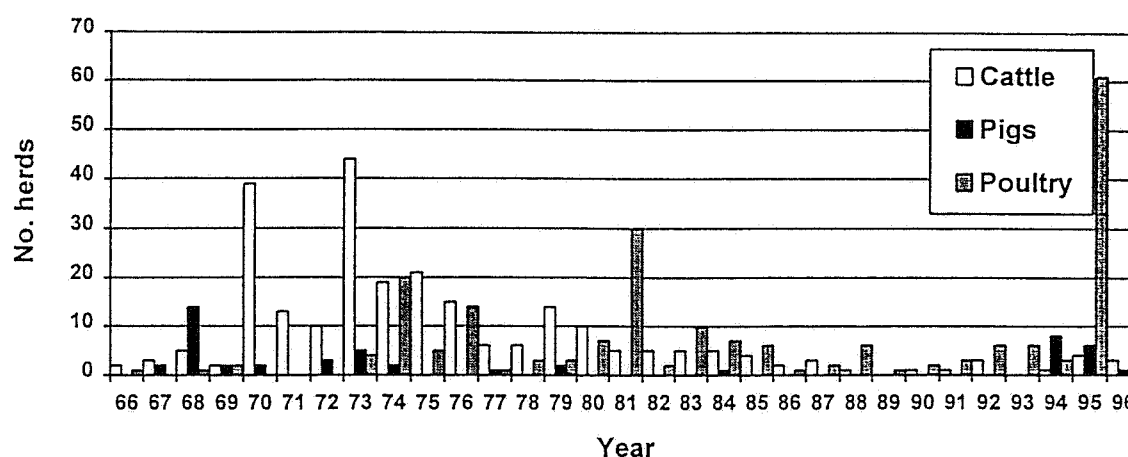
Table 9. Results from the examinations for *Salmonella* of imported live animals. NA = Not available.

Species	No. imported animals	No. imports	No. submissions	No. samples	No. pos. animals	No. pos. imports	Serovars of <i>Salmonella</i>
Cattle	129	NA	36	267	0	0	
Swine	24	3	9	66	1	1	<i>S. Typhimurium</i>
Chicken	194 046	approx. 35	153			0	
Turkeys	5504	approx. 9	32			0	
Ducks and geese	14280	approx. 2	5			1	<i>S. Enteritidis</i>
Ostriches	NA	approx. 8	28			1	<i>S. Idikan</i>
Pigeon	NA	NA	2	2	0	0	
Turtle	NA	NA	2	2	1	1	<i>S. Poona</i>

Table 10. 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	Disease evaluation	Routine control	Follow ups	Total	Serovars of <i>Salmonella</i>
Pigs			1	3	<i>S. Brandenburg</i>
Cattle		1		1	<i>S. Typhimurium</i>
Sheep	2			2	<i>S. enterica diarizona 61:-:1,5</i>
Hen					
Dog	2			2	<i>S. Cerro</i> , <i>S. Bovismorbificans</i>
Turtle	1	2		3	<i>S. Poona</i> (1), <i>S. enterica salamae</i> 47:a:1,5 (2). <i>S. enterica salamae</i> 47:-:- (1), <i>S. Manhattan</i> (1)
Ostriches	1			1	<i>S. Typhimurium</i>

Figure 1. Number of herds of cattle, pigs and poultry on which restrictions were imposed due to *Salmonella* during 1966 - 1996. Source: Ministry of Agriculture. Veterinary statistics 1966 to 1996.



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 11. 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 12). The figures from 1996 are roughly equal to what was found during 1995, except when considering neck skin where the prevalence of *Salmonella* has been decreasing.

Table 11. 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	crushed meat
Production capacity >20 tons	once a week	crushed meat

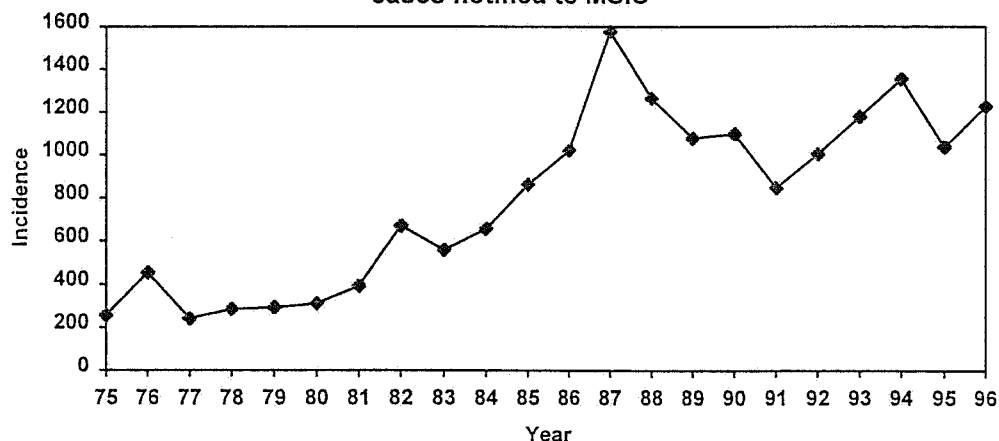
Table 12. Results from the analyses of food products of animal origin in the national *Salmonella* surveillance programme.

Category	Unit	No. samples	No. pos. samples	Prev. %	Serovars of <i>Salmonella</i>
Carcasses of pigs	carcass	2768	0	0	
Carcasses of cattle	carcass	2616	0	0	
Carcasses of sheep	carcass	2802	3	0.11	<i>S. enterica diarizona</i> 61:k:1,5
Carcasses of poultry	neck skin	6653	0	0	
Crushed meat	25 gram crushed meat collected at different locations in the plant	1577	0	0	

Man

Salmonellosis was diagnosed in 1225 people in 1996 (Table 13). Of these, 104 (10%) were domestic cases, 867 (84%) had acquired the infection abroad, and in 64 cases the place of acquisition of the infection was unknown. The incidence data for salmonellosis in man in Norway during 1975 - 1996 are presented in Figure 2. 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.

Figure 2. Samonellosis in man by year, Norway, 1975-1996, cases notified to MSIS



The most common serovars of *Salmonella* isolated are given in Table 14 and, for domestic cases only, in Table 15. Of the serovars also isolated from mammals and poultry (import control not included), and which are not included in Table 15, there is only one recorded human case of domestic acquisition involving *S. Livingstone* and no recordings with the serovars *S. Bredeney*, *S. Brandenburg*, *S. Schwartzengrund*, *S. Cerro*, *S. Bovismorbificans*, *S. Poona*, *S. Manhattan*, *S. Konstantz*, *S. enterica salamae* 47:a:1,5, *S. enterica salamae* 47:-:-, *S. enterica diarizona* 61:k:1,5, *S. enterica diarizona* 61:-:1,5.

Table 13. Incidence of human cases of salmonellosis, trichinosis, brucellosis, bovine tuberculosis and *E. coli* O157 infection during the last 6 years. For 1996 the number of cases per 100.000 population is also given in brackets.

	1996	1995	1994	1993	1992	1991	1990
Salmonellosis	1225 (28.4)	1035	1352	1178	1001	860	1096
Trichinosis	2 (0.05)	0	0	0	0	0	0
Brucellosis	0 (0.0)	0	0	0	0	0	0
Tuberculosis with <i>M. bovis</i>	0 (0.0)	0	2	1	0	0	0
<i>E. coli</i> O157 infection	10 (0.2)	0	1	0	0	0	0

Table 14. The serovars of *Salmonella* with a human incidence higher than 10 in 1996 irrespective of place of acquisition.

No.	Serovars
614	<i>S. Enteritidis</i>
208	<i>S. Typhimurium</i>
66	<i>S. Virchow</i>
26	<i>S. Hadar</i>
25	<i>S. Montevideo</i>
23	<i>S. Agona</i>
21	<i>S. Java</i>
16	<i>S. Berta</i>
16	<i>S. Heidelberg</i>
14	<i>S. Stanley</i>
11	<i>S. Derby</i>
11	<i>S. Mbandaka</i>

Table 15. The ten most common serovars of *Salmonella* isolated from domestic human cases of salmonellosis.

No.	Serovars
67	<i>S. Typhimurium</i>
48	<i>S. Enteritidis</i>
7	<i>S. Java</i>
5	<i>S. Montevideo</i>
5	<i>S. Stanley</i>
3	<i>S. Agona</i>
3	<i>S. Panama</i>
2	<i>S. Breanderup</i>
2	<i>S. Hadar</i>
2	<i>S. Heidelberg</i>

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.

Man

In 1996 two cases of trichinosis were reported both were infected in ex-Yugoslavia (Table 13). Before that, the last reported case of trichinosis in man was in 1980. The place of acquisition was unknown, but the patient had been abroad.

Brucellosis and the agents thereof

Live animals

Bovine brucellosis (*Brucella abortus*) has been eradicated from Norway since 1953. The brucellosis eradication programme is described in "Animal health standards of Norway" (Source: Ministry of Agriculture). Today some hundred blood samples are tested each year. All bulls are tested routinely before entering a semen collection centre and subsequently once annually. 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

The last case of brucellosis in man was recorded in 1987. The person who was infected with *B. melitensis*, had acquired the infection abroad (Mediterranean area).

Tuberculosis due to *Mycobacterium bovis*

Live animals and food

Bovine tuberculosis (*Mycobacterium bovis*) was deemed to have been eradicated in Norway in 1963. The tuberculosis eradication programme is described in "Animal health standards of Norway" (Source: Ministry of Agriculture). 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 with diagnosed tuberculosis. The man had died at the time of the outbreak.

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

Every slaughtered animal except poultry is submitted to a post mortem examination regarding tuberculosis (lymph node examination). If findings suspicious of tuberculosis are made, samples are submitted to the National Veterinary Institute for cultivation. Every year 150 to 200 samples (121 samples in 1996), mostly from pigs, are subjected to further examination, *M. avium* being isolated from 2/3 - 3/4 of these (86 in 1996). 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

Whenever a case of tuberculosis is registered epidemiological information is collected and measures are taken to identify the infection source. The last two cases of human infection with tuberculosis due to *M. bovis* were registered in 1994 (Table 13). One of these cases involved a 100-years 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 had been reported since 1977.

***Escherichia coli* O157 infection**

Live animals

In 1995 a survey in the Norwegian cattle population for shigatoxinogenic *E. coli* O157 where carried out. During July to November 1980 faecal samples from 198 herds located in three high density cattle regions in Norway were collected. 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%.

Food

In 1996 a sample of 1319 samples minced meat collected at cutting plants and retail outlets in different parts of Norway, were examined for *E. coli* O157. Shigatoxinogenic producing strains of *E. coli* O157 was not found. This indicates a prevalence of shigatoxinogenic

producing *E. coli* O157 less than 0.3% in minced meat (95% confidence level) presuming a random sample.

Man

E. coli O157 infection is negligible in Norway. The last three years the incidence has been 0-10 cases (table 13). In 1996 only 2 out of 10 were domestic cases.