



Chemical spray cabinet intervention

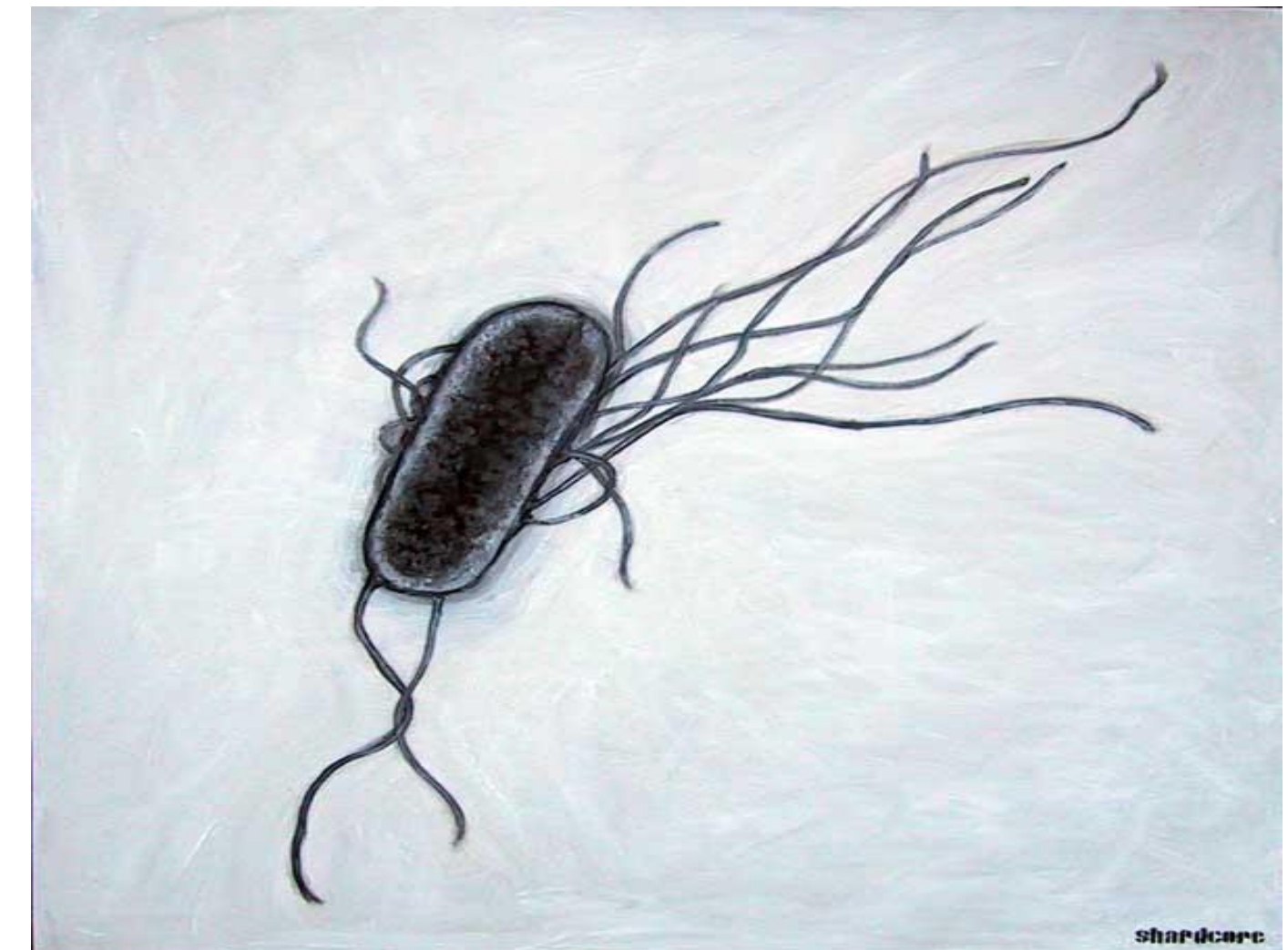
Dr. Jay Kocharunchitt
Mr Zachary Block



The Story So far

- Meat safety

- The biggest problem
- Mainly pathogenic *Escherichia coli* such as O157:H7, O111, O26 etc.
- poses a serious threat to public health
- have a big impact on economy
- stringent requirement for *E. coli* on meat



- No single intervention is 100% effective

- UTas has been working into developing spray chilling process as an effective intervention (i.e., by adding an oxidant into spray chill water)

Commercial Trials

- All trials were conducted at the JBS Longford abattoir (TAS)
- Three carcasses were tested in each trial
- Non-pathogenic *E. coli* cultures
 - a five-strain cocktail



Challenge Studies



1. Hind Leg



2. Flank

- Inoculation achieved by painting onto four different sites

- Giving a concentration of ~4 log CFU/cm²



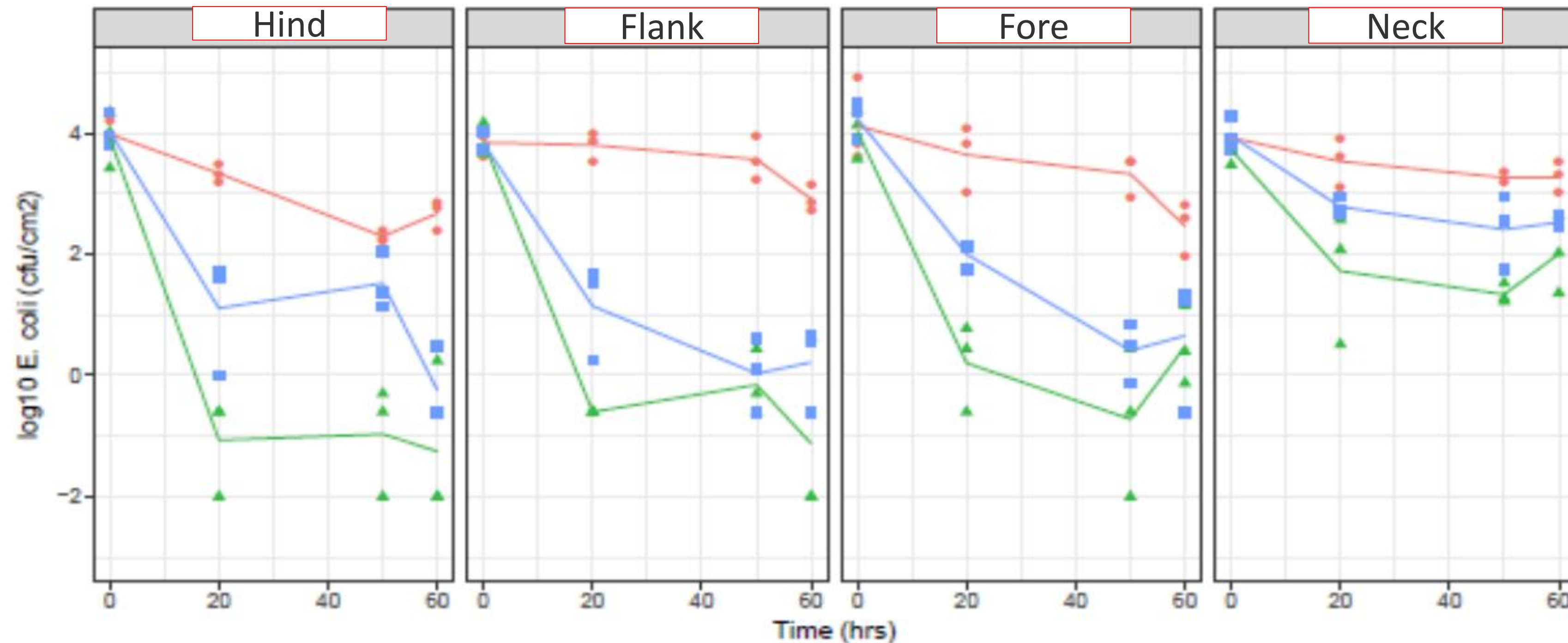
3. Fore Leg and 4. Neck

Challenge Studies

- All trials used the same chilling protocol (a 30-s spray every 15 min for 42 cycles) but with either:
 1. Water (normal spray chill);
 2. ClO_2 solution; or
 3. PAA solution
- Tested for *E. coli*
 - by swabbing those inoculated areas
 - after 0 h, 20 h, 50 h and 60 h of chilling



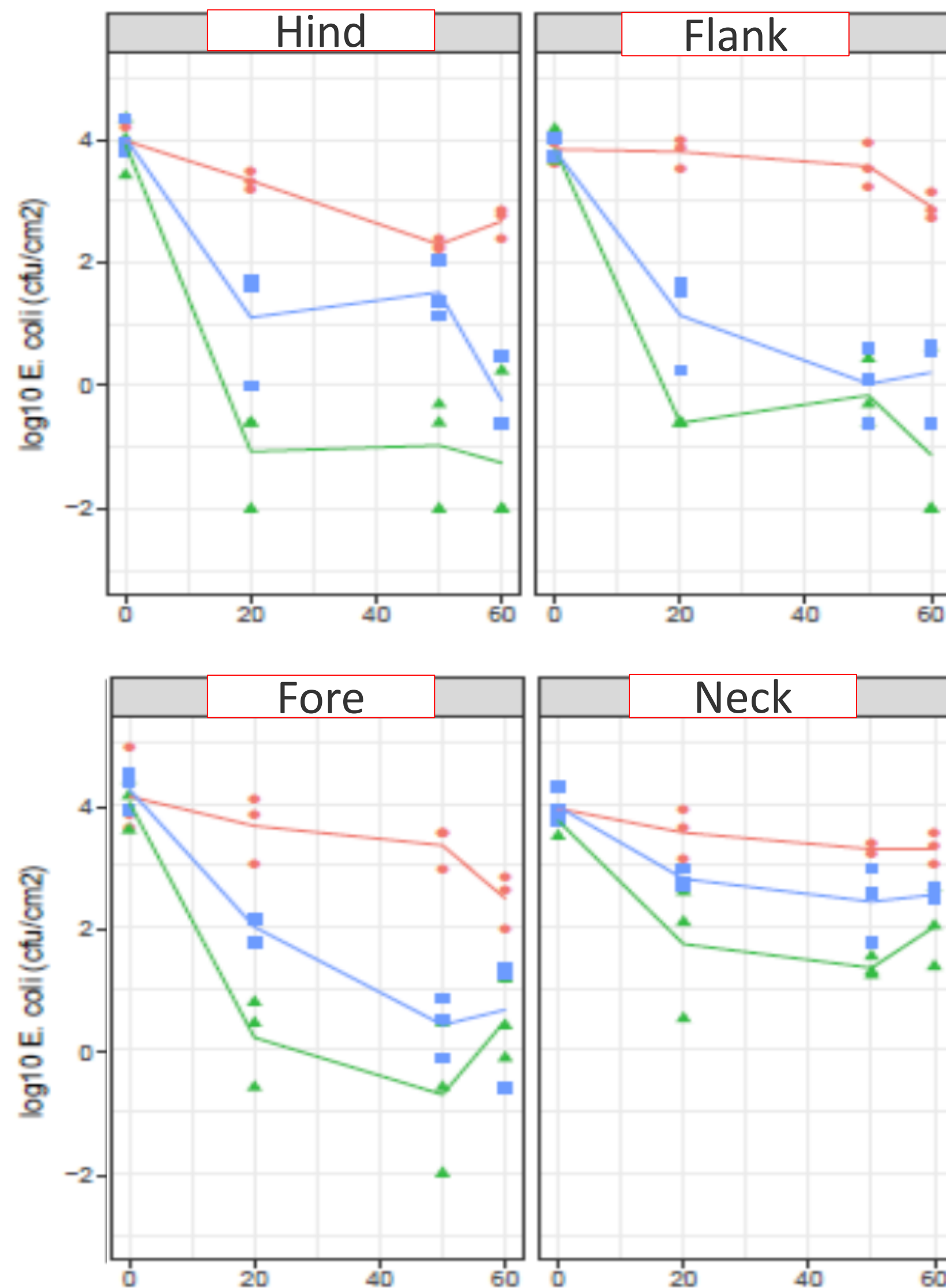
Results



Changes in *E. coli* numbers (log CFU/cm²) at different sites of carcasses during exposure to spray chilling treatment with water (red), ClO₂ (blue) and PAA (green) Note: LOD = 0.01 CFU/cm²

- All treatments reduced *E. coli* numbers
- The effects were site-dependent
 - greatest at higher sites and lowest at lower sites

Results



Water (red), ClO₂ (blue) and PAA (green)
 Note: LOD = 0.01 CFU/cm²

- Water alone reduced *E. coli* numbers by ≤ 1.3 log units at the hind leg, but much less at the other sites
- ClO₂ achieved ≤ 3.5 log reductions at most sites, but about 1.5 log reductions at the neck
- PAA was most effective, achieving 3.5-4.0 log reductions at all sites, except for the neck (~2-log reduction)

Key Message

Interventions	Log Reduction
Hide wash and sanitise	1.5-2.0
Steam vacuum	1.0-1.5
Pre-evisceration acid rinse	1.0-1.5
Thermal pasteurisation	1.5-2.0
Chilled carcass acid rinse	1.0-1.5
UTas Intervention using ClO₂	1.5-3.5*
UTas Intervention using PAA	2.0-4.0*

* depends on the sites of carcasses

- UTas Intervention outperforms any of existing interventions

Limitations

- Chemicals used are not accepted in all major markets (limits market access)

		Chlorine dioxide	Peroxyacetic acid
Regulatory status			
Australia		Yes	Yes
USA		Yes	Yes
Japan		No	No (currently under revision)
Korea		No	No
China		Yes	Yes?

Possible solutions

- Chemical intervention could be applied later during the processing
- Installing a spray cabinet to apply right before vacuum packaging will allow for selected sub-primal cuts to be sprayed
- No negative impact on the market access while still minimizing the risk of enteric pathogens for countries that allow the treatment.



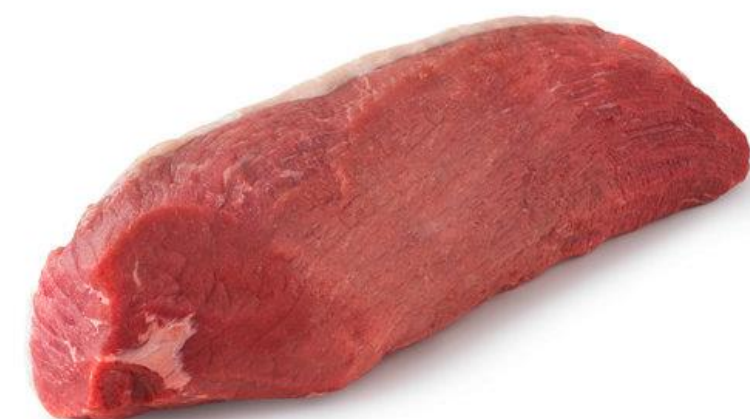
Industry trial (JBS Scone, NSW)

- JBS is interested in this idea. Accordingly JBS has installed a spray cabinet in the JBS Scone plant.
- A trial has been conducted to evaluate the effectiveness of an antimicrobial agent using this cabinet
- PAA was selected as the test chemical



Trial Specifics

- Two cuts were used (Eye round and Bolar blade)
- 200 pieces per cut were tested
- Each cut were subjected to either
 - Water (control)
 - PAA at 150, 180 and 220ppm

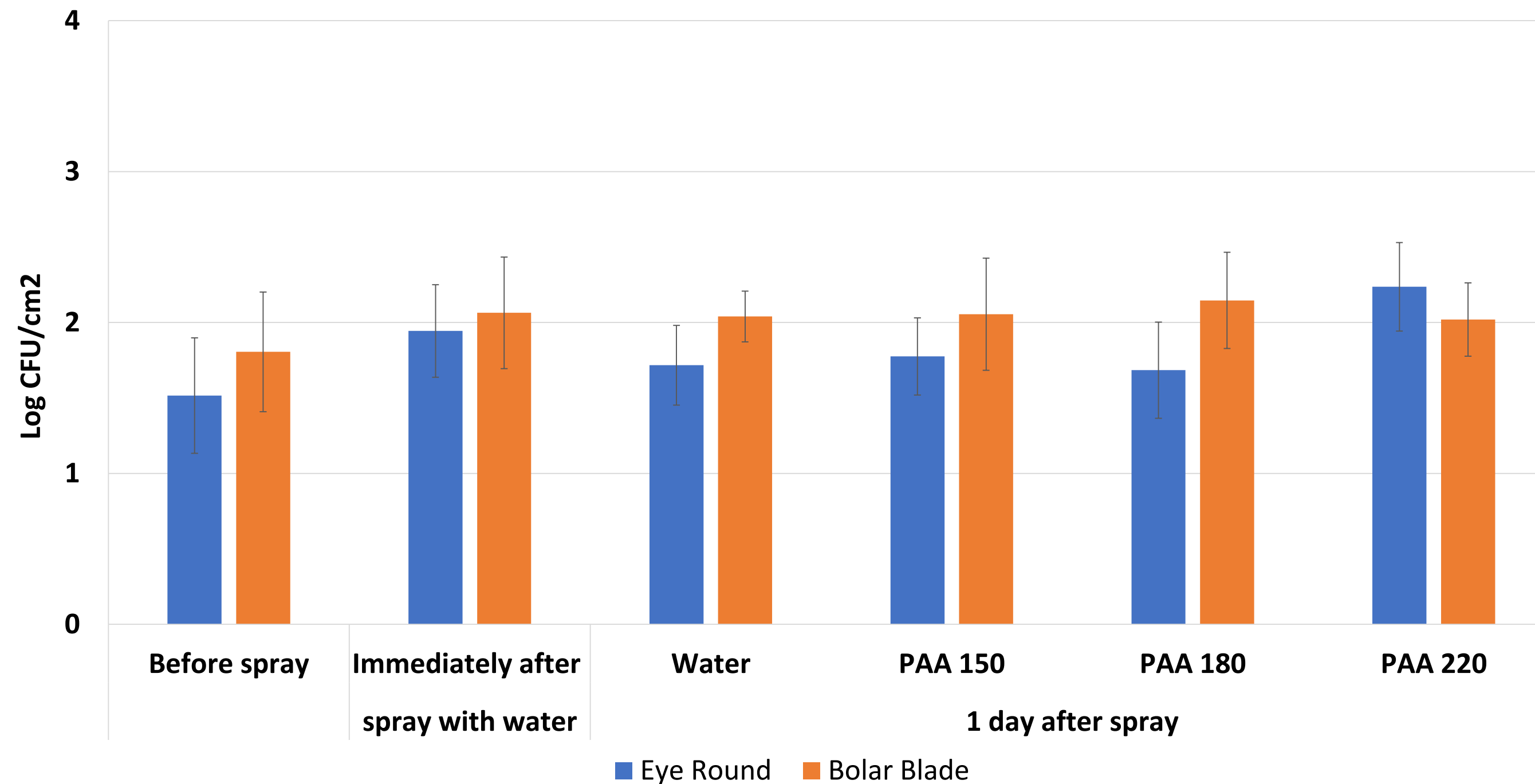


Microbial analysis

- Test for
 - TVC (pertrifilm)
 - Generic *E. coli* (MPN)
- Tests performed on day 0, 1, and 60



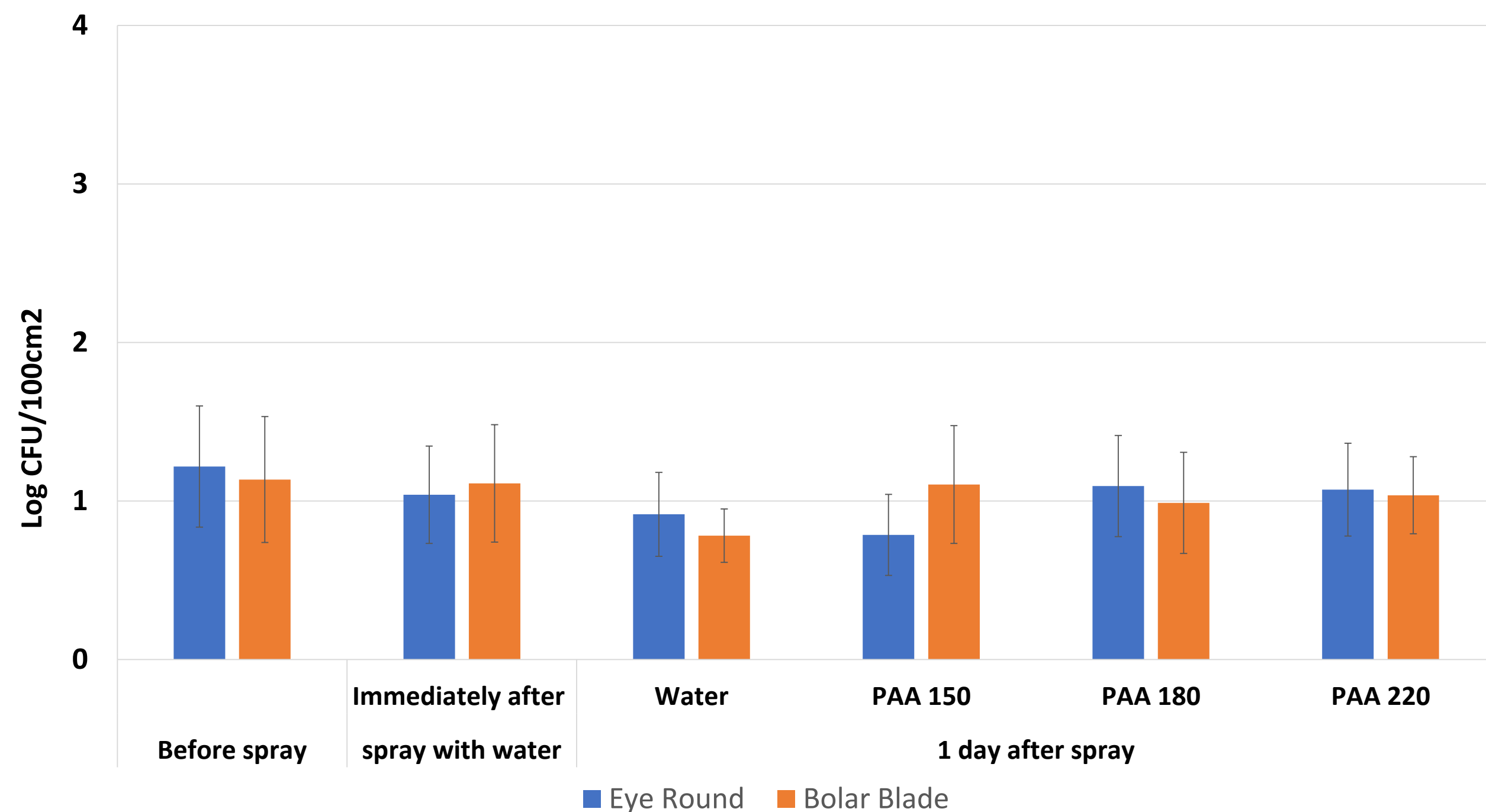
Results so far - TVC



Changes in TVC (Log CFU/cm²) on Bolar Blade (blue) and Eye Round (orange) before and after spray with water or PAA at three different concentrations

- In all cases, PAA did not produce any immediate effects on TVC on meat.
- Both cuts had TVC ranging from 1.5 to 2.5 log CFU/cm² throughout the trial to date.

Results so far – *E. coli*



Changes in *E. coli* (Log CFU/100cm²) on Bolar Blade (blue) and Eye Round (orange) before and after spray with water or PAA at three different concentrations

- The data revealed that generic *E. coli* was detected in all meat samples.
- In all cases, PAA did not have any immediate effects on *E. coli* numbers.
- *E. coli* numbers ranged from 0.5 to 1.5 Log CFU/100cm² on both cuts throughout the trial to date.

Key message

- In all cases, PAA did not have any immediate effects on *E. coli* or TVC numbers compared to the control.
- However we should not make conclusions about the efficacy as the trial is still going

Some thoughts

- Improving coverage of current spray on the piece of meat
- Increase the flow rate of the spray system

Conclusions

- Spray chilling intervention was effective against *E. coli* on beef carcasses.
- However there is market access issues.
- We looking into possible solutions by applying chemicals right before vacuum packaging.
- Ultimately minimising the risk of enteric pathogens

Thank You

University of Tasmania

- Laura Rood
- Edward Cheah
- Tom Ross
- Lyndal Mellefont
- John Bowman
- Claire Baker



JBS Australia

Michael Johnston

Jodie Ihle

Blaze Baker

MLA and AMPC

John Sumner

Andreas Kiermeier

Long Huynh

Ian Jenson



UTas Blog for Meat Safety and Quality

- UTas is here and we can help you
 - with any future intervention trials
 - with latest news in meat safety and quality
- To contact us, just google 'Meaty Micro Matters' and look for 'UTas Blogs'

