National Office of Animal Health

MRSA in Animals

Briefing Document No.26

Methicillin-resistant *Staphylococcus aureus*

A critical point of note is that the specific strain of the MRSA organism referred to as ST398 found in pigs and some other livestock (poultry and horses) is different from that found in humans in hospital and community infections.

Introduction

Methicillin-resistant *Staphylococcus aureus*, or MRSA, has been known for a long time as a major human health problem due to its resistance to most traditional antibiotic classes. Originally, human MRSA infections were only found in hospitals (hospital-acquired or HA-MRSA). Nowadays, MRSA infections are increasingly found in the general community (community-acquired or CA-MRSA), although they still represent <1% MRSA in the UK (Elston *et al*, 2009).

These same strains can be found in companion animals, usually dogs and occasionally cats, and horses, probably as a result of transfer from humans coming into contact with them. Thus, pets can act as a reservoir for these bugs.

Recently, a new clone known as NT MRSA[1], (or ST398) has been found on food animals, mostly in pigs and poultry. So far, no connection between this new emerging strain and the more familiar human MRSA has been established. ST398, whilst resistant to the penicillin family of antibiotics, is sensitive to many other antibiotics so allowing successful treatment of an infection. It is also less virulent than CA-MRSA.

It is known that ST398 MRSA can be transmitted between animals and humans by direct contact without causing disease but so far the experts and regulatory authorities agree that eating meat from those animals that were carriers does not pose a threat to human health (EFSA Report, March 2009). Similarly, only a few sporadic cases of humans with ST398 MRSA have been reported.

[1] Originally called NT-MRSA; subsequently called MRSA CC398, ST398 or LA MRSA (Livestock associated)

There are a number of publicly funded projects on-going in Europe and the USA helping to provide a better understanding of the epidemiology of ST398. There is still much to learn.

What is MRSA?

Staphylococcus aureus is a common bacterium that lives primarily on the skin of people and is commonly associated with infections there such as spots and boils (skin and soft tissue infections). It can also be carried in the human nasal cavity without producing signs of disease. In fact, most of the time, it cause no problems in healthy individuals.

In hospital situations, the great concern is that it may cause infections in surgical wounds. Transplant and joint replacement units are particularly risky areas. Similarly, people whose immune system is weakened, for instance after major surgery (particularly transplant surgery) or chemotherapy, those with immunosuppressive disease such as HIV/AIDS or the elderly and very young can also be particularly susceptible.

In the past, *S aureus* infections were relatively easily treated with penicillins. But with time, the bacteria became resistant, initially to first generation penicillins, then later to stronger versions such as methicillins (hence the M in MRSA) and most recently to the first, third and fourth generation cephalosporins, the newest of the penicillins

The impact of this is that the range of antibiotics available in hospitals to treat infections may be much reduced and practitioners are forced to use 'last resort' antibiotics like vancomycin, which require IV administration.

What about animal ST398 MRSA?

ST398 MRSA has been found in pigs and some other livestock species (poultry), and is especially prevalent in Germany and Netherlands. In dogs, cats and horses it is more common to find CA MRSA (although horses have been found with ST398). In pets, this is probably

due to transfer from man to animals and transfer back to man.

ST398 MRSA is clearly different from the human hospital and community epidemic strains. Nevertheless, it can cause disease in humans if wounds become infected or it gets into the blood stream. This is why, in the countries where ST398 is more common, authorities responsible for hospital hygiene are extremely cautious about admitting individuals who are regularly in close contact with livestock.

The organism is encountered quite frequently amongst specific sectors of the population in The Netherlands and Germany. In a study conducted amongst Dutch farmers, 50% of those tested using nasal swabs carried animal MRSA (Wulf et al, 2008) versus only 0.03% in the general public. Similarly in a German study, 30% of pig vets, 14% of meat inspectors and 38% of diagnostic workers who also visited pig farms, were positive for animal MRSA (Blaha et al, 2008).

Why is the incidence in Germany and Holland so high?

First of all, it is important to note that these studies relate to a specific sample of the population, those who work in pig production, and not to the public at large. Possibly part of the answer lies in the intensity of their livestock systems, the proximity of the two countries and the regular movement of livestock and people between these two countries. This would be supported by the fact that Sweden, with a low livestock density and its relative geographical isolation, reported the absence of ST398 MRSA (Eliasson et al, 2008). Similarly, the UK has negligible incidence and Ireland recently indicated a very low 2% infection level. The organism has very little clinical impact in livestock and it is not considered to be a primary pathogen - it is not a major cause of disease (van der Wolf et al, 2008).

Can infection be caught from eating meat from animals carrying MRSA?

The available evidence suggests that eating or handling contaminated food does not give rise to a greater risk of humans becoming either infected with or becoming 'healthy carriers' of MRSA. (EFSA Press release March 2009).

Where has the ST 398 MRSA come from and how does it spread to man?

Although originally it was thought that the ST398 emerged as a resistance phenotype (strain) independent of human MRSA, the current thinking is that a swine-adapted MSSA (Methicillin susceptible *S. aureus*) acquired a gene (*mec*A) from a human CA-MRSA by direct gene transfer to the swine MSSA. Thus, the swine MSSA became a swine MRSA. However, further studies are needed to confirm this hypothesis.

The most likely way that ST398 MRSA transfers from animals to man is via the environment in the pig house. The organism can survive for some time in dust and pig houses inevitably are sources of dust. In 2010 in the UK, we can expect a report on a major survey containing the results of tests from over 300 pig herds. This should give a valuable insight into possible incidence and reasons for its occurrence, as well as helping design new prevention programmes and possible additional biosecurity measures.

References

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