Project number: 5415
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Aerial contamination in beef, pork and lamb abattoirs

Key external stakeholders:
Beef, pork and lamb processors, scientists, regulatory personnel, epidemiologists, microbiologists, consumers, EFSA

Practical implications for stakeholders:
Beef, lamb and pork processors should control airborne contamination within their processing plants.

Main results:

High bacterial counts, including *Salmonella*, were detected in the air in Irish beef, lamb and pork plants.

Opportunity / Benefit:

This project provides important information supporting the control of airborne contamination in meat processing plants as part of the hazard analysis and critical control point (HACCP) programme or as a prerequisite activity.

Collaborating Institutions:

None

Contact Declan Bolton Email: declan.bolton@teagasc.ie.

Teagasc project team: Dr. Declan Bolton

External collaborators: None

1. Project background:

Airborne bacteria pose a risk to product quality/shelf-life and air has a significant role as a vehicle for the transmission of pathogens within the processing environment. Pathogens such as *Salmonella* survive in aerosols for extended periods and may be carried throughout the food plant to contaminate a range of surfaces including food. While there are several reported studies on the quantity of aerial contamination present in abattoirs, the relationship between the quantity of bacterial contamination in the air and that deposited on meat carcasses has not been established Indeed there my not be any relationship between aerial and carcass contamination levels. The objectives of this study were to investigate the relationship between aerial and carcass contamination and to establish the levels of aerial contamination in beef, lamb and pork abattoirs.

2. Questions addressed by the project:

- What are the sources of *Salmonella*, *E. coli* O157 and *Campylobacter* contamination on different farms?
- What are the antibiotic resistance patterns and are these associated with SGI in the *Salmonella* isolates?
- How well does *Salmonella* and *E. coli* O157 survive in the farming environment?

3. The experimental studies:

An Irish beef abattoir was visited on 12 occasions over the course of 1 year. The levels of aerial contamination, total viable counts (TVC), total enterobacteriaceae counts (TEC) and total coliform counts (TCC), were measured at lairage/clipping, dehiding, evisceration and chilling using the settle plate method. The air was also tested for *Salmonella* and *Listeria* spp. Irish lamb and pig abattoirs were visited on 6 occasions over the course of 6 months. The levels of aerial contamination, TVC, TEC and TCC, were measured at lairage/clipping, dehiding/dehairing, evisceration and chilling using the settle plate method. As in the beef plant, the air was also tested for *Salmonella* and *Listeria* spp.

4. Main results:

In the beef plant TVC, TEC and TCC counts of up to 2.8, 1.6 and 1.4 $\log_{10}$ CFU per m^2 per minute were detected. The corresponding figures for the lamb and pork plants were 2.7, 2.2 and 2.0 and 2.9, 1.8 and 1.5 $\log_{10}$ CFU per m^2 per minute, respectively. In the beef abattoir, *Salmonella* spp. were detected on 3 occasions (lairage: 2, Hide clipping: 0, hide removal: 0, evisceration: 0 and chilling: 1). In the sheep abattoir, *Salmonella* spp. were detected on 20 occasions (lairage: 1, fleece removal: 16, evisceration: 1, chilling 2) and in the pork plant *Salmonella* spp. were detected on 31 occasions (lairage: 10, singeing: 8, scraping: 2 and evisceration: 11) and *Listeria* spp. on 1 occasion (lairage).

5. Opportunity/Benefit:

While this study established that there was no measurable relationship between aerial and carcass contamination it clearly demonstrated that the air was an important source of bacterial contamination including dangerous pathogens, highlighting the need for control measures to prevent airflow from dirty to clean areas.

6. Dissemination:

Dissemination was primarily achieved through peer reviewed publication and presentation at

Contact Declan Bolton Email: declan.bolton@teagasc.ie.

national conferences.

Main publications:

Okraszska- Lasica, W., Bolton, D. J., Sheridan, J. J. and McDowell, D. A. (2012). Comparison of aerial counts at different sites in beef and sheep abattoirs and the relationship between aerial and beef carcass contamination. *Food Microbiology*, submitted.

7. Compiled by: Dr. Declan Bolton

Contact Declan Bolton Email: declan.bolton@teagasc.ie.