

The surveillance programme for specific virus infections in swine herds in Norway 2013

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The surveillance programme for specific viral infections in swine herds in Norway 2013

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The surveillance programme for specific viral infections in swine herds in 2013 continued to show Norway to be 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 46% (95% CI 42 - 49%) of the 737 herds sampled were seropositive against H1N1pdm during the surveillance in 2013, the Norwegian swine population was tested negative for 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 2013.

Year	Total no. of herds	Herds tested	Animals tested	H1N1pdm		Other viruses		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
2012	2,213	764	4,961	2,412	378	0	0	AD, TGE, PRCV, PRRS, SI
2013	2,178	737	5,038	1,417	338	0	0	AD, TGE, PRCV, PRRS, SI
Total			109,076					

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 coordinated the programme and collected the samples, while the Norwegian Veterinary Institute was responsible for the surveillance design, laboratory analyses and the reporting of the results.

The EFTA Surveillance Authority (ESA) has recognized Norway's disease-free status for AD since July 1 1994, and has laid down additional measures for 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 and to maintain this favourable situation. The program also monitors the status of H1N1pdm infection in the Norwegian swine population.

Materials and methods

Herds and sampling

All the 104 nucleus and multiplying herds as well as the nucleus units of all 14 sow pools were included in the programme. Blood samples from ten adult swine in each herd were collected, usually at the farms, but occasionally also at the abattoirs. In addition, a selection of the remaining Norwegian swine herds was included in the programme. At the 16 largest abattoirs where more than 97% of the pig slaughter takes place, blood samples proportional to the number of sows and boars per herd, were collected. The samples were randomly collected from different herds and the sampling periods were evenly distributed throughout the year. 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. Inconclusive or positive samples in the routine tests were re-tested with specified reference tests. If the subsequent results were still positive or inconclusive (except for H1N1pdm virus which is enzootic in Norway), at least 20 new pigs were resampled from the herd in question. If this herd had no detectable clinical sign of disease 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 kit (SVANOVIR™ PRV gB-Ab). This test detected antibodies against glycoprotein B (previously glycoprotein II) found on the surface of the virus. Positive or inconclusive results were retested with the same kit and when the result was still positive or inconclusive, these samples were subjected to neutralisation test (NT).

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 (pre)dominant European and American strains of PRRS virus(es). In the case of inconclusive or positive results, the samples were re-tested at the National Veterinary Institute of the Technical University of Denmark using blocking ELISAs and immune-peroxidase tests (IPT).

Swine influenza

To test for swine influenza virus antibodies, the serum samples were initially analysed using an ELISA kit (ID Screen® Influenza A Antibody Competition multi-serotypes test, IDVET) designed to detect anti-influenza A specific antibodies. When the results were positive or inconclusive, the serum samples were re-examined using the hemagglutination-inhibition (HI) assay(s) 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 5,038 individual pigs representing 737 herds were received by our laboratory (Table 1). The distribution of sampled herds in relation to production type is given in Table 2. Only one sample was rejected (Table 3). The mean number of animals tested per farm was 7 (range 1 - 46).

Of the 737 tested herds, 46 % were sero-positive for H1N1pdm. The proportion of herds tested positive by region varied from 28% in the aggregated counties of Finnmark/Troms/Nordland to 63% in the counties of Rogaland and Agder (Table 4).

Table 2. Distribution of swine herds in the surveillance and control programme 2013 according to type of production and the results for antibodies to H1N1pdm

Category	No. of herds sampled	Total no. of individual samples collected	No. of positive herds H1N1pdm	Percentage positive H1N1pdm
Nucleus herds and multiplying herds	100	1,371	50	50%
Sow pools	14	314	13	93%
Integrated and piglet-producing herds	565	2,734	266	47%
Fattening herds	60	631	10	17%
Total	737	5,038	338	46%

Table 3. Number of samples submitted and their results for AD, swine influenza, and PRRS, PRCV and TGE in 2013

Disease	Samples				Herds	
	Received	Rejected	Negative	Positive	Negative	Positive
AD	5,038	1	5,037	0	737	0
SI (H1N1pdm)	5,038		3,620	1,417	338	399
SI (H1N1, H3N2, H1N2)	5,038		5,037	0	737	0
PRRS	5,038		5,037	0	737	0
TGE	5,038	1	5,037	0	737	0
PRCV	5,038	1	5,037	0	737	0

Table 4. Number of herds tested and percentage of herds positive for H1N1pdm by regions in 2013

Region	Total herds	No. of herds tested	No. of herds tested positive	Percentage of herds tested positive (95% CI)
Finnmark/Troms/Nordland	147	54	15	28(18-41)
Trøndelag/Møre and Romsdal	411	164	75	46(38-53)
Hordaland/Sogn and Fjordane	138	28	6	21(10-40)
Rogaland/Agder	622	209	131	63(56-69)
Buskerud/Vestfold/Telemark	219	95	35	37(28-47)
Oslo/Akershus/Østfold	230	76	26	34(25-45)
Hedmark/Oppland	411	111	50	45(36-55)
Total	2,178	737	338	46(42-50)

Discussion

The results from the surveillance and control programme in 2013 showed that Norway has maintained its freedom of disease status for AD, TGE, PRCV and PRRS virus infections in the national swine population since the surveillance started in 1994.

Except for the outbreak of swine influenza caused by H1N1pdm in October 2009, the presence of any of the viral infections under this surveillance and control programme has never been detected either by clinical findings or laboratory investigations. Studies have shown that the H1N1pdm virus was most likely introduced to pigs by humans infected with the same virus (2, 3). Under the routine surveillance and control programme in 2013, a total of 338 swine herd or 46 % of tested herds were positive for antibodies against H1N1pdm. Comparing this figure with 49 % in 2012, 48 % in 2011 and 41% in 2010 shows that influenza caused by H1N1pdm virus has become endemic in the Norwegian pig population. The surveillance in 2013, however also showed that Norway continued to be free from other influenza A subtypes that are endemic in most pig producing countries which are specific to pigs only.

Despite the extensive spread of swine influenza A H1N1pdm, the economic impact of this disease on swine production appears to be minimal (2, 4, 5). Further targeted surveillance and research work will continue to monitor how the H1N1pdm virus evolve and impact the Norwegian pig population clinically and economically.

The Norwegian swine industry continued with the trend of herd numbers declining, while the average herd size is increasing. The pork production by tonnage however, has remained relatively stable. Due to changes in the sampling procedure for conventional herds with sows in 2011, the fraction of the total pig herd population sampled increased from 19 % in 2010 to 31 % in 2011 and 34 % both in 2012 and in 2013, 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.

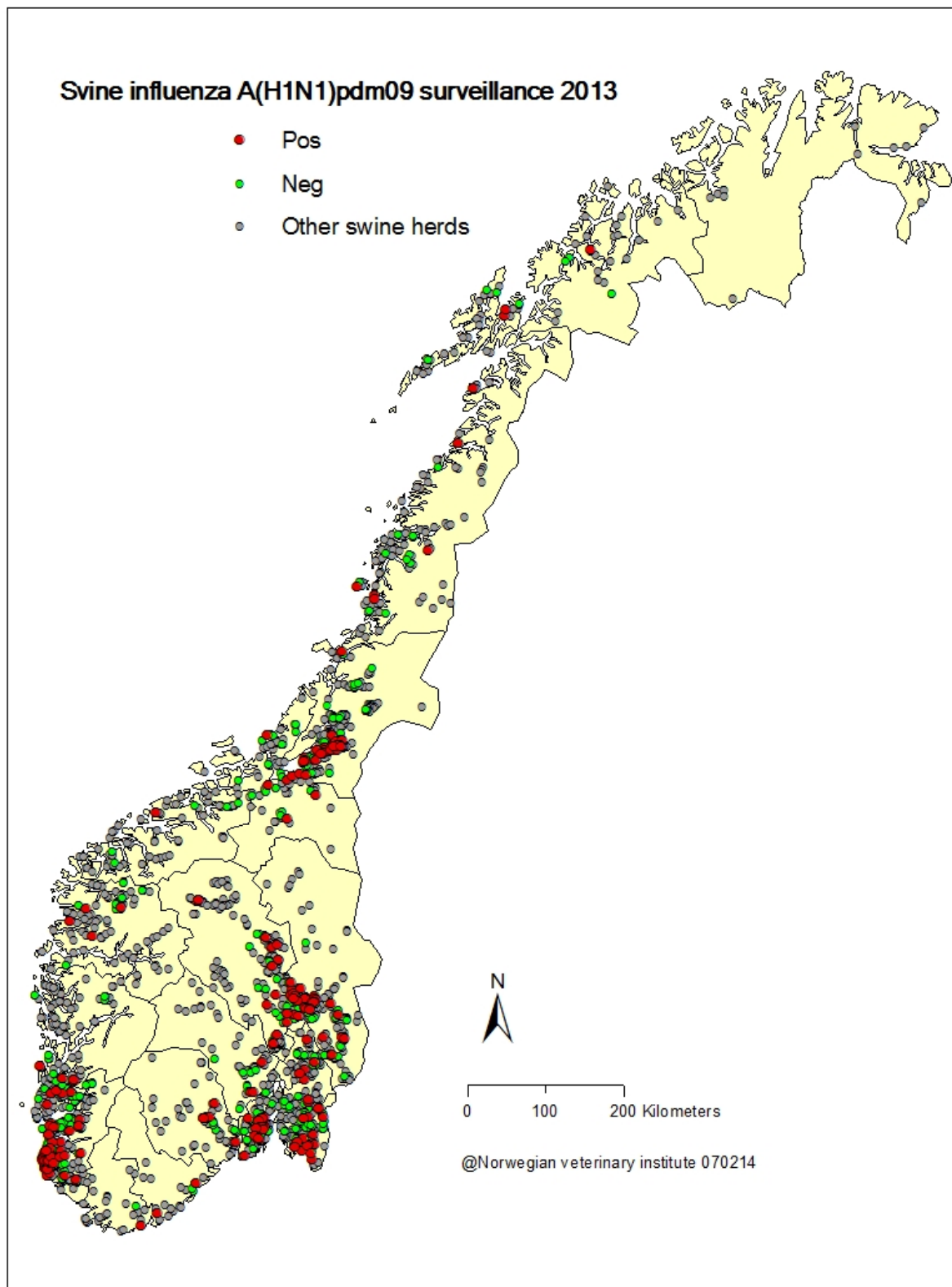
Apart from AD, the EU has not approved additional guarantees (safeguards) against other swine viral infections when importing pigs into Norway. To protect its swine population against disease-related risks, Norway has its own national guidelines for the trade of live swine and pork products.

In conclusion, the surveillance and control programme for specific viral infections in 2013 provided more evidence that demonstrates Norwegian pig herds remained free from several serious infectious diseases, hence maintaining Norwegian pig herd's favourable health status.

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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 2013.



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.

The Norwegian Veterinary Institute has its main laboratory in Oslo, with regional laboratories in Sandnes, Bergen, Trondheim, Harstad og Tromsø, with about 360 employees in total.

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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.

The NFSA advises and reports to the Ministry of Agriculture and Food, the Ministry of Fisheries and Coastal Affairs and the Ministry of Health and Care Services.

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