

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

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While the surveillance in 2009 continued to show that Norway is free from Aujeszky's disease, transmissible gastroenteritis, porcine respiratory corona virus, porcine respiratory and reproductive syndrome, Norway recorded its first outbreak of swine influenza (pandemic influenza A (H1N1) 2009 virus (H1N1/09 virus) on a Norwegian swine herd on 10th of October 2009. A total of 20 swine herds were tested positive in the surveillance and control programme in 2009. Another 71 swine herds were tested positive in the targeted surveillance from 10th of October to 31st of December 2009. With the exception of one herd where some pigs were tested positive for antibodies against H3N2 in 1998, this is the first positive tests for influenza A virus in Norwegian pigs.

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 added (1), (Table 1).

The Norwegian Food Safety Authority is responsible for running the programme, while the National Veterinary Institute is responsible for planning, laboratory analyses and reporting.

The EFTA Surveillance Authority (ESA) has recognised the swine population in Norway as free from AD since 1st of July 1994, and has defined additional guarantees on imported pigs to protect the freedom from AD status in Norway. The additional guarantees are described in ESA Decision 75/94/COL, amending ESA Decision 31/94/COL, later replaced by ESA Decision 226/96/COL.

Introduction

The national surveillance and control programme for specific viral infections in swine was launched in 1994 in order to document the status of Aujeszky's disease (AD), transmissible gastroenteritis (TGE), and porcine respiratory corona virus (PRCV) in the Norwegian

Aims

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

Table 1. 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) during the years 1994 to 2009.

Year	Herds in population	Herds tested	Animals tested	Animals positive	Diseases included
1994	7,799	1,112	12,010	0	AD, TGE, PRCV
1995	7,471	956	11,197	0	AD, TGE, PRCV, PRRS
1996	7,045	468	4,968	0	AD, TGE, PRCV, PRRS
1997	6,661	512	4,925	0	AD, TGE, PRCV, PRRS, PED, SI
1998	6,275	491	4,695	2*	AD, TGE, PRCV, PRRS, PED, SI
1999	5,761	470	4,705	0	AD, TGE, PRCV, PRRS, PED, SI
2000	4,827	458	4,600	0	AD, TGE, PRCV, PRRS, SI
2001	4,554	472	4,972	0	AD, TGE, PRCV, PRRS, SI
2002	4,150	492	4,899	0	AD, TGE, PRCV, PRRS, SI
2003	4,005	483	4,783	0	AD, TGE, PRCV, PRRS, SI
2004	4,006	492	4,935	0	AD, TGE, PRCV, PRRS, SI
2005	3,762	468	4,644	1*	AD, TGE, PRCV, PRRS, SI
2006	3,339	457	4,569	0	AD, TGE, PRCV, PRRS, SI
2007	3,010	456	4,641	0	AD, TGE, PRCV, PRRS, SI
2008	2,682	487	4,845	0	AD, TGE, PRCV, PRRS, SI
2009	2,546	452	4,724	131*	AD, TGE, PRCV, PRRS, SI
Total			90,112	135*	

* 2 positive for SI H3N2 in 1998 (probably infection from man) and 1 positive for PRCV in 2005 (probably unspecific reaction). 131 samples from 20 herds were positive for the H1N1/09 virus. In addition, a targeted surveillance found an additional of 71 herds positive for the H1N1/09 virus by the end of 31 Dec 2009.

Materials and methods

All the 128 nucleus and multiplying herds were selected for testing. In addition, the nucleus units of all the 13 sow pools and a random selection of the remaining swine population were included in the programme. The random selection was conducted on all swine herds receiving governmental production subsidies according to the records of 31st July 2008. The register contained 2,682 commercial swine herds, of which 300 integrated and piglet-producing herds and 60 fattening herds were selected.

The counties Østfold, Akershus, Vestfold and Rogaland were considered to be "high risk areas" and a relatively larger proportion of farms from these counties were selected.

Samples were collected at the farms, except for the fattening herds, which were collected at six different abattoirs. The sample size from each herd was ten pigs.

All the serological analyses were performed at the National Veterinary Institute in Oslo. All inconclusive or positive samples in the routine tests were re-tested by specified reference tests.

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 were 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. Depending on the reaction pattern of two different monoclonal antibodies against TGEV/PRCV and TGEV respectively, the test was able to distinguish between antibodies against TGEV and PRCV.

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 or American strain of PRRS viruses. In the case of dubious or positive results, the samples were retested at the National Veterinary Institute in Denmark using blocking ELISAs and immune-peroxidase tests (IPT).

Swine influenza

To test for swine influenza, the serum samples were examined using hemagglutination-inhibition (HI) assays for antibodies against the European serotypes H1N1 and H3N2, according to the method described in the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (2). Due to the outbreak of H1N1/09 virus detected on 10th of October 2009, the testing procedure for swine influenza was modified. Serum samples collected from 21.10.2009 onwards 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 examined again using the subtype specific HI test against the European H1N1 and H3N2 and the pandemic H1N1/09 virus subtype. This testing procedure was retrospectively carried out for all samples from 2009. The antigens for the tests were produced at the National Veterinary Institute in Oslo.

Results

Blood samples from 4,724 individual animals were submitted and the results are shown in Table 2. The distribution of tested herds in relation to type of production is given in Table 3. The mean number of animals tested per farm was 10 (range 1 - 31).

Routine surveillance revealed 20 herds were positive for the (H1N1)09 virus and an additional targeted surveillance following the outbreak revealed another 71 herds were positive for the H1N1/09 virus in 2009.

Discussion

AD, TGE, PRCV and PRRS

Except for swine influenza, the results from the surveillance and control programme in 2009 showed that Norway maintained its disease freedom status for AD, TGE, PRCV and PRRS virus infections in its swine population since the surveillance started in 1994. Before the outbreak of swine influenza on 10th October 2009, there have never been any clinical recordings indicating the presence of any of the viral infections included in this surveillance and control programme (1, 3, 4).

Swine influenza

Although infection with influenza A H1N1/09 virus was first detected on the 10th of October in nasal swabs (PCR) from pigs in a swine herd located in Trøndelag

Table 2. Number of samples submitted to the laboratory and the test results for AD, swine influenza, and PRRS, PRCV and TGE in 2009.

Disease	Samples				Herds	
	Received	Rejected	Negative	Positive	Negative	Positive
AD	4,724	6	4,718	0	452	0
SI	4,724	3	4,589*	131	432	20
PRRS	4,724	6	4,718	0	452	0
TGE	4,724	6	4,718	0	452	0
PRCV	4,724	6	4,718	0	452	0

* Three samples from positive herds with uncertain result are included as negative samples.

Table 3. Distribution of swine herds in the surveillance and control programme 2009 related to the type of production.

Category	No. of herds tested	Total no. of individual samples collected
Nucleus herds and multiplying herds	124	1,404
Sow pools	13	151
Integrated and piglet-producing herds	264	2,659
Fattening herds	51	510
Total	452	4,724

that had clinical disease, retrospective investigation found that the earliest samples found positive were actually taken from a herd in Rogaland on 30th of September under the routine surveillance programme. Eventually, a total of 20 swine herds were tested positive under the routine surveillance and control programme in 2009 while another 71 swine herds were tested positive in the targeted surveillance from 10th of October to 31st Dec 2009.

The majority of the positive herds in the targeted surveillance, especially among the herds tested first, had a history of contact between pigs and humans whom were diagnosed with pandemic influenza or people with influenza-like symptoms. This suggested infected humans to be the most likely source for transmission of H1N1/09 virus to positive pig herds (5). Whether the pandemic H1N1/09 virus would become endemic in the Norwegian swine population remained to be seen.

The Norwegian swine industry has structurally changed during the last ten years in that although the number of herds has been declining, the average herd size has increased. The pork production by tonnage has remained relatively stable. The fraction of farms sampled has been relatively stable since the start of the programme, the figures being 14.3% and 17.8% in 1994 and 2009, respectively. The geographical distribution of investigated farms is in accordance with the spatial distribution of the total swine herd population (Figure 1).

Farmed wild boars and pigs kept as pets are not included in the programme. There is no wild boar population registered in Norway.

Apart from AD, the EU has not approved additional guarantees (safeguards) against any other swine viral infections when importing pigs into Norway. For the other infections included in this surveillance programme, Norway has national guidelines for trade with pigs.

In conclusion, the surveillance and control programme for specific virus infections provides solid documentation of the favourable health situation in the Norwegian swine population. The recent introduction of swine influenza necessitates further surveillance.

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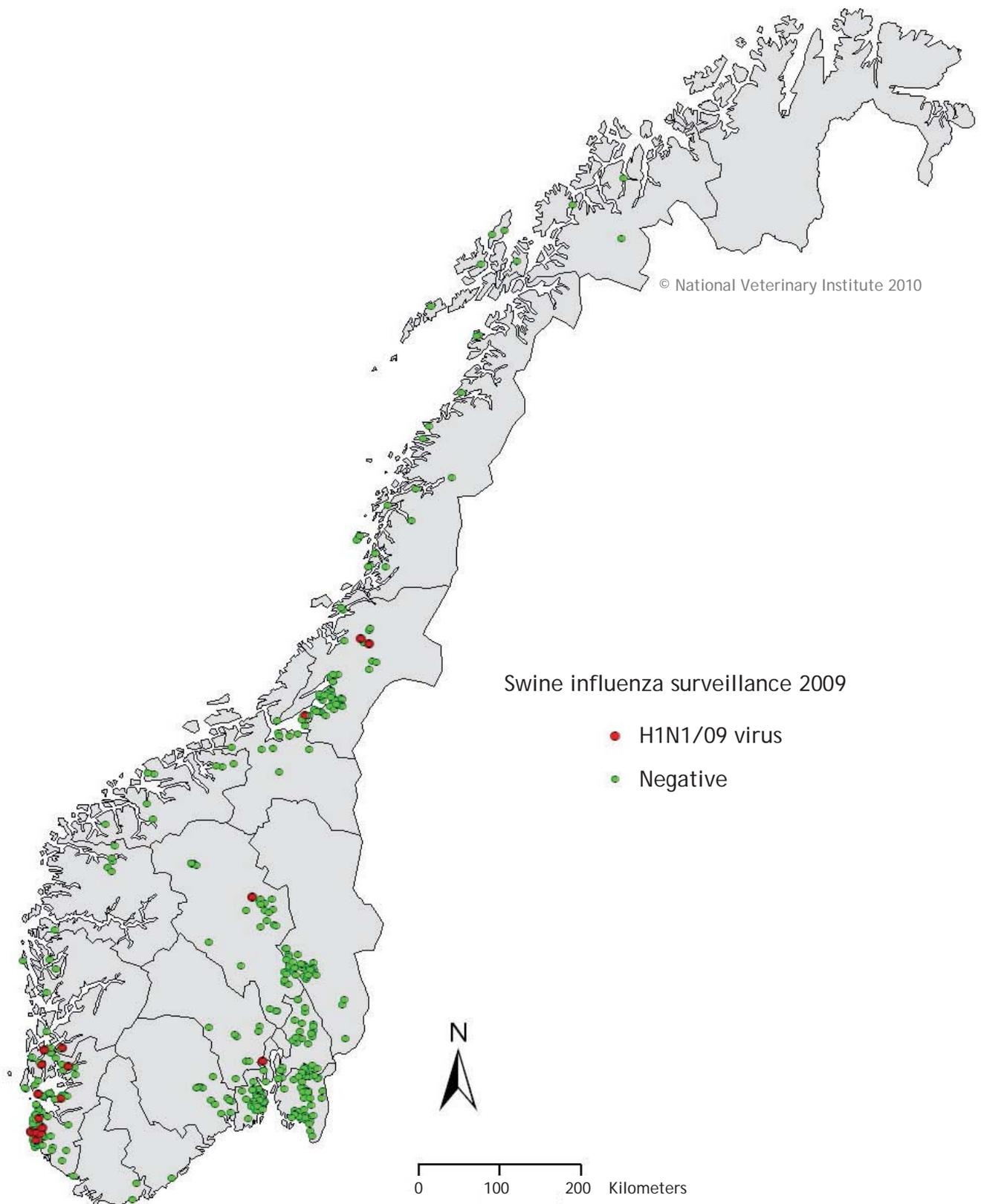


Figure 1. Serological results and geographical distribution of swine herds tested for influenza A in the surveillance and control programme for specific virus infections in 2009.

The National Veterinary Institute (NVI) is a nation-wide 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 National 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.

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