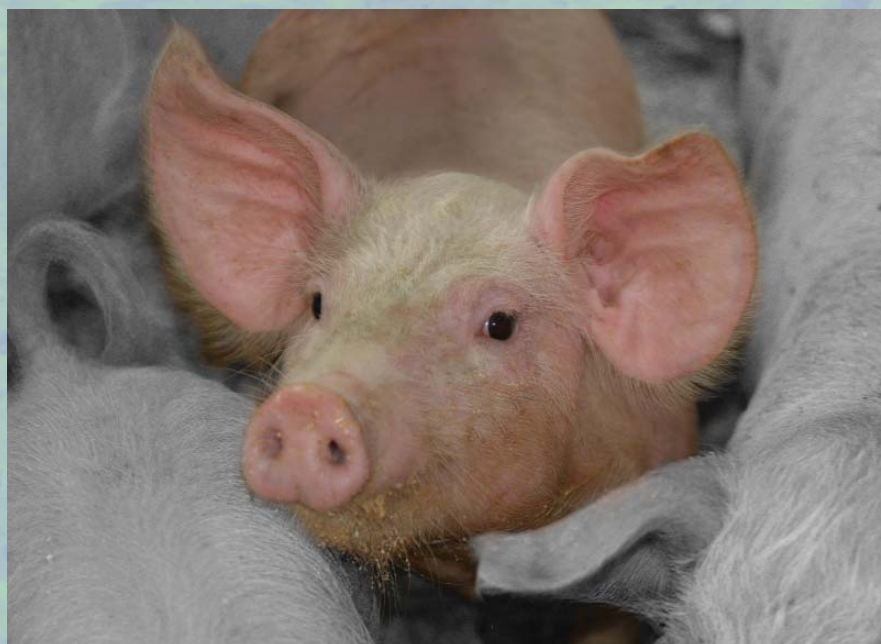


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The surveillance and control programme for specific virus infections in swine herds in Norway 2012

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Surveillance and control programmes for terrestrial and aquatic animals in Norway

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The surveillance and control programme for specific viral infections in swine herds in Norway 2012

Bjørn Lium, Adam M. Zerihun, Chiek Er

The surveillance and control programme for specific viral infections in swine herds in 2012 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 49 % of the 764 herds sampled were seropositive against H1N1pdm during the surveillance in 2012, 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 2012.

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
Total			104,038					

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 the status of H1N1pdm infection in the Norwegian swine population and to maintain this favourable situation.

Materials and methods

Herds and sampling

All the 112 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 at the abattoirs. In addition, a selection of the remaining Norwegian swine herds was included in the programme. At the 13 largest abattoirs slaughtering at least 97 % of the pigs in Norway, blood samples from slaughtered sows and boars were collected proportionally according to the total number of adult swine slaughtered. Sampling was spread throughout the year, and each day the samples were ideally collected from different herds. Furthermore, at the six largest abattoirs, ten blood samples were collected from 61 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. When the result was still positive or inconclusive for another agent other than H1N1pdm virus, then the herd in question was resampled by selecting at least 20 more new pigs. 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™). This 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 (pre)dominant European and American strains of PRRS virus(es). In the case of dubious or positive results, the samples were re-tested at the National Veterinary Institute Technical University of Denmark 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) 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 4,961 individual animals from 764 herds were received by the laboratory. The distribution of sampled herds in relation to production type is given in Table 2. No sample was rejected. The mean number of animals tested per farm was 6.7 (range 1 - 43) (Table 3).

Of the 764 herds tested, 49 % were sero-positive for H1N1pdm. The proportion of herds tested positive by region varied from 21% in the aggregated counties of Finnmark/Troms/Nordland to 70% in the counties of Rogaland and Agder (Table 4).

Table 2. Distribution of swine herds in the surveillance and control programme 2012 according to type of production

Category	No. of herds sampled	Total no. of individual samples collected	No. of positive herds	Percentage positive
Nucleus herds and multiplying herds	102	1,313	57	56 %
Nucleus	44		23	52 %
Multiplying	58		34	59 %
Sow pools	14	294	12	86 %
Integrated and piglet-producing herds	587	2,746	293	51 %
Fattening herds	61	608	16	26 %
Total	764	4,961	378	49 %

Table 3. Number of samples submitted and their results for AD, swine influenza, and PRRS, PRCV and TGE in 2012

Disease	Samples				Herds	
	Received	Rejected	Negative	Positive	Negative	Positive
AD	4,961	0	4,961	0	764	0
SI (H1N1pdm)	4,961	0	2549	2412	386	378
SI (H3N2)	4,961	0	4961	0	764	0
PRRS	4,961	0	4,961	0	764	0
TGE	4,961	1	4,960	0	764	0
PRCV	4,961	1	4,960	0	764	0

Table 4. Number of herds tested and percentage of herds positive for H1N1pdm by regions in 2012

Region	Total herds	No. of herds tested	No. of herds tested positive	Percentage of herds tested positive (95% CI)
Finnmark/Troms/Nordland	144	28	6	21(14-29)
Trøndelag/Møre and Romsdal	428	211	104	49(46-53)
Hordaland/Sogn and Fjordane	136	31	8	26(18-34)
Rogaland/Agder	652	191	134	70(67-73)
Buskerud/Vestfold/Telemark	214	95	46	48(43-54)
Oslo/Akershus/Østfold	229	87	25	29(24-34)
Hedmark/Oppland	410	121	55	45(41-50)
Total	2,213	764	378	49(48-51)

Discussion

The results from the surveillance and control programme in 2012 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.

Except for the outbreak of swine influenza caused by H1N1pdm in October 2009, there have never been any clinical or laboratory findings indicating the presence of any of the viral infections under the surveillance and control programme for swine herds in Norway. Studies have shown that the H1N1pdm virus was most likely introduced by humans infected with the same virus that had direct contact with the pigs (2). Under the routine surveillance and control programme in 2012, a total of 378 or 49 % of swine herds tested were positive for antibodies against H1N1pdm. Comparing this figure with 48 % in 2011 and 41% in 2010 indicates that influenza caused by H1N1pdm virus has established itself as an endemic infection in the Norwegian pig population. The surveillance in 2012 also showed that Norway continued to be free from other influenza A subtypes that are endemic in most pig producing countries and are specific to pigs only.

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 % in 2012, 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.

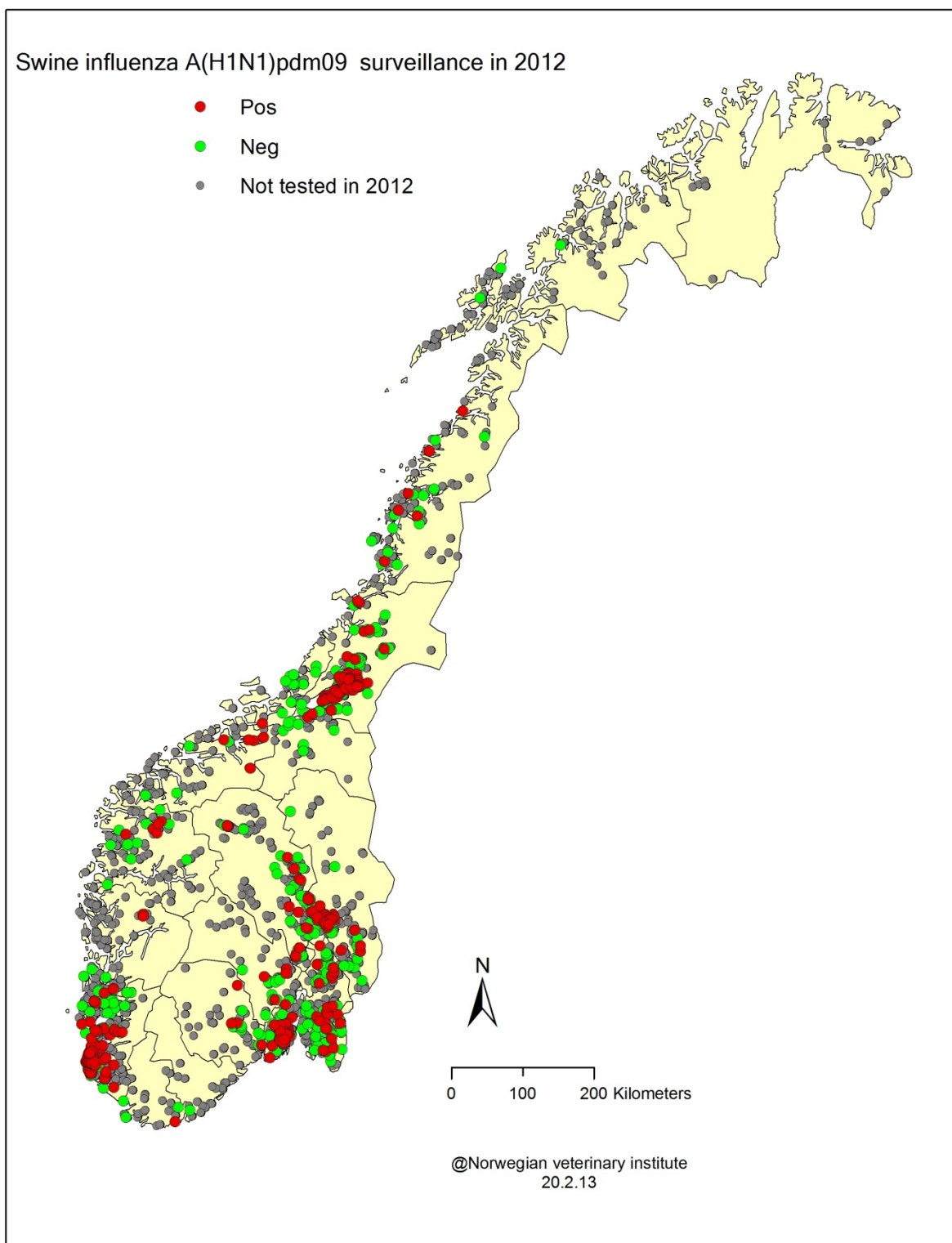
Apart from AD, the EU has not approved additional guarantees (safeguards) against other swine viral infections when importing pigs into Norway. To protect its swine population against disease-related risks, Norway has its own national guidelines for the trade of live swine and pork products.

In conclusion, the surveillance and control programme for specific viral infections in 2012 provided good evidence of the favourable health situation in Norway's swine population because it is 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 evolve and impact the Norwegian pig population clinically and economically.

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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 2012.



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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