FSA Project M01046:

Pre-skinning treatments of slaughtered cattle and sheep to improve meat safety

Duration

1st November 2005 - 31st October 2007

Project Partners:

Division of Food Animal Science (DFAS), University of Bristol

Food Refrigeration and Process Engineering Research Centre (FRPERC), University of Bristol

Background

The hide/fleece is a major source of contamination of the resultant meat carcass during dressing. In particular, parts of the carcass close to the cutting lines can be at risk of contamination. The use of a post-slaughter cleaning technique as part of an abattoir's procedures based on HACCP (Hazard Analysis & Critical Control Points) could be used in conjunction with an anti-mortem clean livestock inspection to further improve meat safety. The key objective of this work were:

1. To review data on the distribution of microbial contamination of ruminants' coats and the effectiveness of current decontamination and handling practices for slaughtered ruminants.
2. To develop in-abattoir decontamination methods for cattle and sheep hides/fleeces and determine effects on bacterial numbers
3. To develop a HACCP-based meat safety system for the incorporation of potential hide/fleece decontamination processes in the abattoir

Research Summary to Date

Literature Review

Studies conducted worldwide indicate that the brisket is the most contaminated area of cattle hides/carcasses; however there is no conclusive evidence regarding the most contaminated sites on sheep fleeces or carcasses.

The most promising methods for hide decontamination include chemical dehairing and application of organic acids, phosphoric acid, electrolyzed oxidising water and sanitizers. For carcass decontamination the most successful interventions seem to based on using hot water rinsing, steam pasteurization, and application of organic acids, lactoferrin, Safe2O ™, electron beam and bacteriophages.

Main Approaches

At the outset, four approaches were considered: removal of hair from the hide (taking microorganisms with it); physical interventions to decontaminate the hide (with or

without dehairing); chemical interventions for decontamination (with or without dehairing); immobilisation of hair or microorganisms. On samples of fresh hide, effects on the natural microflora were measured. On frozen/thawed samples, marker bacteria were used to study intervention effects.

Physical Interventions

Two options for reducing the contamination potential of hides have been investigated. These are hair removal and hair decontamination.

A number of treatments to remove hair from hide samples have been evaluated. Some tapes and wax treatments were very successful, removing virtually all hair. There was little difference between hot wax and wax strips in reducing the number of ACC on the skin and the reduction from hide to skin was less than 1 log unit in both cases.

Hair removal by clipping reduced applied E. coli K12 on hide samples by approximately 3 log units but there was no additional benefit from vacuuming after clipping.

A study using four methods to reduce numbers of marker bacteria on hide samples showed that a naked gas flame and hot water destroyed all organisms whereas hot air and steam reduced log 10 CFU cm-2 by approximately four and five units, respectively.

Experiments have shown that hides tend to stiffen at different rates when subjected to heat from different sources and at different temperatures. This may be advantageous in engineering stiffer sections of hide to prevent roll-back.

Chemical Interventions

The efficacy of chemical hide decontaminants applied at room temperature and at 60°C, including lactic acid, cetylpyridinium chloride (CPC), hydrogen peroxide and Chemaid CA95 has been evaluated using marker bacteria. Reduction in counts was greater at room temperature and CPC was the most effective with a reduction of 4 log units. Analogous results were obtained for natural microflora, CPC being the most effective decontaminant again, with a reduction of 3 log units.

Lactic acid, CPC and CA95 (all at 2%) were tested for their efficacy in reducing four species of Salmonella: S. montivideo, S. kedougou, S. typhimurium and S. enteriditis For all four Salmonella species, lactic acid was marginally better at reducing counts, by 2.5 - nearly 4 log units, the highest reduction being in S. kedougou.

Combined physical and chemical interventions

Combinations of the two most effective physical interventions (naked flame and hot water) with two of the more effective chemical ones (CPC and lactic acid) did not consistently reduce counts of marker bacteria over the use of either type of intervention alone.

Some Publications from this Project

Microbial studies of carcass hygiene issues.

Purnell, G., James, S., Wilkin, C-A., Fisher, A., Corry, J., Howell, M., Brown, T. & James, C. 2007. in Proceedings; 2007 CIGR International Symposium on Food and Agricultural Products: Processing and Innovations. Naples, Italy. 24-26 September. [FRPERC Biblio Ref: 921]

This work is continuing and further updates and details of publications will be added here as they become available.

Contacts

Please contact us on +44 (0)1472 582400 or email us on frperc@grimsby.ac.uk