ACT HEALTH PROTECTION SERVICE

MICROBIOLOGICAL
QUALITY OF
MEATS OTHER THAN CHICKEN

NOVEMBER 1999 - APRIL 2000

Report prepared by Geoff Millard and Simon Rockliff
OBJECTIVE

- Determine the microbiological status of raw retail meats other than raw retail chicken i.e. raw meat sold in the ACT;
- Compare these results to those available from Australian and overseas sources and to a previous raw retail chicken (raw chicken) survey conducted in the ACT to illustrate the unacceptable microbiological quality of raw chicken.

BACKGROUND

Literature sources indicate that raw meat has lower rates of contamination with the organisms Escherichia coli, Thermophilic Campylobacter sp (Campylobacter), Salmonella sp and Listeria monocytogenes than raw chicken\(^3\). This short survey was undertaken to confirm that the ACT was consistent with the literature.

In 1996 Meat and Livestock Australia\(^4\) (MLA) implemented the Microbial Food Safety Key program, in line with the Meat Industry Strategic Plan (MISP) prepared by the Meat Industry Council for the period 1996 – 2000. One aim of the MISP was to introduce a comprehensive quality assurance system based on the Hazard Analysis of Critical Control Points (HACCP) to all levels of the meat industry. To measure the effectiveness of the MISP the industry undertook baseline studies on the microbiological status of carcass and carton meats in both 1993-4 and 1998. In February 2000 MLA\(^4\) produced a report comparing these baseline studies. The report “was based on samples excised from carcass surfaces which had been chilled for at least 12 hours and from pieces of meat drilled from cartons of frozen manufacturing meat.”

As recognition of this quality assurance system approach, the USA in 1999 accepted the Australian Quarantine Inspection Service (AQIS) Australian Meat Safety Enhancement Program as equivalent to the U.S. inspection system.\(^5\)

STANDARDS

There are no Australia New Zealand Food Authority Food Standard Code Standards for this product.

SURVEY

During the period 08/11/1999 to 11/04/2001, 53 raw meat samples consisting of 18 Beef, 11 Pork, 9 Lamb/mutton, 9 Fish, 3 Veal, 2 Ox and 1 Prawn were collected from 13 ACT retail establishments. These samples were tested to determine the presence of Escherichia coli (E. coli), Listeria monocytogenes (L. monocytogenes), Salmonella sp. and Thermophilic Campylobacter sp.
RESULTS
The isolation rates for the different types of ACT meat are given in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Meat</th>
<th>[n]</th>
<th>E. coli (%)</th>
<th>L. monocytogenes (%)</th>
<th>Salmonella (%)</th>
<th>Campylobacter (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veal</td>
<td>3</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Prawns</td>
<td>1</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Fish</td>
<td>9</td>
<td>0 (0.0)</td>
<td>1 (11.1)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Beef</td>
<td>18</td>
<td>3 (16.6)</td>
<td>3 (16.6)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Pork</td>
<td>11</td>
<td>1 (9.1)</td>
<td>3 (27.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Lamb/mutton</td>
<td>9</td>
<td>2 (22.2)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Ox</td>
<td>2</td>
<td>2 (100)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Samples Positive</td>
<td></td>
<td>8 (15.1)</td>
<td>7 (13.2)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
</tbody>
</table>

[n] = number of samples tested.
(%) = percentage of samples positive.

Table 2 compares the results of the ACT raw meat survey with those of the ACT raw chicken survey (3) and meat results from the literature. (1)(2)(4)

Table 2

<table>
<thead>
<tr>
<th>Organism</th>
<th>Meat Survey % Pos</th>
<th>Raw chicken Survey % Pos</th>
<th>Literature %Pos</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>15.1</td>
<td>70.8</td>
<td>2.3 – 31.0</td>
</tr>
<tr>
<td>Listeria monocytogenes</td>
<td>13.2</td>
<td>36.0</td>
<td>2.0 – 47.9</td>
</tr>
<tr>
<td>Salmonella sp.</td>
<td>0.0</td>
<td>39.9</td>
<td>0.4 – 45.6</td>
</tr>
<tr>
<td>Campylobacter</td>
<td>0.0</td>
<td>20.6</td>
<td>0.0 - 5.1</td>
</tr>
</tbody>
</table>

Pos = positive result

DISCUSSION
While the survey sample numbers for some of the cuts and types of meat are statistically small we believe that the overall trends are valid but the actual percentage isolation or non-isolation rate may not be representative.

Escherichia coli
The presence of E. coli on the sample is an indicator of faecal contamination and its isolation rate gives some indication of the degree of contamination for the individual types of meat. E. coli was isolated from beef, lamb/mutton, pork and ox samples. The ACT study showed that 16.6% beef, 22.2% lamb/mutton, 9.1% pork and 100% ox samples carried E. coli. Only 2 ox samples were tested in the survey and the high isolation rate could be due to low number of samples. The overall isolation rate was 15.1% which is approximately one fifth the isolation rate for raw chicken and in the mid range reported in the literature (Table 2).

The overall E. coli isolation rate in 1998 (4) for beef carcasses and boneless meat was 10.3% and 5.3 % respectively and 29.1% and 24.5% respectively for sheep carcasses and boneless meat. The ACT isolation rate from retail beef samples is higher than beef carcasses while sheep carcasses and retail sheep samples tend to have similar isolation rates. It is difficult to determine from the survey the reason for the differing beef and sheep meat results.

Listeria Monocytogenes
Listeria Monocytogenes was isolated from fish, beef and pork samples at individual rates of 11.1%, 16.6 % and 27.3% respectively. The overall isolation rate was 13.2% which is less than half the isolation rate for raw chicken and in the lower third of the range reported in the literature (Table 2). Listeria Monocytogenes analysis was not performed by the Meat and Livestock Australia Surveys.
Salmonella
Salmonella was not found in any of the survey samples, which is below the range reported in the literature (Table 2). The overall isolation rate for raw chicken was reported as 39.9%. The Microbiology of Australian Meat 1998 results indicate that, with an overall isolation rate for beef carcasses of 0.2% and 0.1% for sheep carcasses (4) this organism is not prevalent at slaughter.

Campylobacter
Thermophilic Campylobacter was also not found in any of the samples and is at the lowest end of the range reported in the literature (Table 2). Meanwhile the overall isolation rate for raw chicken was reported as 20.6%. In 1993-4 (4) the overall isolation rates for Thermophilic Campylobacter for beef and sheep carcasses were 0.26% and 1.3% respectively. Thermophilic Campylobacter tests were not undertaken in 1998.

CONCLUSION
This was only a small survey with low sample numbers in each of the food types but the results indicate that the original premise as stated in the BACKGROUND was correct. Raw meat does have a much lower contamination rate of E. coli, L. monocytogenes, Salmonella and Thermophilic Campylobacter than raw chicken meat. This lower contamination rate (in some cases zero) indicates a lower risk to the public from these undercooked, mishandled and cross-contaminated foods. The HACCP (4) approach introduced into the meat industry appears to be achieving a small but significant improvement in some microbiological quality criteria of beef and sheep carcasses. A similar approach in the poultry industry could result in a reduction of overall levels of contamination for raw chicken carcasses.

RECOMMENDATION
• That a follow up survey be conducted in the future, to ascertain if the present situation has continued.

BIBLIOGRAPHY
1. Nationwide Microbiological Baseline Data Collection Program
2. Flemming Bagar Ed. 2000, DANMAP 99. Consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from food animals, food and humans in Denmark. Danish Veterinary Laboratory. [http://www.svs.dk](http://www.svs.dk)
5. Australian Meat Safety Enhancement Program (MSEP) Approved