Norwegian Veterinary Institute

Report 37 – 2026

The surveillance programme for specific viral infections in swine herds in Norway 2025

REPORT 37/2026

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Suggested citation

Grøntvedt, Carl Andreas, Nordstoga, Anne Bang, Tarpai, Attila. The surveillance programme for specific viral infections in swine herds in Norway 2025. Surveillance program report. Veterinærinstituttet 2026. © Norwegian Veterinary Institute, copy permitted with citation

Quality controlled by

Merete Hofshagen, Surveillance Programme Coordinator, Norwegian Veterinary Institute

Commissioned by

Norwegian Food Safety Authority

Mattilsynet

Published

2026 on www.vetinst.no
ISSN 1890-3290 (electronic edition)

Colophon

Cover photo: Carl Andreas Grøntvedt
www.vetinst.no

Content

Summary

The surveillance programme for specific viral infections in swine herds in 2025 continued to document Norway to be free from Aujeszky's disease, and the continued absence of transmissible gastroenteritis, porcine epidemic diarrhoea and porcine respiratory and reproductive syndrome.

Since 2009, influenza A (H1N1) pdm09 virus (H1N1pdm09) and H1N1pdm09-like viruses has been endemic in the Norwegian swine population, with a seroprevalence of approx. 28.6% of herds testing positive during 2025 which is comparable to 2024, but higher than the two preceding years. Other swine-associated influenza strains have never been detected in Norway.

In 2018, porcine respiratory corona virus (PRCV) was detected for the first time in Norway, in the county of Rogaland. Since then, serological positive animals have also been detected in other parts of Norway although the seroprevalence remains higher in the neighbouring south-western counties of Rogaland and Agder. In 2025, the seroprevalence for PRCV was 6.2% which is lower than the three previous years.

Introduction

The Norwegian Food Safety Authority (NFSA) is responsible for implementing the surveillance programme for specific viral infections in swine. The national surveillance programme for specific viral infections in swine was launched in 1994 to document Norway's disease-free status for Aujeszky's disease (AD), and the status of transmissible gastroenteritis (TGE), porcine respiratory corona virus (PRCV), porcine reproductive and respiratory syndrome (PRRS), swine influenza (SI) and porcine epidemic diarrhoea (PED) in the Norwegian swine population. An overview of the national listing, EU categorization and years in surveillance programme for the viral agents can be found in Table 1. The NFSA is responsible for collecting the samples. The Norwegian Veterinary Institute (NVI) is responsible for sampling plans, laboratory investigations, reporting the results to the NFSA and writing the annual report.

Table 1. Specific viral agents (abbr.) with contemporary national listing, EU categorization, and the years the agents were included in the Norwegian surveillance programme. ADV: Aujeszky's disease virus, TGEV: transmissible gastroenteritis virus, PRCV: porcine respiratory corona virus, PRRSV: porcine reproductive and respiratory virus, SIV: swine influenza virus, PEDV: porcine epidemic diarrhoea virus.

Viral agent	National listing	EU category	Included years
ADV (SuHV-1)	1	C + D + E	1994 ->
TGEV	1	None	1994 ->
PRCV	3	None	1994 ->
PRRSV	2	D + E	1995 ->
SIV	2	None	1997 ->
PEDV	2	None	1997 – 1999, 2015 ->

AD, PRRS, TGE and PED have never been detected in Norway.

The EFTA Surveillance Authority (ESA) has recognized Norway's disease-free status for AD since 1st July 1994, and the current approval of disease-free status is described in ESA Decision No 032/21/COL. Specific criteria for documentation of maintenance of the disease-free status is regulated in 2020/689 (EU), art 81. Additional measures for the trade of pigs have been laid down to protect Norway's disease-free status for AD (regulation (EU) 2020/688, art 21).

Norway recorded its first outbreak of influenza A (H1N1) pdm09 virus (H1N1pdm) in the swine population in 2009, and in the following years, a stable herd prevalence of between 40% and 50% indicated endemicity of H1N1pdm09-like viruses, but with a more variable pattern since 2018 (Figure 1).

In 2018, antibodies against PRCV were detected in seven swine herds in the county of Rogaland through the surveillance programme, and an outbreak investigation revealed PRCV specific antibodies in a high proportion (68%) of contact herds sampled. The herd seroprevalence for PRCV since 2018 is shown in Figure 1.

Aims

The aims of the serological surveillance programme are to document the disease-free status of ADV in accordance with 2020/689 (EU) article 81, ascertain the continued absence of PRRS and TGE and to contribute to the maintenance of this favourable situation. The programme also includes surveillance for PED and monitors the seroprevalence of influenza A H1N1pdm09-like viruses and PRCV in the Norwegian pig population.

Materials and methods

Herds and sampling

All 71 nucleus and multiplying herds as well as the central units of all 11 sow pools in Norway were included in the programme. Blood samples (target sample size of ten pigs) from adult swine in each herd were collected, usually at the abattoirs, but occasionally also at the farms. In addition, a selection of the remaining Norwegian swine herds was included in the programme. At the 12 abattoirs where more than 98% of the adult pigs are slaughtered, blood samples proportional to the number of sows and boars slaughtered were collected. The samples were randomly collected from different herds, and the sampling periods were evenly distributed throughout the year. Furthermore, at the seven largest abattoirs, blood samples (targeted sample size ten pigs) were collected from seven randomly selected large fattening herds at each abattoir, in total 49 herds.

Laboratory analyses

All serological analyses were performed at NVI. Positive or inconclusive results in the surveillance programme were retested in duplicate with the same test method. Samples were concluded as negative if the retest gave a negative result. If the result of the retest was positive or inconclusive, a specified confirmatory test was performed. In cases of positive or inconclusive test results for confirmatory tests (except for H1N1pdm virus and PRCV), the NFSA would collect additional samples (at least 10 samples) from the herd in question to confirm or refute the result. If clinical signs of disease were absent in the herd, and all resampled animals were negative for antibodies against the pathogen in question, a single positive or inconclusive sample in the surveillance programme was considered false positive. If follow-up serum samples were positive, or the agent was detected in agent-based diagnostic methods, the NVI would immediately notify the NFSA of the detection of a notifiable disease.

Aujeszky's disease/pseudorabies virus (ADV/PRV)

The diagnostic methods for granting and maintaining disease-free status are laid down in Art 6 of Regulation (EU) 2020/689. All serum samples were tested for antibodies against ADV using a commercial blocking ELISA from Svanova (SVANOVIR® PRV gB-Ab). The test detects antibodies against glycoprotein B (previously glycoprotein II) found on the surface of the virus in accordance with the requirements in Section 5 of Annex III of Regulation (EU) 2020/689. Positive or inconclusive samples were further analysed with ID Screen® Aujeszky gE Competition ELISA at the NVI.

Transmissible gastroenteritis virus (TGEV) and porcine respiratory coronavirus (PRCV)

A commercial blocking ELISA from Biovet (Swinecheck®TGEV/PRCV Recombinant) was used to detect antibodies against TGEV/PRCV. The ELISA test enables discrimination between antibodies to TGEV and PRCV in serum samples. TGEV positive or inconclusive samples were tested with a confirmatory test (SVANOVIR® TGEV/PRCV-Ab, Svanova) at the NVI.

Porcine reproductive and respiratory syndrome virus (PRRSV)

All serum samples were tested for antibodies against PRRSV using a commercial indirect ELISA from IDEXX (IDEXX PRRS X3 Ab Test), which detects the most (pre)dominant type-1 and type-2 strains of PRRSV. PRRSV positive or inconclusive samples were tested with a confirmatory ELISA (ID Screen® PRRS Indirect) at the NVI. If still positive, the samples were analysed with a real-time PCR for PRRSV (Applied Biosystems™, VetMAX™ PRRSV EU & NA 3.0 Kit)

Swine influenza virus

A commercial competitive ELISA from IDvet (ID Screen® Influenza A Antibody Competition, Multi-species) was used to screen serum samples from swine for antibodies against influenza A virus.
Positive or inconclusive samples were tested for subtype specific antibodies using the haemagglutination inhibition (HI) test, including antigens from human seasonal influenza (A/Victoria/2570/2019 (H1N1), referred to as H1N1pdm09-like virus) and classic swine influenza strains (A/Swine/Belgium/1/98 (H1N1), A/Swine/Gent/7623/99 (H1N2) and A/Swine/Flanders/1/98 (H3N2) subtypes as described in the WOAH Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (1). The antigens for the HI tests were produced in eggs at the NVI. Virus for production of A/Victoria/2570/2019 (H1N1) was donated by the Norwegian Public Health Institute.

Porcine epidemic diarrhoea virus (PEDV)

All serum samples were tested for antibodies against PEDV using a commercial indirect ELISA from IDvet (ID Screen® PEDV Indirect). In cases of positive or inconclusive results, the samples were sent to Statens Serum Institut (SSI) in Denmark for confirmatory testing.

Results and Discussion

Distribution of sampled herds in relation to production type is given in Table 2. The mean number of animals tested per farm aggregated for the year was 8.0 (range 1 - 32). Approximately 0.1% of the collected samples were rejected, resulting in 3,878 individual pig samples representing 482 herds being analysed (Table 3). Of the tested herds, 138 (28.6%) were seropositive for H1N1pdm09-like virus and 30 (6.2%) were seropositive for PRCV (Table 2). The proportion of herds tested positive by region is presented in Table 4/Figure 2 (PRCV) and Table 5/Figure 3 (H1N1pdm09-like virus).

Table 2. Distribution of swine herds in the surveillance programme 2025 according to type of production and the results for antibodies to H1N1pdm09-like virus and PRCV.

Category	No. of herds sampled	No. (%) of positive herds H1N1pdm09-like virus	No. (%) of positive herds PRCV
Nucleus herds and multiplying herds	63	14 (22.2)	5 (7.9)
Sow pools	110	8 (72.7)	1 (9.1)
Integrated and piglet-producing herds	362 (PRCV 361)	115 (31.8)	23 (6.4)
Fattening herds	46	1 (2.2)	1 (2.2)
Total herds (pigs)	**482**	**138 (28.6)**	**30 (6.2)**

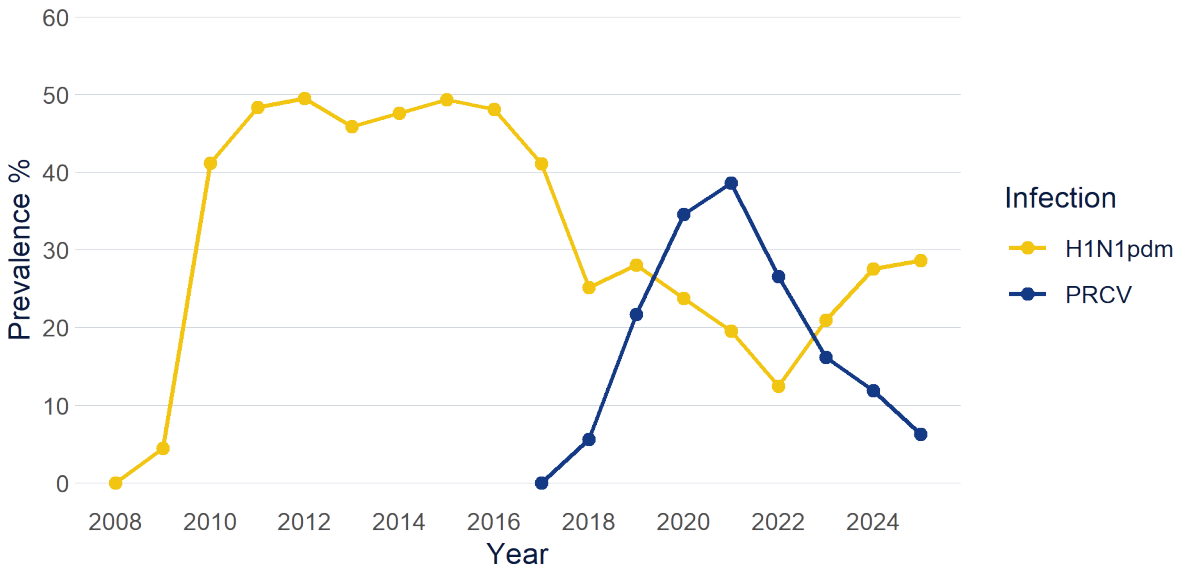

Figure 1. National prevalence of herds with serological positive animals for influenza A H1N1pdm09-like virus and porcine respiratory coronavirus (PRCV) in the surveillance programme for specific viral infections from year of first detection until 2025.

Table 3. Results from the surveillance for Aujeszky's disease (AD), transmissible gastroenteritis (TGE), porcine respiratory corona virus (PRCV), porcine epidemic diarrhoea (PED), porcine respiratory and reproductive syndrome (PRRS) and swine influenza (SI) from 1994 to 2025.

Year	Total no. of herds	Herds tested	Animals tested	H1N1pdm09-like viruses		PRCV		Other viruses		Diseases included in "Other viruses"
				Animals positive[3]	Herds positive	Animals positive	Herds positive	Animals positive	Herds positive	
1994	7,799	1,112	12,010	-	-	0	0	0	0	AD, TGE
1995	7,471	956	11,197	-	-	0	0	0	0	AD, TGE, PRRS
1996	7,045	468	4,968	-	-	0	0	0	0	AD, TGE, PRRS
1997	6,661	512	4,925	-	-	0	0	0	0	AD, TGE, PRRS, SI, PED
1998	6,275	491	4,695	-	-	0	0	2[1]	1[1]	AD, TGE, PRRS, SI, PED
1999	5,761	470	4,705	-	-	0	0	0	0	AD, TGE, PRRS, SI, PED
2000	4,827	458	4,600	-	-	0	0	0	0	AD, TGE, PRRS, SI
2001	4,554	472	4,972	-	-	0	0	0	0	AD, TGE, PRRS, SI
2002	4,150	492	4,899	-	-	0	0	0	0	AD, TGE, PRRS, SI
2003	4,005	483	4,783	-	-	0	0	0	0	AD, TGE, PRRS, SI
2004	4,006	492	4,935	-	-	0	0	0	0	AD, TGE, PRRS, SI
2005	3,762	468	4,644	-	-	1[2]	1[2]	0	0	AD, TGE, PRRS, SI
2006	3,339	457	4,569	-	-	0	0	0	0	AD, TGE, PRRS, SI
2007	3,010	456	4,641	-	-	0	0	0	0	AD, TGE, PRRS, SI
2008	2,682	487	4,845	-	-	0	0	0	0	AD, TGE, PRRS, SI
2009	2,546	452	4,724	131	20	0	0	0	0	AD, TGE, PRRS, SI
2010	2,441	459	4,250	940	189	0	0	0	0	AD, TGE, PRRS, SI
2011	2,346	730	4,713	2,216	353	0	0	0	0	AD, TGE, PRRS, SI
2012	2,213	764	4,961	2,412	378	0	0	0	0	AD, TGE, PRRS, SI
2013	2,178	737	5,038	1,417	338	0	0	0	0	AD, TGE, PRRS, SI
2014	2,117	622	4,083	1,138	296	0	0	0	0	AD, TGE, PRRS, SI
2015	2,141	568	3,764	993	280	0	0	0	0	AD, TGE, PRRS, SI, PED
2016	2,180	564	3,824	952	271	0	0	0	0	AD, TGE, PRRS, SI, PED
2017	1,955	548	3,804	695	225	0	0	0	0	AD, TGE, PRRS, SI, PED
2018	2,038	533	3,598[3]	473	134	126[4]	30[4]	0	0	AD, TGE, PRRS, SI, PED
2019	1,853	545	3,838[3]	526	153	532	118	0	0	AD, TGE, PRRS, SI, PED
2020	1,724	527	3,851[3]	534	125	753	182	0	0	AD, TGE, PRRS, SI, PED
2021	1,693	521	4,012[3]	394	102	904	201[5]	0	0	AD, TGE, PRRS, SI, PED
2022	1,666	531	3,803[3]	131	66	554	141[5]	0	0	AD, TGE, PRRS, SI, PED
2023	1,597	515	3,998[3]	387	108	264	83[5]	0	0	AD, TGE, PRRS, SI, PED
2024	1,534	496	3,831[3]	368	137	152	59[5]	0	0	AD, TGE, PRRS, SI, PED
2025	1,537	482	3,878[3]	231	138	87	30[5]	0	0	AD, TGE, PRRS, SI, PED
Total			**155,358**							

[1] Two samples from one herd were seropositive for SI H3N2 in 1998 (probably infection from humans)

[2] One sero-positive sample for PRCV in 2005 (probably unspecific reaction).

[3] Maximum 5 influenza A positive samples per submission were followed up with a HI-test to identify the influenza strain.

[4] In addition to routine surveillance for PRCV and not included in this table, NVI also detected 238 positive pigs in 30 positive herds (27 in Rogaland, 1 in Vest-Agder and 2 in Hedmark).

[5] For some herds, serological analyses were inconclusive for antibodies against TGEV, while antibodies against PRCV were detected in other animals from the herds. We consider it likely that this is due to serological cross-reactions between PRCV and TGEV. See discussion for details.

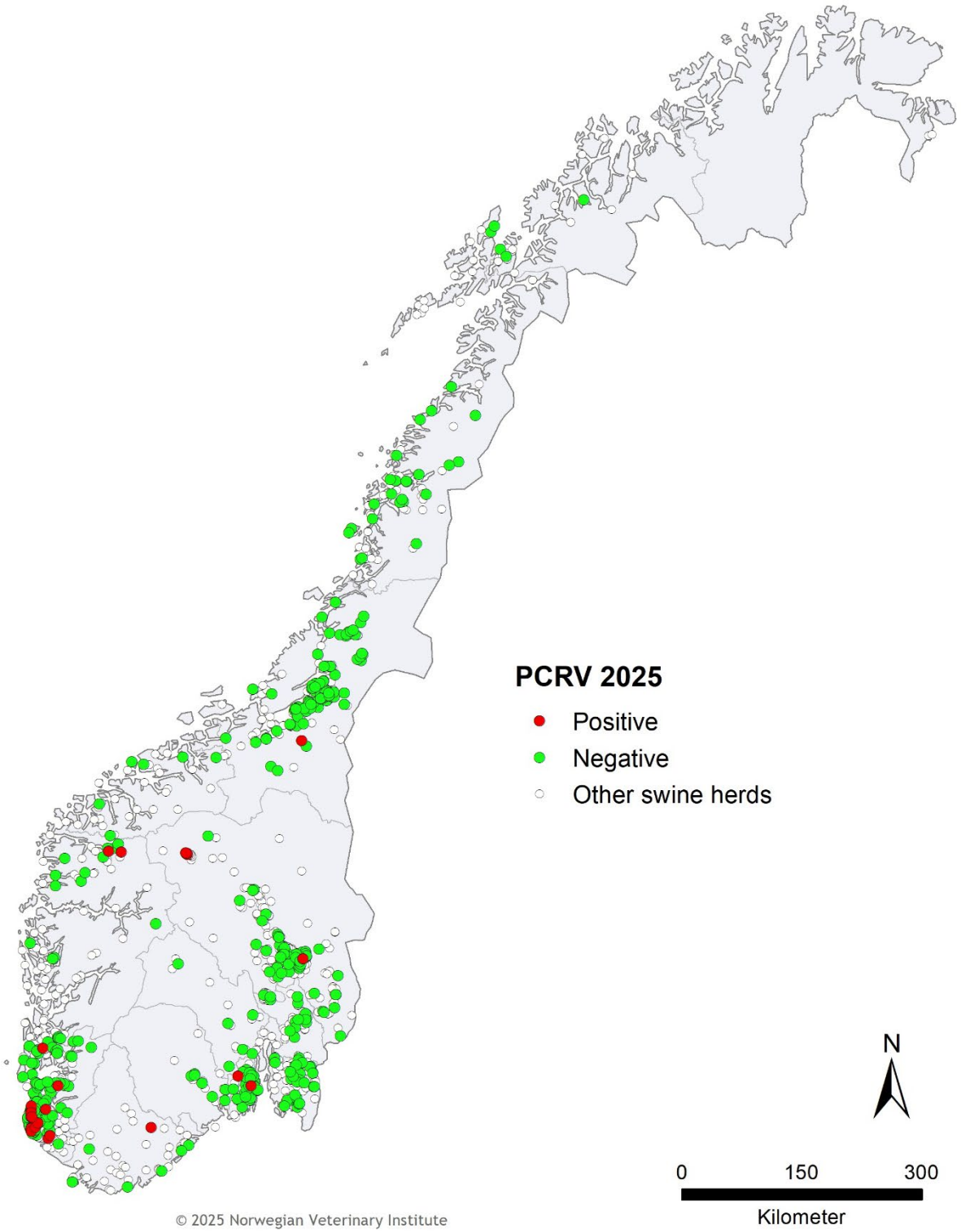

Figure 2. Serological results and geographical distribution of swine herds tested for antibodies against porcine respiratory coronavirus in the surveillance programme for specific viral infections in 2025.

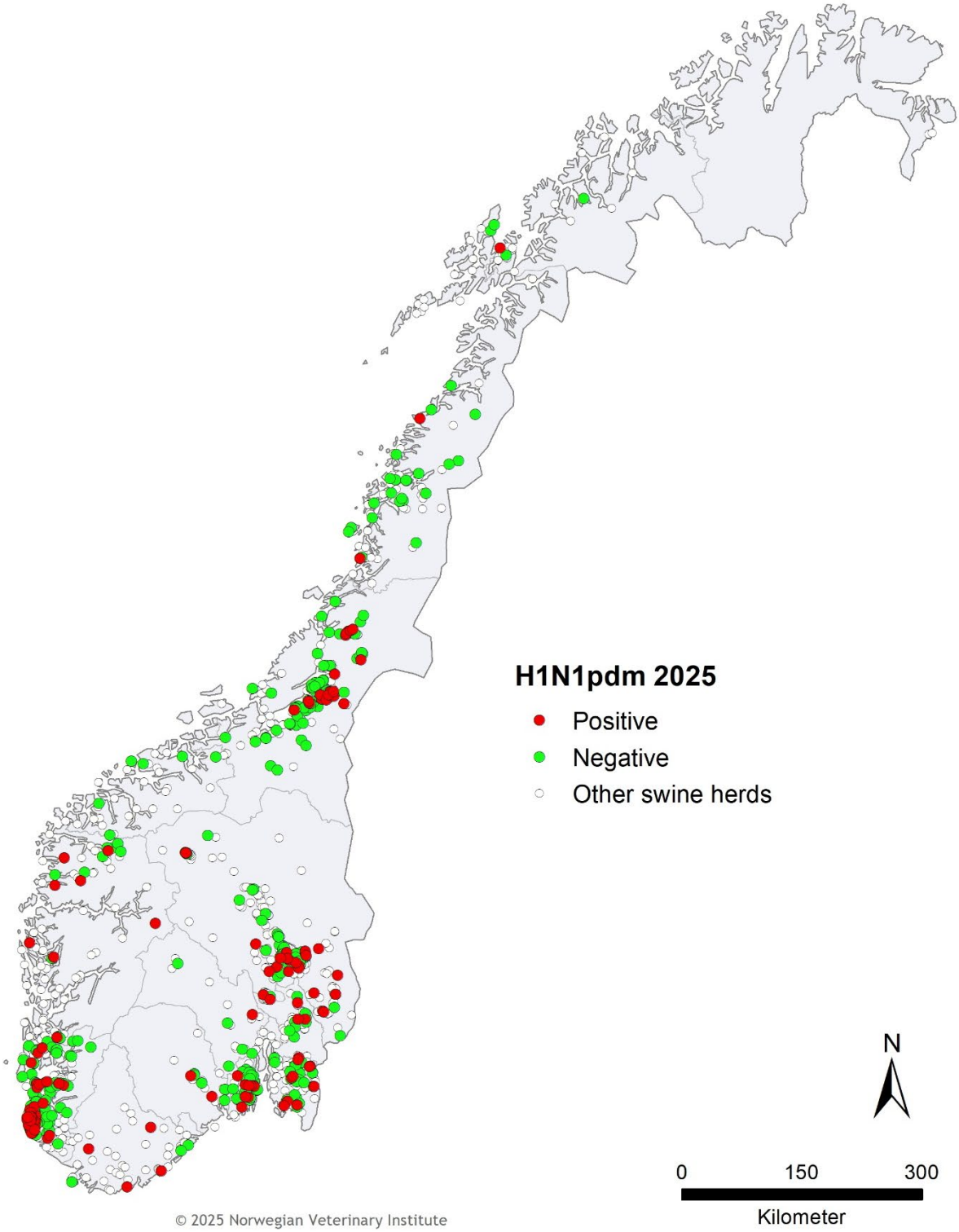

Figure 3. Serological results and geographical distribution of swine herds tested for antibodies against influenza A virus in the surveillance programme for specific viral infections in 2025.

The results from the surveillance programme in 2025 showed that Norway has maintained its freedom of disease status for AD, below a between-herd design prevalence rate of 0.2% and the within-herd prevalence rate of 20%, with 99% confidence. TGE and PRRS virus infections have not been detected in the national swine population since the surveillance started in 1994, and the same applies to PED for those years it has been included (Table 3).

PRCV is a variant of transmissible gastroenteritis virus (TGEV). PRCV likely emerged naturally and subsequently spread rapidly in the European swine populations during the early 1980s, causing mostly unapparent infections and ameliorating TGE through immunological cross-protection (2).

Table 4. Number of herds tested and percentage of herds positive for PRCV per region in 2025. The total number of herds is based on Register of Production Subsidies as of 1st March 2025.

Region	Total no. of herds	No. of herds tested	No. of herds tested positive	No. of herds tested inconclusive	Percentage of herds tested positive (95% CI)
Nordland, Troms, Finnmark	105	29	0	0	0 (0 - 11.9)
Trøndelag, Møre og Romsdal	278	113	1	0	0.9 (0 - 4.8)
Vestland	91	21	2	0	9.5 (1.2 - 30.4)
Rogaland, Agder	463	153	20	0	13.1 (8.2 - 19.5)
Vestfold, Telemark	114	42	2	0	4.8 (0.6 - 16.2)
Oslo, Akershus, Østfold, Buskerud	174	48	0	0	0 (0 - 7.4)
Innlandet	312	75	5	0	6.7 (2.2 - 14.9)
Total	**1 537**	**481**	**30**	**0**	**6.2 (4.2 - 8.8)**

Based on surveillance data from this and previous years, it is likely that the introduction of PRCV to the Norwegian pig population occurred during 2018. The outbreak investigation conducted by the NFSA further showed that the virus spread rapidly to a high proportion of herds connected by trade of live pigs, but also to herds located less than 3 km from PRCV seropositive herds. The route of introduction to Norway was not identified. In 2025, the national herd seroprevalence for PRCV was estimated to 6.2%. In the counties of Rogaland and Agder the PRCV herd seroprevalence was 13.1%, while the corresponding herd seroprevalence was 3% outside Rogaland and Agder. This is lower than in the three previous years, but the cause of the decreasing seroprevalence is not known.

With regards to influenza A, studies have shown that the H1N1pdm virus was most likely introduced to pigs by humans infected with the same virus (4, 5). The herd seroprevalence for H1N1pdm was 28.6% in 2025. It is not unlikely that the prevalence in the pig population is correlated with H1N1pdm09-like viruses in the human population. A decline from 2017 in herd prevalence was observed across all four production types and across all counties until 2022 when the seroprevalence was 12%. Since 2022 there has been an increase in the herd seroprevalence to the current year of reporting, but with considerable variation between counties (Table 5). The herd prevalence in the Rogaland/Agder region, the densest pig farming area in Norway, remains the highest at 38.3% indicating a continued endemic situation. Except for H1N1pdm09-like viruses, the Norwegian swine population tested negative against other strains of influenza A virus that are endemic in most pig producing countries.

Table 5. Number of herds tested and percentage of herds positive for H1N1pdm09-like viruses per region in 2025. The total number of herds is based on Register of Production Subsidies as of 1st March 2025.

Region	Total herds	No. of herds tested	No. of herds tested positive	Percentage of herds tested positive (95% CI)
Nordland, Troms, Finnmark	105	29	3	10.3 (2.2 - 27.4)
Trøndelag, Møre og Romsdal	278	113	18	15.9 (9.7 - 24)
Vestland	91	21	8	38.1 (18.1 - 61.6)
Rogaland, Agder	463	154	59	38.3 (30.6 - 46.5)
Vestfold, Telemark	114	42	11	26.2 (13.9 - 42)
Oslo, Akershus, Østfold, Buskerud	174	48	14	29.2 (17 - 44.1)
Innlandet	312	75	25	33.3 (22.9 - 45.2)
Total	**1 537**	**482**	**138**	**28.6 (24.6 - 32.9)**

Swine influenza A H1N1pdm09-like virus infection in Norwegian pig herds have mainly been subclinical or with mild clinical signs in a small proportion of the herds (4, 7, 8). A longitudinal study from a Norwegian boar testing station published in 2014 showed that infected growing pigs had reduced feed efficiency due to poorer feed conversion ratio and as such increased the time before being sent to slaughter (9).

In the recent years, the number of herds in the Norwegian swine production has stabilized while the average herd size has increased. The pork production by tonnage has remained relatively stable. In 2011, the sampling procedure for conventional herds with sows, changed from 10 samples collected in randomly selected herds to individual animals being collected at the abattoir. Therefore, the mean number of samples per herd decreased, while the fraction of the total pig herd population sampled increased from 19% in 2010 to 31% in 2011. Since 2014, this proportion has been between 26% and 32%, while the mean number of samples per herd has further decreased.

Farmed wild boars and pigs kept as pets were not included in the programme. These populations are small and are presumed have little to no contact with the commercial pig population. There is a small wild boar population mainly in an area along the Swedish border in the southeast of Norway. A wild boar health surveillance was conducted during 2025 and is reported separately.

Apart from AD, the EU has not approved additional measures against other porcine viral infections for trading pigs into Norway. To protect the swine population against disease-related risks, Norway has its own national legislation for the trade of live pigs (10).

In conclusion, the surveillance programme for specific viral infections in 2025 documents Norwegian pig herd's favourable health status by demonstrating that Norwegian pig herds remained free from the serious infectious diseases: AD, TGE, PRRS and PED. For AD, the findings are in agreement with the disease specific criteria for documentation of maintenance of the disease-free status regulated in 2020/689 (EU), art 81. The programme also documents that SI other than H1N1pdm09-like viruses was not detected in the pig population.

Acknowledgement

The authors would like to thank the technical staff for performing the analyses with excellence, in particular Irene Haugen, Kristin Staal, Helena Bekkevold, Alexsander Lysberg, Nelja Emzeeva, Kristin Udjus, Silje Strømstad Kristensen and Ida Kristin Myhrvold. The authors would also like to thank Petter Hopp, Norwegian Veterinary Institute. Moreover, the authors would like to thank all personnel from the Norwegian Food Safety Authority for collection and submission of samples.

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10. Forskrift som utfyller dyrehelseforskriften med bestemmelser om forflytning av landdyr, rugeegg og animalske produkter fra landdyr i EØS-området (landdyrforflytningsforskriften) - Vedlegg I. Nasjonale overvåkingsprogrammer etter § 11 - Lovdata

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