Effectiveness of chemical and refrigeration hurdles in the control of *E. coli* O157:H7

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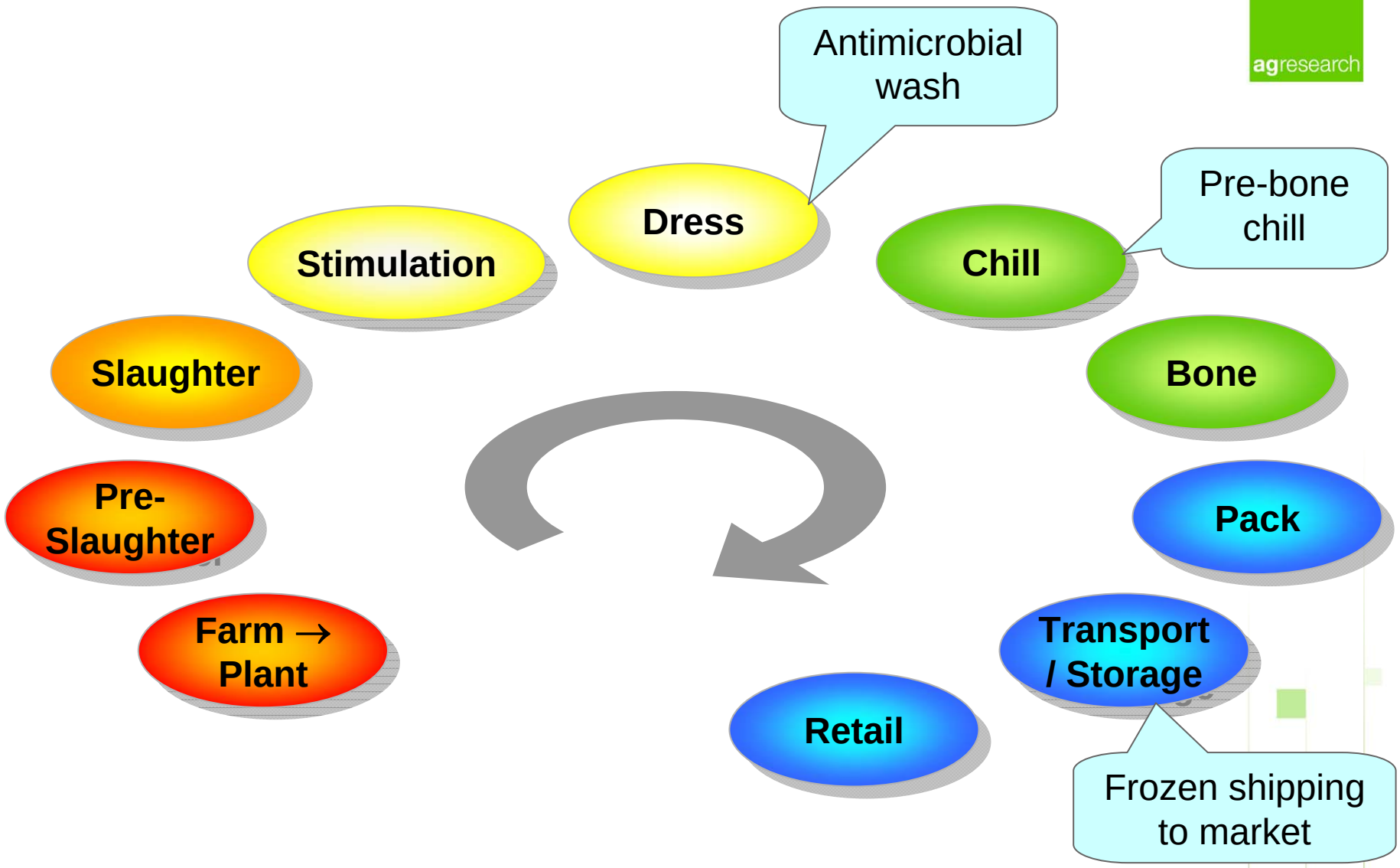
agresearch Farming, Food and Health. First
Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi


Antimicrobial wash
Dress
Pre-bone chill
Stimulation
Chill
Slaughter
Bone
Pre-Slaughter
Pack
Farm → Plant
Transport / Storage
Retail
Frozen shipping to market

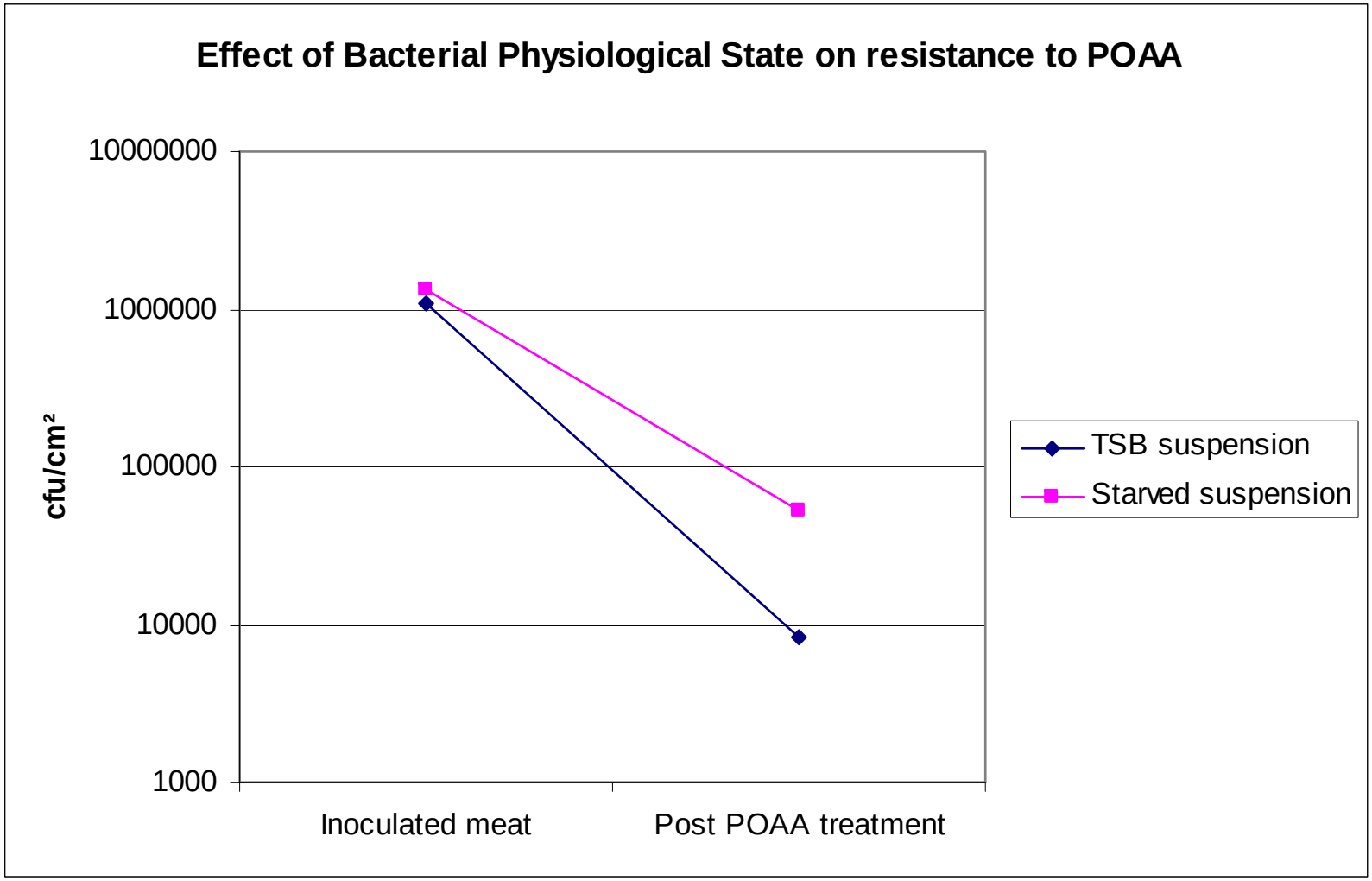
Conundrum

- Published efficacy test results of individual antimicrobial interventions typically indicate a 2 – 3 $\log_{10}$ reduction in culturable *E. coli* O157:H7.
- NZ bobby calf longitudinal studies reveal no differences in prevalence or bacterial numbers of positives between pre- and post- intervention samples.
- US data suggests the combined effects of multiple interventions (other than post-slaughter hide washing) can achieve a maximum reduction of 3 $\log_{10}$

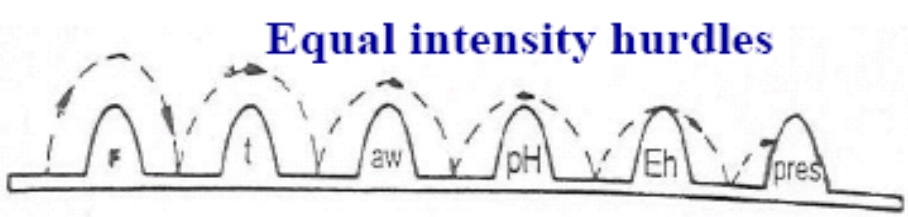
What could be the cause?

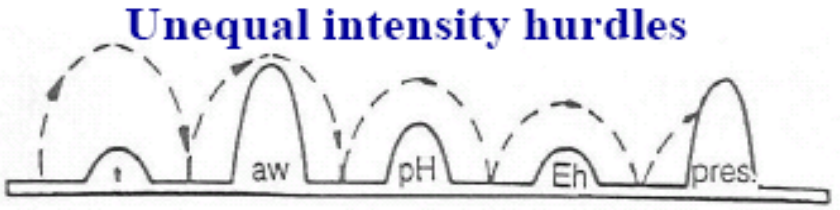
- Recent publications show that subjecting bacteria to “stressors” (heat, cold, acid, lack of nutrients, drying etc) can result in a cross-protective resistance to other agents
- This is not the same as resistance that emerges from constant exposure to antimicrobials
- The principle source of *E. coli* O157:H7 contamination is from hide to carcass transfer during opening cuts
- The most likely stressor acting on hide-resident bacteria is starvation

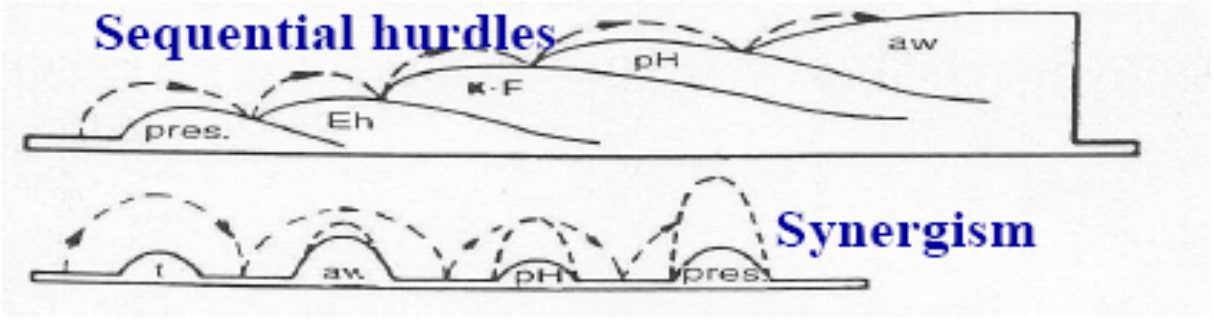
What effect can this have?



How do we overcome this?



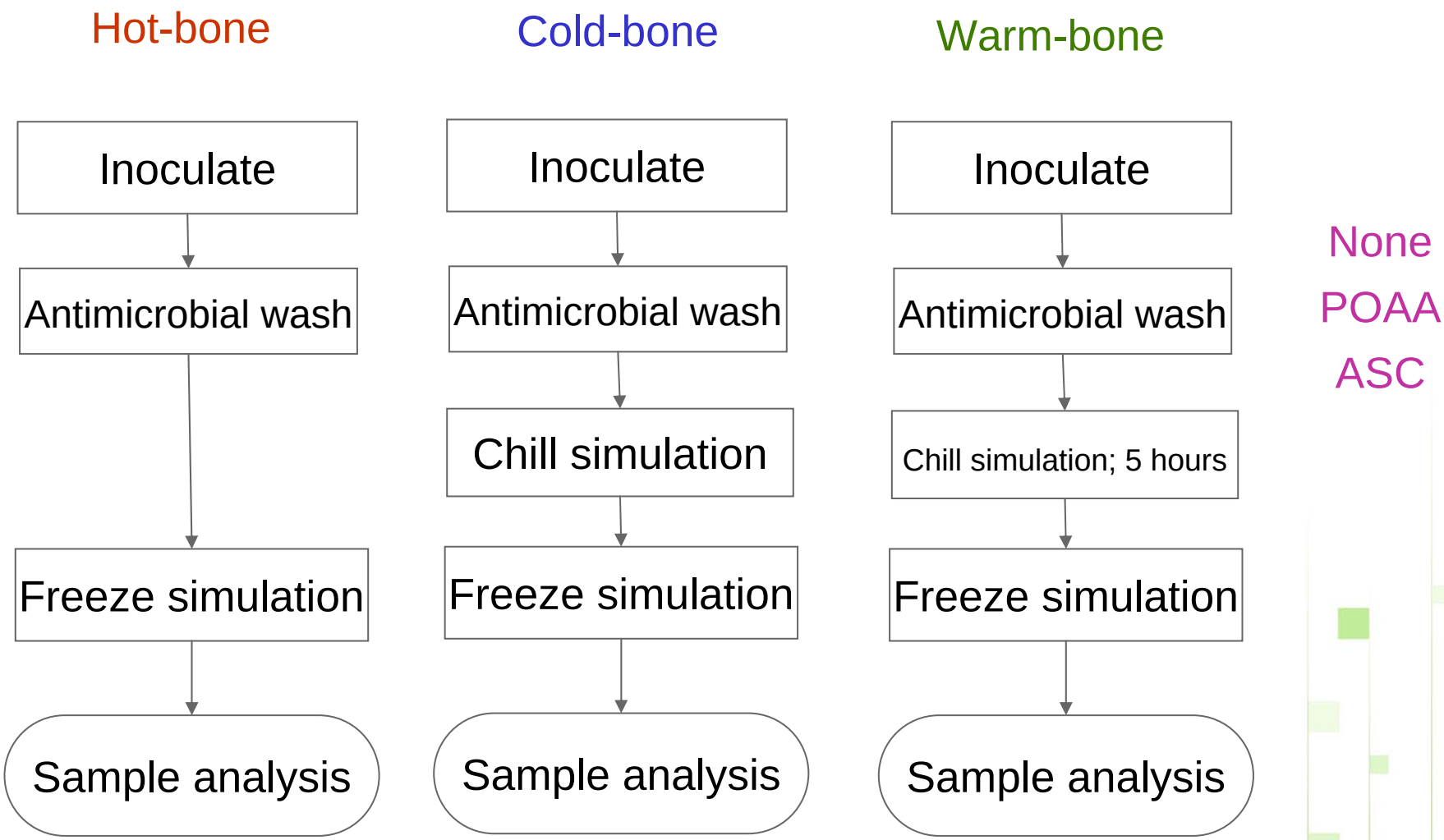




Leistner

- This year's project studied the existing hurdles of POAA or ASC intervention, combined with the refrigeration effects of hot- or cold- boning

This study

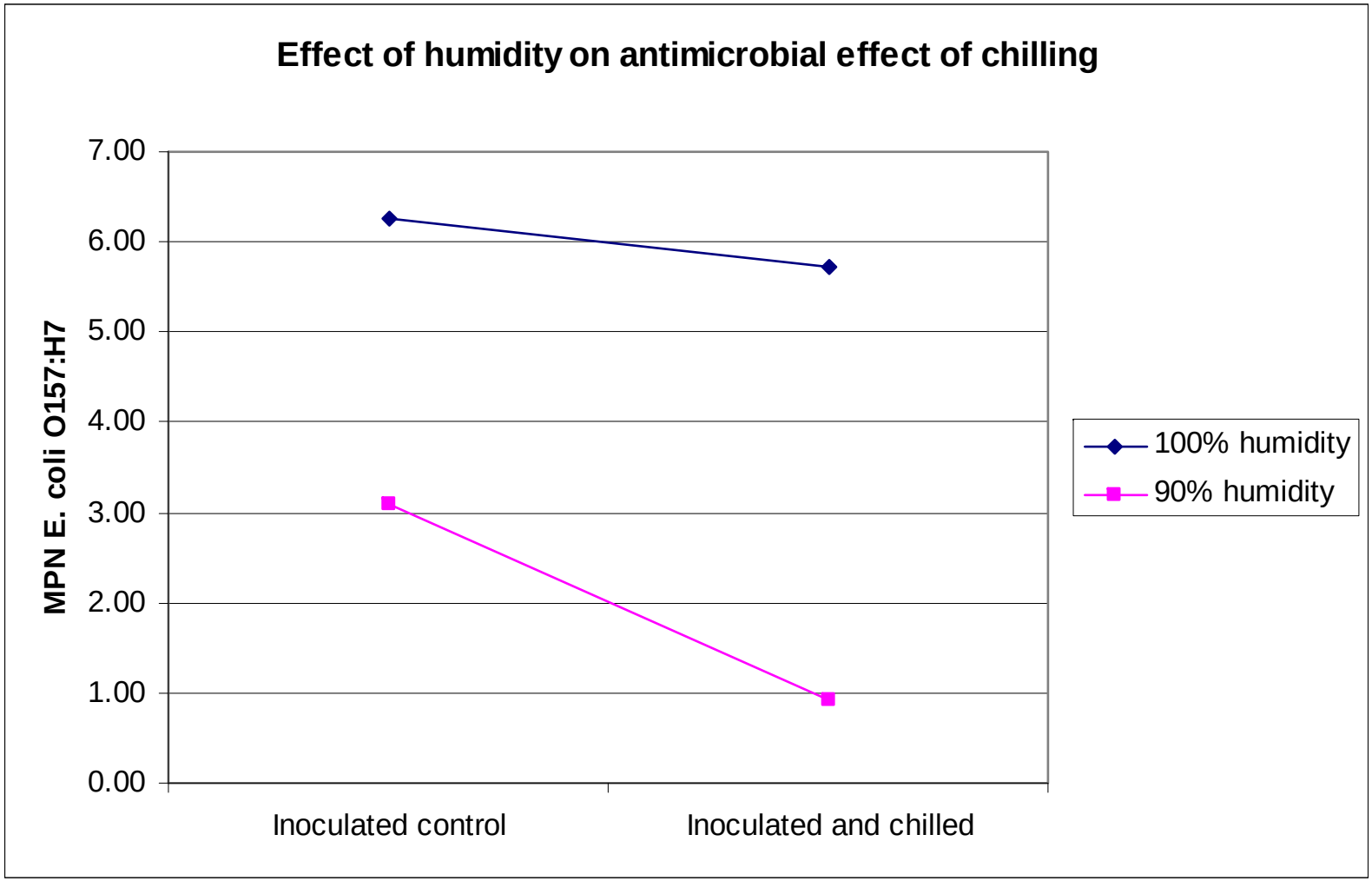

Hot-bone
Inoculate
Antimicrobial wash
Freeze simulation
Sample analysis
Cold-bone
Inoculate
Antimicrobial wash
Chill simulation
Freeze simulation
Sample analysis
Warm-bone
Inoculate
Antimicrobial wash
Chill simulation; 5 hours
Freeze simulation
Sample analysis
None
POAA
ASC

Antimicrobial wash simulation

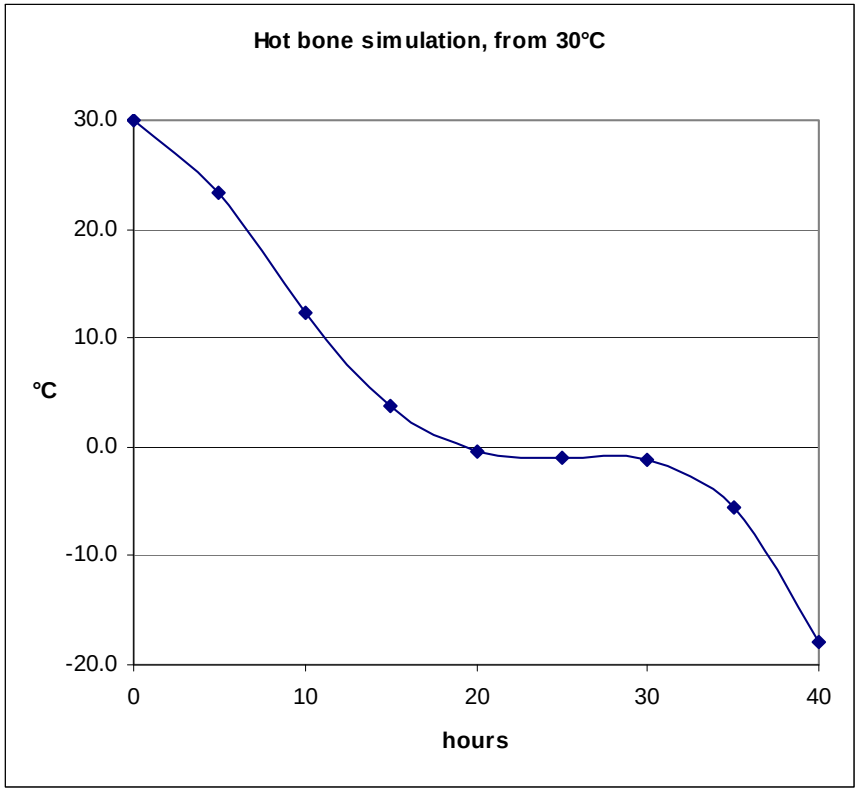
Chilling simulation

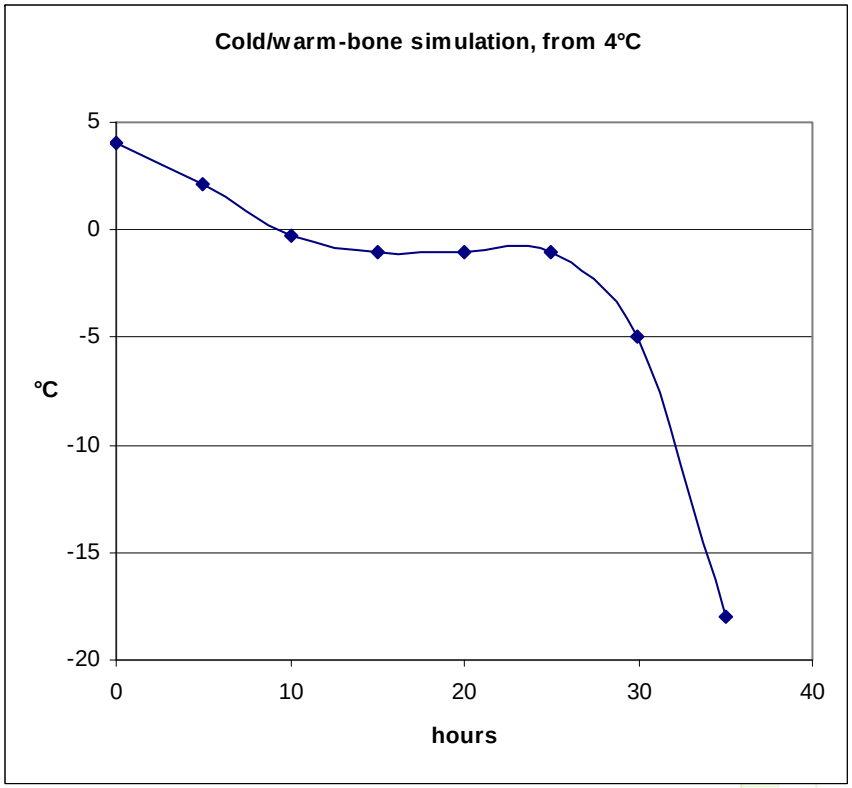
- 100% humidity
- 7°C 7 hours, then 4°C until carcasses removed
- Warm-bone samples taken at 5 hours

Chilling simulation



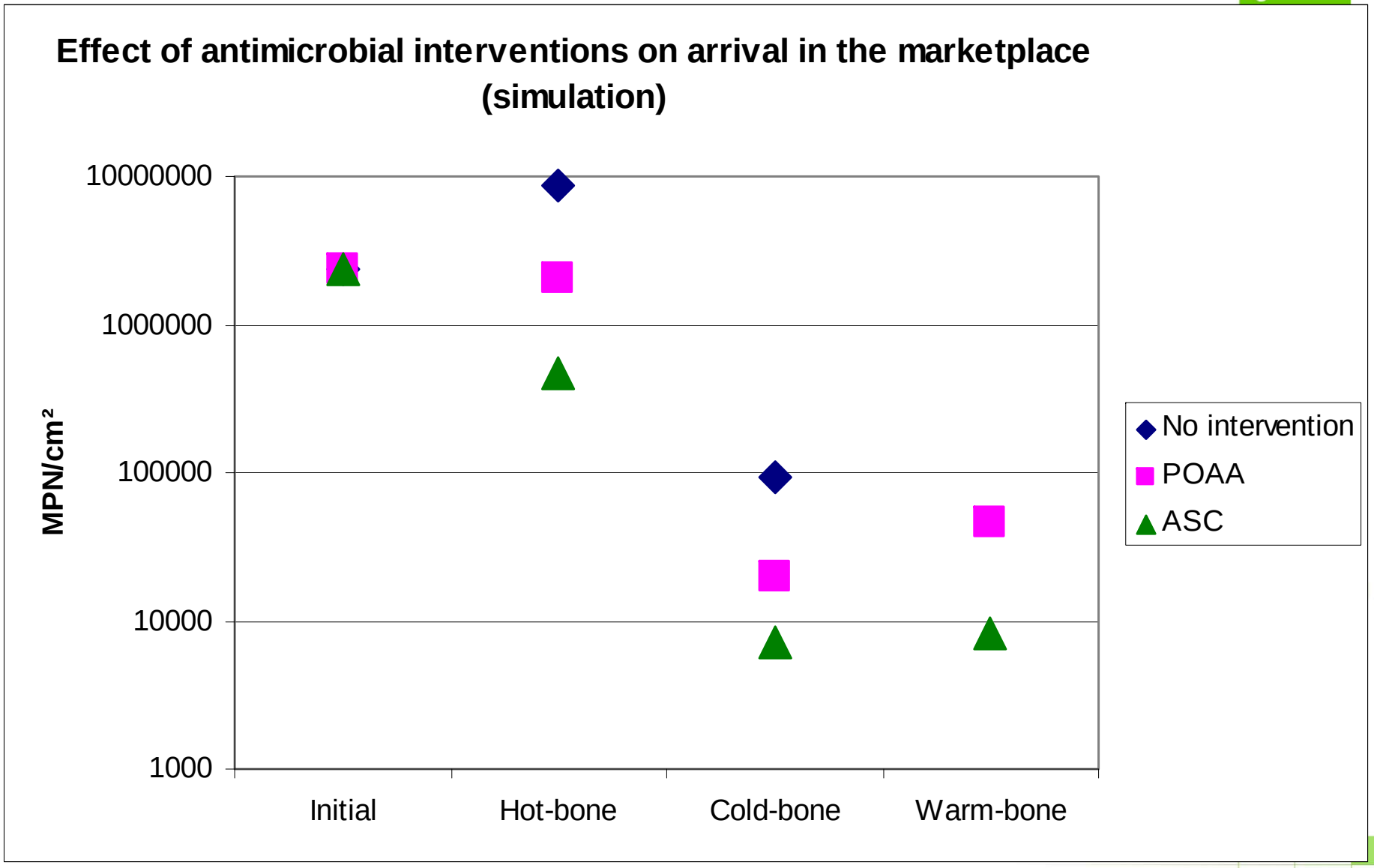
Freezing simulation





- Constructed using Food Product Modeller® based on a 27Kg box

Hurdle results



Issues to consider:

- Combined hurdle effects (reduction in *E. coli* O157:H7) will not be detected using current methods, as samples are collected before the freezing process.
- Research to determine the ideal compromise during chilling between carcass moisture loss and antimicrobial effect