MICROBIOLOGICAL SURVEILLANCE OF READY TO EAT SALADS

REPORT, PREPARED JUNE 2011

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**GLOSSARY**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CFU</td>
<td>Colony forming units</td>
</tr>
<tr>
<td>CPS</td>
<td>Coagulase positive <em>Staphylococci</em></td>
</tr>
<tr>
<td>EHO</td>
<td>Environmental Health Officer</td>
</tr>
<tr>
<td>FSANZ</td>
<td>Food Standards Australia New Zealand</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Authority</td>
</tr>
<tr>
<td>REHO</td>
<td>Regional Environmental Health Officer</td>
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</table>

**EXECUTIVE SUMMARY**

The microbiological hygiene of these ready to eat, potentially hazardous, foods (as assessed in this survey) was good. However, the storage temperature of many of the food premises should be addressed as a matter of urgency by officers.
INTRODUCTION

The Victorian Food Act 1984 specifies that councils should regularly sample foods retailed or manufactured in their local government authority (LGA) region as part of their food safety activities. Such sampling contributes to the safety of consumers in Victoria by allowing councils to identify microbiological or chemical hazards and take steps to address these issues. However, unless coordinated, food sampling can cover a vast range of foods of varying risk to consumers, and regional food surveillance groups have been convened under the auspices of some departmental Regional Environmental Health Officers (REHO) to coordinate council activities. The coordination aims of these regional sampling groups include:

- better targeting of high risk foods or high risk food premises for sampling.
- more consistent sampling to provide a better picture of microbiological or chemical risk with certain foods.
- sampling to provide data that can direct appropriate corrective actions where relevant in the food premises.

The regional sampling groups are responsive to local issues and problems, and are a valuable source of data for use by the Department of Health (the department) in monitoring food safety risks across the state.

Ready to eat foods are defined by FSANZ as “food that is ordinarily consumed in the same state as that in which it is sold or distributed and does not include nuts in the shell and whole, raw fruits and vegetables that are intended for hulling, peeling or washing by the consumer”. Ready to eat salads are classified as “potentially hazardous foods”\(^1\), and food premises that manufacture and retail these foods are categorised as Class 2 food premises under the Victorian Food Act 1984 and such businesses are required to have a Food Safety Supervisor, a HACCP-based food safety program, and are regularly assessed for compliance with this program\(^2\). Prepared salads present nutritious and healthy options for consumers but, unless prepared with satisfactory hygiene, can be contaminated with potential pathogens such as *Salmonella* spp., or *Listeria monocytogenes*\(^3\). This survey was conducted by local government Environmental Health Officers in the North & Western Metropolitan Region and focussed on the microbiological

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quality and safety of ready to eat salads prepared in small to medium size food businesses. Sampling also required that the officers complete a questionnaire, in which information about food safety practices in the preparation and storage of these foods was collected.

Microbiological assessment was conducted in accordance with the Guidelines for ready to eat foods prepared by Food Standards Australia New Zealand (FSANZ) Standard 1.6.1 and the accompanying guidelines (2). Samples were analysed for *E.coli*, *Listeria* spp. (particularly *L.monocytogenes*) and Coagulase Positive *Staphylococci* (CPS). Selected samples were also analysed for *B.cereus* (products containing rice, pasta or burghul) and *Salmonella* spp. (products containing egg, chicken, nuts or raw egg dressings).

It is important to note that all council participants agreed to act where premises returned samples with unacceptable microbiological results, or where the questionnaire indicated unsatisfactory practices. The action required would vary with the compliance issue, but may include requiring the premises to complete a clean-up in accordance with departmental guidelines or re-sampling foods.

A total of 412 samples of ready to eat salads were submitted for analysis by Moonee Valley, Nillumbik, Greater Geelong, Moreland, Whittlesea, Wyndham, Melton, Brimbank, Hobsons Bay, Yarra and City of Melbourne.

**METHODS**

**SAMPLE ANALYSIS**

Samples were processed by analysts authorised under the Victorian Food Act 1984, and the three laboratories, OMIC, DTS and NMI, are NATA accredited for the testing methods applied in this survey, and the assumption was made that all laboratories were equally able to detect the organisms.

Analyses included

- *Escherichia coli* (*E.coli*)
- Coagulase Positive *Staphylococci* (CPS)
- *Listeria* spp. including *L.monocytogenes*
- *Salmonella* spp. (samples which included egg, chicken, raw egg dressing, chicken or nuts)
- *Bacillus cereus* (*B.cereus*) (samples which contain pasta, rice or burghul).

Standard Plate Counts and Enterobacteriaceaee analyses are not indicated as general guides to the hygienic status of these products, as the salads include raw or uncooked
vegetables which would be expected to have a relatively high natural flora (2). *E. coli* is ubiquitous in the intestines of warm blooded animals and these organisms serve as indicators of faecal contamination and the presence of potential pathogens such as *Salmonella* spp.(1). *Listeria* spp are wide-spread in the environment and are frequently associated with ready to eat foods, such as salads, that have not undergone a listeridical treatment. However, *L. monocytogenes* presents a public health risk to the broader community and specifically to vulnerable populations, and the presence of this organism in ready to eat foods should be controlled. *B. cereus* is a potential food pathogen specifically associated with starchy foods such as rice and pasta.

**STATISTICAL ANALYSIS**

Results of analyses were converted to log$_{10}$ cfu/g. The three laboratories varied in their reporting of the lower and upper limit of detection for different tests. Results expressed as less than the lowest limit of detection for a test were ascribed a value of half the lowest limit of detection (i.e. where values <10 cfu/g were reported, a value of 5 cfu/g was ascribed to the sample). Where the laboratories reported values greater than the upper limit of detection for the test (X), a value of $X + 1/3X$ was ascribed to the result. The frequency distributions of samples according to the microbiological guidelines in Table 2 were performed using the Excel data analysis toolpack.
## RESULTS

### TABLE 1: SALADS SAMPLED (MARCH-MAY, 2011)

<table>
<thead>
<tr>
<th>Salad</th>
<th>Typical ingredients</th>
<th>Number submitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greek</td>
<td>Cheese (fetta), olives, tomatoes, cucumber</td>
<td>36</td>
</tr>
<tr>
<td>Coleslaw</td>
<td>Cabbage, carrot, parsley, mayonnaise</td>
<td>59</td>
</tr>
<tr>
<td>Pasta</td>
<td>Tomato, capsicum, lettuce, olives, other vegetables</td>
<td>58</td>
</tr>
<tr>
<td>Garden</td>
<td>Lettuce, onion tomatoes, other vegetables</td>
<td>13</td>
</tr>
<tr>
<td>Chicken (various)</td>
<td>Avocado, onion, capsicum, dressing</td>
<td>17</td>
</tr>
<tr>
<td>Tabouli</td>
<td>Burghul, parsley, tomato, onion</td>
<td>30</td>
</tr>
<tr>
<td>Green</td>
<td>Vegetable</td>
<td>30</td>
</tr>
<tr>
<td>Miscellaneous/unknown</td>
<td>Vegetable</td>
<td>85</td>
</tr>
<tr>
<td>Potato</td>
<td>Egg, tuna, tomato, bacon</td>
<td>50</td>
</tr>
<tr>
<td>Rice</td>
<td>Vegetable, bacon, egg, chicken</td>
<td>11</td>
</tr>
<tr>
<td>Seafood</td>
<td>Feta cheese, carrot, tuna, basil</td>
<td>11</td>
</tr>
<tr>
<td>Fruit</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Council</td>
<td>Samples</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Moonee Valley</td>
<td>61</td>
<td></td>
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<tr>
<td>Nillumbik</td>
<td>13</td>
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<tr>
<td>Greater Geelong</td>
<td>40</td>
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<td>Moreland</td>
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<td>Whittlesea</td>
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<td>Wyndham</td>
<td>38</td>
<td></td>
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<tr>
<td>Melton</td>
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<td></td>
</tr>
<tr>
<td>Brimbank</td>
<td>19</td>
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<tr>
<td>Hobsons Bay</td>
<td>23</td>
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</tr>
<tr>
<td>Yarra</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Melbourne</td>
<td>115</td>
<td></td>
</tr>
</tbody>
</table>
FIGURE 1: TEMPERATURE OF SALADS SAMPLED DURING SURVEY (n=412)

FIGURE 2: MICROBIOLOGICAL QUALITY – *BACILLUS CEREUS* (n=137)
FIGURE 3: MICROBIOLOGICAL QUALITY—*LISTERIA* SPP. (*n*=160)

FIGURE 4: MICROBIOLOGICAL QUALITY—COAGULASE +VE *STAPHYLOCOCCI* (*n*=411)
FIGURE 5: MICROBIOLOGICAL QUALITY – *E.COLI.* (n=410)
DISCUSSION

These results suggest that the hygiene and safety of ready to eat salads in the NWMR is good. 293 of sampled salads taken were manufactured at the premises.

Salmonella spp. were not detected from any of the samples assayed for this pathogen (127 samples): this test was only performed on those samples identified as containing cooked or raw egg, chicken or nuts.

- E.coli was detected at marginal levels in only 7.8% of salads sampled and 3.2% at unsatisfactory levels. One salad sample, containing chicken, had an E.coli level of $4.5 \times 10^3$ cfu/g. This sample was stored under temperature control, and no other reason could be ascertained from the survey data as to why this level was so high.

- Detection of Bacillus cereus was conducted for salads that contained rice, pasta or burghul. 137 samples were analysed for this potential food pathogen, with 94% demonstrating acceptable results, 3.6% having marginal results and 2.2% (3 salad) demonstrating an unsatisfactory level of these organisms (2).

- CPS were detected at satisfactory levels on 97.8% (n= 402 samples) of salads.

- All 410 samples were analysed for Listeria spp., and 18 salads samples had detectable Listeria spp. (4%). Of these only four samples contained the potential pathogen, Listeria monocytogenes (1% of all samples). In both of these cases the pathogen was detected at very low levels (< 100 cfu/g).

A survey (see Appendix 1) outlining manufacturing and hygiene processes within the premises was supposed to accompany all samples, but not all surveys were fully completed. In future surveys, guidance should be given to officers about how to quote the size of the batch. The completed surveys indicated that:

- Almost all salads (87.1%) were stored in food grade containers, the majority of them covered. Where the food grade container was uncovered, the salads were in chill display.

- All salads sampled were stored under cold conditions, either in refrigeration (89.3%) or in a cool room (4.1%).
• Very few premises (2.9%) used sanitisers or other chemicals to reduce *Listeria* spp. on the salad ingredients. These salads did not have detectable *Listeria* spp.

• Where salads were identified as having dressings (284 samples) 16.5% (47) were recorded as being produced with raw egg. 14 of these were reported as being made on the premises. This statistic needs to be viewed with some caution, as samples made with commercial mayonnaise were identified as containing raw egg, and this statement warrants further investigation.

• Where the temperature of the salad was recorded (412 samples) nearly half (57%) of the salads were stored at temperatures of greater than 5°C.

These results indicate overall that the handling and safety of salads is good in these premises, but the poor performance of the refrigerators or cold displays used to store these samples is of concern. The reasons for this may include:

• Poor air flow within the refrigeration unit. Adequate air flow is essential for good chilling and, in particular, overloading refrigerators reduces effectiveness.

• Poor seals on doors of refrigerators. These should be repaired.

• Old equipment or siting the refrigerator in a very warm place.

The document prepared by the South Australian Government⁴ may be useful to local government EHOs in discussing the results of this survey with these premises.

**CONCLUSIONS**

The microbiological hygiene of these ready to eat, potentially hazardous, foods (as assessed in this survey) was good. However, the storage temperature of many of the food premises should be addressed as a matter of urgency by officers.

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Appendix 1: Questionnaire

EMR REGIONAL SAMPLING GROUP
READY-TO-EAT SALADS SURVEY

BACKGROUND/OBJECTIVE

Many vegetables are not cooked before eating and it is common practice for raw vegetables to be washed, chopped, packaged, chilled or frozen before consumption in and used in ready to eat salads. The aim of this survey is to determine the microbiological quality of these types of salads as a result of handling involved in preparation and the manufacturing processes and temperature control of the product.

RECOMMENDED SAMPLE TYPES

Ready to-eat raw and/or cooked salads. For example: tabouli, tossed, Caesar, Greek, coleslaw, pasta, rice.

Potato and egg salads are not to be included in this survey.

All products sampled should be made on site. Do not sample products made off site.

All samples are to be obtained and submitted for analysis between 1/02/11 and 11/03/11.

PROPOSED ANALYSIS

A minimum of 30 samples per council will be required. Councils may submit more samples if they choose to. 100 g of sample will be required for analysis and should be supplied to the laboratory in a sterile bag or container.

All samples should be placed in an esky with ice bricks and delivered to the laboratory as soon as possible after sampling.

All samples should be delivered to the laboratory with the council submission sheet and questionnaire. A single questionnaire should be filled in and supplied with each sample submitted.

STANDARDS

Raw and/or cooked salads are considered to be a ready to eat food in accordance with the Food Standards Australia New Zealand Food (FSANZ) Guidelines for the microbiological examination of Ready-To-Eat (RTE) Foods. These Standards identify four categories of microbiological quality ranging from satisfactory to potentially hazardous. This reflects both the high level of microbiological quality that is achievable for ready-to-eat foods in Australia and New Zealand and indicates the level of contamination that is considered to be a significant risk to public health.

TESTS

<table>
<thead>
<tr>
<th>Test</th>
<th>Method Requirement</th>
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<tbody>
<tr>
<td><em>Escherichia coli</em></td>
<td>Method to provide a count of between &lt;10/g and ≥10²/g</td>
</tr>
<tr>
<td>Coagulase +ve <em>Staphylococci</em></td>
<td>Method to provide a count of between &lt;10⁵/g and ≥10⁷/g</td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em> enumeration</td>
<td>Detection and enumeration Method to provide a count of between &lt;10⁵/g and ≥10⁷/g</td>
</tr>
<tr>
<td><em>Bacillus cereus</em> (for products containing pasta, rice, burghul)</td>
<td>Method to provide a count of between &lt;10⁵/g and ≥10⁷/g</td>
</tr>
<tr>
<td>Salmonella (for products containing chicken, nuts, and raw egg dressings only)</td>
<td>Method to provide presence/absence in 25g</td>
</tr>
<tr>
<td>Municipality</td>
<td>Sample Number</td>
</tr>
<tr>
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</tr>
</tbody>
</table>

**What are the main ingredients?**
- □ Leaves
- □ Rice
- □ Pasta
- □ Cheese
- □ Burghul (white grain in tabouli)
- □ Other (please specify)

**When was the product made?**

**Was the salad made on site?**
- □ Yes
- □ No

**Size of batch**

**What was the condition of the container it was stored in?**
- □ chipped/cracked
- □ food grade covered
- □ recycled food container (ice cream container)

**How was the product being stored at the time of sampling?**
- □ refrigerator/cold display
- □ coolroom
- □ ambient

**Temperature of product at time of sampling?**
- __________ °C

**How is the salad prepared?**
- □ Washed
- □ Chopped
- □ some ingredients cooked
- □ Other (please specify)

If washed explain the process: (See attached explanations)

Potable water used?

Listericidal treatment?

Separate sink?

Drying?

**Is a dressing added?**
- □ Yes
- □ No

**Does the dressing contain raw egg?** (i.e. mayonnaise, aioli)
- □ Yes
- □ No
Is the dressing made on the premise? □ Yes □ No

REFERENCES
