final report

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Prepared by: Michael White

Northern Co-operative Meat Company

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Meat & Livestock Australia Limited
Locked Bag 991
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The affect of 4% lactic acid at 50°C on TVC and *Escherichia coli* levels on topside beef

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Background

After analysing bacterial levels of carcases from a variety of sample groups, it was concluded that due to both bacterial prevalence and market influence, a decontamination facility would be required to be installed at Northern Cooperative Meat Co. Ltd. so as to maintain market access. It was recommended that lactic acid at 4% be used post chilling and quartering. As part of approving this recommendation, it is necessary to conduct an in plant validation so as to assess the affect of the lactic acid on bacterial levels and product quality.

Method

TEST 1:

Six samples of topside beef were obtained from the processing plant. The exterior surfaces of the samples were segregated into three 100cm^2 areas, totaling 300cm^2. The 300cm^2 area was divided into three 100cm^2 areas so as to record bacterial levels at three different time stages. All three areas were inoculated with a non pathogenic *E. coli* solution and allowed to dry. One area was swabbed untreated so as to obtain a reading of pre-treatment bacterial levels. The other two 100cm^2 areas were treated with the lactic acid solution. One of these areas was swabbed one minute after treatment, and the other was swabbed fifteen minutes after treatment. This process was repeated for all samples. Samples were then plated, and bacterial levels were recorded after 24 hours incubation at 37°C.

TEST 2:

Six beef topside caps were individually divided into three 100cm^2 areas. Each 100cm^2 area was inoculated with a non pathogenic *E. coli* solution and allowed to dry for 30 minutes. Each area was then sequentially treated with a 4% lactic acid solution at 50°C. The treated areas were left for 15 minutes each, then swabbed.

NOTE: The concentration of the bacterial inoculum was noted to be at a level of 6 log_{10}. It is under general consensus at Food Science Australia that after application to a meat surface, bacterial levels would reduce to approximately 5 log_{10}.

Swabbing Procedure

- Sponges were soaked in approximately 25ml of Butterfield's Solution and sponges were replaced into sterile bags. All sponges were prepared prior to swabbing.
- Excess solution was squeezed out into sterile bag.
- A 10cm x 10cm template was placed over swabbing area.
- Sponge was wiped 10 times horizontally across each test area, followed by 10 times vertically.
- The sponge was returned to its bag, and the test area was recorded.

**It was ensured that gloves were changed in between sample area and carcases so as to prevent cross contamination.*

- Each individual solution was homogenised in its bag by squeezing the sponge and releasing the bacteria.
- A Pasteur Pipette was used to transfer 1ml of homogenate on to Petrifilm Aerobic Plate Count Slides and *E. coli*/Coliform Slides.
- The slides were incubated for 24 hours at 37°C.
- Bacterial colonies formed on the Petrifilm slides were counted, and figures were recorded accordingly.
- Colony numbers were recorded in colonies per cm^2 of the carcase swab area, both in cfu and log_{10} readings.

Results

NOTE: All bacterial levels referred to are recorded in per cm^2 of carcase swab area. It is considered that initial bacterial levels were 5 log_{10}.

TEST 1:

Test 1 results yielded plates that were too concentrated to derive an accurate count.

TEST 2:

Table 1: Individual swab results

Swab No.	E.coli/cm^2	E.coli log_{10}/cm^2	TVC/cm^2	TVC log_{10}/cm^2
1	4687.0	3.7	104687.0	5.0
2	937.0	3.0	2187.0	3.3
3	625.0	2.8	3281.0	3.5
4	2031.0	3.3	10781.0	4.0
5	2656.0	3.4	9531.0	4.0
6	0.0	0.0	1718.0	3.2
7	4531.0	3.7	9375.0	4.0
8	5781.0	3.8	12187.0	4.1
9	1093.0	3.0	3437.0	3.5
10	4218.0	3.6	8437.0	3.9
Average	**2655.9**	**3.0**	**16562.1**	**3.9**

Table 1 indicates that average *E. coli* levels were 3 log_{10}. TVC (Total Viable Count) levels were found to be 3.9 log_{10}.

Chart 1: *E. coli* levels in response to lactic acid treatment

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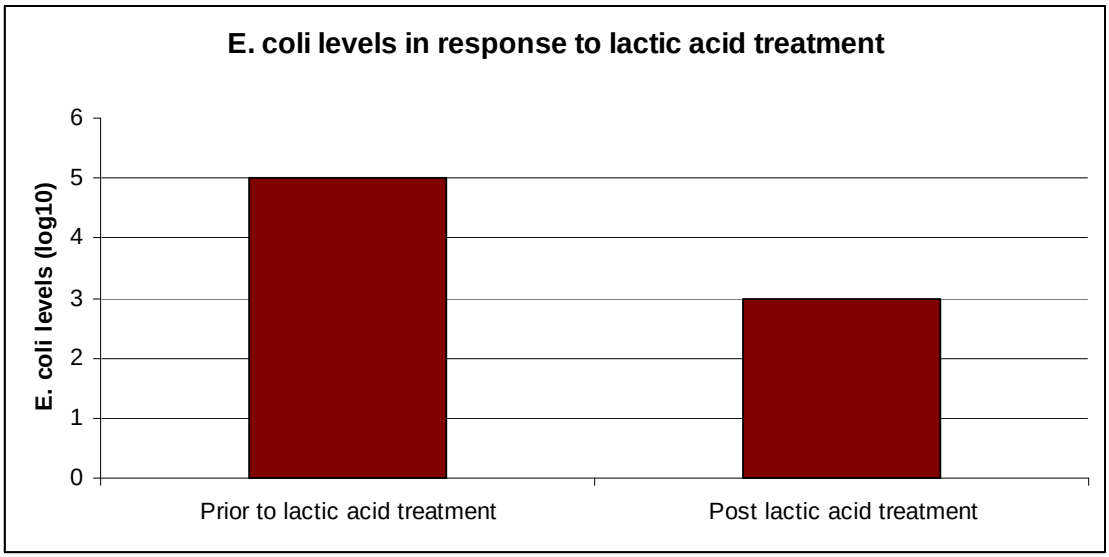

Chart 1 indicates a 2 $\log_{10}$ reduction in *E. coli* levels throughout lactic acid treatment.

Chart 2: TVC levels in response to lactic acid treatment

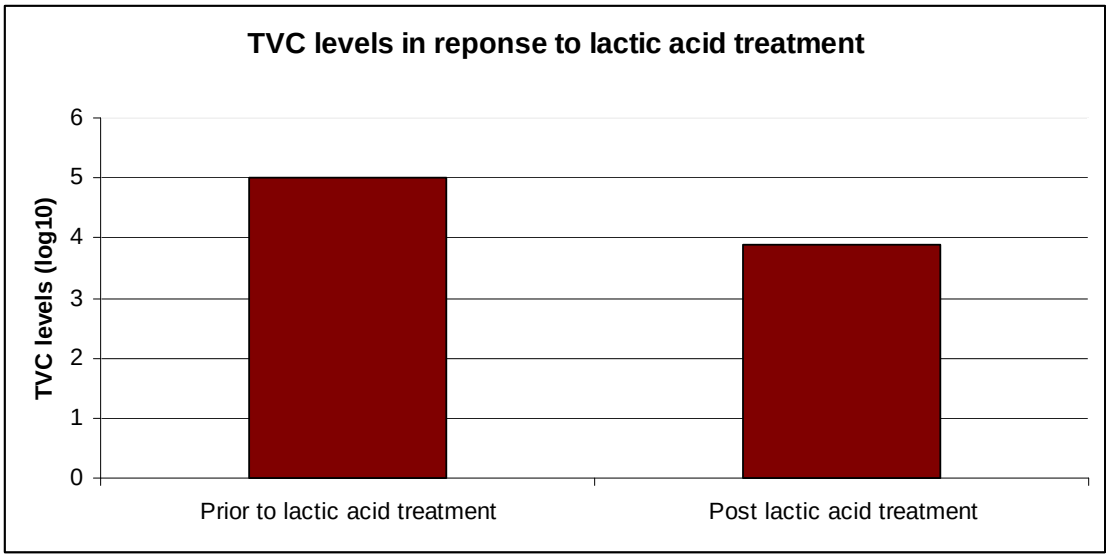

Chart 2 indicates a 1.1 $\log_{10}$ reduction in TVC levels throughout lactic acid treatment.

Discussion

The results revealed a 2 $\log_{10}$ reduction in *E. coli* levels, and a 1.1 $\log_{10}$ reduction in TVC levels. These reductions are not entirely accurate due to the fact that initial individual bacterial levels were not recorded. For further investigation, test 1 could be repeated using the same bacterial inoculum to find *E. coli* and TVC levels prior to treatment and 1 minute after application of the lactic acid solution.