final report

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Practical approaches to reducing S. aureus contamination in the Australian red meat industry

Stage 1 – Initial plant surveys

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1 Introduction

The third baseline study (PRMS.045A) showed that *S. aureus* occupied a significant role in the microflora of carcases and boneless trim, both in beef and sheep. An analysis of that data indicated that, while some plants had product with low prevalence and concentration of *S. aureus* others had the opposite with prevalence sometimes exceeding 50%. In addition, the industry retail survey indicated that some retail meats had levels of *S. aureus* which were close to that associated with food poisoning.

During the mid-1990's the Meat Research Corporation funded two projects:

1. Food Science Australia (then CSIRO) established that carcase contamination with *S. aureus* occurred predominantly following hide removal and that contamination was primarily of human origin.
2. Chris Orr evaluated *S. aureus* levels on both workers hands and meat product throughout slaughter and processing. He demonstrated that *S.* aureus levels on meat products were reduced where process workers handling the product wore gloves.

This report provides a summary of our findings from a survey of meat processors that participated in the last baseline study and recorded a range of *S. aureus* levels. This report provides observations on the possible causes of "good" and "bad" *S. aureus* levels today in the red meat processing industry and identifies practical preventative measures that could be reviewed in more depth in an attempt to assist meat processors in minimising the prevalence and concentration of *S. aureus* levels on their meat products.

2 Approach

Three meat industry experts were employed to undertake all plant surveys. To ensure consistency across plant surveys an initial meeting of all team members at one beef and one sheep plant located in close proximity to Melbourne was undertaken.

Industry support for the project was first sought through AMIC. Participation by any meat processor in the project was voluntary with a total of 10 beef and 9 sheepmeat processors agreeing to participate. These meat processors were located in Qld, NSW, Vic, SA and WA.

From a review of data collected in the last Baseline project a 'Hygiene Index' (HI) for carcase and boneless trim products was calculated based on *S. aureus* prevalence and level. The HI was then used to categorise plants visited into one of the following four categories:

– 1. High carcase HI/High trim HI
– 2. High carcase HI/Low trim HI
– 3. Low carcase HI/High trim HI
– 4. Low carcase HI/Low trim HI

3 Survey findings

The primary finding for both sheep and beef processors was the high use of latex gloves by process workers on the slaughter floor. All beef plants visited recorded at least 73% of process workers wearing latex gloves while all but two sheep plants recorded at least 79% glove use by process workers. Table 1 provides summary data on glove usage at each of the plants visited.

Table 1: Summary Data from Beef and Sheep Plants

Plant	% Gloves (S/floor)	Intervention	Carcase Wash	Gloves used 2004	Carcase HI	Trim HI	Hot Bone	Freezer Type
BEEF								
1	100	None	None	Unsure	Low	Low		Plate
2	73	None	None	Unsure	Low	High	Rewarm	Plate
3	89	Decont./wash	None	Unsure	Low	High		Plate
4	93	Decont./wash	Chine only	Yes	Low	Low	Hot - 2nd shift	Plate
5	97	None	Chine only	Unsure	High	High	Rewarm	Plate
6	98	Steam vac.	Chine only	Unsure	High	Low		Plate
7	97	None	None	No	High	High		Plate
8	89	None	None	No	High	Low	Warm	Blast
9	88	None	None	Yes	Low			
10	82	Acid spray	None	Yes	Low			
SHEEP								
11		None	Yes	No	High			
12	54	Steam vac.	None	No	High	High	No	Blast
13	81	Steam vac.	None	Unsure	Low			
14	11	None	Yes	No	High			
15	79	None	Yes	No	High			
16	85	Steam vac.	None	Unsure	Low	High		
17	96	Steam vac.	None	Unsure	Low	High	Hot	Blast
18	95	None	None	Unsure	Low	High	Hot	Plate
19	91	Steam vac.	None	Yes	Low	Low	Hot	Plate

From our observations of work practices made at each plant and in relation to the summary data presented in Table 1, the following 'best practices', in respect to *S. aureus* levels on carcase and boneless trim, have been made:

Beef Carcase	Beef Boneless Trim
• Decontamination via hot water wash or lactic acid spray • Use of latex gloves on all hands touching exposed meat surfaces • Full length disposable gloves at evisceration • Inspectors wear gloves • Good glove hygiene and replacement practices • Continual coaching/checking to ensure correct work procedures	• No carcase rewarming prior to boning • Disposable latex glove under/over mesh or Kevlar glove • Wearing of hoods covering mouth and ears • Plant & equipment clean down through day
Sheep Carcase	**Sheep Boneless Trim**
• Decontamination via steam vacuum on cutting lines • Use of latex gloves on all hands touching exposed meat surfaces • Full length disposable gloves at evisceration • Glove hygiene and replacement practices • Continual coaching/checking to ensure correct work procedures	• Plate freezing particularly where hot boning • Disposable latex glove under/over mesh or Kevlar glove

The widespread introduction of disposable latex gloves used by personnel on the slaughterfloor has occurred as a result of a need to meet OH&S issues. This has probably had a beneficial effect in a reduction of overall *S. aureus* levels although this could only be quantified following another baseline study.

4 Implementation of identified practices for the reduction of s. aureus

Before being able to finalise 'best practice' guidelines for distribution to meat processors the relevant benefits of some practices needs to be confirmed. These are listed for consideration below. These practices could probably be examined in either beef or sheep meat processing operations.

4.1 Carcase

1. Effect of various disposable glove cleaning practices throughout the day on glove *S. aureus* levels.
2. For sheep processing, the impact on *S. aureus* counts of the introduction of disposable gloves at key process stations where hand/arm contact with the carcase is occurring. These stations include:
    a. Pelt removal (punching)
    b. Evisceration

c. Carcase inspection

3. Relative effects of hand washing between carcases and final carcase wash on final carcase *S. aureus* counts.
4. Quantification of the impact of intervention steps (hot carcase wash, lactic acid spray and possibly steam vacuuming) on carcase *S. aureus* counts.

4.2 Boning

1. Effect of the provision of soap containing a suitable anti-bacterial agent on hand *S. aureus* counts throughout the day.
2. The use of wet v dry Kevlar gloves on *S. aureus* counts of trim product or personnel hands.
3. Relative effect of plate v blast freezing on *S. aureus* counts of boneless trim particularly when hot boning undertaken. Higher RI appears to be recorded in plants undertaking blast freezing of boneless trim.
4. Introduction of disposable gloves to packers, taking into consideration the potential for contamination of final product with rubber pieces from torn or cut gloves.
5. Effect of introduction of hoods that cover mouth and ears on *S. aureus* counts of boneless trim.

5 Next steps

1. Finalise what practices listed in section 4 will be examined and how within the budget constraints of this projection.
2. In conjunction with budget constraints consider the examination of various work practices on both *S. aureus* and Enterococcus levels.
3. Finalise location(s) to undertake trial work.