Comparison of chilling and freezing processes on the survival of *Escherichia coli* O157:H7 on New Zealand bobby-veal

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Introduction

- Previous studies have examined the survival of *E. coli* O157:H7 on beef under hot-bone conditions[1,2].
- This work adds to this knowledge by comparing the survival of *E. coli* O157:H7 on **bobby-veal** under New Zealand processing conditions.

Aim

- **To examine whether the "cold-boning" protocol of chilling meat prior to cutting and freezing affected the survival of *E. coli* O157:H7 compared to freezing alone.**

Bobby-veal processing in New Zealand

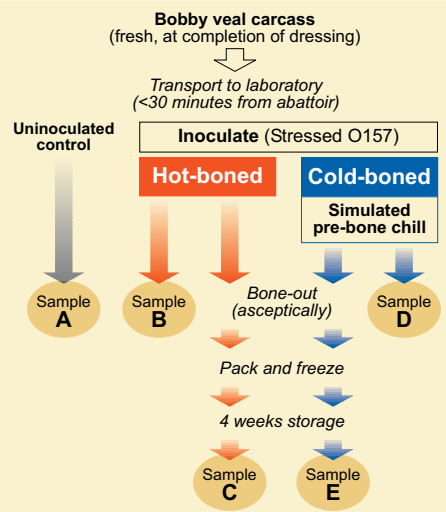
- One of two processes may be applied to the production of boxed manufacturing grade bobby-veal in New Zealand following slaughter and dressing:

(1) **Cold-boning** Overnight refrigeration to approximately 0-5˚C, prior to cutting and packing.

(2) **Hot-boning** The carcass is cut before body temperature has been significantly reduced, usually following electrical stimulation to overcome toughening associated with pre-rigor processing.

- In both cases the boxed meats are then frozen to -18 ˚C and shipped to the U.S.A., which normally takes 4-5 weeks.

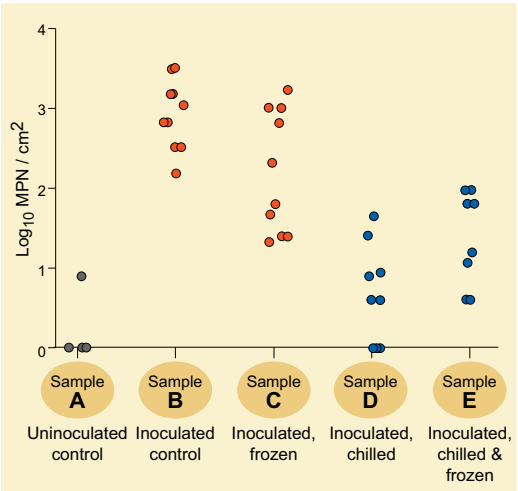
Experimental overview



- To stimulate the stress response[3], an avirulent strain of *E. coli* O157:H7 (NCTC12900) was starved in water for 3 hours at 4˚C prior to inoculation.
- Approximately 3 $\log_{10}$ cfu/mL of this suspension was inoculated onto marked rump, shoulder and flap sites of five veal carcasses after slaughter and dressing but prior to refrigeration. Uninoculated (**A**) and inoculated (**B**) control samples were excised and immediately enumerated.
- To simulate **hot-boning**, inoculated sample areas were excised from the carcass, packed in freezer bags and frozen at -18˚C. After 4 weeks storage, samples were thawed and enumerated (**C**).
- Carcasses were then chilled in an environment chamber, validated to simulate the rate of cooling and surface drying observed during **cold-boning** in a typical New Zealand commercial operation. On completion, the remaining inoculated sample areas were excised, half being enumerated immediately (**D**) and half frozen at -18˚C for 4 weeks prior to thawing and enumeration (**E**).
- Samples were screened for presence/absence of *E. coli* O157:H7 by TaqMan® and positives enumerated by MPN.

Results

- Immediate freezing of the hot-boned meat resulted in a $\log_{10}$ reduction of only 0.8 MPN/cm^2 (**B, C**).
- A reduction in *E. coli* O157:H7 of $\log_{10}$ 2.2 MPN/cm^2 was observed after chilling of the carcasses (**B, D**).
- Subsequent freezing of the chilled, cut meat did not lead to further microbial reduction (**D, E**).
- The decrease in aerobic plate count that occurred during carcass chilling was similar to that observed under the New Zealand National Microbiological Database programme[4], verifying the adequacy of the carcass chilling simulation.



Conclusions

- **These results indicate there is potential for validating current cold-boning refrigeration processes as an antimicrobial intervention strategy against *E. coli* O157:H7.**
- **As found in previous studies[1,2], freezing alone is not an effective intervention.**

Future work

- Identify critical parameters and additional processes, e.g. combination of chemical or physical carcass decontamination procedures.
- Determine whether the reduction observed represents a lethal process or a switch to a viable/non-culturable condition.

Acknowledgements
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References
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4 NZFSA (2006) National Microbiological Database. Retrieved 16/10/06 from http://www.nzfsa.govt.nz/animalproducts/publications/manualsguides/nmd/index.htm

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