# MICROBIOLOGICAL QUALITY OF READY-TO-EAT FOODS

# ACT HEALTH PROTECTION SERVICE

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## BACKGROUND/OBJECTIVE

Ready-to-Eat (RTE) food is food that is ordinarily consumed in the same condition 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.

Sandwiches, rolls, stir-fries, baked goods as well as various other RTE foods are widely available in the Australian Capital Territory (ACT) with approximately 250 different licensed outlets. Due to the diverse nature and popularity of these foods it was considered prudent to perform ongoing surveys on these products. The survey of RTE products was undertaken for three main reasons:

1. To determine the bacteriological status of ready-to-eat food products available on the ACT market.
2. To determine the compliance of these products to Food Standards Australia New Zealand (FSANZ) Guidelines for the Microbiological Examination of Ready-to-Eat Foods 2001 (FSANZ RTE Guidelines).
3. To complement and focus audits of high-risk food producing establishments.

## STANDARDS

The FSANZ RTE Guidelines identify four categories of microbiological quality ranging from satisfactory to potentially hazardous. Table 1 details the recommended guidelines. Table 1 not only reflects both the high level of microbiological quality that is achievable for RTE foods in Australia and New Zealand but also indicates the level of contamination that is considered to be a significant risk to public health.

**Table 1**

| Test | Microbiological Quality (colony forming units per gram(cfu/g)) | | | |
|---|---|---|---|---|
| | **Satisfactory (S)** | **Marginal (M)** | **Unsatisfactory (U)** | **Potentially Hazardous (PH)** |
| **Standard Plate Count (SPC)** | | | | |
| Level 1* | $<10^4$ | $<10^5$ | $\geq 10^5$ | |
| Level 2* | $<10^6$ | $<10^7$ | $\geq 10^7$ | |
| Level 3* | N/A | N/A | N/A | |
| **Indicators** | | | | |
| *Escherichia coli (E. coli)* | <3 | 3-100 | >100 | ** |
| **Pathogens** | | | | |
| Coagulase positive *staphylococci (Staph)* | $<10^2$ | $10^2$-$10^3$ | $10^3$-$10^4$ | $\geq 10^4$ SET +ve |
| *Bacillus cereus (B. cereus)* | $<10^2$ | $10^2$-$10^3$ | $10^3$-$10^4$ | $\geq 10^4$ |
| Salmonella | not detected in 25g | | | detected |
| *Listeria monocytogenes (L. monocytogenes)* | not detected in 25g | detected but $<10^{2\ \#}$ | | $\geq 10^{2\ \#\#}$ |

**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).
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 i.e. fried chicken.
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 i.e. custard slice.
Level 3 – SPC 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

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 predominant microorganisms or other microbiological testing.

## SURVEY

This survey was conducted between July 2010 and June 2011. A total of 156 samples were collected from fifty two different ACT retail outlets. A total of twenty five re-samples were also collected. The samples were randomly collected by the Public Health Officers (PHO) and processed by the Microbiology Unit of the Health Protection Service (HPS). The survey collected multiple samples from single outlets and in general outlets were only tested once.

The samples were collected in such a manner as to cover a wide range of the available ready to eat food ranging from dips to grilled chicken. All of the samples were tested for the hygiene indicators SPC and *E. coli,* and the food pathogens coagulase positive *Staphylococci, Salmonella* species and *L. monocytogenes*. Foods containing pasta or rice were also tested for *B. cereus*.

Where the HPS identifies non compliance issues in food businesses, corrective actions are addressed through a graduated and proportionate response. Unsatisfactory results, excluding those for SPC are re-sampled. Marginal results may be re-sampled; this is dependent on resources as these foods are still considered compliant. Unsatisfactory SPC results are not re-sampled unless pathogens are also isolated.

## MICROBIOLOGICAL METHOD OF ANALYSIS

- *Salmonella* AS 1766.2.5 – 1991 (modified).
- SPC AS 5013.5 – 2004.
- *B. cereus* AS 5013.2 – 2007.
- Coagulase positive *staphylococci* AS 5013.12.2 – 2004.
- *E. coli* ISO:16649.2 – 2001.
- *L. monocytogenes AS* 1766.2.16.1 – 1998 (modified).

The sample preparation for SPC, *E. coli,* coagulase positive *staphylococci* and *B. cereus* consisted of:

- 25g of sample being homogenised with 225mL of 0.1% peptone diluent
- subsequent serial dilutions were prepared for use in enumeration.

***B. cereus* enumeration:** Spread plates (using a 100µl of each dilution) on a solid selective medium containing egg yolk and mannitol (MYP agar). Typical large, pink colonies, with or without lecithinase action were counted and a proportion of the colonies confirmed by a haemolysis test and spore staining. *B. cereus* cells are rods 4-5 μm long and 1-1.5 μm wide and stain red. The cells contain black-stained lipid globules. The spores stain green, are ellipsoidal in shape, central to sub central in position, and do not swell the sporangium.

**Coagulase positive *Staphylococci* enumeration:** Pour plates (using 1.0 ml of each dilution) of Baird Parker medium with rabbit plasma fibrinogen added were prepared in duplicate and incubated at 37°C/48h. Typical black colonies, surrounded by a halo of precipitation, were counted.

***E. coli* enumeration:** Pour plates using 1.0 ml in each plate of TBX media were prepared and incubated at 37 degrees Celsius for 4 hours and then 44 degrees Celsius for 18-24 hours. Typical blue/green colonies were counted.

***Salmonella* detection:** 25g of sample was weighed out aseptically and homogenised with 225mL buffered peptone water (non-selective enrichment) and incubated at 37°C/16-20h. Aliquots were then transferred into Brain Heart Infusion broth (BHI) and incubated for 3h. DNA was extracted from 200uL of enriched BHI. This was screened for the presence of *Salmonella* using a BAX cyber green Polymerase Chain Reaction (PCR) and a BAX Q7. No confirmation testing was performed as there were no samples that screened positive.

**SPC:** Pour plates (using a 1.0ml of each dilution or 0.1ml at the -6 dilution) of plate count agar where incubated at 30 ºC/72h. Plates from the dilution on which there are greater 15 and less than 300 colonies visible were counted. Counts outside this range were considered estimate counts only.

***L. monocytogenes* detection:** 25g of sample was weighed out aseptically and homogenised with 225mL half Fraser broth (selective enrichment) and incubated at 30°C/24h. Aliquots were then transferred into a single tube of Fraser broth incubated for 37°C/48h and MOPS BLEB broth incubated for 37°C/24h. DNA was extracted from 200uL of enriched MOPS BLEB broth. This was screened for the presence of *L. monocytogenes* using a BAX cyber green PCR and a BAX Q7. No confirmation testing was performed as there were no samples that screened positive.

## RESULTS

| Test | Coagulase positive staphylococci (n=150) | *L. monocytogenes* (n=151) | *Salmonella sp* (n=154) | *E.coli* (n=156) | SPC (n=156) | *B. cereus* (n=37) |
|---|---|---|---|---|---|---|
| **Number of marginal samples** | Nil | 5 | N/A | 3 | 7 | 1 |
| **Number of unsatisfactory samples** | Nil | Nil | N/A | 1 | 7 | 3 |
| **Number of Potentially Hazardous samples** | Nil | Nil | Nil | N/A | N/A | 2 |

Detailed results are tabled in Appendix B.

## DISCUSSION

### SPC

All samples (156) were tested for SPC. The results for all the samples ranged between <50 and 3.4 x $10^8$ colony forming units per gram (cfu/g). A total of seven samples were in the marginal range (4.5% of the total SPC tests) and a total of seven samples were in the unsatisfactory range (4.5% of the total SPC tests).

Sixty five samples were assessed as being in the Level 1 category. The results for these products ranged from <50 to 4.3 x $10^6$ cfu/g. Five samples (7.7% of the total level 1 SPC tests) were in the marginal category. Four samples (6.2% of the total level 1 SPC tests) were in the unsatisfactory category: roasted pumpkin quiche, vegetable samosa, beef lasagne and pork dumpling. High SPC for cooked products suggests that the handling or storage of these foods may have been less than optimal. No re-samples were taken of these foods as no pathogens or *E. coli* were detected at the time of testing.

Twenty six samples were assessed as being in the level 2 category. The results for these products ranged from <50 to 1.6 x $10^6$ cfu/g. Two samples were in the marginal category (7.7% of the total level 2 SPC tests). Three samples (11.5% of the total level 2 SPC tests) were in the unsatisfactory category: Greek burek, chocolate mousse and beef brisket. High SPC for cooked products suggests that the handling or storage of these foods may have been less than optimal. No re-samples were taken of these foods as no pathogens or *E. coli* were detected at the time of testing.

A total of sixty five samples were assessed as applying to the Level 3 SPC criterion. The SPC test is not applicable to these products. The results for these products ranged from 100 to 3.4 x $10^8$ cfu/g.

***E. coli***

All samples (156) were tested for *E. coli*. 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/g has been set for satisfactory samples. One hundred and fifty two (97.4%) samples tested in this survey had <3 cfu/g of *E. coli* and met the satisfactory criterion. There were three (1.9%) samples in the marginal category. Two of the marginal samples (chicken sushi roll and salmon sushi roll) were re-sampled as they were positive for *L. monocytogenes*. Follow-up action and five re-samples were taken including other products from the same premises that reported the unsatisfactory result. All the re-samples reported satisfactory results.

There was one (0.6%) sample (vegetable rice salad) in the unsatisfactory category. Five re-samples were taken including other products from the same premises and were tested for *E. coli* and all of the pathogens in Table 1. Four of the re-samples reported satisfactory results and one marginal result (tomato, cucumber, onion couscous) for *E. coli* and satisfactory results for the other tests. The premises was advised of corrective action that could be taken to improve food preparation and handling.

The detection of *E. coli* in foods is not a direct indication that the food is unsafe rather it is an indication of potential problems involving the preparing and handling of foods.

**Coagulase positive *Staphylococci***

One hundred and fifty samples were tested for coagulase positive *Staphylococci.* All samples tested in this survey had met the satisfactory criterion i.e. <100 cfu/g. Six samples were not tested due testing media not being available.

***Salmonella***

*Salmonella* was not detected in any of the 154 samples tested; two samples were not tested due insufficient sample size. RTE foods should be free of *Salmonella* as consumption of food containing this pathogen may result in food borne illness. All RTE foods are tested for the presence of *Salmonella* spp. in 25g.

***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 *L. monocytogenes*. The detection of *L. monocytogenes* in such foods indicates the food was inadequately prepared or the food was contaminated post preparation. The detection of higher levels (>$10^2$ cfu/g) of *L. monocytogenes* in RTE foods indicates a failure of food handling controls and is also considered a public health risk.

All RTE foods are tested for the presence of *L. monocytogenes* in 25g. If *L. monocytogenes* is detected PHO will inspect the premises and collect a resample of the food item if available. This re-sample will be tested semi-quantitatively to measure the level of *L. monocytogenes* in the food.

One hundred and fifty one samples were analysed for *L. monocytogenes*. *L. monocytogenes* was found in five samples (3.3%). Five samples were not tested due testing media not being available. Two samples from one premises and three

from another premises reported positive results for *L. monocytogenes*. Follow-up action and five re-samples were taken for the two positive samples of chicken sushi roll and salmon sushi roll from the first premises. All the re-samples reported satisfactory results from this particular premises. Follow-up action and five re-samples were taken for the three positive samples of chicken sushi roll, salmon sushi roll and beef sushi roll from the second premises. All of these re-samples reported satisfactory results for *L. monocytogenes*.

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

Thirty seven samples containing rice or pasta were tested for *B. cereus.* Thirty one samples (83.8%) tested were satisfactory reporting counts of less than 100cfu/g. There was one sample (2.7%) samples in the marginal category. There were three (8.1%) samples (inari roll, chicken sushi roll and salmon sushi roll) from two premises in the unsatisfactory category and two (5.4%) samples (beef sushi roll and vegetable rice salad) from two premises in the potentially hazardous category. Beef sushi roll, chicken sushi roll and salmon sushi roll where from the same premises, inari roll and vegetable rice salad was from two other premises.

Follow-up action and five re-samples were taken for the vegetable rice salad sample including other products from the same premises and were tested for *B. cereus* and all of the pathogens listed in Table 1. All of the re-samples reported satisfactory results for *B. cereus* of less than 100cfu/g and satisfactory results for the other tests.

Follow-up action and five re-samples were taken for the inari roll sample including other products from the same premises and were tested for *B. cereus* and all of the pathogens listed in Table 1. All of the re-samples reported satisfactory results for *B. cereus* of less than 100cfu/g and satisfactory results for the other tests except one follow-up sample (salmon sushi roll) reported an unsatisfactory *E. coli* result and another sample reported (seaweed sushi) a marginal *E. coli* result. A further five re-samples were conducted with four re-samples reporting marginal results for *E. coli* and one reporting an unsatisfactory for *E. coli*. Two of the samples also reported marginal result for *B. cereus and* another reported a marginal result for coagulase positive *Staphylococci.* Further enforcement action was taken with this particular premises including advising of what immediate corrective action could be taken to improve food preparation and handling.

Follow-up action and five re-samples were taken for the beef sushi roll, chicken sushi roll and salmon sushi roll including other products from the same premises and were tested for *B. cereus* and all of the pathogens listed in Table 1. All of the re-samples reported satisfactory or marginal results for *B. cereus*. The premises was advised of what corrective action could be taken to improve food preparation and handling.

## CONCLUSION

The microbiological quality of the RTE foods surveyed in the ACT is good. Overall the results have improved compared to those found in the previous five years (Appendix A). Raw results of the analysis are attached at Appendix B. SPC results for 2010-2011 has seen decrease in satisfactory results for level one samples but a slight increase in level two samples. This could indicate poor temperature control, inadequate reheating or the age of products sold.

The overall results for pathogens have remained steady when compared to previous years. Coagulase positive *Staphylococci* and *E. coli* results have improved on previous years, whereas satisfactory *L. monocytogenes* and *B. cereus* have decreased. The percentage of satisfactory samples for *Salmonella* has been very consistent, with none isolated in the last five years. Poor *B. cereus* results can be attributed to two particular premises and the poor *L. monocytogenes* results are due to one premises. In conclusion, the results of this survey overall show a very high level of compliance with the FSANZ RTE Guidelines.

## BIBLIOGRAPHY


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3. Microbiological Quality of Ready-To-Eat Foods 2007-2008, ACT Health Protection Service.
4. Microbiological Quality of Ready-To-Eat Foods 2008-2009, ACT Health Protection Service.
5. Microbiological Quality of Ready-To-Eat Foods 2009-2010, ACT Health Protection Service.
6. Foodborne Microorganisms of Public Health Significance, AIFST Inc. Food Microbiology Group.

## APPENDIX A

## COMPARISON TO PREVIOUS SURVEYS: 2006–2007, 2007–2008, 2008–2009 and 2010 -2011

One can be seen from Tables 1 and 2 below that the quality of RTE foods varies depending on the test. The percentage of satisfactory samples in both the SPC Level 1 and 2 categories have improved since the 2006-7 year. SPC results for 2009-2010 has seen improvement in satisfactory results for level one samples but a decrease in level two samples. Whereas results for pathogens tested has improved on previous years.

### Table 1

**Comparison of Standard Plate Counts (rounded)**

| % | Satisfactory | | | | | Marginal | | | | | Unsatisfactory | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **06-07** | **07-08** | **08-09** | **09-10** | **10-11** | **06-07** | **07-08** | **08-09** | **09-10** | **10-11** | **06-07** | **07-08** | **08-09** | **09-10** | **10-11** |
| **Level 1** | 95.0 | 98.6 | 90.0 | 100 | 85.9 | 5.0 | 1.4 | 8.0 | 0.0 | 7.7 | 0.0 | 0.0 | 2.0 | 0.0 | 6.2 |
| **Level 2** | 88.0 | 91.1 | 90.0 | 76.5 | 80.8 | 12.0 | 5.1 | 6.0 | 0.0 | 7.7 | 0.0 | 3.8 | 4.0 | 23.5 | 11.5 |
| **Level 3** | | | | | | | | | | | | | | | |

### Table 2

| % | 2006-2007 | | | | 2007-2008 | | | | 2008-2009 | | | | 2009-2010 | | | | 2010-2011 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Sat** | **Marg** | **Unsat** | **Pot. Haz** | **Sat** | **Marg** | **Unsat** | **Pot. Haz** | **Sat** | **Marg** | **Unsat** | **Pot. Haz** | **Sat** | **Marg** | **Unsat** | **Pot. Haz** | **Sat** | **Marg** | **Unsat** | **Pot. Haz** |
| ***E. coli*** | 86 | 11.0 | 3.0 | | 93.1 | 6.5 | 0.4 | | 94.4 | 5.0 | 0.6 | | 95.3 | 3.5 | 1.2 | | 97.5 | 1.9 | 0.6 | |
| ***Coagulase +ve Staphylococcus*** | 84 | 10.1 | 4.8 | 3.0 | 99.1 | 0.9 | 0.0 | 0.0 | 100 | 0.0 | 0.0 | 0.0 | 94.2 | 5.8 | 0.0 | 0.0 | 100 | 0.0 | 0.0 | 0.0 |
| ***Salmonella* spp.** | 100 | | | 0.0 | 100 | | | 0.0 | 100 | | | 0.0 | 100 | | | 0.0 | 100 | | | 0.0 |
| ***L. monocytogenes*** | 97.8 | 2.2 | | 0.0 | 99.6 | 0.4 | | 0.0 | 100 | 0.0 | | 0.0 | 100 | 0.0 | | 0.0 | 96.8 | 3.2 | | 0.0 |
| ***B. cereus*** | 88.0 | 12.0 | 0.0 | 0.0 | 93.1 | 6.9 | 0.0 | 0.0 | 92.0 | 8.0 | 0.0 | 0.0 | 100 | 0.0 | 0.0 | 0.0 | 83.8 | 2.7 | 8.1 | 5.4 |

**Comparison between the Microbiological Quality indicators**

Sat – Satisfactory, Unsat – Unsatisfactory, Marg – Marginal, Pot. Haz – Potentially Hazardous.

Not applicable

## Appendix B

| Sample | Level | SPC | E. coli | Staph | Salmonella | L. monocytogenes | B. cereus | Assessment |
|---|---|---|---|---|---|---|---|---|
| **Tuna wrap** | 3 | 700000 | <3 | <50 | Absent | Absent | N/A | S |
| **Moroccan beef warp** | 3 | 700000 | <3 | <50 | Absent | Absent | N/A | S |
| **Sundried tomato and pesto pasta salad.** | 3 | 3400000* | <3 | <50 | Absent | Absent | <50 | S |
| **Chicken sushi roll** | 3 | 300000 | 20 | <50 | Absent | Present | <50 | M |
| **Salmon sushi roll** | 3 | 340000 | 40 | <50 | Absent | Present | <50 | M |
| **White Bread** | 1 | 100* | <3 | <50 | Absent | Absent | N/A | S |
| **Chicken pie** | 2 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Ham and cheese crispy** | 2 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Caesar salad** | 3 | 1800000 | <3 | <50 | Absent | Absent | N/A | S |
| **Chick pea & tomato salad** | 3 | 26000000 | <3 | <50 | Absent | Absent | N/A | S |
| **Baklava** | 2 | 180000 | <3 | <50 | Absent | Absent | N/A | M |
| **Greek burek** | 2 | 1500000 | <3 | <50 | Absent | Absent | N/A | U |
| **Egyptian pastry** | 2 | 1600* | <3 | <50 | Absent | Absent | N/A | S |
| **Smoked salmon quiche** | 2 | 540000 | <3 | <50 | Absent | Absent | N/A | M |
| **Roasted pumpkin quiche** | 1 | 1100000 | <3 | <50 | Absent | Absent | N/A | U |
| **Thai chicken wrap** | 3 | 500000 | <3 | <50 | Absent | Absent | N/A | S |
| **Ham semi dried tomato and cheese wrap** | 3 | 840000 | <3 | <50 | Absent | Absent | N/A | S |
| **Pesto chicken and sun dried tomato** | 3 | 25000* | <3 | <50 | Absent | Absent | N/A | S |
| **Ham salad sandwich** | 3 | 1600000 | <3 | <50 | Absent | Absent | N/A | S |
| **Silverside, cheese and pickle sandwich** | 3 | 390000 | <3 | <50 | Absent | Absent | N/A | S |
| **Salmon sushi roll** | 3 | 1300000 | <3 | NP | Absent | Absent | <50 | S |
| **Pecking duck sushi roll** | 3 | 120000* | <3 | NP | Absent | Absent | <50 | S |
| **Inari roll** | 3 | 880000 | <3 | NP | Absent | Absent | 2500 | U |
| **chicken sushi roll** | 3 | 90000* | <3 | NP | Absent | Absent | <50 | S |
| **SPC California seafood inari** | 3 | 300* | <3 | NP | NP | Absent | <50 | S |
| **Potato pie** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Pepper steak pie** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Blue berry danish** | 2 | 6800 | <3 | <50 | Absent | Absent | N/A | S |
| **Chiko roll** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Chicken shish kebab** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Steak and mushroom pie** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Curry vegetable samosa** | 1 | 150* | <3 | <50 | Absent | Absent | N/A | S |
| **Quiche spinach** | 1 | 150* | <3 | <50 | Absent | Absent | N/A | S |
| **Mexicana pizza** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Salami danish** | 3 | 200* | <3 | <50 | Absent | Absent | N/A | S |
| **Fresh salad** | 3 | 6000000* | <3 | <50 | Absent | Absent | N/A | S |

| Sample | Level | SPC | E. coli | Staph | Salmonella | L. monocytogenes | B. cereus | Assessment |
|---|---|---|---|---|---|---|---|---|
| **Primo roast beef** | 2 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Mango and orange yoghurt** | 3 | 100* | <3 | <50 | Absent | Absent | N/A | S |
| **Chiko roll** | 1 | 2600 | <3 | <50 | Absent | Absent | N/A | S |
| **Dagwood dog** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Crab claw** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Mini samosa** | 1 | 150* | <3 | <50 | Absent | Absent | N/A | S |
| **Spring rolls** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Chicken and cashew with fried rice** | 1 | <50 | <3 | <50 | Absent | Absent | <50 | S |
| **Chilli beef with fried rice** | 1 | 800* | <3 | <50 | Absent | Absent | <50 | S |
| **Pecan tart** | 2 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Spicy hot dog** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Combination Pizza** | 1 | 14000 | <3 | <50 | Absent | Absent | N/A | M |
| **Quiche** | 1 | 18000* | <3 | <50 | Absent | Absent | N/A | M |
| **Fruit slice** | 2 | 1000* | <3 | <50 | Absent | Absent | N/A | S |
| **Tara Mosalata dip** | 3 | 3100 | <3 | <50 | Absent | NP | N/A | S |
| **Tatziki Dip** | 3 | 25000000 | <3 | <50 | Absent | Absent | N/A | S |
| **Fresh Falafel** | 2 | 40000* | <3 | <50 | Absent | NP | N/A | M |
| **Passionfruit yoghurt** | 3 | 150000000 | <3 | <50 | Absent | Absent | N/A | S |
| **Sweet home made custard rice** | 2 | 300* | <3 | <50 | Absent | NP | <50 | S |
| **Tempura prawn sushi roll** | 3 | *65000 | <3 | <50 | Absent | Absent | <50 | S |
| **Chicken schnitzel sushi roll** | 3 | * 7200 | <3 | <50 | Absent | Absent | <50 | S |
| **Beef sushi roll** | 3 | 130000 | <3 | <50 | Absent | Absent | <50 | S |
| **Meat pie** | 1 | *50 | <3 | <50 | Absent | Absent | N/A | S |
| **Tomato & capsicum quiche** | 1 | *10000 | <3 | <50 | Absent | Absent | N/A | M |
| **Roast Chicken** | 1 | 350* | <3 | <50 | Absent | Absent | N/A | S |
| **Egg, Bacon & Potato Salad** | 3 | 4000 | <3 | <50 | Absent | Absent | N/A | S |
| **Tomato & Basil pasta salad** | 3 | 10000* | <3 | <50 | Absent | Absent | <50 | S |
| **Eggplant & shallot dip** | 3 | 100* | <3 | <50 | Absent | Absent | N/A | S |
| **Sweet potato & cashews dip** | 3 | <5000 | <3 | <50 | Absent | Absent | N/A | S |
| **Banana and walnut bread** | 2 | 11000 | <3 | <50 | Absent | Absent | N/A | S |
| **Sausage roll** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Samosa** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Roast chicken** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Chiko roll** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Honey chicken and fried rice** | 1 | 50* | <3 | <50 | Absent | Absent | <50 | S |
| **Spring rolls** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Dim sim** | 1 | 600* | <3 | <50 | Absent | Absent | N/A | S |
| **Steak pepper pie** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |

| Sample | Level | SPC | E. coli | Staph | Salmonella | L. monocytogenes | B. cereus | Assessment |
|---|---|---|---|---|---|---|---|---|
| **Chicken tandoori pie** | 1 | 150* | <3 | <50 | Absent | Absent | N/A | S |
| **Tortellini** | 1 | 50* | <3 | <50 | Absent | Absent | <50 | S |
| **Chicken shish kebab** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Garlic dim sim** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Custard tart** | 2 | 300* | <3 | <50 | Absent | Absent | N/A | S |
| **Egg sandwich** | 3 | 900000 | <3 | <50 | Absent | Absent | N/A | S |
| **Vegetable samosa** | 1 | 420000 | <3 | <50 | Absent | Absent | N/A | U |
| **Pumpkin and couscous salad** | 3 | 520000 | <3 | <50 | Absent | Absent | <50 | S |
| **Vegetable rice salad** | 3 | 270000000 | 790 | <50 | Absent | Absent | 50000* | PH |
| **Caesar salad** | 3 | 800000 | <3 | <50 | Absent | Absent | N/A | S |
| **Spicy Salmon Inari** | 3 | 24000000 | <3 | <50 | Absent | Absent | <50 | S |
| **Squid Salad** | 3 | 20000 | <3 | <50 | Absent | Absent | N/A | S |
| **Quiche** | 1 | 400* | <3 | <50 | Absent | Absent | N/A | S |
| **Baklava** | 2 | 400* | <3 | <50 | Absent | Absent | N/A | S |
| **Apple Pie** | 2 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Chicken sushi roll** | 3 | 70000 | <3 | <50 | Absent | Absent | <50 | S |
| **Tuna ultimate sushi roll** | 3 | 260000 | <3 | <50 | Absent | Absent | 100 | M |
| **Chocolate Mousse** | 2 | 1600000 | <3 | <50 | Absent | Absent | N/A | U |
| **Beetroot Dip** | 3 | 160000 | <3 | <50 | Absent | Absent | N/A | S |
| **Chicken nuggets** | 1 | 150* | <3 | <50 | Absent | Absent | N/A | S |
| **Chicken bites** | 1 | 100* | <3 | <50 | Absent | NP | N/A | S |
| **Cheeseburger** | 1 | 2000 | <3 | <50 | Absent | Absent | N/A | S |
| **Muffin** | 2 | 150* | <3 | <50 | Absent | Absent | N/A | S |
| **Beef pie** | 1 | 250* | <3 | <50 | Absent | Absent | N/A | S |
| **Yoghurt and berries** | 3 | 140000000 | <3 | <50 | Absent | Absent | N/A | S |
| **Beef lasagne** | 1 | 4300000* | <3 | <50 | Absent | Absent | N/A | U |
| **Beef wrap** | 3 | 1900000 | 6 | <50 | Absent | Absent | N/A | M |
| **Lemon honey chicken strips** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Rissole** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Pork floss bun** | 1 | 500 | <3 | <50 | Absent | Absent | N/A | S |
| **Fish finger bun** | 2 | 200 | <3 | <50 | Absent | Absent | N/A | S |
| **Red bean bun** | 2 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Pecan tart** | 2 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Potato & steak pie** | 1 | 1500* | <3 | <50 | Absent | Absent | N/A | S |
| **Seafood salad** | 3 | 140000 | <3 | <50 | Absent | Absent | N/A | S |
| **Hong Kong dim sim** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Chicken & corn cob** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Sweet fermented glutinous rice** | 3 | 84000000 | <3 | <50 | Absent | Absent | <50 | S |
| **Fresh soya drink** | 3 | 340000000 | <3 | <50 | Absent | Absent | N/A | S |
| **BBQ pork** | 2 | 5900 | <3 | <50 | Absent | Absent | N/A | S |
| **BBQ roast duck** | 2 | 35000 | <3 | <50 | Absent | Absent | N/A | S |

| Sample | Level | SPC | E. coli | Staph | Salmonella | L. monocytogenes | B. cereus | Assessment |
|---|---|---|---|---|---|---|---|---|
| **Beef brisket** | 2 | 1500000 | <3 | <50 | Absent | Absent | N/A | U |
| **Pork fried rice** | 1 | 25000* | <3 | <50 | Absent | Absent | <50 | M |
| **Seafood fried rice** | 1 | 10000* | <3 | <50 | Absent | Absent | <50 | M |
| **Vegetable noodle chicken** | 2 | 27000 | <3 | <50 | Absent | Absent | <50 | S |
| **Pork spring rolls** | 1 | 150* | <3 | <50 | Absent | Absent | N/A | S |
| **Pork dim sim** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Egg sushi roll** | 3 | 1700000 | <3 | <50 | Absent | Absent | <50 | S |
| **Fish egg** | 3 | 5600000* | <3 | <50 | Absent | Absent | <50 | S |
| **Spicy salmon inari** | 3 | 350* | <3 | <50 | Absent | Absent | <50 | S |
| **Pork dumpling** | 1 | 500000 | <3 | <50 | Absent | Absent | N/A | U |
| **Squid salad** | 3 | 190000 | <3 | <50 | Absent | Absent | N/A | S |
| **Salmon sushi roll** | 3 | 5700000* | <3 | <50 | Absent | Present | 4400 | U |
| **Chicken sushi roll** | 3 | 15000000 | <3 | <50 | Absent | Present | 5900 | U |
| **Beef sushi roll** | 3 | 22000000 | <3 | <50 | Absent | Present | 16000 | PH |
| **Half tuna wrap** | 3 | 1100000 | <3 | <50 | Absent | Absent | N/A | S |
| **Half chicken avocado wrap** | 3 | 5300000* | <3 | <50 | Absent | Absent | N/A | S |
| **Boiled rice** | 1 | <50 | <3 | <50 | Absent | Absent | <50 | S |
| **Daal** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Chicken korma** | 1 | 50 | <3 | <50 | Absent | Absent | N/A | S |
| **Beef vindaloo** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Lamb Curry** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Creamy potato salad** | 3 | 1100000 | <3 | <50 | Absent | Absent | N/A | S |
| **Tabouli salad** | 3 | 7200 | <3 | <50 | Absent | Absent | N/A | S |
| **Tomato couscous salad** | 3 | 100000* | <3 | <50 | Absent | Absent | N/A | S |
| **Chick pea & pumpkin salad** | 3 | 49000* | <3 | <50 | Absent | Absent | N/A | S |
| **Chicken pesto pasta salad** | 3 | 18000* | <3 | <50 | Absent | Absent | <50 | S |
| **Prawn and avocado sushi** | 3 | 3000000 | <3 | <50 | Absent | Absent | <50 | S |
| **Teriyaki chicken sushi** | 3 | 58000000 | <3 | <50 | Absent | Absent | <50 | S |
| **Chicken shish kebab** | 1 | 100* | <3 | <50 | Absent | Absent | N/A | S |
| **Spring roll** | 1 | <50 | <3 | <50 | Absent | Absent | N/A | S |
| **Lamb gozleme** | 2 | 5000* | <3 | <50 | Absent | Absent | N/A | S |
| **Pumpkin, walnut and pine nut salad** | 3 | 1500000 | <3 | <50 | Absent | Absent | N/A | S |
| **Basil pesto pasta salad** | 3 | 15000* | <3 | <50 | Absent | Absent | <50 | S |
| **Caesar salad** | 3 | 3300000* | <3 | <50 | Absent | Absent | N/A | S |
| **Potato salad** | 3 | 100000 | <3 | <50 | Absent | Absent | N/A | S |
| **Fruit salad** | 3 | 4800 | <3 | <50 | Absent | Absent | N/A | S |
| **Devil wings** | 1 | 100* | <3 | <50 | Absent | Absent | N/A | S |
| **Spring rolls** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Dim sim** | 1 | 50* | <3 | <50 | Absent | Absent | N/A | S |
| **Ham and pineapple pizza** | 1 | 700* | <3 | <50 | Absent | Absent | N/A | S |

| Sample | Level | SPC | E. coli | Staph | Salmonella | L. monocytogenes | B. cereus | Assessment |
|---|---|---|---|---|---|---|---|---|
| **Pepperoni pizza** | 1 | 300* | <3 | <50 | Absent | Absent | N/A | S |
| ***Salmon sushi roll*** | *3* | *NP* | *<3* | *NP* | *NP* | *Absent* | *NP* | *S* |
| ***Chicken sushi roll*** | *3* | *NP* | *<3* | *NP* | *NP* | *Absent* | *NP* | *S* |
| ***Beef sushi roll*** | *3* | *NP* | *<3* | *NP* | *NP* | *Absent* | *NP* | *S* |
| ***Prawn sushi roll*** | *3* | *NP* | *<3* | *NP* | *NP* | *Absent* | *NP* | *S* |
| ***Prawn tempura sushi roll*** | *3* | *NP* | *<3* | *NP* | *NP* | *Absent* | *NP* | *S* |
| ***Vegetable rice salad*** | *3* | *640000* | *<3* | *<50* | *Absent* | *Absent* | *<50* | *S* |
| ***Cous cous (tomato, cucumber, onion)*** | *3* | *140000* | *47* | *<50* | *Absent* | *Absent* | *<50* | *M* |
| ***Caesar salad*** | *3* | *340000* | *<3* | *<50* | *Absent* | *Absent* | *N/A* | *S* |
| ***Pasta, chicken, broccoli, celery salad*** | *3* | *2800000* | *<3* | *<50* | *Absent* | *Absent* | *<50* | *S* |
| ***Spinach and feta pie*** | *1* | *1200* | *<3* | *<50* | *Absent* | *Absent* | *N/A* | *S* |
| ***Nigiri*** | *3* | *14000000* | *30* | *250* | *Absent* | *Absent* | *<50* | *M* |
| ***Salmon sushi roll*** | *3* | *10000000* | *110* | *<50* | *Absent* | *Absent* | *<50* | *U* |
| ***Seaweed sushi*** | *3* | *480000* | *27* | *50* | *Absent* | *Absent* | *<50* | *M* |
| ***Inari sushi*** | *3* | *22000000* | *<3* | *<50* | *Absent* | *Absent* | *<50* | *S* |
| ***Prawn sushi roll*** | *3* | *1100000* | *<3* | *<50* | *Absent* | *Absent* | *<50* | *S* |
| ***Seafood sushi roll*** | *3* | *780000* | *37* | *<50* | *Absent* | *Absent* | *<50* | *M* |
| ***Eel sushi roll*** | *3* | *48000000* | *33* | *<50* | *Absent* | *Absent* | *50* | *M* |
| ***Shrimp sushi*** | *3* | *90000000* | *53* | *<50* | *Absent* | *Absent* | *550* | *M* |
| ***Tuna sushi roll*** | *3* | *43000000* | *100* | *<50* | *Absent* | *Absent* | *100* | *U* |
| ***Chicken sushi roll*** | *3* | *2100000* | *<3* | *<50* | *Absent* | *Absent* | *50* | *S* |
| ***Beef sushi roll*** | *3* | *3700000* | *<3* | *<50* | *Absent* | *Absent* | *<50* | *S* |
| ***Chicken sushi roll*** | *3* | *2100000* | *<3* | *<50* | *Absent* | *Absent* | *50* | *M* |
| ***Salmon sushi roll*** | *3* | *12000000* | *<3* | *<50* | *Absent* | *Absent* | *650* | *M* |
| ***Sushi carrot, cucumber, pickle*** | *3* | *11000000* | *<3* | *<50* | *Absent* | *Absent* | *300* | *M* |
| ***Tuna sushi roll*** | *3* | *22000000* | *<3* | *<50* | *Absent* | *Absent* | *<50* | *S* |

Italic results are re-samples, * = estimate count only, NP = Not Performed, N/A = Not Applicable.