

LA-MRSA in Norway

One Health Seminar 27 June 2017, Ålesund

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Outline

- Background
 - Epidemiology of MRSA in Norway
 - MRSA in humans
 - MRSA in swine
 - Antimicrobial usage
- A Norwegian One Health Study of LA-MRSA



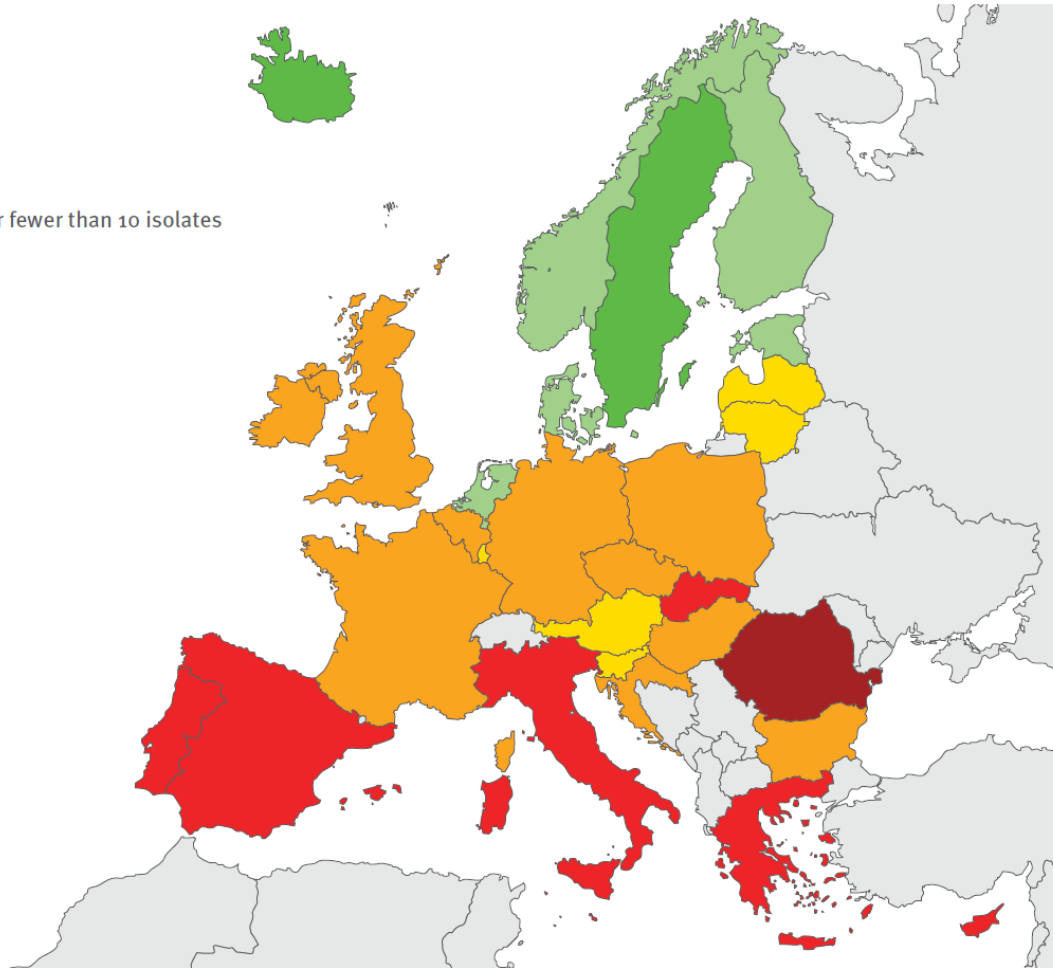
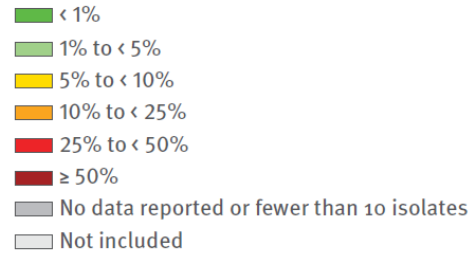
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MRSA in Europe



Percentage (%) of invasive *S. aureus* isolates resistant to methicillin (MRSA), 2015

European Centre for Disease Prevention and Control. Antimicrobial resistance surveillance in Europe 2015. Annual Report of the European Antimicrobial Resistance Surveillance Network (EARS-Net). Stockholm: ECDC; 2017



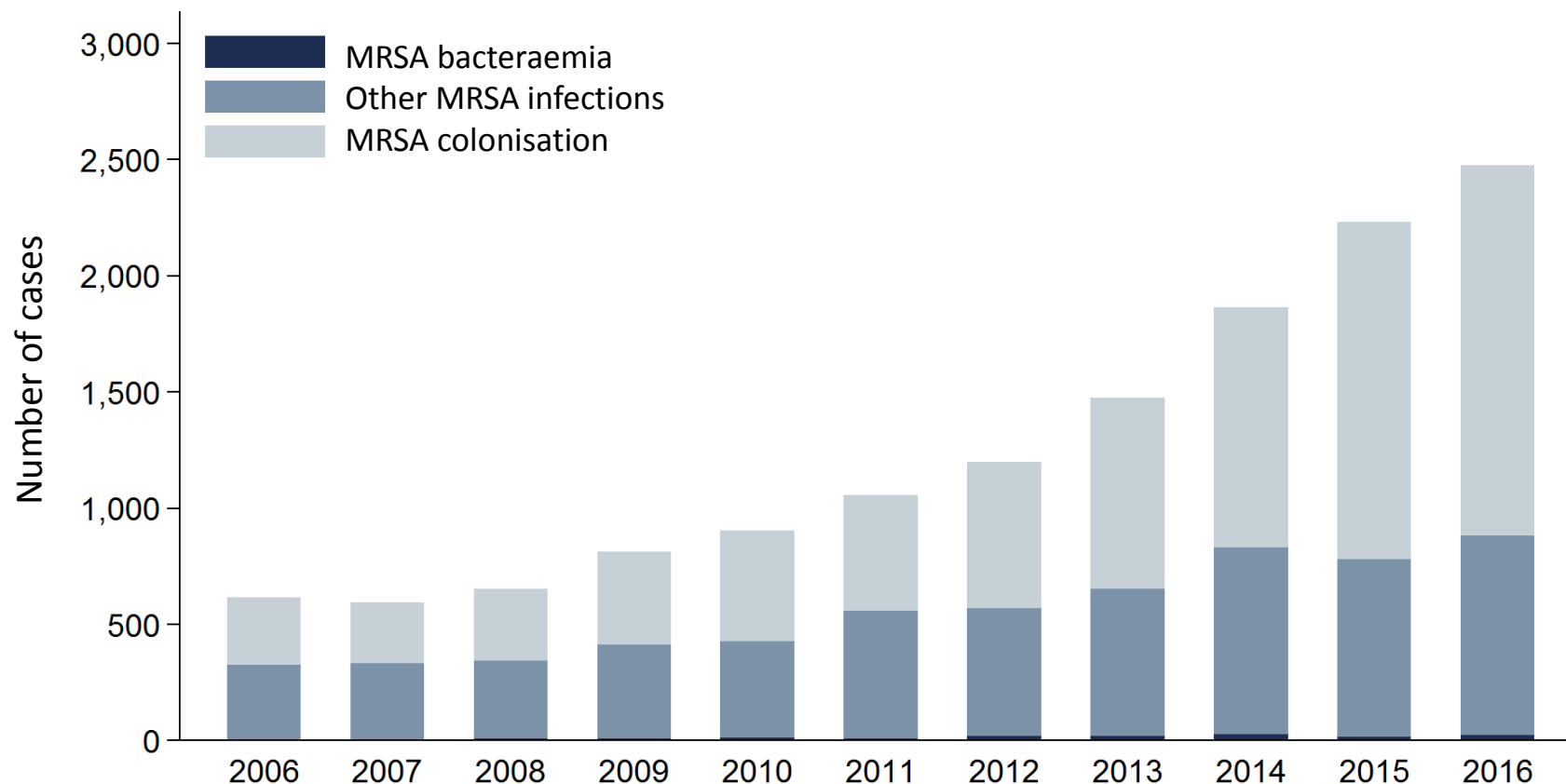
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Notified human cases of MRSA in Norway



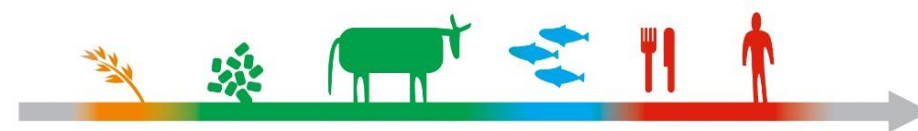
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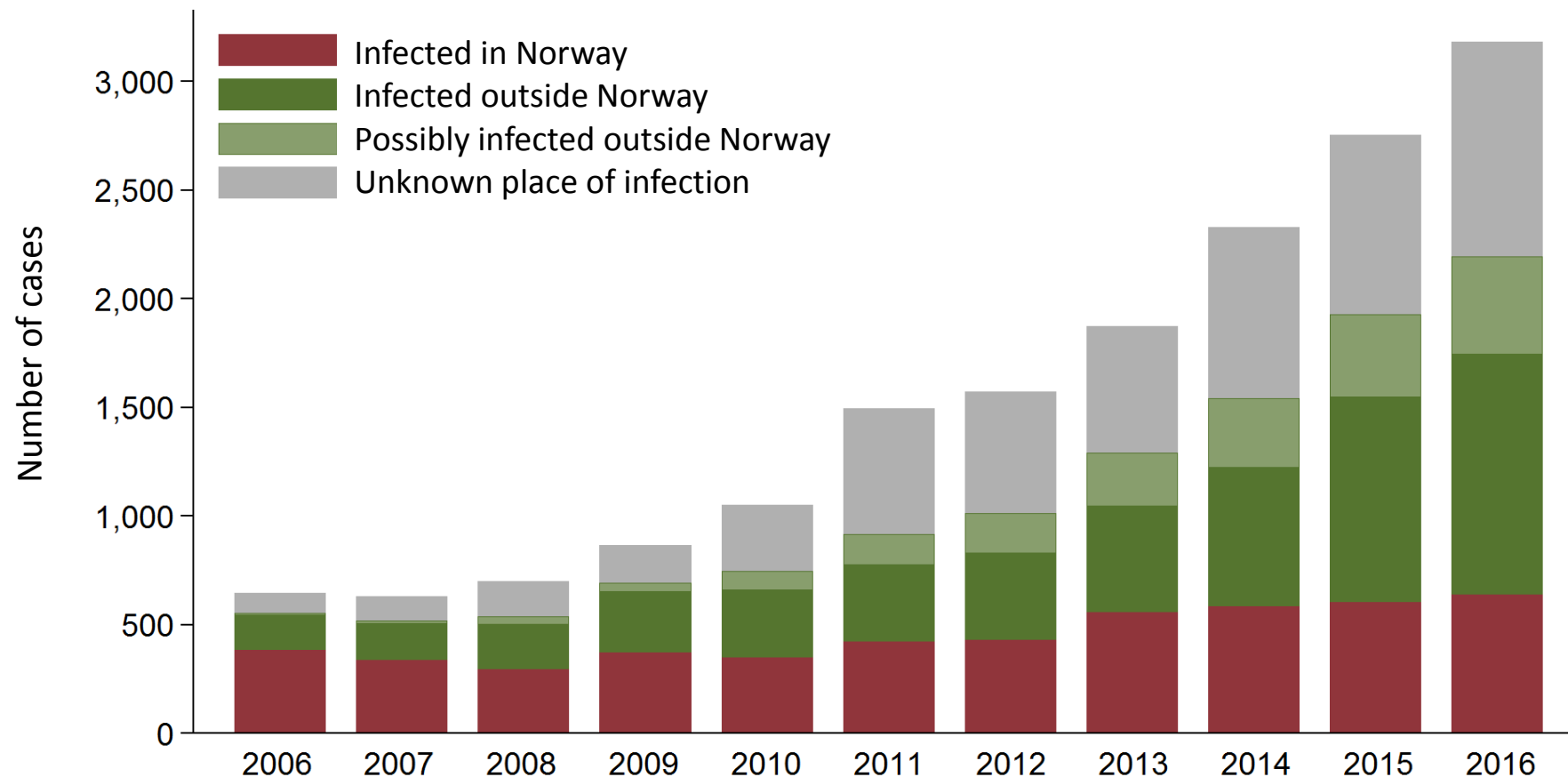
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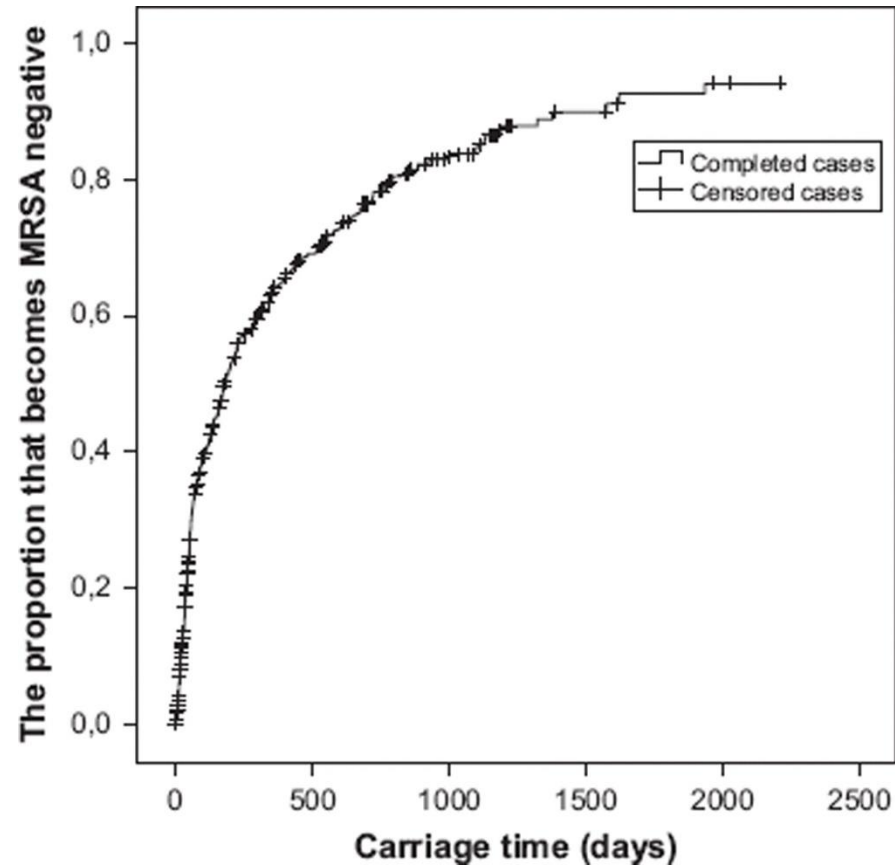
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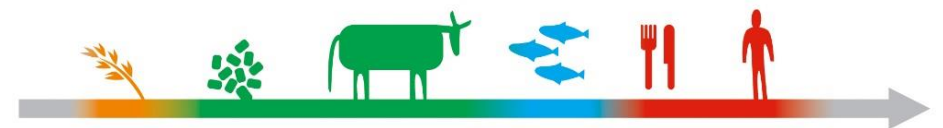
MRSA – Duration of colonisation



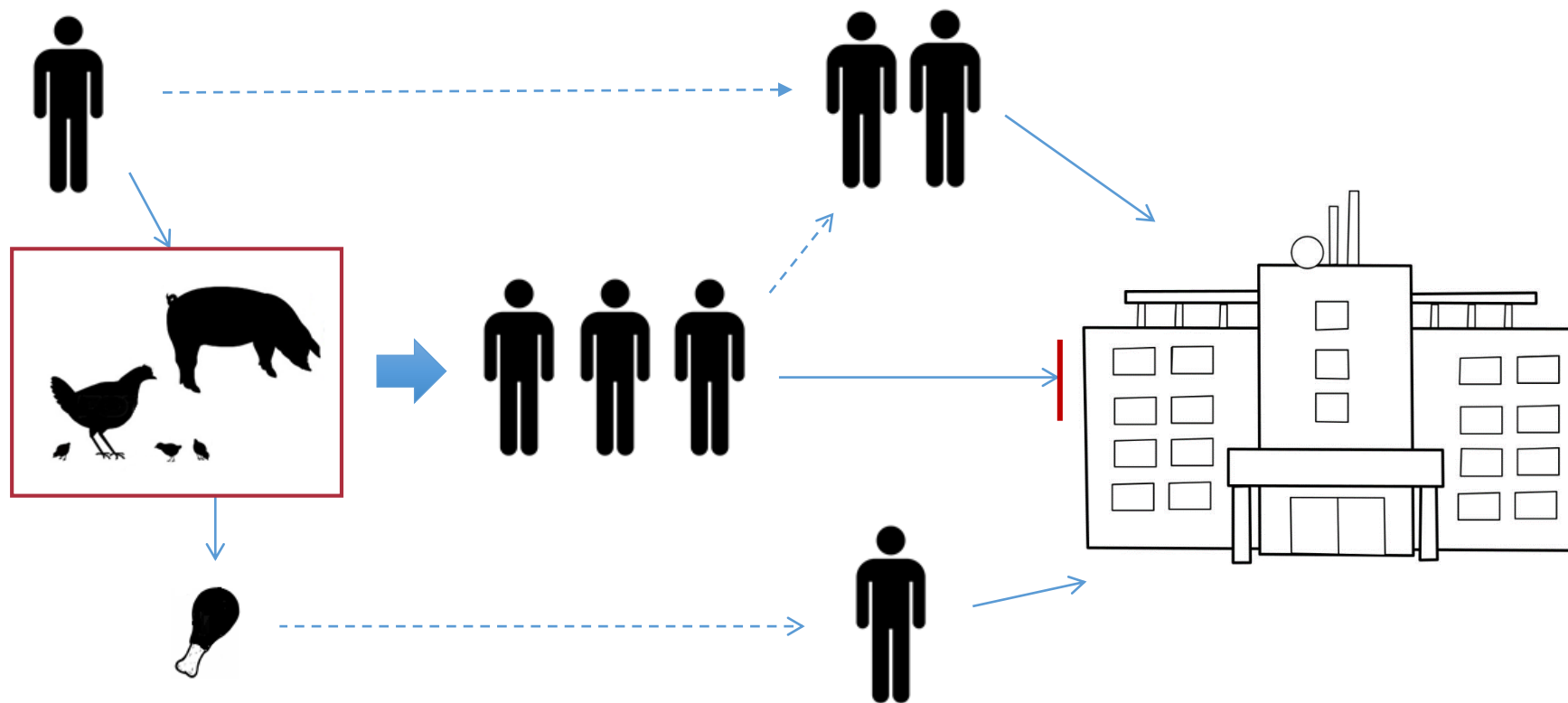
4 years follow up of MRSA pos. persons in Sweden

- Median time of colonisation (n=535): 179 days
- 43% became MRSA negative within 2 month

Anna-Karin Larsson; Eva Gustafsson; Anna C. Nilsson; Inga Odenholt; Håkan Ringberg; Eva Melander; Scandinavian Journal of Infectious Diseases 2011, 43, 456-462.



The public health implications of LA-MRSA



Larsen J et al. Emergence of livestock-associated methicillin-resistant *Staphylococcus aureus* bloodstream infections in Denmark. *Clin Infect Dis* 2017

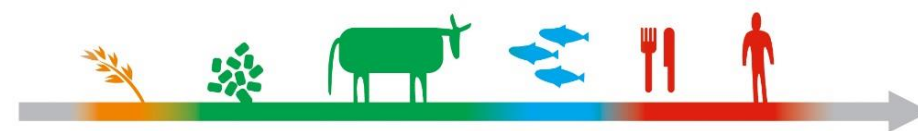
Larsen J et al. Evidence for Human Adaption and Foodborne Transmission of Livestock-Associated Methicillin-Resistant *Staphylococcus aureus*. *Clin Infect Dis* 2016



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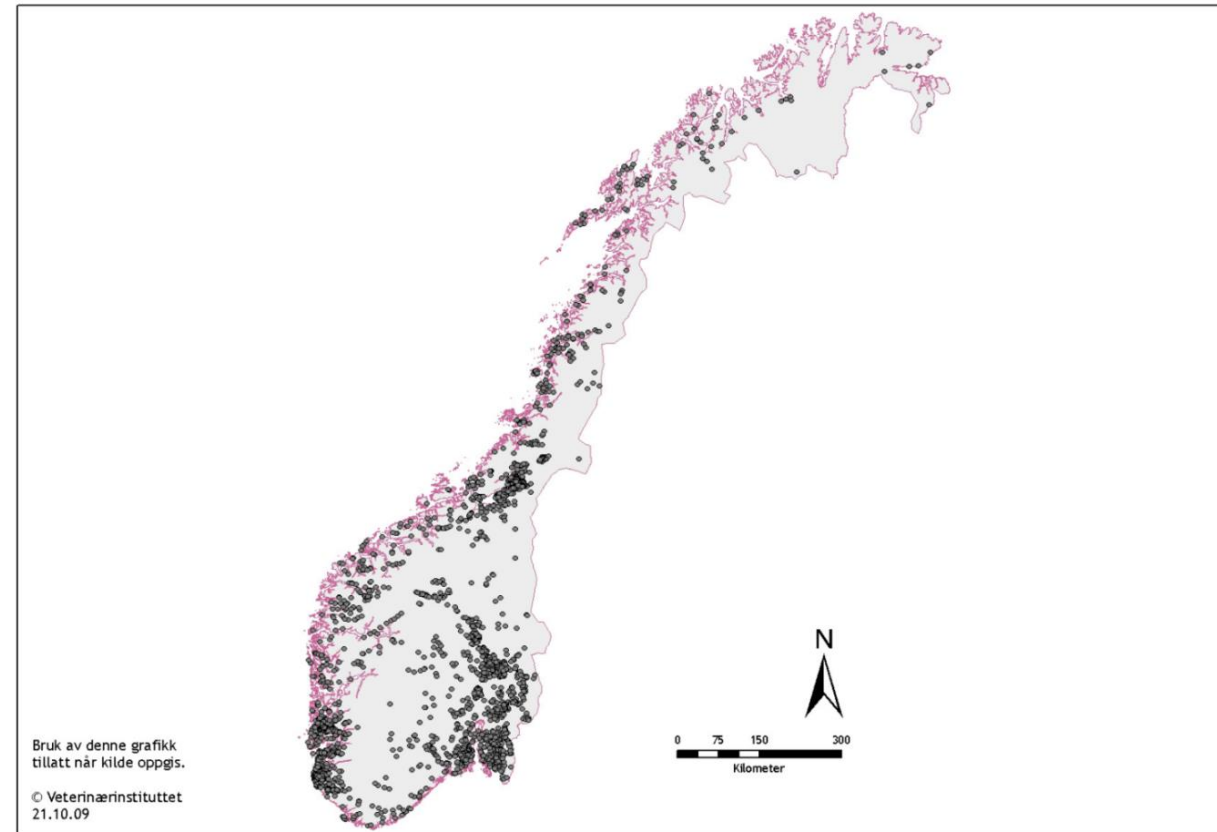


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Pig production in Norway

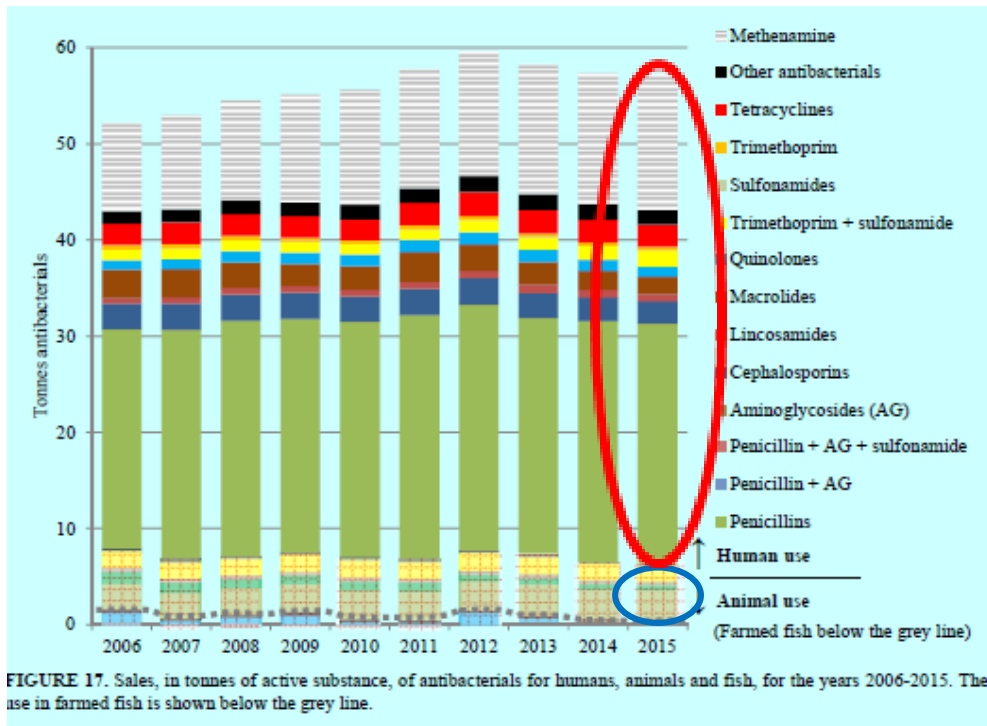
- Animals
 - Slaughter pigs: ≈ 1.6 million/year
 - Sows: ≈ 60.000
- Herds
 - Sow herds: ≈ 1200
 - Slaughter pig herds: ≈ 800
- Negligible import of live animals



Antimicrobial usage in Norway

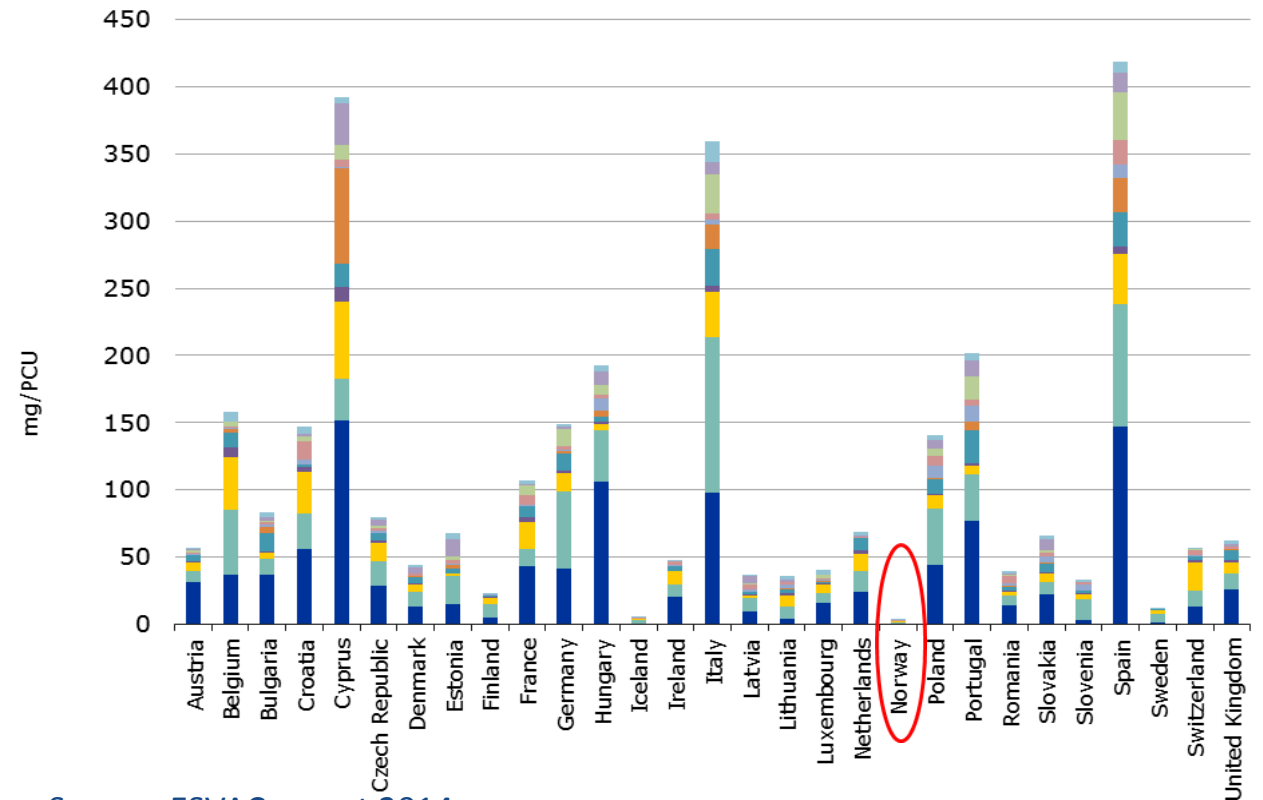
Usage in Norway

- 88% for humans - 12% for animals



Source: NORM-VET 2015

Usage animals in Europe



Source: ESVAC report 2014



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LA-MRSA in swine

- Europe: Up to >90% prevalence of LA-MRSA CC398 in swine herds in many European countries
- Norway: Surveys – and tracing if MRSA is detected

Year	Survey/material	Herds tested	MRSA positive herds	Type MRSA
2008	EU baseline - dust	252	1	«non-LA-MRSA»
2008	Nasal swabs - abattoir	200	0	-
2011	5 nasal swabs - abattoir	207	6 (from 1 abattoir)	CC398
2012	10 skin swabs - at farm	175	1	CC398
2014	Sow farms	986	1	CC398
2015	Breeder/finisher farms	821	4	CC1 (2), CC398 (2)
2016	Sow farms	872	1	CC398



A Norwegian One Health Study

Clinical Infectious Diseases Advance Access published September 23, 2016

MAJOR ARTICLE



Methicillin-Resistant *Staphylococcus aureus* CC398 in Humans and Pigs in Norway: A “One Health” Perspective on Introduction and Transmission

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¹The Norwegian Veterinary Institute, ²The Norwegian Institute of Public Health, Oslo, ³St Olavs Hospital, The Norwegian Reference Laboratory for MRSA, Trondheim, and ⁴The Norwegian Food Safety Authority, Brumunddal; ⁵Statens Serum Institut, Copenhagen, Denmark; and ⁶Pathogen Genomics Division, Translational Genomics Research Institute (TGen), Flagstaff, Arizona



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Study design

- All strains of MRSA CC398 from humans and swine 2008 - 2014
 - Humans = 84
 - Swine herds = 26
- Epidemiological data
 - Collected during surveillance, investigations and MSIS
- All isolates: Whole Genome Sequenced by Statens Serum Institut, DK



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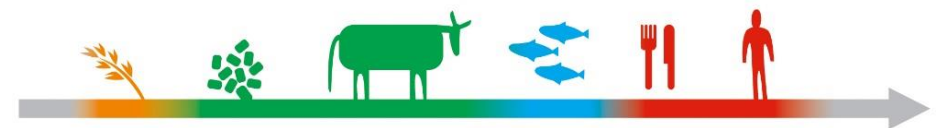
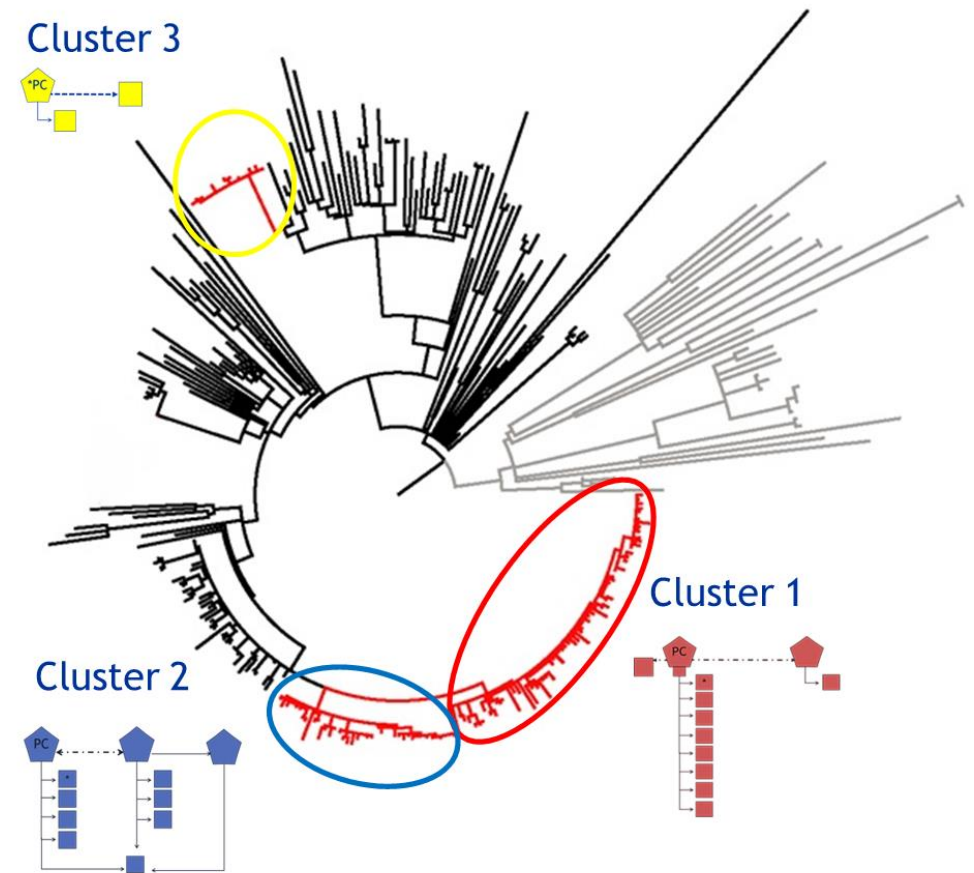


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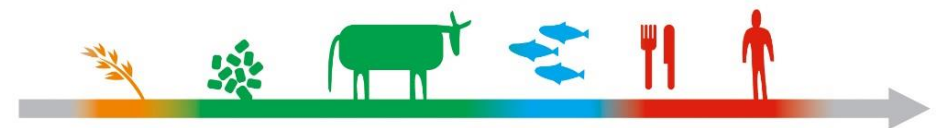
Results – Epidemiological data + results of WGS

- Three separate outbreaks identified - including
 - 36 humans
 - 2 slaughterhouses
 - 26 swine herds
 - 3 primary sow herds



Results – Further spread of infection

- Probable routes of infection from 3 primary sow herds to other herds
 - Trade with animals: 19 herds
 - Infection via humans: 3 herds
 - Infection via truck (used for transport of live animals): 1 herd



Results – Contact tracing swine herds

Type of herd	Total (positive/contacts tested) (% positive)	Cluster 1	Cluster 2	Cluster 3
Total	26/74 (35%)	12/26 (46%)	11/44 (25%)	3/4 (75%)
Sow herds	7/24 (30%)	3/7	3/16	1/1
Slaughter herds	18/49 (37%)	9/19	8/28	2/3

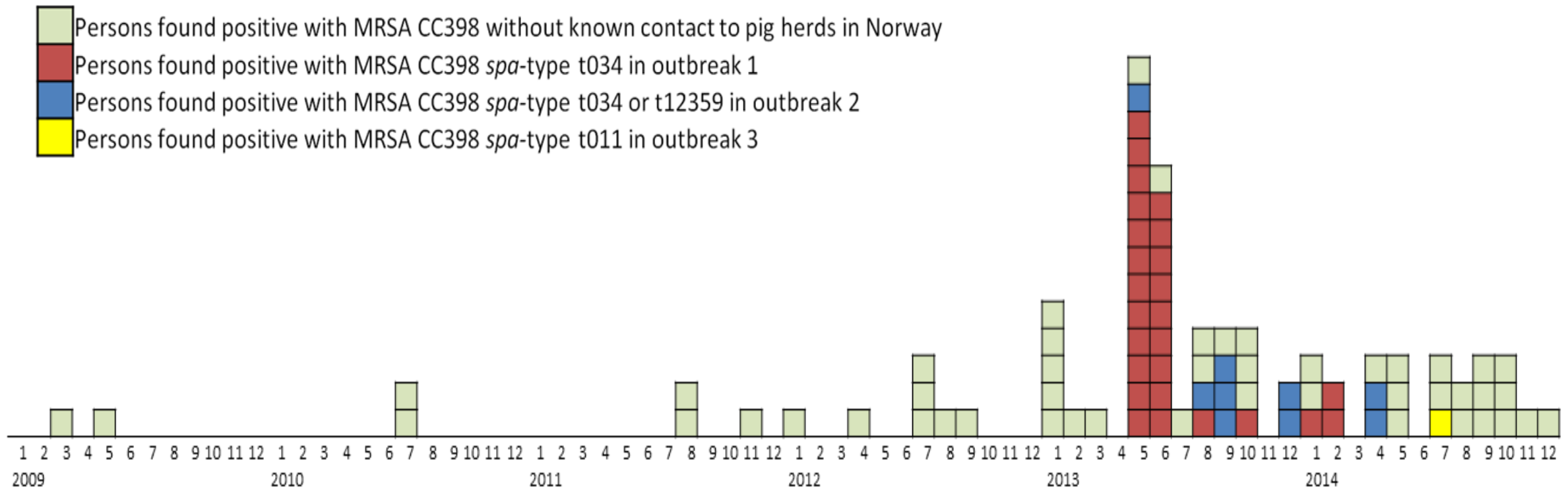


Results – Humans and risk of infection

Type of exposure	Total (positive/total tested) (% positive)	Cluster 1	Cluster 2	Cluster 3
Total	36/272 (13%)	26/171 (15%)	9/97 (9%)	1/4 (25%)
Working in sow herd	14/62 (25%)	10/19	3/39	1/4
Veterinarian	3/15 (20%)	2/11	1/4	-
Working in slaughter herd	9/63 (14%)	5/29	4/34	-
Working at slaughter house	10/124 (8%)	9/107	1/17	-
Living in the same house as persons above	0/8 (0%)	0/5	0/3	-



Results – MRSA CC398 in humans 2009 - 2014



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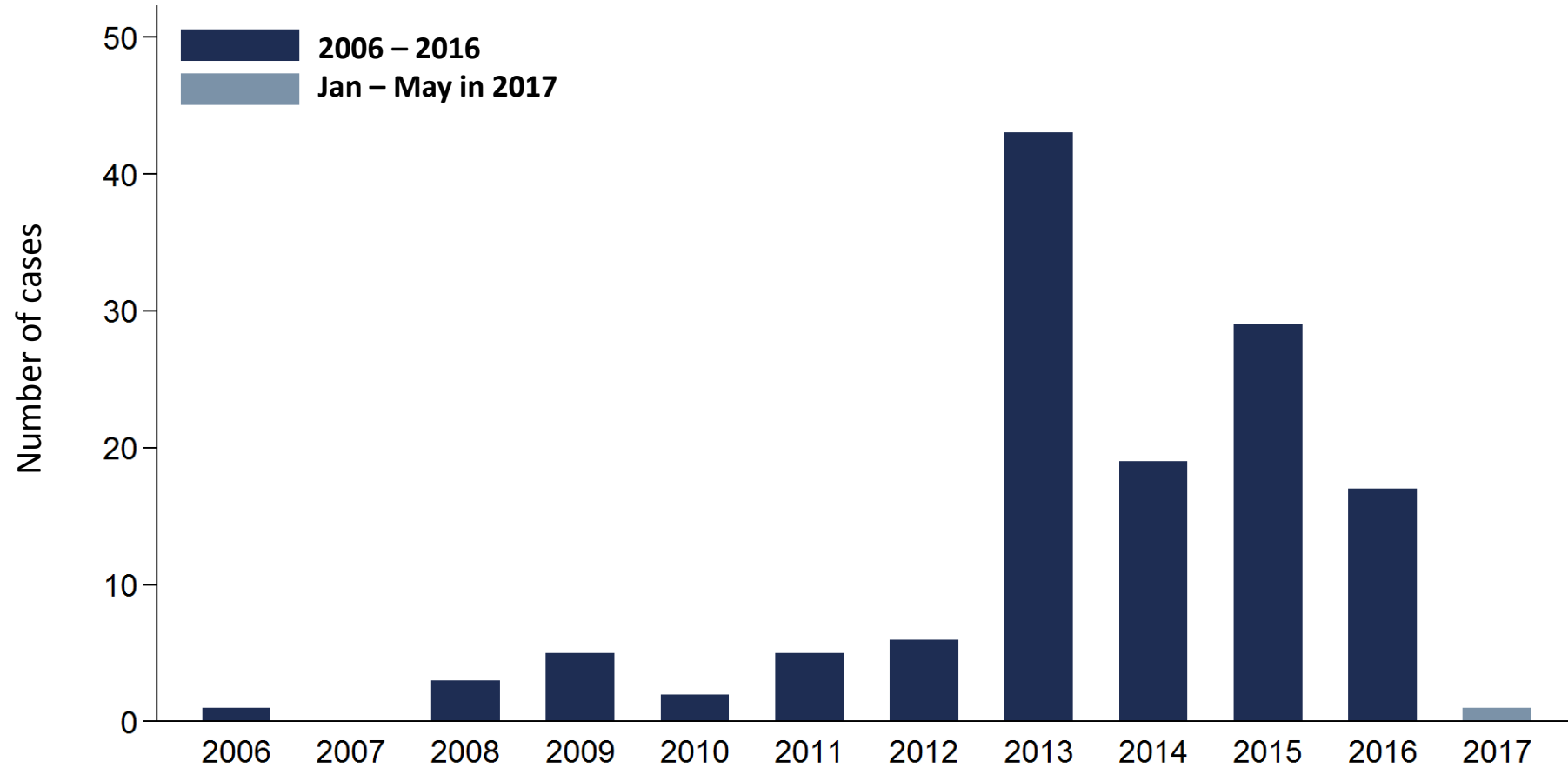


Conclusions

- All three outbreaks: Primary introduction by humans
- Main route of secondary spread: Trading live animals
- So far, not discovered spread of MRSA CC398 to persons without contact with the animals



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