A critical literature review to assess the significance of intervention methods to reduce the microbiological load on beef through primary production

Area of research interest: Foodborne pathogens
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Background

The sale and consumption of burgers served less than thoroughly cooked (LTTC) and pink in the middle is a steadily increasing trend and several catering chains and outlets now offer this option to customers. This prompted concerns that there may be an increased risk of exposure to E. coli O157 for consumers who prefer this type of food. Our Board concluded that burgers served LTTC should be delivered to the same level of protection as thorough cooking provides the consumer. The safe production of this product at catering establishments is likely to be significantly reliant on controls and/or interventions applied at the beef processing facilities previously in the chain, particularly slaughterhouses and cutting plants.

Research Approach

The main aim of this study is to perform a broad critical review of available literature on the scientific research in intervention measures for beef, to obtain quantitative information on the reduction of bacterial load in the minced beef production chain. The review covers a range of GHP-based and hazard-based interventions at the abattoir stage (from receive and unload of animals to chilled carcasses) and post-abattoir stage (further processing of raw beef and packaging). It looks at the outcome of interventions on a range of bacterial indicators and foodborne pathogens.

Relevant outcome measures for interventions where the effectiveness of each intervention in reducing log levels of indicator bacteria (aerobic colony counts (ACC), Enterobacteriaceae counts (EBC), total coliform counts and generic E. coli counts and log levels of foodborne pathogens (primarily E. coli O157 and other VTEC and Salmonella, but also other foodborne pathogens).

Results

The main relevant outcome measures are:

- Pre-slaughter beef interventions: Several interventions were identified at the lairage stage, from cattle received to the stunning and bleeding steps. Good hygiene practices such as lairage cleaning, proper cattle handling to prevent hide cross-contamination and hide cleanliness assessment, are recommended for use
- Beef interventions at slaughter: Cattle hide interventions, such as chemical hide washes and microbial immobilisation treatment with shellac, are recommended for consideration as potential hazard-based interventions when applied post-exsanguination and before

dehiding for reducing microbial contamination of resulting beef carcasses

Multiple use of carcass interventions was shown to have the biggest impact on microbial reduction on beef carcasses, more than any of these interventions applied alone

- Post-slaughter beef interventions: Good hygiene practices during carcass fabrication are necessary to prevent and minimise carcass cross-contamination post-chill. Various interventions for beef primals, subprimals and trim with physical (hot water) or chemical substances have shown good reduction effects on microbiota, often statistically significant. However, these treatments can only be used if properly optimised so to retain acceptable sensory quality of the final products

Packaging-based interventions for beef cuts and minced beef had very variable effects in reduction of microbiota. Modified atmosphere packaging (MAP) and vacuum packaging are considered useful to extend the shelf life of beef trim and minced beef, but they had very limited and not statistically significant reduction effect on E. coli O157:H7

Research report
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