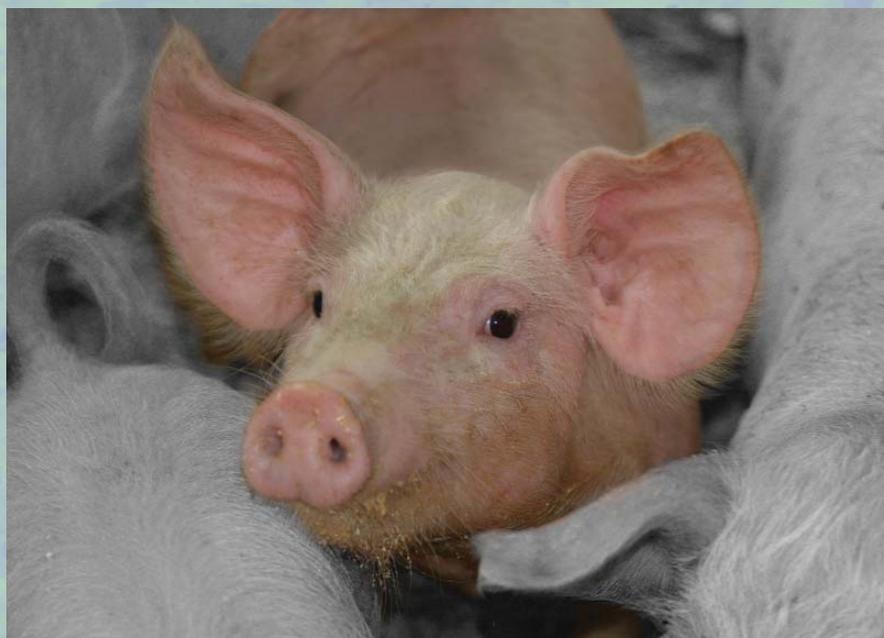


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The surveillance and control programme for specific virus infections in swine herds in Norway 2011

Bjørn Lium, Adam Zerihun, Attila Tarpai, Petter Hopp

The surveillance and control programme for specific virus infections in swine herds in 2011 continued to show that Norway is free from Aujeszky's disease, transmissible gastroenteritis, porcine respiratory corona virus and porcine respiratory and reproductive syndrome. Norway recorded its first outbreak of swine influenza, influenza A (H1N1) pdm09 virus (H1N1pdm), in 2009. Although the surveillance in 2011 showed that swine in 48 % of the 730 herds tested had antibodies against H1N1pdm, the Norwegian swine population continued to be tested free from other strains of the influenza A virus.

Introduction

The national surveillance and control programme for specific viral infections in swine was launched in 1994 to document the status of Aujeszky's disease (AD), transmissible gastroenteritis (TGE), and porcine respiratory corona virus (PRCV) in the Norwegian swine population. Porcine respiratory and reproductive syndrome (PRRS) and swine influenza (SI) were added to the programme in 1995 and 1997, respectively. From 1997 to 1999, porcine epidemic diarrhoea (PED) was also included in the programme (Table 1).

Table1. Monitoring of the Norwegian swine population for antibodies against 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 2011.

Year	Total no. of herds	Herds tested	Animals tested	H1N1pdm		Other virus		Diseases included
				Animals positive	Herds positive	Animals positive	Herds positive	
1994	7,799	1112	12,010	-	-	0	0	AD, TGE, PRCV
1995	7,471	956	11,197	-	-	0	0	AD, TGE, PRCV, PRRS
1996	7,045	468	4,968	-	-	0	0	AD, TGE, PRCV, PRRS
1997	6,661	512	4,925	-	-	0	0	AD, TGE, PRCV, PRRS, SI, PED
1998	6,275	491	4,695	-	-	2 ¹	1	AD, TGE, PRCV, PRRS, SI, PED
1999	5,761	470	4,705	-	-	0	0	AD, TGE, PRCV, PRRS, SI, PED
2000	4,827	458	4,600	-	-	0	0	AD, TGE, PRCV, PRRS, SI
2001	4,554	472	4,972	-	-	0	0	AD, TGE, PRCV, PRRS, SI
2002	4,150	492	4,899	-	-	0	0	AD, TGE, PRCV, PRRS, SI
2003	4,005	483	4,783	-	-	0	0	AD, TGE, PRCV, PRRS, SI
2004	4,006	492	4,935	-	-	0	0	AD, TGE, PRCV, PRRS, SI
2005	3,762	468	4,644	-	-	1 ²	1	AD, TGE, PRCV, PRRS, SI
2006	3,339	457	4,569	-	-	0	0	AD, TGE, PRCV, PRRS, SI
2007	3,010	456	4,641	-	-	0	0	AD, TGE, PRCV, PRRS, SI
2008	2,682	487	4,845	-	-	0	0	AD, TGE, PRCV, PRRS, SI
2009	2,546	452	4,724	131	20	0	0	AD, TGE, PRCV, PRRS, SI
2010	2,441	459	4,250	940	189	0	0	AD, TGE, PRCV, PRRS, SI
2011	2,346	730	4,713	2,216	353	0	0	AD, TGE, PRCV, PRRS, SI
Total			99,077					

¹ Two samples from one herd were sero-positive for SI H3N2 in 1998 (probably infection from human)

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

The Norwegian Food Safety Authority was responsible for coordinating the programme and collected the samples, while the Norwegian Veterinary Institute was responsible for design, laboratory analyses and reporting.

The EFTA Surveillance Authority (ESA) has recognized Norway's disease-free status for AD since July 1 1994, and has laid down additional measures in the trade of pigs and pork to protect Norway's Disease free status for AD. The additional measures are described in ESA Decision No 160/10/COL.

Aims

The aims of the serological surveillance programme are to ascertain the continued absence of specific infectious diseases in the Norwegian swine population and to maintain this favourable situation.

Materials and methods

Herds and sampling

All the 120 nucleus and multiplying herds as well as the nucleus units of all 15 sow pools were included in the programme. Blood samples from ten adult swine in each herd were collected, usually at the farms, but occasionally at the abattoirs. In addition, a selection of the remaining Norwegian swine herds was included in the programme. At the 12 largest abattoirs slaughtering 97% of the pigs in Norway, blood samples from slaughtered sows and boars were collected proportionate to the total number of adult swine slaughtered. The samples were spread throughout the year, and each day the samples should ideally be collected from different herds. Furthermore, at the six largest abattoirs, ten blood samples were collected from 60 randomly selected large fattening herds.

Laboratory analyses

All the serological analyses were performed at the Norwegian Veterinary Institute in Oslo. All inconclusive or positive samples in the routine tests were re-tested with specified reference tests. If the result still was positive or inconclusive for another agent than H1N1pdm, at least 20 pigs in the herd from which the sample originated were resampled. If there was no clinical sign of disease in the herd, and all these samples were negative for the infection, a single inconclusive or positive sample in the surveillance programme was considered false positive.

Aujeszky's disease

All serum samples were tested for antibodies against AD virus using a commercial blocking ELISA (SVANOVIR™). The test detected antibodies against glycoprotein B (previously glycoprotein II) found on the surface of the virus. Positive or dubious results are retested with the SVANOVIR™ PRV-gE.

Transmissible gastroenteritis virus and porcine respiratory coronavirus

A combined blocking ELISA (SVANOVIR™) was used to detect antibodies against TGEV/PRCV. This ELISA test makes it possible to differentiate between antibodies against TGEV and PRCV, respectively, in serum samples.

Porcine reproductive and respiratory syndrome

All serum samples were tested for antibodies against PRRS virus using the HerdChek PRRS 3XR Antibody Test Kit (IDEXX) which detects the most predominant European and American strain of PRRS viruses. In the case of dubious or positive results, the samples were re-tested at the National Veterinary Institute Technical University of Denmark by using blocking ELISAs and immune-peroxidase tests (IPT).

Swine influenza

To test for swine influenza, the serum samples were initially tested using an ELISA kit (ID Screen® Influenza A Antibody Competition test, IDVET) that was designed to detect anti-Influenza A specific antibodies in pigs. If the results were positive or doubtful, the serum samples were re-examined using the hemagglutination-inhibition (HI) assays for antibodies against the H1N1pdm and European H1N1, H1N2 and H3N2 serotypes according to the method described in the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (1). The antigens for the tests were produced at the Norwegian Veterinary Institute.

Results

Blood samples from 4,715 individual animals from 731 herds were received by the laboratory. The distribution of sampled herds in relation to production type is given in Table 2. Two samples from two herds were rejected, leaving 4,713 samples from 730 herds for analysis. The mean number of animals tested per farm was 6 (range 1 - 64) (Table 3).

Of the 730 herds tested, 48% were sero-positive for H1N1pdm. The proportion of herds testing positive by region varied from 26% in the counties Oslo, Akershus and Østfold to 64% in the counties Rogaland and Agder (Table 4).

Table 2. Distribution of swine herds in the surveillance and control programme 2011 according to type of production

Category	No. of herds sampled	Total no. of individual samples collected
Nucleus herds and multiplying herds	110	1,249
Sow pools	12	295
Integrated and piglet-producing herds	539	2384
Fattening herds	69	787
Total	731	4,715

Table 3. Number of samples submitted and their results for AD, swine influenza, and PRRS, PRCV and TGE in 2011

Disease	Samples				Herds	
	Received	Rejected	Negative	Positive	Negative	Positive
AD	4,715	2	4,713	0	730	0
SI	4,715	2	2,498	2,216	377	353
PRRS	4,715	2	4,713	0	730	0
TGE	4,715	2	4,713	0	730	0
PRCV	4,715	2	4,713	0	730	0

Table 4. Number of herds tested and percentage of herds positive for H1N1pdm by regions

Region	Total herds	No. of herds tested	No. of herds tested positive	Percentage of herds tested positive (95% CI)
Finnmark/Troms/Nordland	146	29	8	28 (13 - 47)
Trøndelag/Møre and Romsdal	472	197	108	55 (48 - 62)
Hordaland/Sogn and Fjordane	163	13	5	38 (14 - 68)
Rogaland/Agder	669	199	128	64 (57 - 71)
Buskerud/Vestfold/Telemark	230	102	45	44 (34 - 54)
Oslo/Akershus/Østfold	235	80	21	26 (17 - 37)
Hedmark/Oppland	431	110	38	35 (26 - 44)
Total	2,346	730	353	48 (45 - 52)

Discussion

The results from the surveillance and control programme in 2011 showed that Norway has maintained its disease freedom status for AD, TGE, PRCV and PRRS virus infections in the national swine population since the surveillance started in 1994.

Before the outbreak of swine influenza caused by H1N1pdm in October 2009, there have never been any clinical records that indicated the presence of the specific viral infections included in this surveillance and control programme. A total of 353 or 48% of swine herds were sero-positive for H1N1pdm under the routine surveillance and control programme by the end of 2011, while 41% of the herds were sero-positive in 2010. This indicates that the H1N1pdm virus is established as an endemic infection in the Norwegian pig population. The surveillance in 2011 showed that Norway continued to be free from other influenza A subtypes that are endemic in most pig producing countries.

The Norwegian swine industry continued with the trend of herd numbers declining, while average herd size increased. The pork production by tonnage however, has remained relatively stable. Due to changing in the sampling procedure for conventional herds with sows, the fraction of the total pig herd population sampled increased from 19% in 2010 to 31% in 2011, while the mean number of samples per herd decreased.

Farmed wild boars and pigs kept as pets were not included in the programme. There is a very small wild boar population in a local area along the Swedish boarder in the South-East of Norway.

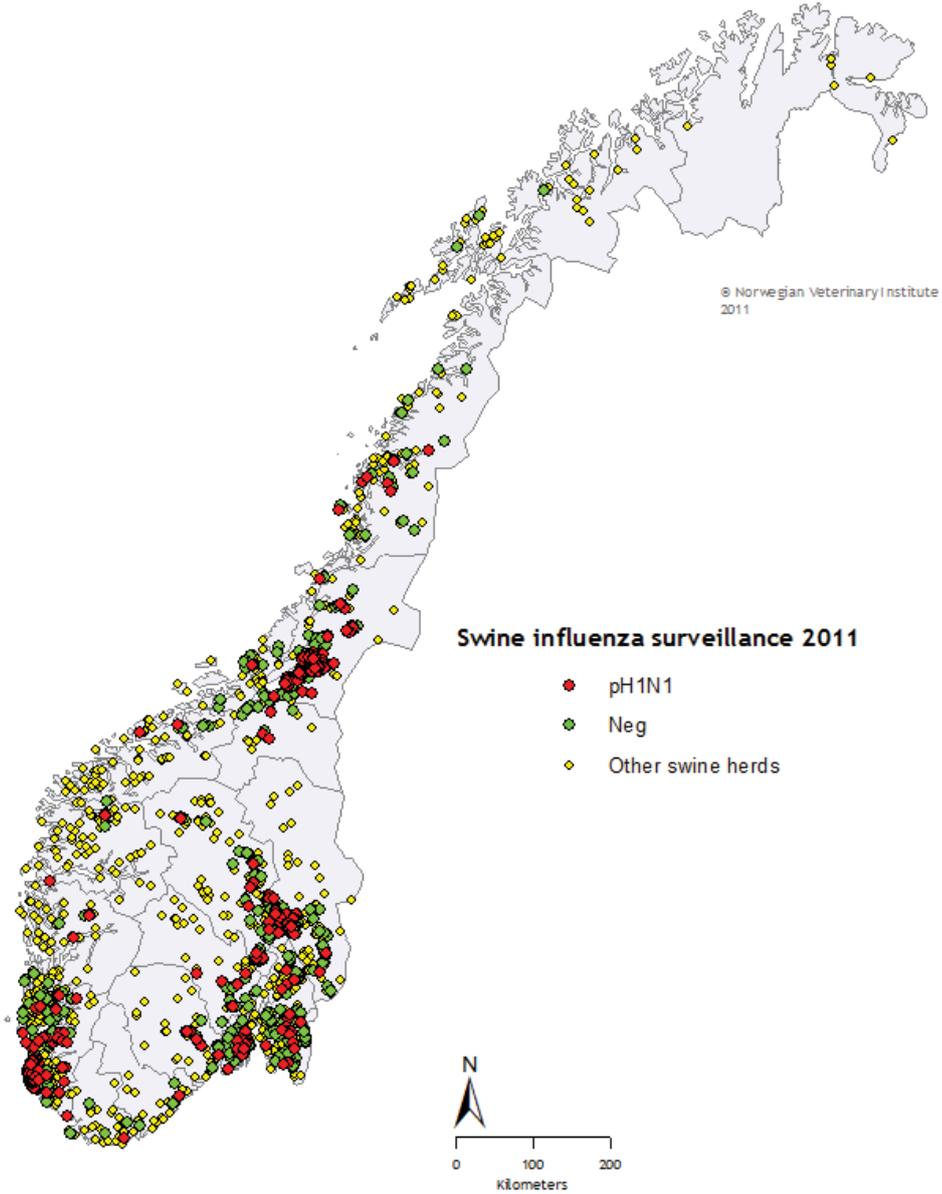
Apart from AD, the EU has not approved additional guarantees (safeguards) against other swine viral infections when importing pigs into Norway. To protect its swine population against disease-related risks, Norway has its own national guidelines for trade of live swine and pork products.

In conclusion, the surveillance and control programme for specific virus infections in 2011 provided good evidence that the health situation in Norway's swine population continued to be favourable with the population being free of several serious infectious diseases. Despite the extensive spread of swine influenza A H1N1pdm, the economic impact of this disease on swine production appears to be minimal (2, 3, 4). Further targeted surveillance and research work will continue to monitor how the H1N1pdm virus will evolve, and its clinical and economic impact on the Norwegian pig population.

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Figure 1. Serological results and geographical distribution of swine herds tested for influenza A in the surveillance and control programme for specific virus infections 2011.



The Norwegian Veterinary Institute (NVI) is a nationwide research institute in the fields of animal health, fish health, and food safety. The primary mission of the NVI is to give research-based independent advisory support to ministries and governing authorities. Preparedness, diagnostics, surveillance, reference functions, risk assessments, and advisory and educational functions are the most important areas of operation.

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The Norwegian Food Safety Authority (NFSA) is a governmental body whose aim is to ensure through regulations and controls that food and drinking water are as safe and healthy as possible for consumers and to promote plant, fish and animal health and ethical farming of fish and animals. We encourage environmentally friendly production and we also regulate and control cosmetics, veterinary medicines and animal health personnel. The NFSA drafts and provides information on legislation, performs risk-based inspections, monitors food safety, plant, fish and animal health, draws up contingency plans and provides updates on developments in our field of competence.

The NFSA comprises three administrative levels, and has some 1300 employees.

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