

# MRSA - surveillance and control in Norway

## Experiences from the Norwegian pig population

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# Overview of presentation

- Brief introduction to Norwegian pig production
- Occurrence of MRSA in humans and pigs in Norway
- LA-MRSA epidemiological descriptions (examples)
- LA-MRSA eradication
  - Methods and results
- Concluding remarks



# Norwegian pig production

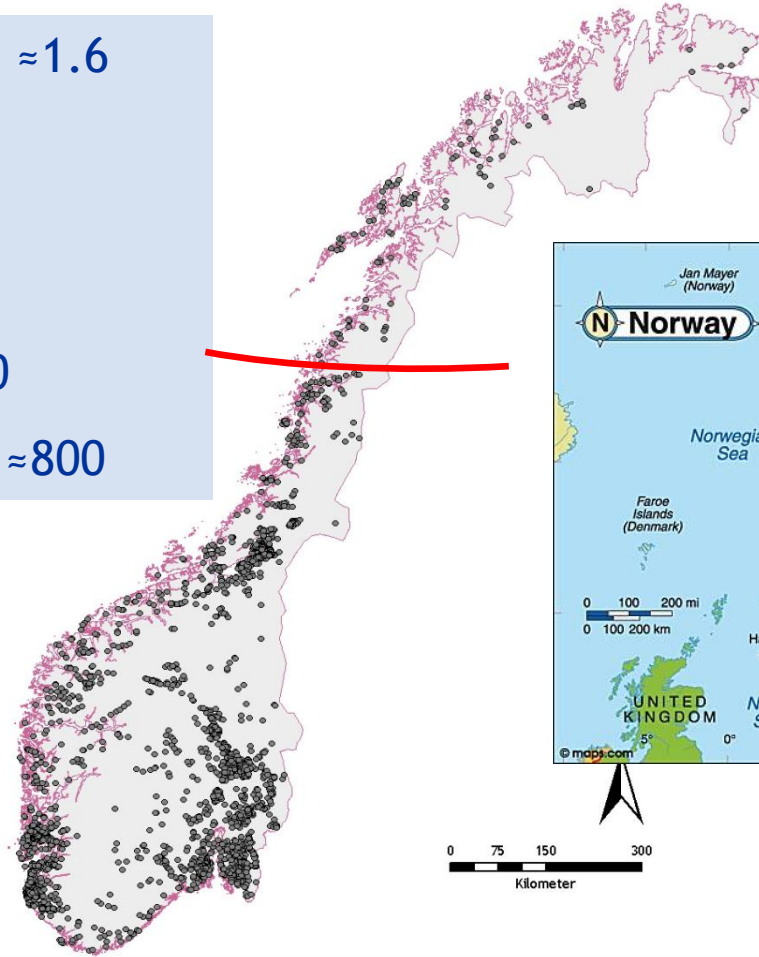
Pigs slaughtered:  $\approx 1.6$  million

Sows:  $\approx 60.000$

Herds:  $\approx 2000$

Sow herds:  $\approx 1200$

Fattening herds:  $\approx 800$

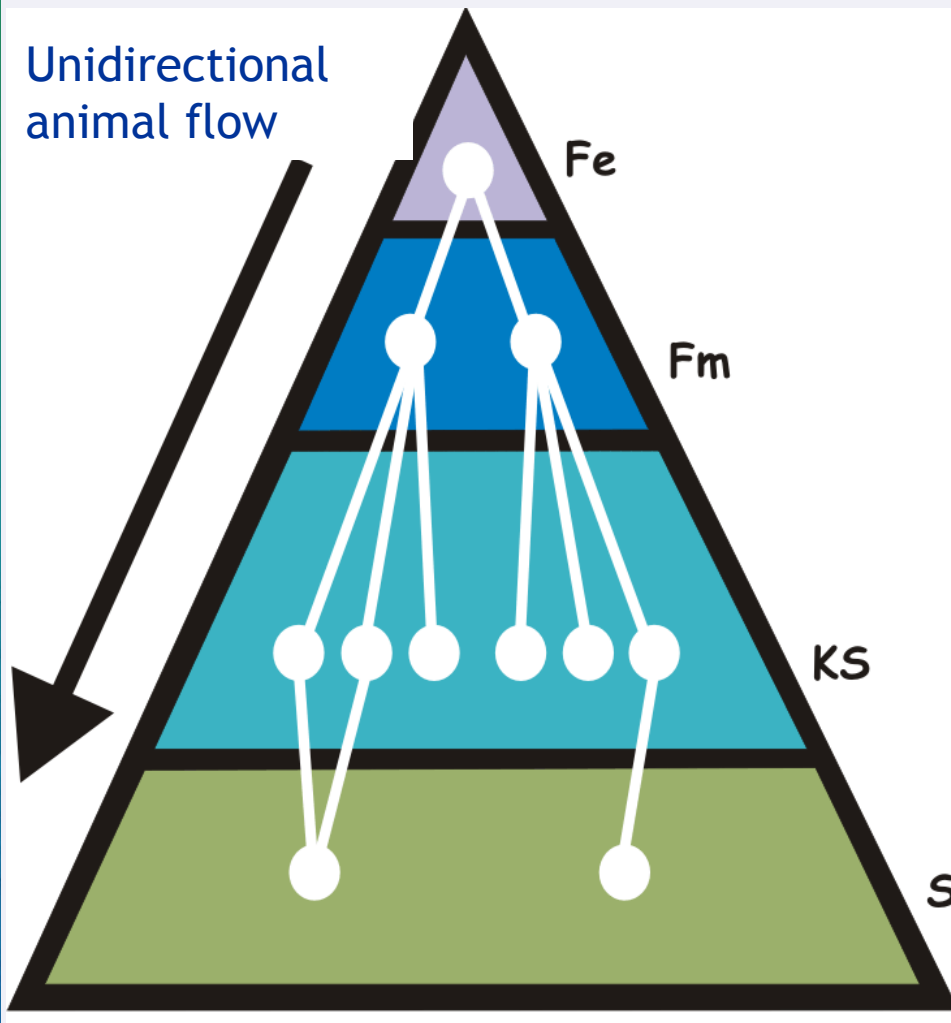


Bruk av denne grafikk  
tillatt når kilde oppgis.

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# The breeding and health pyramid



Fe= Genetic nucleus

- 40 herds with pure breeds

Fm= multipliers

- 50 herds with production of LY-hybrid sows

Piglet producers (n=1100)

- Farrow-to-feed
- Farrow-to-finish

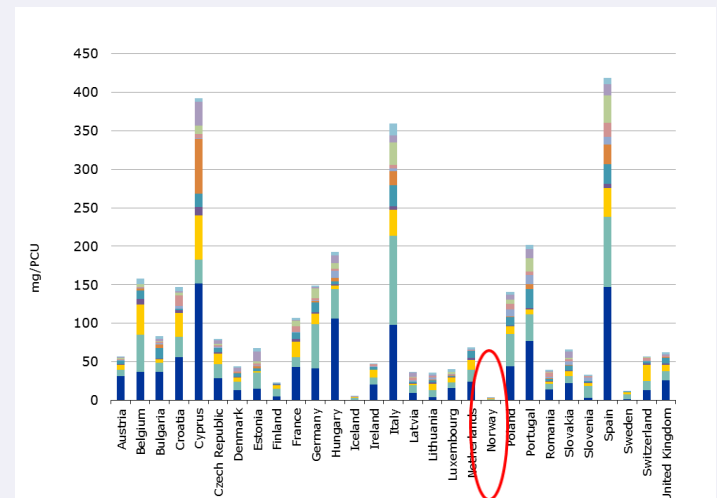
Finisher herds (n=800)

# Norwegian pig production

- Important features of Norwegian pig production concerning LA-MRSA
  - Negligible import of live pigs, 20 pigs in the last 7 years (KOORIMP 2014)
    - Identified as a major risk factor for transboundary transmission of LA-MRSA among pigs (EFSA Journal 2010; 8(6):1597)
  - Low consumption of antimicrobials to production animals (pigs, cattle, small ruminants, horses and farmed fish)

6th ESVAC report,  
2014 data

88% human usage,  
12% animal usage



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# MRSA in humans in Norway

Norway is considered a low prevalence country for MRSA

- MRSA is notifiable in humans

Year	MRSA infection	MRSA carriage	Total MRSA
2011	563	497	1060
2012	575	632	1207
2013	659	823	1482
2014	833	1035	1868
2015	785	1452	2237

Source: MSIS statistics, Norwegian Surveillance System for Communicable Diseases

- >1/3 infected abroad
- MRSA CC398 in humans, 2006-2014: 84 cases
  - 36 cases by contact tracing from MRSA+ pig farms (Grøntvedt, CA et al. Clinical Infectious Diseases 2016; doi: 10.1093/cid/ciw552)





# History of MRSA surveillance in Norwegian pig production

## -Low prevalence of MRSA in pigs

Year	Material	Herds tested	MRSA positive	Type MRSA
2008	EU baseline, dust samples	252	1 (0,4 %)	CC08 <i>spa</i> -type t008
2008	Pig health service, nasal swabs, abattoir	200	0	-
2011	NORM-VET, nasal swabs, 5 finishers, abattoir	207	6 (3 %)* all from one abattoir	CC398 <i>spa</i> -type t034
2012	NORM-VET, 10 pigs, skin swabs, in herds	175	1 (0.6 %)	CC398 <i>spa</i> -type t034
2014	MRSA sow farms	986	1 (0.1 %)	CC398, <i>spa</i> -type t011
2015	MRSA nucleus-, breeding herds and finisher farms	821	4 (0.4 %)	CC1, <i>spa</i> -type t177 CC398, <i>spa</i> -type t034





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# LA-MRSA cluster 1

In February 2013 MRSA CC398 t034 was detected in samples from a pig submitted for post-mortem examination at the Norwegian Veterinary Institute in Oslo

Samples were collected from the fattening pig producer and the supplying sow and weaner farm

- All pooled samples from all three farms were positive for CC398 t034

Contact tracing and sampling detected a total of 13 pig holdings positive for CC398 t034

# LA-MRSA - surveillance 2014

- Sampled all sow farms > 10 sows
  - Pooled skin swabs from 3x20 pigs
  - Environmental swabs from 2x15 points

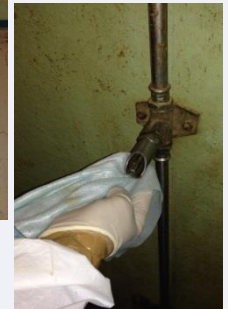
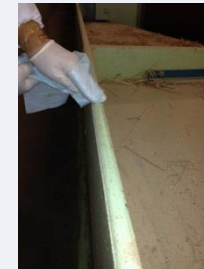


- In total 986 farms

- LA-MRSA detected in samples from 1 farm

- MRSA CC398, t011 in skin and environmental swabs

- CC398, t011 detected in 2 of 3 contact farms



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# LA-MRSA control strategy in pig farms

Primary case herd in cluster 1 was converting to a SPF herd when MRSA was detected, and MRSA eradication was attempted and successful

These results and the low prevalence of MRSA in humans and pigs in Norway, prompted implementation of a national control strategy in 2013

**Goal:** Prevention of the pig population becoming a reservoir for MRSA, with zoonotic transmission to humans

**Means:** Through targeted screening of persons, active surveillance in the pig population, epidemiological investigations and eradication measures upon detection

# LA-MRSA eradication

- Total depopulation (slaughter and/or culling)
- Thorough cleaning and disinfection (QACs and glutaraldehyde)
- Down-time of minimum 7 days after disinfection
- Repopulation with LA-MRSA free pigs
  - Testing at given times after repopulation
    - At least three months (plus six and nine months for sow herds) after restocking
- Testing environment after washing and disinfection
- Successful eradication >90% in the first attempt



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## Concluding remarks

- Likely source of primary introductions are **humans** (Grøntvedt, CA et al. Clinical Infectious Diseases 2016; doi: 10.1093/cid/ciw552)
  - Prevention of introductions are crucial to prevent transmission/dissemination
- Major route of further transmission is trade of live pigs between herds
- LA-MRSA eradication in Norwegian pig herds is possible
  - Very laborious and costly, particularly in sow herds
  - Complicating factors may exist



# Experiences from Norway

## Concluding remarks

- Further work
  - Follow up on outbreak/contact herds
  - Risk-based guidelines for screening of humans with contact to Norwegian pig herds
  - Survey the pig population through
    - Surveillance and control program
    - Targeted samples on suspicion of introduction
  - Control LA-MRSA in pig herds through depopulation, sanitation and disinfection



# Thank you for your kind attention!

## ■ Acknowledgements

- Statens Serum Institute
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- The Norwegian Veterinary Institute

