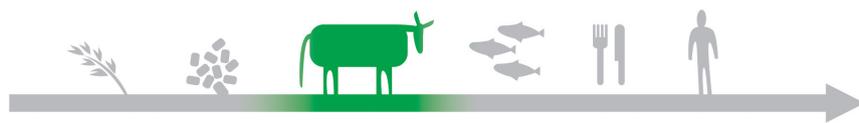
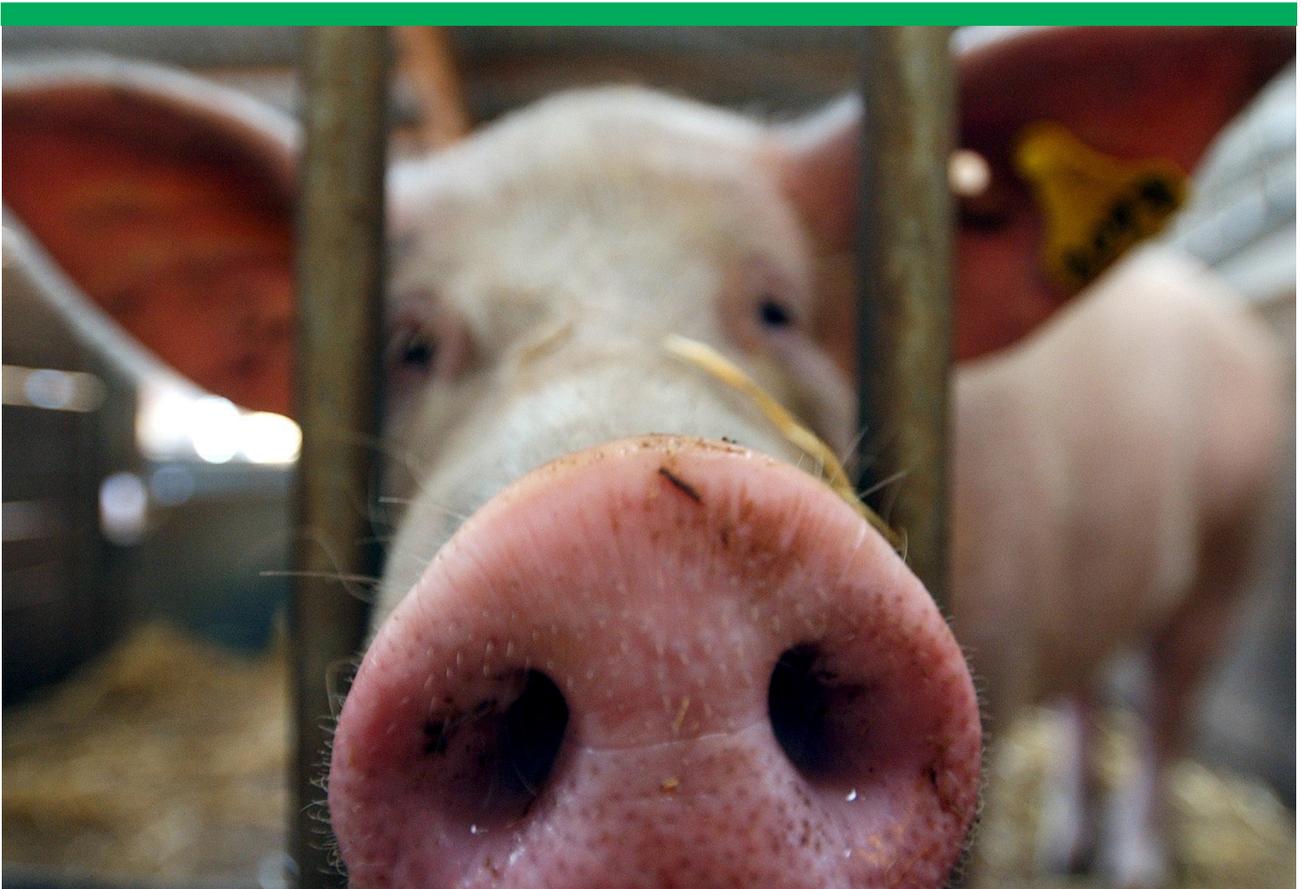


The surveillance programme for methicillin resistant *Staphylococcus aureus* in pigs in Norway 2018



Veterinærinstituttet
Norwegian Veterinary Institute



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Summary

The surveillance programme in 2018 did not detect any pig herds with MRSA. In total, 716 herds were included in the survey, of which 86 were genetic nucleus or multiplier herds, 12 herds were central units of the sow pool herds, 19 were of the largest farrow to grower or farrow to finish herds, and 599 were finishing pig herds.

Introduction

There are several varieties of Methicillin resistant *Staphylococcus aureus* (MRSA) some of which are associated with animals (especially pigs), and are collectively referred to as LA-MRSA (livestock associated - MRSA). Within a few years, LA-MRSAs have become widespread in pig populations around the world, thereby representing a risk for dissemination to the human population.

All types of MRSA can be transmitted between humans and animals. However, not all types are well adapted for establishing in other species than their original host specie. MRSA is not typically associated with disease in animals or healthy humans, but it is important to prevent transmission, especially to health institutions such as hospitals and nursing homes where the bacteria can cause severe infections that are difficult to treat.

The commercial Norwegian pig population is characterized by being essentially closed due to negligible imports of live pigs (<https://www.animalia.no/no/Dyr/koorimp---import/arsmeldinger-koorimp-og-kif/>). The population is based on a pyramidal structure with genetic nucleus herds at the apex, and with a unidirectional downward trade of live animals. The number of herds with breeding sows were about 1100 during 2018, while the number of specialized fattening pig herds were about 1250 during 2017 (2018 data not available) (<https://www.animalia.no/no/animalia/publikasjoner/kjottets-tilstand/>).

Surveys that were conducted in 2008 (1), 2011 (2) and 2012 (3) indicated a very low prevalence of MRSA-positive pig herds in Norway. The MRSA belonging to the animal associated clonal complex CC398 *spa*-type t034 was detected in pig samples for the first time in 2011 (anonymous study). In 2013/14, three clusters of MRSA CC398 positive pig herds were detected, in eastern and southwestern Norway, respectively, and measures to eradicate LA-MRSA from positive pig herds were imposed. The rationale behind this strategy was to avoid the pig population becoming a reservoir of MRSA with the potential of zoonotic transmission. The LA-MRSA eradication strategy includes restrictions on trade of live animals upon suspicion, depopulation of pigs in LA-MRSA positive pig herds, thorough cleaning and disinfection of premises, negative samples from the environment and mandatory down-time before restocking with pigs from MRSA negative herds. After restocking, samples are collected from animals and the environment several times to assess the effectiveness of MRSA eradication.

From 2014, a yearly surveillance program of MRSA in the pig population was implemented. The first year, all sow herds with more than ten sows were examined (n=986 herds) and a single positive herd with MRSA CC398, t11 was identified (4). In 2015, a total of 821 herds were included, of which 86 were nucleus or multiplier herds and 735 was finishing herds (5). LA-MRSA was identified in four herds; three finishing herds and one multiplier herd. The isolates from two finishing herds were typed as CC1, t177 and further outbreak tracing showed that the two herds belonged to the same cluster of positive herds. The last two herds were not linked, but both positive for MRSA CC398, t034. The surveillance programme in 2016 detected one farrow to finish pig herd and two contact pig herds with LA-MRSA CC398 t034, and during this year MRSA was neither detected in any of the genetic nucleus or multiplier herds, nor in the central units of the sow pool herds (6). The surveillance programme in 2017 did not detect any pig herds with LA-MRSA CC398. However, MRSA CC7, and CC130 and CC425 were detected in one multiplier herd and in two farrow to finish herds, respectively (7).

In total, nine herds have been found through the surveillance programmes from 2014 to 2018. Additionally, contact tracing from positive herds or from persons have detected a total of 65 MRSA

positive herds, bringing the total number of pig herds found positive for MRSA to 74 in this time period (8, 4, 5, 6, 7). In all LA-MRSA positive herds, measures to eradicate MRSA were imposed.

Aims

The objective of the surveillance programme is to identify methicillin resistant *Staphylococcus aureus* (MRSA) positive pig herds with the intention of contact tracing and eradication of LA-MRSA, as the overall goal is to keep the Norwegian pig population free of LA-MRSA.

Materials and methods

In 2018, all the genetic nucleus and multiplier herds (n = 87), 12 sow pool herds, the 24 largest farrow to grower or farrow to finish herds with more than 10 sows, and all finishing pig herds with an annual production more than 70 pigs (n = 927) according to the Registry of slaughter deliverances between 1st of July 2016 and 30th of June 2017, were to be sampled by the Norwegian Food Safety Authorities. An additional two genetic herds were not included in the 2018 surveillance as they were out of service due to a barn fire and eradication due to previous findings, respectively. The genetic nucleus and multiplier herds, as well as the sow pool herds and the largest commercial sow herds, were to be sampled twice. Sampling was conducted throughout the whole year.

Pigs were sampled by using sterile SodiBox™ cloths (Sodibox™, Pont C'hoat 29920 Nevez, France) moistened with sterile saline water. A part of the cloth was rubbed firmly against the skin behind both ears of the pig (about 5x5 cm on each side). Each cloth was used for 20 pigs, and a total of three cloths, representing 60 pigs distributed on all rooms and all age groups (except suckling piglets), were used per herd. The three cloths were analyzed as one pooled sample. In addition, in each herd two cloths were used for environmental samples taken in all rooms with pigs. Each cloth was used on about 15 control points (about 10x10 cm per location) representing furnishings, feeders, water nipples, window sills, door handles, tools, boots, ventilation system etc. These two cloths were analyzed as one pooled sample.

The samples were submitted to the Norwegian Veterinary Institute's laboratory in Oslo and analysed for MRSA by enrichment in 300 mL Mueller Hinton broth with 6.5% NaCl at 37°C for 18-24 h. From the culture obtained in the Mueller Hinton Broth, 10 µL were streaked on Brilliance™ MRSA2 Agar (Oxoid) and incubated at 37°C for 18-24 h. The 95% confidence interval (CI) was calculated based on a binomial distribution.

Results and Discussion

Of the 87 genetic nucleus and multiplier herds, samples were received from 86 herds. Of these 86 herds, samples were received twice from 65 herds, and once from 21 herds.

All 12 sow pool herds were sampled, 11 of these twice as planned. Of the 24 largest farrow to grower or farrow to finish herds, samples were received from 19 herds. Samples from one of these were not suitable for analyses, leaving 18 herds to be included in the surveillance. From these 18, samples were received twice from 10 of the herds.

Samples were sent in from a total of 603 finishing pig herds, although samples from four of these were not suitable for analyses. Thereby 599 finishing pig herds were included in the 2018 MRSA surveillance. This constitute a total coverage of 64.6%. The coverage in the NFSA region "Sør og Vest" were considerably lower than the other regions.

MRSA was not detected in samples from any of the total 716 herds included in the 2018 surveillance (95% CI [0-0.05%]). This result is valid under the assumption that among the sampled finishing herds, these have been chosen randomly.

Table 1. Number of pig herds included in the MRSA surveillance per Norwegian Food Safety Authorities (NFSA) Region in 2018.

NFSA Region	No. genetic nucleus and multiplier herds	No. sow pool herds	No. large farrow to grower herds	No. of finishing herds
Stor-Oslo	10	3	0	62
Øst	33	4	4	200
Sør og Vest	17	4	5	190
Midt	21	1	3	129
Nord	5	0	6	18
Total	86	12	19	599

References

1. NORM/NORM-VET 2008. Usage of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Norway. Tromsø / Oslo 2009. ISSN:1502-2307 (print) / 1890-9965 (electronic).
2. NORM/NORM-VET 2011. Usage of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Norway. Tromsø / Oslo 2012. ISSN:1502-2307 (print) / 1890-9965 (electronic).
3. NORM/NORM-VET 2012. Usage of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Norway. Tromsø / Oslo 2013. ISSN:1502-2307 (print) / 1890-9965 (electronic).
4. Urdahl AM, Bergsjø B, Hofshagen M, Norström M, Lium B. The surveillance programme for methicillinresistant *Staphylococcus aureus* in pigs in Norway 2014. *Surveillance programmes for terrestrial and aquatic animals in Norway. Annual report 2014*. Oslo: Norwegian Veterinary Institute 2014.
5. Urdahl AM, Bergsjø B, Norström M, Grøntvedt CA. The surveillance programme for methicillinresistant *Staphylococcus aureus* in pigs in Norway 2015. *Surveillance programmes for terrestrial and aquatic animals in Norway. Annual report 2015*. Oslo: Norwegian Veterinary Institute 2016.
6. Urdahl AM, Bergsjø B, Norström M, Grøntvedt CA. The surveillance programme for methicillinresistant *Staphylococcus aureus* in pigs in Norway 2016. *Surveillance programmes for terrestrial and aquatic animals in Norway. Annual report 2015*. Oslo: Norwegian Veterinary Institute 2017.
7. Urdahl AM, Norström M, Bergsjø B, Grøntvedt CA. The surveillance programme for methicillinresistant *Staphylococcus aureus* in pigs in Norway 2017. *Surveillance programmes for terrestrial and aquatic animals in Norway. Annual report 2015*. Oslo: Norwegian Veterinary Institute 2018.
8. Grøntvedt CA, Elstrøm P, Stegger M, Skov RL, Andersen PS, Larssen KW, Urdahl AM, Angen Ø, Larsen J, Åmdal S, Løtvedt SM, Sunde M, Bjørnholt JV. MRSA CC398 in humans and pigs in Norway: A "One Health" perspective on introduction and transmission. *Clin Infect Dis*. 2016 Dec 1; 63(11):1431-1438.

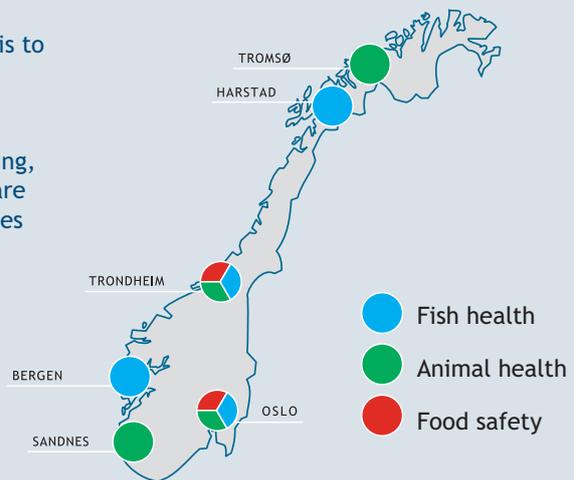
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