Detecting MRSA in Swine Production Facilities

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Introduction: In the last decade livestock-associated methicillin-resistant *S. aureus* (LA-MRSA) has become a public health concern in many parts of the world. Of particular concern has been persons working in or associated with swine production facilities. Numerous studies have been conducted to determine the prevalence of LA-MRSA in these facilities as well the associated risk to people. Various sample collection devices and methods have been used in these studies. Most sampling methods have involved animal samples with or without environmental sampling. While animal sampling is perhaps testing "closest to the source", environmental sampling has been a very reliable method as well for detecting MRSA in animal facilities. Recently we explored the use of oral fluids to detect MRSA in swine production facilities. Here we summarize our findings from various investigations.

Methods: Samples (nasal swabs, environmental sponges, and oral fluids) were collected from swine production facilities with known and unknown MRSA status. Additionally aliquots of oral fluids were taken from diagnostic samples submitted for routine testing and tested for MRSA. All samples were processed by initially placing in an enrichment broth (10g tryptone/L, 75g NaCl/L, 10g mannitol/L and 2.5g yeast extract/L) prior to streaking onto chromogenic media (BioRad MRSASelect). Suspect colonies were confirmed as *S. aureus* with biochemical tests (coagulase, maltose, lactose, trehalose, Voges-Proskauer) or matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI TOF MS). Screening for methicillin resistance was performed by testing for susceptibility to oxacillin with disc diffusion method (6 ug/ml Oxacillin disc on Mueller Hinton agar with 4% NaCl). Presence of *mecA* gene was determined by testing for PBP 2a protein with latex agglutination test (Oxoid Ltd., Hants, UK) and/or *mecA* PCR testing. Selected isolates were further characterized by staphylococcal protein A (*spa*) typing.

Results: MRSA could be detected from all samples of pig nasal swabs, environmental sponges and oral fluids collected at a known MRSA positive swine production farm. From pig nasal swabs and environmental sponges collected at 40 swine production facilities with unknown status, MRSA was detected in 30% (12/40) of the facilities by either sample. In this study samples from MRSA-positive facilities, either animal or environmental, were positive 60.1% (63/104) of the time. Of these, 69.4% (34/49) of pig samples and 52.7% (29/55) of environmental samples were MRSA-positive. There was no significant differences in MRSA detection between pig and environmental samples ($p = 0.08$). In a separate study oral fluids and environmental sponges were collected from 15 swine production facilities of unknown MRSA status. Four facilities were positive for MRSA (3 from oral fluids, 1 from environmental sponge). From diagnostic oral fluid samples, MRSA was detected in 30 of 513 (5.8%) samples. Prevalence of MRSA based on case submission was 12.2% (18 of 148 submissions had a least one positive sample). Predominant *spa* types found in these studies included: t002, t034, t548,

Conclusion: The use of environmental sponges or oral fluid samples for detection of MRSA in swine production facilities is a viable alternative to pig nasal swabs. These samples types are convenient to collect and do not stress the pigs.