

ACT HEALTH PROTECTION SERVICE

**MICROBIOLOGICAL
QUALITY OF
READY-TO-EAT FOODS**

JULY 2003 – JUNE 2004

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OBJECTIVE

- Determine the bacteriological status of ready-to-eat food products available on the ACT market.
- Determine the compliance of these products to Food Standards Australia New Zealand (FSANZ) Draft Guidelines for the Microbiological Examination of Ready-to-Eat Foods.

BACKGROUND

“Ready-to-Eat” (RTE) food is 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 consumers.”¹

Sandwiches, rolls, stir-fries, baked goods as well as various other RTE foods are widely available in approximately 450 establishments of which 250 are considered to be of higher risk. Due to the diverse nature and popularity of these foods it was considered prudent to perform ongoing surveys on these products in conjunction with the Health Protection Service Premises Auditing Program of high-risk retail, food establishments.

STANDARDS

Samples collected for surveillance and monitoring purposes are often multi-component products for which there are no microbiological standards or guidelines. Interpreting the significance of the types and levels of reported microorganisms for these foods may therefore be difficult. The FSANZ Draft Guidelines for the Microbiological Examination of Ready-to-Eat Foods (the Guidelines) identify four categories of microbiological quality ranging from satisfactory to potentially hazardous. Table 1 below details the recommended guidelines. This Table reflects both the high level of microbiological quality that is achievable for RTE foods in Australia and New Zealand and also indicates the level of contamination that is considered to be a significant risk to public health.

Table 1¹

Test	Microbiological Quality (CFU per gram)			
	Satisfactory	Marginal	Unsatisfactory	Potentially Hazardous
Standard Plate Count (SPC)				
Level 1*	<10 ⁴	<10 ⁵	≥10 ⁵	
Level 2*	<10 ⁶	<10 ⁷	≥10 ⁷	
Level 3*	N/A	N/A	N/A	
Indicators				
<i>Escherichia coli</i>	<3	3-100	>100	**
Pathogens				
Coagulase positive staphylococci	<10 ²	10 ² -10 ³	10 ³ -10 ⁴	≥10 ⁴ SET +ve
<i>Bacillus cereus</i>	<10 ²	10 ² -10 ³	10 ³ -10 ⁴	≥10 ⁴
Salmonella spp.	not detected in 25g			detected
<i>Listeria monocytogenes</i>	not detected in 25g	detected but <10 ² #		≥10 ² ##

NOTE:

*see below “Standard Plate Counts” for definition of level.

** Pathogenic strains of *E. coli* should be absent.

Foods with a long shelf life stored under refrigeration should have no *L. monocytogenes* detected in 25g.

The detection of *L. monocytogenes* in ready-to-eat-foods prepared specifically for “at risk” population groups (the elderly, immuno-compromised and infants) should also be considered as potentially hazardous.

SET +ve: Staphylococcus enterotoxin positive.

N/A – SPC testing not applicable. This applies to foods such as fresh fruits and vegetables (including salad vegetables), fermented foods and foods incorporating these (such as sandwiches and filled rolls).

Standard Plate Count (SPC)

The Standard Plate Count (SPC), also referred to as the Aerobic Plate Count or the Total Viable Count, is one of the most common tests applied to indicate the microbiological quality of food. The total count of viable microbes reflects the handling/ storage history of the food. Total counts may be taken to indicate the type of sanitary control exercised in the production, transport, and storage of the food. The significance of SPC, however, varies markedly according to the type of food product and the processing it has received. When the SPC testing is applied on a regular basis it can be a useful means of observing trends by comparing SPC results over time. Three levels of SPC are listed in Table 1 based on food type and the processing/ handling the food has undergone.

Level 1 – applies to ready-to-eat foods in which all components of the food have been cooked in the manufacturing process/preparation of the final food product and, as such, microbial counts should be low.

Level 2 – applies to ready-to-eat foods which contain some components which have been cooked and then further handled (stored, sliced or mixed) prior to preparation of the final food or where no cooking process has been used.

Level 3 – SPCs not applicable. This applies to foods such as fresh fruits and vegetables (including salad vegetables), fermented foods and foods incorporating these (such as sandwiches and filled rolls). It would be expected that these foods would have an inherent high SPC because of the normal microbial flora present.

Note: An examination of the microbiological quality of a food should not be based on SPC alone. The significance of high (unsatisfactory) SPC cannot truly be made without identifying the microorganisms that predominate or without other microbiological testing.

SURVEY

This survey was conducted between the 01 July 2003 and 29 June 2004. During this period 278 samples from 74 ACT retail outlets were collected randomly by Health Protection Service Officers (HPS) and processed by Australian Capital Territory Government Analytical Laboratory (ACTGAL). The samples were collected in such a manner as to cover a wide range of the available RTE food types including salads, sushi, pies, quiches, sandwiches, noodles, pasta, meats and desserts. The SPC, *E.coli*, coagulase positive *Staphylococci* analyses assessed samples for overall hygiene quality. Where the foods contained meat/rice, other food pathogens such as *Salmonella* sp, *Listeria monocytogenes* and *Bacillus cereus* were tested. The survey collected multiple samples from single outlets and outlets were only tested once.

RESULTS / DISCUSSION

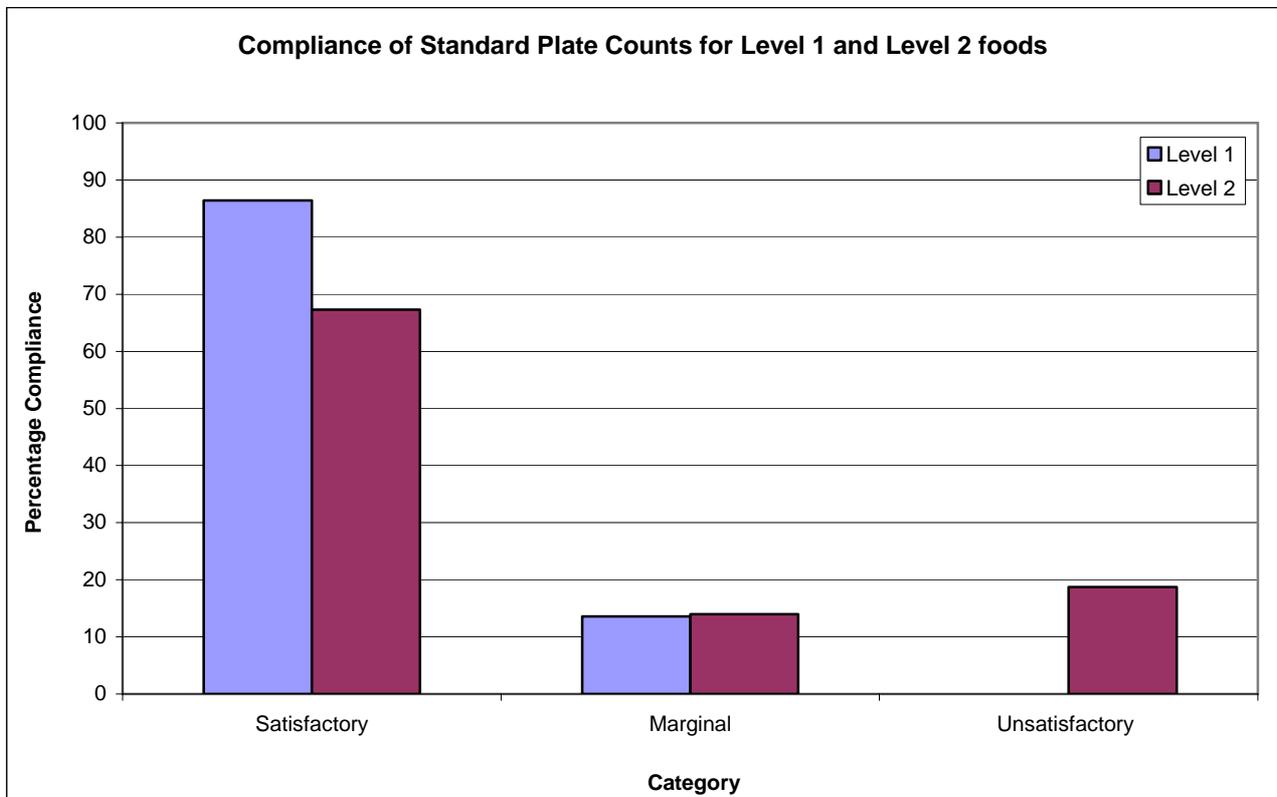
Standard Plate Counts (SPC)

All samples (278) were tested for SPC. The results for the samples ranged between <50 and 3,700,000,000 colony forming units per gram (cfu)/g. A total of 59 of the RTE food samples were assessed as having to comply with the Level 1 SPC criterion with counts ranging between <50 and 100,000 cfu/g. Of the 59 samples, 8 (13.6%) were in the marginal category while 51 samples (86.4%) were in the satisfactory category. There were no samples in the unsatisfactory category.

A total of 107 samples were assessed as having to comply with the Level 2 SPC criterion. The results ranged between <50 and 340,000,000cfu/g. 20 of these samples (18.7%) were in the unsatisfactory category. 15 samples (14.0%) were in the marginal category while 72 samples (67.3%) were satisfactory.

A total 111 samples were assessed as having to comply with the Level 3 SPC criterion as such the SPC test is not applicable to these products. The results for these products ranged from 250 to as high as 3,700,000,000 cfu/g. This is to be expected as these foods, (mostly raw fruits and vegetables or fermented foods) would have an inherently high SPC because of their normal microbial flora.

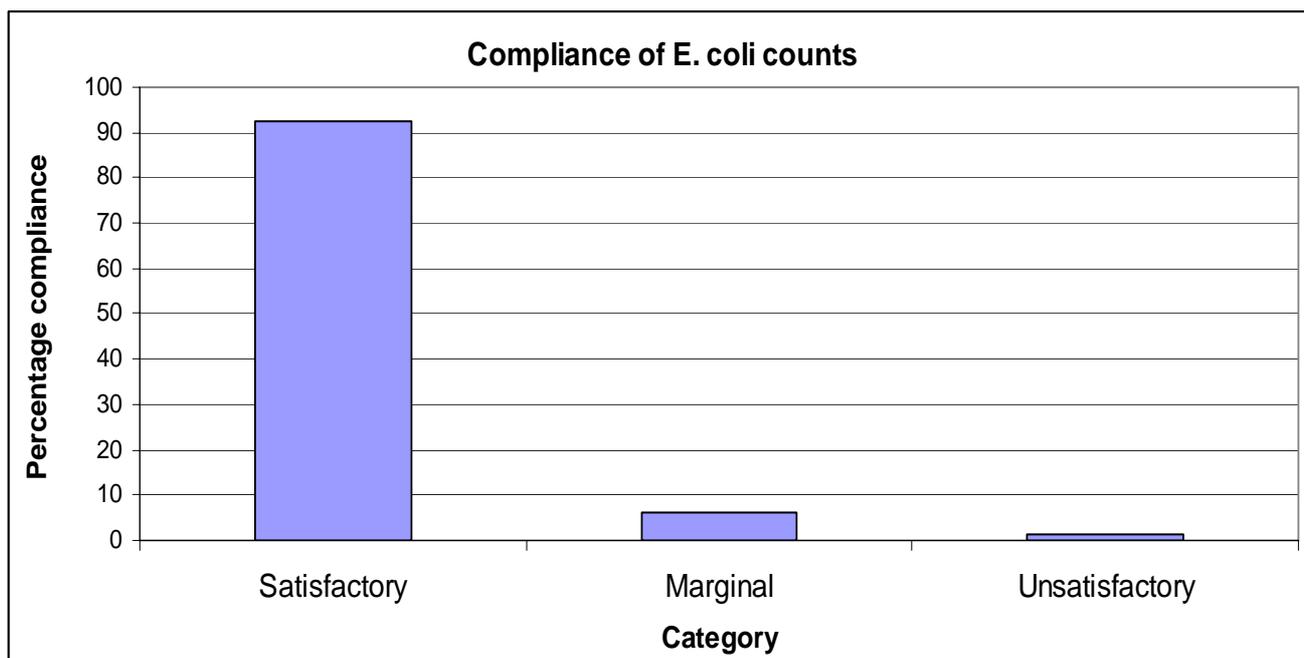
Figure 1.



Escherichia coli

278 samples were tested for *E. coli*. Figure 2 represents the results for the three microbiological categories included in the Guidelines. The presence of *E. coli* in RTE foods is undesirable because it indicates that the food has possibly been prepared under poor hygienic conditions. Ideally *E. coli* should not be detected and as such a level of <3 cfu per gram (the limit of the Most Probable Number test) has been set for satisfactory samples. 257 (92.4%) of the samples had <3 cfu/g *E. coli* and met the satisfactory criterion. There were 17 (6.1%) samples with *E. coli* in the marginal category i.e. from 3 to 100cfu/g. Levels exceeding 100 per gram are unsatisfactory and indicate a level of contamination which may have introduced pathogens or that pathogens, if present in the food prior to processing, may have survived processing.¹ A total of 4 (1.4%) samples had levels >100 cfu/g of *E. coli* and were considered unsatisfactory. Resamples were requested from these items. The resamples received were negative on retesting.

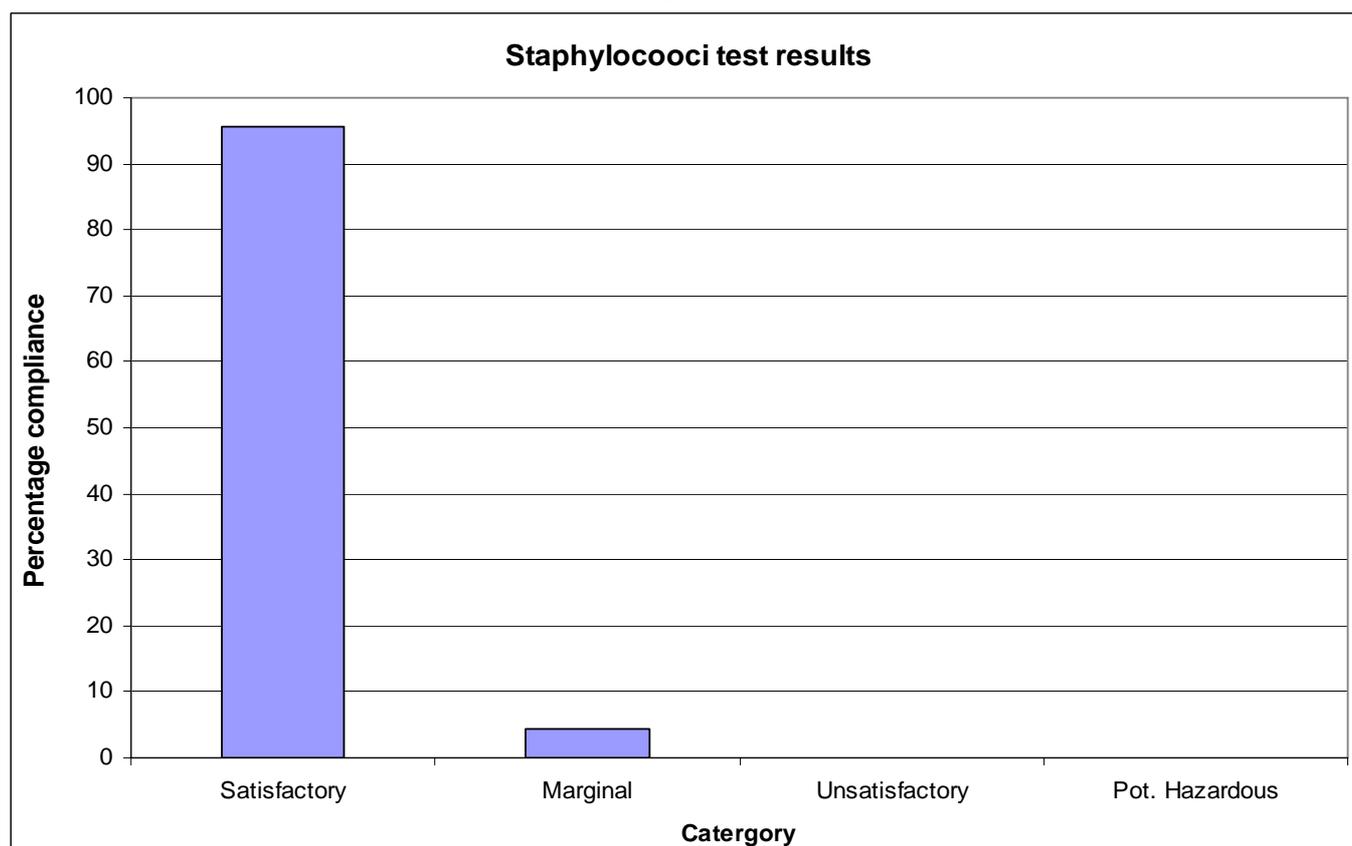
Figure 2.



Coagulase positive *Staphylococci*

278 RTE samples were tested for coagulase positive *Staphylococci*. 266 (95.7%) of the samples were in the satisfactory category, i.e. <100 cfu/g, while 12 samples (4.3%) were in the marginal category i.e. 100-1000cfu/g. There were no samples in the unsatisfactory or Potentially Hazardous categories. See Figure 3. The positive results for coagulase positive *Staphylococci* ranged from 50-750cfu/g. The presence of coagulase positive *Staphylococci* indicate that handling and/or time/temperature abuse of a food is likely to have occurred due to improper procedures during food preparation.

Figure 3



***Salmonella* spp.**

Salmonella spp. was not detected in any of the 278 samples tested. RTE foods should be free of *Salmonella* as consumption of food containing this pathogen may result in food borne illness.

Listeria monocytogenes

273 samples were analysed for *Listeria monocytogenes*. 263 (96.3%) of the samples were satisfactory i.e. *Listeria monocytogenes* was not detected, whereas 10 (3.7%) samples were positive for *Listeria monocytogenes*. Foods in which all components have been cooked in the final food preparation, or have received some other listericidal treatment, should be free of *Listeria monocytogenes*. The detection of *L. monocytogenes* in such foods indicates the food was inadequately cooked or the food was contaminated post preparation. The detection of high levels ($>10^2$ cfu/g) of *Listeria monocytogenes* in RTE foods that have not undergone a listericidal treatment indicates a failure of food handling controls and is also considered a public health risk.

***Bacillus cereus* (Tested for in RTE foods containing rice only)**

22 samples contained rice and were tested for *B. cereus*. 21 (95.5) of samples tested were satisfactory with and 1 sample (4.5%) in the potentially hazardous category i.e. $>10,000$ cfu/g

CONCLUSION

Overall the results of the 2003-4 Ready-to-Eat survey were similar to or better than the results for the previous three years. The percentage of results in the satisfactory category for, both level I and level 2 SPC counts were the highest since the survey started.

BIBLIOGRAPHY

1. Guidelines for the microbiological examination of ready-to-eat foods FSANZ Dec 2001