

ACT HEALTH PROTECTION SERVICE

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

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Report prepared by
Geoff Millard and Simon Rockliff

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 consumers¹.”

Sandwiches, rolls, stir-fries, baked goods as well as various other RTE foods are widely available in approximately 450 ACT establishments. 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 Environmental Health Section Premises Auditing Program of high-risk food producing establishments. The previous surveys on RTE foods conducted in 2000-2001 and 2001-2002 highlighted some problems with handling, storage and cross-contamination. This is a report on the third year’s survey including comparisons with the previous two years results.

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 09 July 2002 and 24 June 2003. During this period 193 samples from 69 ACT retail outlets were collected randomly by Environmental Health Officers (EHO) and processed by the Microbiology Unit of 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, 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* spp., *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)

A total of 190 samples were tested for SPC. The results for all samples ranged between <50 and 790,000,000 colony forming units (cfu)/g. A total of 55 of the RTE food samples were assessed as having to comply with the Level 1 criterion. Of these 9 (16.4%) samples gave unsatisfactory results, 13 (23.6%) gave marginal results and 33 (60%) gave satisfactory results.

A total of 78 samples were assessed as having to comply with the Level 2 criterion. The results ranged between <50 and 2,300,000,000 cfu/g. Of these 13 (16.6%) samples that were tested gave unsatisfactory results, 20 (25.6%) gave marginal results and 45 (57.8%) gave satisfactory results. A total 60 samples were assessed as having to comply with the Level 3 criterion. The SPC test is not applicable to these products. The results these products ranged from as low as 1000 to as high as 260,000,000 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.

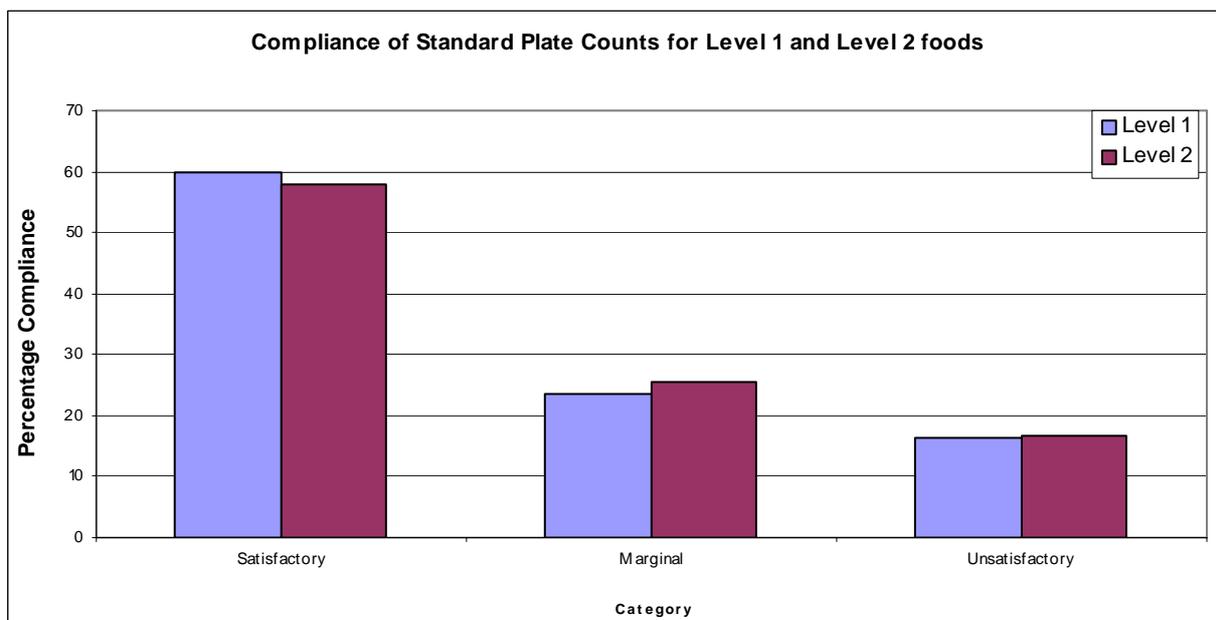
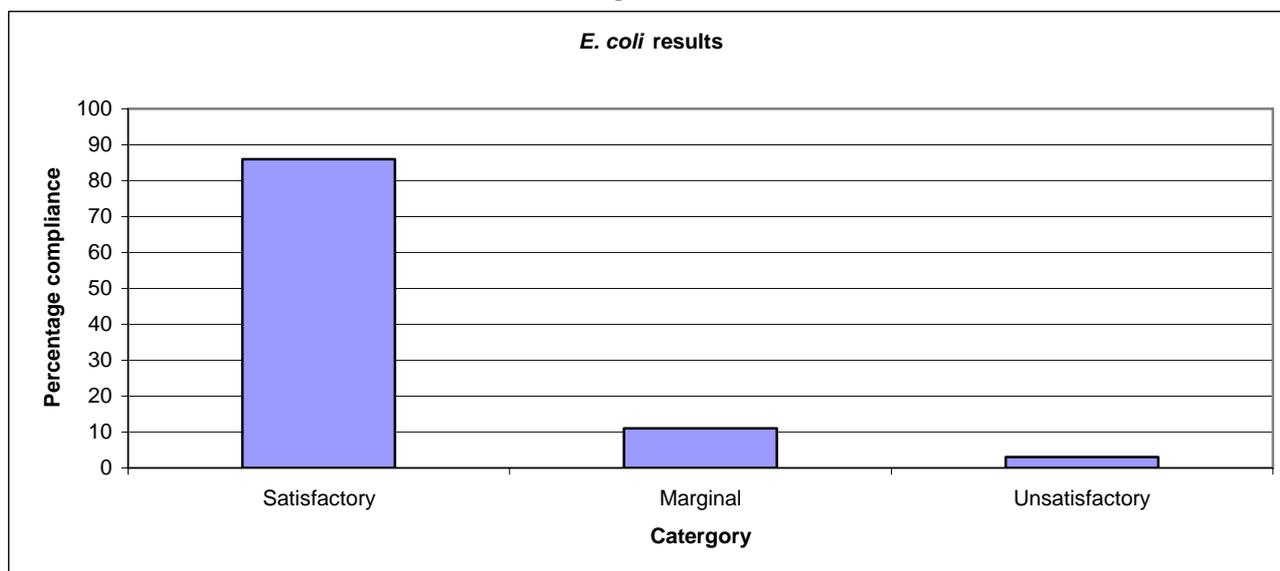


Figure 1 illustrates the results for the three SPC categories. The majority of the results were satisfactory or marginal and no further action is required for these samples/premises.

The marginal results while within the limits of acceptable microbiological quality may indicate possible hygiene problems in the preparation of the food. The unsatisfactory results are outside of the acceptable microbiological limits and are indicative of poor hygiene or food handling practices. One surveyed outlet had unsatisfactory results for foods sampled across all three SPC criteria. Further sampling of the foods from this and other premises may be required and an investigation undertaken to determine whether food handling controls and hygiene practices are adequate.

Figure 2.

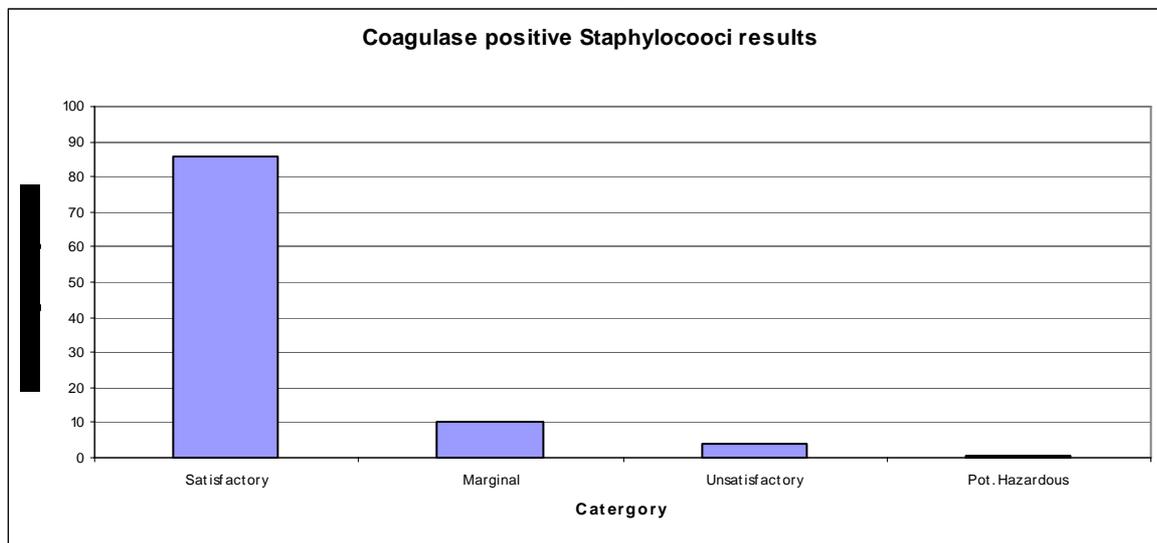


Escherichia coli

193 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 given as the satisfactory criterion for this organism. 166 (86%) of the

samples had <3 cfu/g *E.coli* and met the satisfactory criterion. Levels exceeding 100 per gram are unacceptable 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 6 (3%) samples had levels of >100 cfu/g to >1100 cfu/g *E. coli* and considered unsatisfactory. There were 21 (11%) samples with *E. coli* in the marginal range from 4 to 75 cfu/g.

Figure 3



Coagulase positive *Staphylococci*

183 RTE samples were tested for coagulase positive *Staphylococci*. 157 (86%) of the samples were satisfactory i.e. <100 cfu/g, 18 (10%) samples were “marginal” i.e. 100-1000 cfu/g, 7 (4%) were “unsatisfactory” i.e. 1000-10000 cfu/g and 1(0.5%) was potentially hazardous. See Figure 3. The positive results for coagulase positive *Staphylococci* ranged from 50-27000. The presence of coagulase positive *Staphylococci* indicate that handling and/or time/temperature abuse of a food is likely to have occurred following improper procedures during food preparation. A resample of the potentially hazardous product was negative.

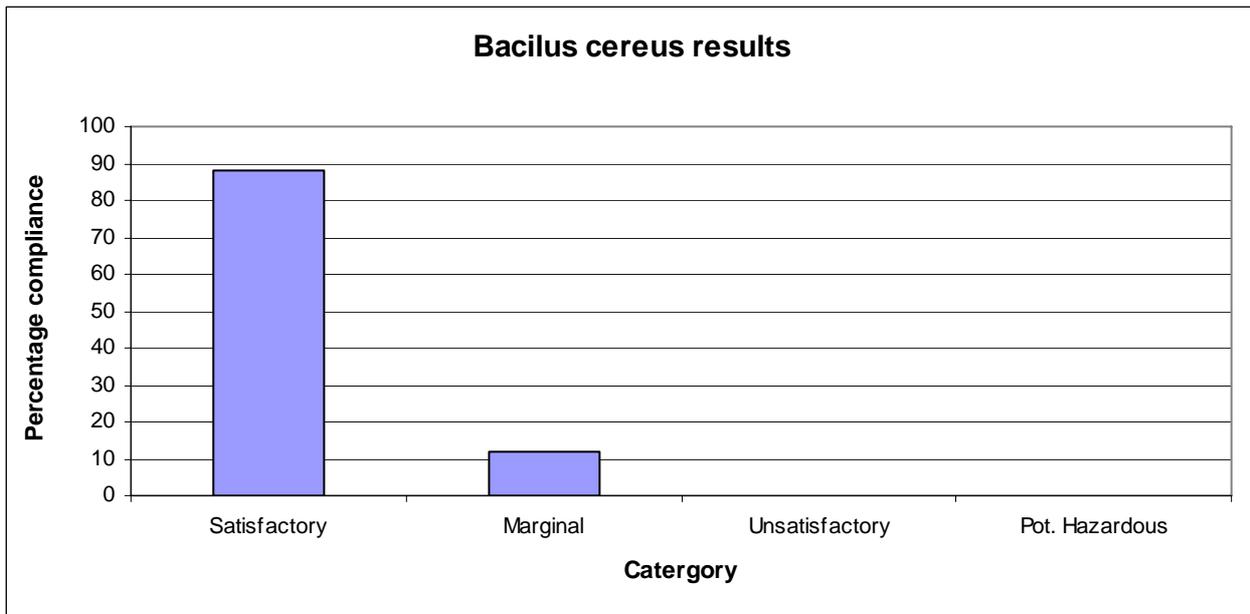
***Salmonella* spp.**

Salmonella spp. was detected in 1 (0.6%) of the 183 samples tested. Resamples of this product were negative. RTE foods should be free of *Salmonella* as consumption of food containing this pathogen may result in food borne illness.

Listeria monocytogenes

188 samples were analysed for *Listeria monocytogenes*. 184 (97.8%) of the samples were satisfactory i.e. *Listeria monocytogenes* was not detected, whereas 4 (2.2%) 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 (>10² 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.

Figure 4



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

33 samples contained rice and were tested for *B. cereus*. 29 (88%) of samples tested were satisfactory and 4 (12%) gave a marginal result. There were no unsatisfactory or potentially hazardous results.

CONCLUSION

In general the microbiological quality of the Ready-to-eat foods sold in the ACT is good, however the analysis of the trends of positive samples indicate that some premises are inadequately handling / processing the food product they produce.

BIBLIOGRAPHY

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