

PORK SAFETY

Title: Effect of Lairage on Prevalence of Methicillin-resistant *Staphylococcus aureus* (MRSA) in market swine - **NPB#11-131**

Investigator: James D. McKean

Institution: Iowa State University

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Scientific abstract

The bacterium *Staphylococcus aureus* is a commonly found on the skin and mucous membranes of a wide range of mammals; and usually exists in a non-clinical state. Dutch researchers were the first to identify MRSA ST398 as a new clonal type. Subsequent research demonstrated presence in various species and with world-wide distribution. The popular and scientific press has highlighted MRSA398 presence in retail pork as a food safety concern. Little MRSA ecologic data is available for live pigs during normal harvest and processing steps, particularly lairage. An observational study to examine MRSA presence at multiple harvest points from abattoir entry to pre-chill carcass was carried out to gather such information.

Sample procurement occurred from November 2011 to April 2012. Four direct delivery production site-to-abattoir lots were selected by the plant on each of 15 dates. Lairage and harvest impacts on MRSA isolations were measured by rubbing a moistened sponge across the shoulder area (approximately a 10cm X 10cm area) of 10 pigs per lot upon entry (receiving), after several hours in lairage (post-lairage) and at the post-evisceration (pre-chill). Equivalency of skin and nasal swab sampling was tested by collecting individually identified pigs by post-lairage shoulder swab and post-stun nasal swab. All sponges were hydrated and maintained in sterile and uniquely identified whirl-paks overnight. Each sponge was returned to the original bag after use. Nasal swabs, uniquely identified to match post-lairage code, were inserted for each identified pig. Swabs and sponges were chilled after use and delivered to the ISU Veterinary Diagnostic Laboratory within 6-8 hours of collection for *Staphylococcus aureus* culture. Clonal characterization was a PCR for 16s, *mecA* and PVL genes and by PFGE.

This project was designed to determine the impact of normal lairage and pre-chill interventions on MRSA carriage under commercial conditions. Receiving, post-lairage, post-stun and pre-chill isolation rates were 29.3%, 65.5%, 84.4% and 6.9%, respectively. The receiving rate represents on-delivery carriage. Post-lairage isolation rate was greater than at receiving (29.3% vs. 65.5%), which supports MRSA transmission from direct contact and environmental contamination in lairage. With a general rise in MRSA isolation, individual sample date results varied widely. March 27th is instructive: receiving lots with 9/40 positive isolates from 3 of 4 lots:

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For more information contact:

National Pork Board • PO Box 9114 • Des Moines, IA 50306 USA • 800-456-7675 • Fax: 515-223-2646 • pork.org

post-lairage with 27/40 samples and 26/38 post-stun swabs across all lots, and no MRSA isolates at pre-chill. Of those isolates further characterized, all 16 from the post lairage (8) and nasal swabs (8) were ST398. Alternatively the four lots found on other dates with positive pre-chill carcasses were all ST5 with minimal (1/40) receiving lot positives.

The third objective was to determine comparability for MRSA isolation rates from shoulder swabs and nasal swabs from individual pigs. Results demonstrate no direct animal correlation with these sampling strategies. However, both sampling sites produced comparable results at the lot level. Therefore collection of skin swabs before stunning or nasal swabs may be useful to measuring MRSA carriage. As described above, the seven ST5 isolates found on the pre-chill carcasses (7/580) did not provide a path of carriage from the live animals to carcass. Neither MRSA presence/absence on nasal swabs nor any antemortem skin locations was a good predictor of carcass status at pre-chill.

In summary, this data supports: 1) that potential direct linkage between live swine MRSA and pre-chill contamination is low 2) that current plant interventions provide significant protections from MRSA contamination to pre-chill MRSA carcass, and 3) that skin swabs and nasal swab isolations do not detect the same individual animal carriage, but may be used interchangeably to determine group contamination.