Norwegian Veterinary Institute

Report 38 – 2025

The surveillance programme for *Salmonella* spp. in live animals, eggs, and meat in Norway 2024

REPORT 38/2025

The surveillance programme for *Salmonella* spp. in live animals, eggs, and meat in Norway 2024

Authors

Michaela Falk, Petter Hopp, Bjarne Bergsjø

Suggested citation

Falk, Michaela, Hopp, Petter, Bergsjø, Bjarne. The surveillance programme for Salmonella spp. in live animals, eggs, and meat in Norway 2024. Surveillance programme report. Norwegian Veterinary Institute 2025. © Norwegian Veterinary Institute, copy permitted with citation

Quality controlled by

Merete Hofshagen, Director of Animal Health, Animal Welfare and Food Safety, Norwegian Veterinary Institute

Commissioned by

Norwegian Food Safety Authority

Mattilsynet

Published

2025 on www.vetinst.no
ISSN 1890-3290 (electronic edition)

Colophon

Cover photo: Eivind Røhne
www.vetinst.no

Content

Summary

The *Salmonella* surveillance programme in 2024 documents that the Norwegian populations of cattle, swine, and poultry are only sporadically infected. The estimated prevalence is below 0.4% in all examined populations.

Introduction

The occurrence of *Salmonella* in Norwegian production animals and animal products is very low compared to most other countries and has been so for the last decades (1).

The number of confirmed human salmonellosis cases has decreased in Europe over the past 10 years. The reduced prevalence of *Salmonella* in European poultry is presumed to contribute to this reduction. The number of human salmonellosis cases acquired in Norway has remained relatively stable over the last decade, but decreased in 2020 and 2021, probably due to measures against the COVID-19 pandemic. The number increased again since 2022 but is still lower than before the pandemic. This is mainly due to a decrease in the number of travel-associated cases (1).

As it is important to maintain this favourable situation in Norway, the Norwegian *Salmonella* surveillance programme (2) was established in 1995 and launched simultaneously with comparable programmes in Sweden and Finland (3,4). The poultry programme was revised and updated in 2006. The programme is approved by the EU Commission (5), allowing Norway to require additional guarantees regarding *Salmonella* when importing live animals and food products of animal origin from the European Union.

The Norwegian Food Safety Authority (NFSA) implements the surveillance programme according to the regulations (6-8). The Norwegian Veterinary Institute coordinates the surveillance programme, examines the faecal samples, and reports the results. Approved commercial laboratories examine samples collected at slaughterhouses and cutting plants.

Any *Salmonella* isolated in the programme, irrespective of serovar, is notifiable to the NFSA. When *Salmonella* is isolated, action is taken to eliminate the infection, prevent transmission, and prevent contamination of food products.

Aims

The programme aims to ensure that Norwegian food-producing animals and food products of animal origin are virtually free from *Salmonella*, to provide reliable documentation of the prevalence of *Salmonella* in livestock populations and their products, and to prevent an increase in *Salmonella* in Norway.

Materials and methods

The *Salmonella* surveillance of live animals includes the examination of faecal samples (including boot swabs) from swine and poultry, lymph node samples from cattle and swine (at least five ileocaecal lymph nodes from each animal), and environmental samples from adult breeding flocks and broilers.

The *Salmonella* surveillance of fresh meat includes examining swab samples from cattle and swine carcasses, as well as samples of crushed meat from red meat cutting plants and cold stores.
The number of samples requested in the different parts of the programme is estimated to be sufficient to detect at least one *Salmonella*-positive sample if the prevalence in the population is at least 0.1%, with a confidence level of 95%, assuming a 100% sensitive test.

Sampling scheme for live animals

Poultry

The present *Salmonella* programme has been established according to Article 5 of Regulation (EC) 2160/2003 of the European Parliament and of the Council of 17 November 2003 on controlling *Salmonella* and other specified food-borne zoonotic agents (6).

All breeder flocks and commercial production flocks are included in the surveillance programme. All breeder flocks are sampled according to Table 1. All layer flocks are sampled twice during the rearing period and every 15 weeks during the egg-laying period (Table 1), whilst broiler flocks and flocks of turkeys, ducks, and geese other than breeders are sampled one to three weeks before slaughter (Table 1). Results of the testing must be available before slaughter so actions can be taken in positive flocks.

Table 1. Sampling scheme in the surveillance programme for *Salmonella* in Gallus gallus, turkey, duck, geese and guinea fowls in breeder flocks and flocks in production. All samples are collected in the holding.

Production	Sampling time	Sample material	Sampling by*
Breeder flocks			
Rearing flocks	Day old	5 transport crates from one delivery: Crate liners (>1m^2 in total) or swab samples (>1m^2 in total) analysed as one pooled sample.	F
	4 weeks old	2 pairs of boot swabs, analysed as one pooled sample.	F
	2 weeks before being moved	2 pairs of boot swabs, analysed as one pooled sample.	O: Once a year per holding F: Remaining samples
Adult flocks	Every 2nd week	1 pair of boot swabs and 1 specimen of dust (cloth). Analysed as two separate samples. [2 x 150 g faeces analysed separately, if birds were kept in cages].	2 x O: 0-4 weeks after moving, 8-0 weeks before slaughter, once in between F: Remaining samples
Production flocks			
Pullets	Day old	5 transport crates: Crate liners (>1m^2 in total) or swab samples (>1m^2 in total), analysed as one pooled sample.	F
	2 weeks before being moved	2 pairs of boot swabs, analysed as one pooled sample. Cage birds: Faecal samples (150 g)	O: Once a year in each holding F: Remaining samples
Layers	Every 15th week	2 pairs of boot swabs, analysed as one pooled sample. Cage birds: Faecal samples (2x150 g).	O: One of the samples F: Remaining samples
Slaughter flocks	10 – 19 days before slaughter	1 pair of boot swabs and 1 specimen of dust (cloth) analysed as one pooled sample.	O: Once a year per holding F: Remaining samples

*O = Official personnel (Norwegian Food Safety Authority), F = Farmer.

Swine

Norway had 72 elite and multiplier breeding swine herds at the start of 2024. More than 95% of marketed breeding animals are purchased from these herds. All elite and multiplier breeding herds are surveyed annually at the herd level (7). Pooled faecal samples are collected from all pens (up to 20) containing sows aged two to six months. If there are fewer than three pens with sows during sampling, additional faecal samples are collected from all sows individually (up to a maximum of 59).

The pig population is surveyed by sampling a representative proportion of all pigs slaughtered in Norway. Lymph node samples from 3,000 swine (both sows and slaughter pigs) should be collected at slaughter. The estimated sample volume for each slaughterhouse ranged from three to 645 based on the number of onsite slaughtered animals compared to the national total. The sampling is distributed evenly throughout the year (7).

Cattle

The surveillance is based on sampling a representative proportion of all cattle slaughtered in Norway. A total of 3,000 lymph node samples from cattle should be collected at slaughter. The estimated sample volume for each slaughterhouse ranged from one to 600 based on the number of onsite slaughtered animals compared to the national total. The sampling is distributed evenly throughout the year (7).

All animal species - clinical cases

Animals with clinical symptoms consistent with salmonellosis should be sampled for testing. In addition, all sanitary slaughtered animals are tested for the presence of *Salmonella*. Data from these two categories of samples are not in this report.

Sampling scheme for fresh meat

Swab samples from carcasses

Testing slaughtered pigs and cattle for *Salmonella* is done by swabbing carcass surfaces. For each animal species, 3,000 swab samples should be collected at slaughter. The number of swab samples of cattle and swine from each slaughterhouse equals the number of lymph node samples. The sampling is distributed evenly throughout the year. The sampling is done near the end of the slaughter line before the carcasses are refrigerated. About 1,400 cm^2 of each carcass are swabbed (8).

Food products

The *Salmonella* surveillance of cutting plants and cold stores is based on samples of crushed red meat taken from the equipment or trimmings. Each sample consists of 25 g. Each production line is sampled separately but analysed as one pooled sample. The sampling should be performed randomly during the operation. The number of samples taken in cutting plants and cold stores is given by the plant`s production capacity, ranging from one sample per week to two per year (8). Pre-packed fresh meat intended for cold stores does not need to be examined if it comes from cutting plants included in the programme.

Laboratory methods

Faecal samples (including boot swabs)

Testing for the presence of *Salmonella* was carried out using VIDAS®SPT, which is an automated qualitative ELISA test for the detection of *Salmonella* in animal faecal and environmental samples from the primary production stage and based on a novel recombinant phage protein-based technology. The method is validated according to ISO 16140.

Lymph nodes, carcass swabs, and crushed meat samples

All lymph nodes from one animal are divided into two equal parts. One-half is used for testing, and the other half is stored at 4°C until the results of the bacteriological examination are ready. The lymph nodes from at most five animals are pooled and homogenized before bacteriological examination. Swab samples are pooled in groups of five before testing. If a pooled sample is confirmed positive for *Salmonella*, the individual samples are examined separately. The samples are analysed using real-time PCR. The method is validated according to ISO 16140.

All samples

A sample is considered positive when *Salmonella* is detected by the specified method and the referred isolate is verified by the National Reference Laboratory (The Norwegian Veterinary Institute).

Results and discussion

Live animals

Poultry

Altogether 9,225 faecal samples (boot swabs or faeces) with or without specimens of dust (cloths) from 1,237 different holdings were examined (Table 2). One flock with broiler parents and one flock with broilers were positive for *Salmonella*, giving an estimated *Salmonella* prevalence of 0.37% (95% CI: 0.01% - 2.0%) in broiler parental flocks and 0.02% (95% CI: 0.0006% - 0.1%) in broiler flocks. Figure 1 shows the occurrence of *Salmonella* in poultry flocks from the implementation of the programme in 1995.

Table 2. Number of samples from poultry examined in the *Salmonella* surveillance programme in 2024.

Type of production	No. of holdings	No. of flocks	No. of samples	No. of positive flocks	*Salmonella* serovar
Grandparents1					
Layers	2	4	29	0	
Parents[1]					
Layers	7	22	100	0	
Broilers	89	271	1,784	1	S. Enteritidis
Turkey	6	18	109	0	
Ducks and geese	5	18	164	0	
Total breeders	**107**	**333**	**2,187**	**1**	
Egg production					
Pullets	18	82	116	0	
Layers	579	1,204	1,943	0	
Meat production					
Broilers	562	4,111	4,603	1	S. Typhimurium
Turkey	40	127	232	0	
Ducks and geese	12	111	144	0	
Total non-breeders	**1,157**	**5,635**	**7,038**	**1**	
Total	1,237	5,968	9,225	2	

[1] Include rearing and adult flocks

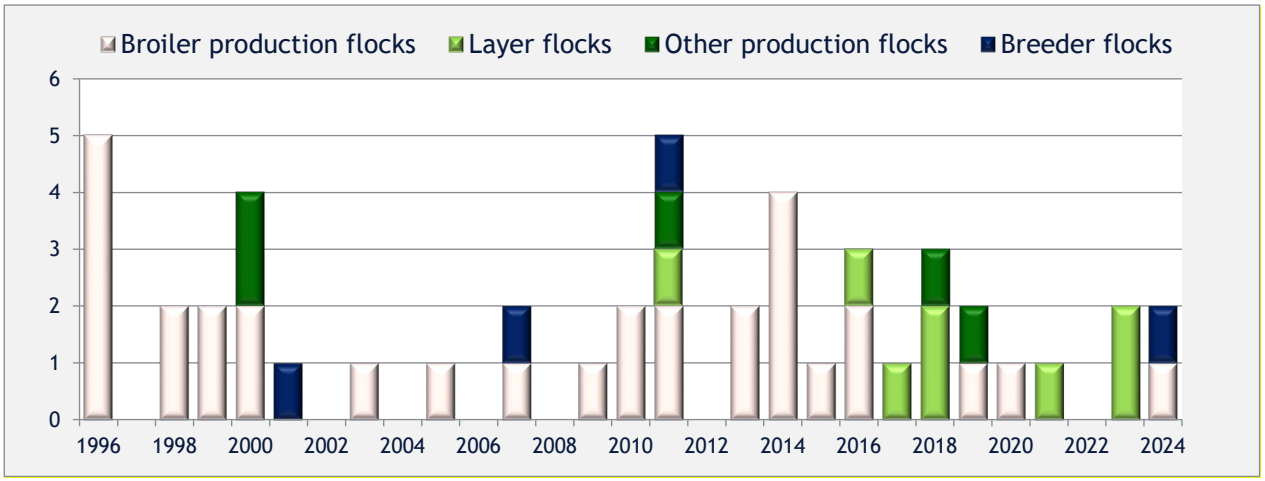

Figure 1. Number of positive poultry flocks found in the *Salmonella* surveillance programme since 1996.

Swine

Altogether 1,201 faecal samples from 56 elite and multiplier breeding herds were examined. *Salmonella* was not detected. Six of the requested herds were no longer breeder herds. From 10 breeder herds, samples were not submitted.

A total of 3,156 lymph node samples from pigs were examined (Table 3). Approximately 45% of the samples were taken from sows, and the remaining from slaughter pigs. *Salmonella* was not detected. Figure 2 shows the number of *Salmonella*-positive samples from swine since the start of the programme.

Cattle

A total of 3,143 lymph node samples from cattle were examined (Table 3). One sample was positive for *Salmonella*, giving an estimated *Salmonella* prevalence of 0.03% (95% CI: 0.01% - 0.18%) at the individual carcass level. Figure 2 shows the number of *Salmonella*-positive samples from cattle since the start of the programme.

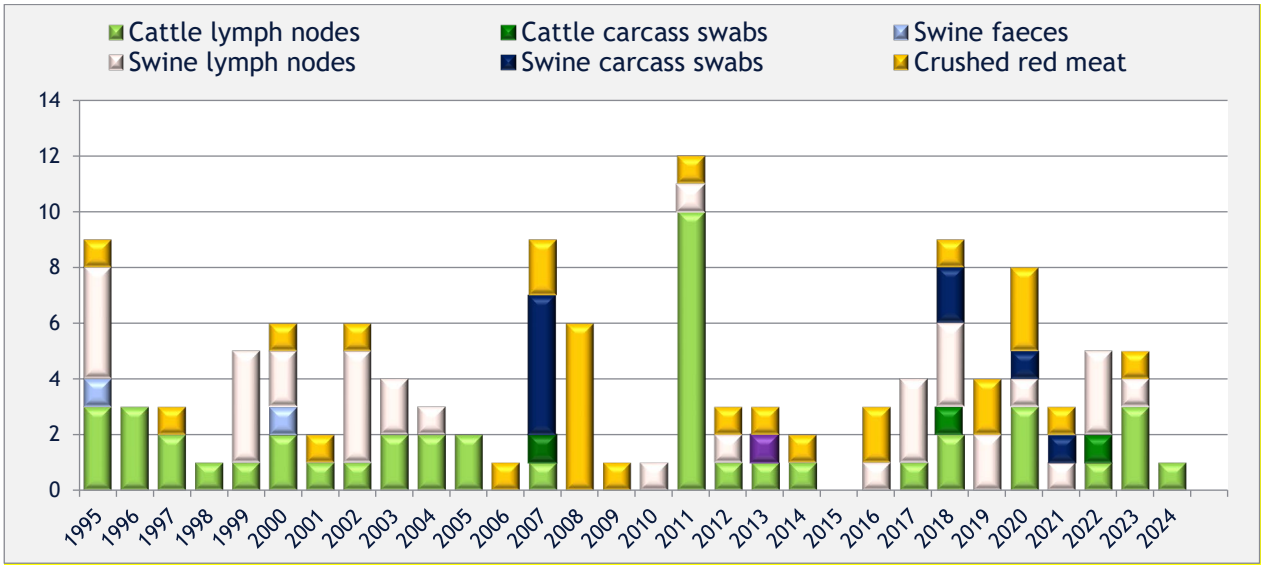

Figure 2. Number of positive faeces samples, lymph nodes, carcass swabs, and crushed meat samples from cattle and swine found in the *Salmonella* surveillance programme since the start in 1995.

Fresh meat

Swab samples from cattle and swine carcasses
A total of 6,884 swab samples were examined (Table 3). *Salmonella* was not detected.

Cutting plants for fresh meat
A total of 2,712 samples of crushed meat were examined (Table 3). *Salmonella* was not detected.

Figure 2 shows the number of *Salmonella*-positive swab samples and samples from crushed meat since the start of the programme.

Table 3. Number of individual lymph nodes, carcass swabs, and crushed meat samples examined in the *Salmonella* surveillance programme in 2024.

Species	No. of samples examined	No. of positive samples	*Salmonella* serovar
Lymph node samples			
Sows	1,425	0	
Slaughter pigs	1,731	0	
Cattle	3,143	1	S. Abony
Swab samples from carcass			
Sows	1,728	0	
Slaughter pigs	1,761	0	
Cattle	3,395	0	
Crushed meat samples	2,712	0	

Lymph node samples from one cattle herd tested positive in 2024. The herd was followed up by the Norwegian Food Safety Authority by sampling of faeces from all animals, feed, and the environment on the farm.

In conclusion, the results from the *Salmonella* surveillance programme in 2024 agree with previous years. The Norwegian cattle, swine, and poultry populations are only sporadically infected with *Salmonella*. The estimated prevalence has been below 0.5% in the examined populations for all years the surveillance programme has been conducted.

Acknowledgement

The authors would like to thank the technical staff for performing the analyses with excellence, in particular Ingrid Natalie Magnussen-Eriksen and Stine Merete Kreutz Grønli. Moreover, the authors would like to thank the personnel from the Norwegian Food Safety Authority and the poultry farmers for collecting and submitting samples.

References

1. Krosness, Marie Myklatun, Haaland, Anita Haug, Lange, Heidi, Lyngstad, Trude Marie, Heier, Tafjord, Berit. The Norwegian Zoonoses Report 2023. Veterinærinstituttet . https://www.vetinst.no/rapporter-og-publikasjoner/rapporter/2024/zoonoserapporten-2023
2. Anonymous. The Norwegian Salmonella surveillance and control programmes for live animals, eggs and meat. Oslo: Veterinary and Food Department, Norwegian Ministry of Agriculture; 1998.
3. Anonymous. The Swedish Salmonella control programmes for live animals, eggs, and meat. National Veterinary Institute, Swedish Board of Agriculture, National Food Administration; 1995.
4. Anonymous. The Finnish Salmonella control programmes for live animals, eggs, and meat. Veterinary and Food Department, Finnish Ministry of Agriculture and Forestry; 1994.
5. EFTA Surveillance Authority: Decision No. 68/95/COL of 19.06.1995.
6. Forskrift om kontroll med Salmonella i fjørfe, fjørfefôr, fjørfekjøtt og egg av 8.6.2007 nr. 603. http://lovdata.no/dokument/SF/forskrift/2007-06-08-603
7. Forskrift om overvåking av og kontroll med forekomsten av Salmonella hos levende storfe og svin av 31.01. 1995 nr. 107. http://lovdata.no/dokument/SF/forskrift/1995-01-31-107
8. Forskrift om overvåking av og kontroll med forekomst av Salmonella i ferskt kjøtt av 10.4.1995 nr. http://lovdata.no/dokument/SF/forskrift/1995-04-10-368

Health and well-being for animals and people

Norwegian Veterinary Institute

Ås ▪ Sandnes ▪ Bergen ▪ Trondheim ▪ Harstad ▪ Tromsø

postmottak@vetinst.no

vetinst.no