Microbiological quality of Australian beef & sheep meat
Fourth national baseline study - 2011

• Brisbane
• Melbourne
• Rockhampton
Agenda

1. Results of baseline 4
2. Comparison with other baselines
3. Comparison with other studies
4. General discussion
Why Undertake Baselines?

1. Demonstrates the hygienic quality of Australian Meat Processing to Importing Countries

2. Data provides confidence in State and Federal regulatory systems

3. Position’s the Australian industry in comparison to other countries with respect to the microbiological quality of meat products – Globally we can claim our meat products are at least equivalent to the best performing industries
Baseline history

Baseline 1: 1993-94
Carcases and frozen trim
Export/domestic (QA) comparisons

Baseline 2: 1998
Carcases and frozen trim
HACCP being installed and implemented

Baseline 3: 2004
Carcases and frozen trim
HACCP well entrenched
Baseline 4

Primals and frozen trim
Carcasses well covered by ESAM
Sampling conducted
  – Summer: 24 Jan – 31 Mar
  – Winter: 6 Jun – 30 Aug
  – 29 Beef plants
  – 12 Sheep plants
• Frozen carton sampling
  – 300g sampled per carton (drilled samples)
• Primal sampling
  – 3 sponges each of 300cm²
    Sponge 1: E. coli O157
    Sponge 2: Salmonella, Listeria
    Sponge 3: TVC, Coliforms, E. coli, Staph, Campylobacter
# Frozen Boneless Beef (n=1165)

<table>
<thead>
<tr>
<th></th>
<th>TVC</th>
<th>E. coli</th>
<th>Staph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence (%)</td>
<td>94.9</td>
<td>2.1</td>
<td>3.4</td>
</tr>
<tr>
<td>Mean log* (cfu/g)</td>
<td>2.22 (166)</td>
<td>1.32 (21)</td>
<td>1.93 (85)</td>
</tr>
<tr>
<td>Max log*</td>
<td>5.53</td>
<td>2.51</td>
<td>4.76</td>
</tr>
</tbody>
</table>

* count of the positive samples
Frozen Boneless Beef – $\log_{10} \text{TVC/g} \times \text{Plant}$
Beef Primals (n=572 striploins, 572 outsides)

<table>
<thead>
<tr>
<th></th>
<th>TVC</th>
<th>E. coli</th>
<th>Staph</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S/loin</td>
<td>O/sde</td>
<td>S/loin</td>
</tr>
<tr>
<td>Prev (%)</td>
<td>99.1</td>
<td>99.1</td>
<td>10.7</td>
</tr>
<tr>
<td>Mean log</td>
<td>1.25</td>
<td>1.51</td>
<td>-0.49</td>
</tr>
<tr>
<td>(cfu/cm²)*</td>
<td>(18)</td>
<td>(32)</td>
<td>(0.3)</td>
</tr>
<tr>
<td>Max log*</td>
<td>5.26</td>
<td>4.22</td>
<td>2.30</td>
</tr>
</tbody>
</table>

* count of the positive samples
Beef Primals – $\log_{10} TVC/cm^2 \times$ Plant
# Frozen Boneless Sheep meat (n=551)

<table>
<thead>
<tr>
<th></th>
<th>TVC</th>
<th>E. coli</th>
<th>Staph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence (%)</td>
<td>99.1</td>
<td>12.5</td>
<td>1.8</td>
</tr>
<tr>
<td>Mean log* (cfu/g)</td>
<td>2.80</td>
<td>1.51</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td>(631)</td>
<td>(32)</td>
<td>(46)</td>
</tr>
<tr>
<td>Max log*</td>
<td>5.51</td>
<td>3.30</td>
<td>2.32</td>
</tr>
</tbody>
</table>

* count of the positive samples
Frozen Boneless Sheep meat – $\log_{10} TVC/g \times \text{Plant}$
# Sheep meat Primals (n=613 legs, 613 shoulders)

<table>
<thead>
<tr>
<th></th>
<th>TVC</th>
<th>E. coli</th>
<th>Staph</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leg</td>
<td>Shld</td>
<td>Leg</td>
</tr>
<tr>
<td><strong>Prev (%)</strong></td>
<td>100</td>
<td>100</td>
<td>42.9</td>
</tr>
<tr>
<td><strong>Mean log</strong></td>
<td>2.02</td>
<td>2.29</td>
<td>-0.44</td>
</tr>
<tr>
<td><strong>(cfu/cm²)</strong></td>
<td>(105)</td>
<td>(195)</td>
<td>(0.4)</td>
</tr>
<tr>
<td><strong>Max log</strong></td>
<td>4.64</td>
<td>6.21</td>
<td>2.36</td>
</tr>
</tbody>
</table>

* count of the positive samples
Sheep Primals – $\log_{10} \text{TVC/cm}^2 \times \text{Plant}$
Pathogens – 2011

• *Listeria mono* was not detected
  • *Listeria spp* detected on 1/613 sheep leg in summer & 1/572 beef striploin in winter (both from the same site)

• Campylobacter not tested in frozen trim
  • Detected on 1/613 sheep shoulder in winter

• *E.coli O157* not tested in frozen trim
  • Detected on 1/613 sheep shoulder in summer & 2/613 sheep legs in winter

• Salmonella detected in
  • 3.1% of sheep meat trim (17/551)
  • 2.8% sheep legs (17/613)
  • 0.8% sheep shoulders (5/613)
Salmonella

- 51% of positives came from two plants which were also processing goats
- 54% of positives came from plants which hot-boned
- One establishment had 13/28 (46%) positives in winter for boneless mutton

<table>
<thead>
<tr>
<th>ESAM</th>
<th>Positive samples</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Summer</td>
<td>Winter</td>
<td></td>
</tr>
<tr>
<td>Carcasses</td>
<td>2 (0.4%)</td>
<td>4 (0.7%)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Positive samples</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Summer</td>
<td>Winter</td>
<td>Total</td>
</tr>
<tr>
<td>Trim</td>
<td>3</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Legs</td>
<td>5</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>Shoulders</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>0.70%</td>
<td>1.52%</td>
<td></td>
</tr>
</tbody>
</table>
Comparisons – previous baselines

Survey          | Mean log_{10} TVC/g
1993/94         | 2.77
1998            | 2.52
2004            | 1.28
2011            | 2.22
**E.coli – Frozen Boneless Beef – 1993-2011**

<table>
<thead>
<tr>
<th>Year</th>
<th>Prevalence %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993/94</td>
<td>7.8</td>
</tr>
<tr>
<td>1998</td>
<td>1.2</td>
</tr>
<tr>
<td>2004</td>
<td>1.1</td>
</tr>
<tr>
<td>2011</td>
<td>2.1</td>
</tr>
</tbody>
</table>

- Incidence %
  - 1998: 17.5
  - 2004: 20.3
  - 2011: 3.4

Survey

Mean log_{10} TVC/g

Survey

1993/94: 3.47
1998: 3.30
2004: 1.85
2011: 2.80
**E. coli – Frozen Boneless Sheep meat 1993-2011**

<table>
<thead>
<tr>
<th>Survey Year</th>
<th>Prevalence %</th>
</tr>
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<tbody>
<tr>
<td>1993/94</td>
<td>17.8</td>
</tr>
<tr>
<td>1998</td>
<td>8.5</td>
</tr>
<tr>
<td>2004</td>
<td>4.3</td>
</tr>
<tr>
<td>2011</td>
<td>12.5</td>
</tr>
</tbody>
</table>
S.aureus – Frozen Boneless Sheep meat
1993-2011

Incidence %


Survey

21.8 38.6 32.7 1.8
Counts increased – why?
Trends good – *E. coli* on beef carcases in 2008/09
Trends good – TVC on beef carcases in 2008/09
Upswing late in 2010-early 2011
Reasons for the upswing?

- MLA’s risk management panel reviewed data and thought weather patterns in winter 2010-summer 2011 may be responsible.
- Common belief that wet conditions lead to higher counts on carcases due to condition of hides.
- SARDI were commissioned to have a close look at ESAM data and see if any alignment with high rainfall.
Rainfall July 2010-June 2011
Theory

• If rainfall is a factor in upward trends in counts there should be a difference between WA (dry) and eastern states (much wetter than normal)

• SARDI divided data according to WA and rest of Australia
E. coli prevalence in steers/heifers in Western Australia and Rest of Australia.
Why should rainfall have such a marked affect?

- Publications link counts with:
  - Contamination of the hide
  - Processing rate (chain speed)
- Could these have changed in 2010-2011?
- We hear about difficulty getting stock to railheads and on trucking routes
Neighbouring establishments

• Not all establishments had increased counts
• Two beef plants in Queensland are 300km apart
• About the same slaughter throughput
• But they are different – why?
Neighbouring establishments

Establishment A

Establishment B
Comparisons – other studies
Beef Primals at packaging

Log TVC

NZ 1  NZ 2  USA 1  USA 2  Base 4
Boneless beef

Log TVC

Australia NZ USA Uruguay