



The surveillance programme for methicillin resistant *Staphylococcus aureus* in pigs in Norway 2023



REPORT 13/2024

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Suggested citation

Urdahl, Anne Margrete, Norström, Madelaine, Sunde, Marianne, Grøntvedt, Carl Andreas. The surveillance programme for methicillin resistant *Staphylococcus aureus* in pigs in Norway 2023. Surveillance program report. Veterinærinstituttet 2024. © Norwegian Veterinary Institute, copy permitted with citation

Quality controlled by

Merete Hofshagen, Director of Animal Health, Animal Welfare and Food Safety, Norwegian Veterinary Institute

Published

2024 on www.vetinst.no

ISSN 1890-3290 (electronic edition)

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Commissioned by

Norwegian Food Safety Authority



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Cover design: Reine Linjer

Cover photo: Colourbox

www.vetinst.no

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Summary

The surveillance programme in 2023 did not detect any pig herds with MRSA. In total, 541 herds were included in the survey, of which 70 were genetic nucleus or multiplier herds, 11 herds were central units of the sow pool herds, 14 were of the largest farrow to grower or farrow to finish herds, and the remaining 446 were herds with more than 10 sows.

Introduction

The Norwegian Food Safety Authority (NFSA) is owner of the surveillance programme for MRSA in swine, and also do all the sampling. The Norwegian Veterinary Institute is responsible for planning, laboratory investigations and reporting components of the programme.

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. 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 (1). 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 841 (preliminary numbers) during 2023, while the number of specialized fattening pig herds in 2022 were 1504 (2).

Surveys that were conducted in 2008 (3), 2011 (4) and 2012 (5) indicated a very low prevalence of MRSA-positive pig herds in Norway. MRSA belonging to the LA-MRSA 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 LA-MRSA CC398 positive pig herds were detected (6), 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. This has also been followed up in the Norwegian National Strategy against Antibiotic Resistance from 2015 stating as a goal that “LA-MRSA will not be established in the Norwegian pig population”.

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.

A comprehensive surveillance program of MRSA in the pig population was implemented in 2014. Sampling description and overview of results are described in the annual reports (7).

In total, nine pig herds have been found positive through the MRSA surveillance programme in 2014 - 2023 (Table 1). Additionally, contact tracing from positive herds or from persons have detected a total of 75 MRSA positive herds, bringing the total number of pig herds found positive for MRSA to 84 in this time period (7). In all LA-MRSA positive herds, measures to eradicate MRSA were imposed.

Table 1: Pig herds positive for methicillin resistant *Staphylococcus aureus* 2014 - 2023. Table show total number of MRSA positive herds detected by the MRSA surveillance programme, total number of MRSA positive herds, as well as results from the MRSA typing.

Year	No. MRSA positive herds detected by the MRSA surveillance prog. (Total no of positive herds)	Herds investigated in the MRSA surveillance prog.	MRSA typing*
2014	1 (5)	986	CC398 t034 (2), CC398 t011 (3)
2015	4 (34)	821	CC398 t034 (25), CC1 t177 (9)
2016	1 (8)	872	CC398 t034 (8)
2017	2 (6)	826	CC7 t091 (2), CC8 t024 (2), CC130 t843 (1), CC425 t6292 (1)
2018	0	716	
2019	1 (9)	722	CC398 t034 (3), CC398 t011 (5), CC130 t843 (1)
2020	0	641	
2021	0	763	
2022	0	591	
2023	0	541	
Total	9 (84**)		CC398 t034 (60), CC398 t011 (8), CC1 t177 (9), CC7 t091 (2), CC8 t024 (2), CC130 t843 (2), CC425 t6292 (1)

* *mecC*-gene detected for CC130 t843 and CC425 t6292, *mecA*-gene detected for the others

**The total number of positive herds also includes 22 herds detected during 2013

Aims

The objective of the surveillance programme is to identify methicillin resistant *Staphylococcus aureus* (MRSA) positive pig herds with the intention of contract 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 2023, the following were to be sampled by the NFSA: all of the genetic nucleus and multiplier herds (n = 70) and the central unit herds of the sow pools (n=11), the 20 largest farrow to grower or farrow to finish herds with more than 10 sows, and herds with more than 10 sows (n =564) according to the Registry of Production subsidies as of 1st of October 2022. Each local NFSA is expected to use their local knowledge and add herds missing in the lists, as the production subsidies registry is not complete. 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 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 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

Samples were received from all of the 70 genetic nucleus and multiplier herds. From these 70 herds, samples were received twice from 51 herds, once from 19 herds.

Samples were received from all 11 sow pool herds. Two herds was sampled once, nine herds were sampled twice.

Samples were received from 14 herds stated by the NFSA to be of the largest farrow to grower or farrow to finish herds, of which nine were sampled twice and seven were sampled once.

Samples were received from a total of 446 herds with more than 10 sows (out of 564).

Additionally 13 herds not included in the frame were sampled and analyzed with no findings of MRSA, but are not included in the tables and statistics.

Altogether 541 herds were included in the 2023 MRSA surveillance. This constitute a total coverage of 81.4%.

MRSA was not detected in samples from any of the 541 herds included in the 2023 surveillance (95% CI [0-0.68%]).

Table 2: Number of pig herds included in the MRSA surveillance per Norwegian Food Safety Authority (NFSA) Region in 2023.

NFSA Region	No. genetic nucleus and multiplier herds	No. sow pool herds	Large Farrow to finish herds	No. herds with more than 10 sows
Stor-Oslo	8	3	1	47
Øst	26	4	5	134
Sør og Vest	14	4	2	157
Midt	16	-	5	81
Nord	6	-	1	27
Total	70	11	14	446

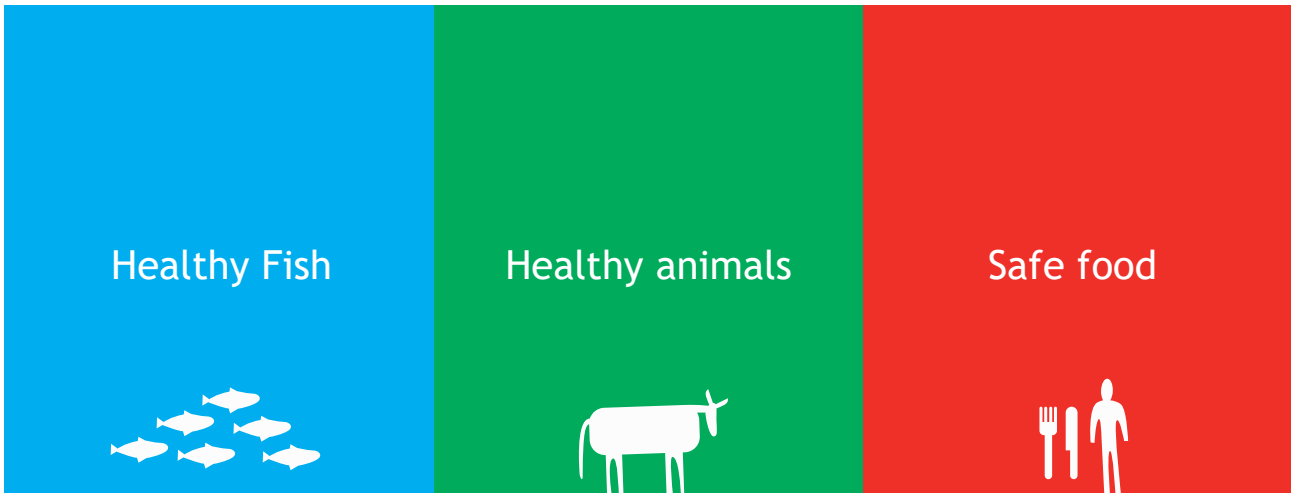
Acknowledgement

The authors would like to thank the technical staff for performing the analyses with excellence. In particular, Hilde Welde, has contributed substantially to the project. Moreover, the authors would like to thank all personnel from the Norwegian Food Safety Authority for collection and submission of samples.

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