

## PUBLIC HEALTH

## Transmission of livestock-associated MRSA to people

IN an excellent review report by the Food Standards Agency (FSA) (2017) where it carried out a qualitative risk assessment on the transmission of livestock-associated methicillin-resistant *Staphylococcus aureus* (LA-MRSA) in the UK food chain, it concluded that 'the prevalence of food contaminated with LA-MRSA is low in the UK'. In addition 'the risk to human health from the preparation, handling and/or consumption of LA-MRSA/MRSA contaminated food stuffs in the UK is very low, especially compared to other routes of transmission'. They also advised that 'raw food should be stored appropriately, handled hygienically and cooked thoroughly. In combination, these measures should be sufficient to ensure that any harmful bacteria present are destroyed.' This is very gratifying as it also reports that 'within the general UK human population, 30 per cent carry methicillin-sensitive *S aureus* (MSSA) in their noses and <2 per cent carry MRSA.' These are primarily community-acquired (CA-MRSA) or hospital-acquired (HA-MRSA) MRSA strains.

Fortunately, LA-MRSA, mainly associated with the clonal complex (CC) 398, has not become widespread in the UK to date. In some European countries, it has colonised pigs, calves and cattle, and chickens and turkeys and has become quite widespread. As a result, the Committee for Medicinal Products for Veterinary Use, the scientific body of the European Medicines Agency (EMA), when reviewing the use of products containing zinc oxide for the prevention of postweaning diarrhoea and

TABLE 1: Epidemiology of direct and indirect spread of LA-MRSA from pigs to people in Denmark and EU

Chain of events	Example	Danish pig farmers / allied workers (In-contact spread)	Danish human population	EU human population
Source	Pigs 68 per cent herds LA-MRSA infected		30 million pigs	250 million pigs
Host	Human	50,016*	5.5 million	505 million
Nasal carriers of LA-MRSA		9576 (19 per cent)*	0.174 per cent	0.0158 per cent
Route	Air/dust inhalation	Direct contact	Direct and indirect	Direct and indirect
Susceptibility of host	High	High	High	High
LA-MRSA cases reported	1277 (100 per cent)**		0.023 per cent	0.0021 per cent
LA-MRSA cases pig related	1140 (89.3 per cent)**		0.021 per cent	0.0018 per cent
LA-MRSA infections	240 (21.1 per cent)**		0.0044 per cent	0.0004 per cent
LA-MRSA bacteraemias	8 (0.63 per cent)**		0.00015 per cent	0.000014 per cent
LA-MRSA mortality	2 (0.16 per cent)†		0.000036 per cent	0.0000033 per cent

\*J. Dahl, personal communication \*\*DANMAP,2015 †Not linked to direct pig contact

enteritis in young piglets, concluded: 'It appears that zinc oxide administered at high doses may co-select for antimicrobial resistance, a phenomenon shown in vivo for LA-MRSA ST398' (EMA 2016). In addition, they felt that 'At this time a detailed risk assessment to examine the risk(s) associated with the co-selection for antimicrobial resistance following the use of zinc oxide is not available. Therefore, in the absence of more data, it is not possible to further characterise the risk posed to both public and animal health. The data presented identify a hazard for human and animal health but, at the present time, that risk is not quantifiable.'

Further data was submitted using Denmark as a model, as it monitors the isolation of LA-MRSA CC398 and differentiate it from other human strains (DANMAP 2015). This has now been refined and can be quantifiably related to the whole EU.

There is a distinct difference in LA-MRSA carriage between workers and pig-associated contacts (19 per cent) and the general overall Danish population (0.174 per cent). If the pig-associated cases are removed (-89 per cent), this falls even further to 0.002 per cent and the majority of these

cases were found in pig-dense areas rather than in towns (DANMAP 2015). Positive samples from farm workers and vets were likely to be 74 per cent from infected farms; 11 per cent and 22 per cent from craftsmen and drivers, respectively; 6 per cent from family members; and 4 per cent from slaughter house workers (J. Dahl, personal communication). So it is likely that 9576 pig farm workers and associated contacts are likely to be carriers of LA-MRSA or overall 0.174 per cent of the 5.5 million Danish population. Actual infections are much lower than colonisation and carriage with LA-MRSA at 0.0044 per cent of the population/year and bacteraemias were 0.00015 per cent. Mortality was 0.000036 per cent and neither case had direct pig contact and may have had other co-morbidities.

Denmark produces approximately 30 million growing pigs and exports over 10.5 million. In EU terms, they are large producers of growing pigs, where LA-MRSA is reported to be commonly found. The EU average is approximately 0.5 million per 1 million human population, but Denmark's ratio is 5.5 million to 1 million. On this basis, one could argue that the above figures could be divided by 11 for the whole EU, assuming

similar levels of herd infection. Nasal carriage of LA-MRSA levels, including pig farmers, and so on, would fall to 0.0158 per cent, cases down to 0.0021 per cent and infections down to 0.0004 per cent. These levels can be reduced further by 89 per cent if pig farmers, and so on, were removed, so nasal carriage would be only 0.0017 per cent.

When normal human nasal carriage of MRSA is less than 2 per cent (or 2000 carriers per 100,000 human population) the additional potential carriage of LA-MRSA at 0.0158 per cent (15.8 carriers per 100,000 population) in the EU is a minor quantifiable contribution to risk from pig farming and zinc oxide use. In countries where LA-MRSA is not endemic, like the UK, then the risk is very low, as the FSA have indicated, especially, if food hygiene measures have been implemented.

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## References

- DANMAP (2015) DANMAP 2014 - Use of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from food animals, food and humans in Denmark. [www.danmap.org/~media/projekt%20sites/danmap/danmap%20reports/danmap%202014/danmap\\_2014.ashx](http://www.danmap.org/~media/projekt%20sites/danmap/danmap%20reports/danmap%202014/danmap_2014.ashx). pp 91-96. Accessed June 7, 2017
- EMA (2016) CVMP referral assessment report under Article 35 of Directive 2001/82/EC. For veterinary medicinal products containing zinc oxide to be administered orally to food producing species.
- FSA (2017) Food Standards Agency - Risk assessment on meticillin-resistant *Staphylococcus aureus* (MRSA) with a focus on livestock-associated MRSA in the UK food chain. February 2017. [www.food.gov.uk/sites/default/files/mrsa\\_risk\\_assessment\\_feb17.pdf](http://www.food.gov.uk/sites/default/files/mrsa_risk_assessment_feb17.pdf). Accessed June 6, 2017

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