

ACT HEALTH PROTECTION SERVICE

**MICROBIOLOGICAL QUALITY
OF
ICE CREAM, SOFT SERVE ICE CREAM
AND GELATO
JULY – OCTOBER 2013**



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BACKGROUND/OBJECTIVE

This program focuses on soft serve ice cream, gelato and ice cream available at ice cream parlours within the Australian Capital Territory (ACT). There has not been a significant ACT survey into this specific area before.

Ice cream from these premises has the potential to be contaminated with bacteria through poor hygiene and poor handling practises such as; inadequate hand washing, using dirty machines and equipment, using dirty utensils, using unclean dishcloths or serving cloths. Ice creams have a high protein, sugar and moisture content which bacteria will thrive upon. Cleaned areas which have been contaminated by spilled product can quickly grow pathogens which may contaminate food for service.

There has been an increase in retail outlets primarily selling ice cream and gelato such as franchises of Gelatissimo, Goodberrys and Cold Rock. This survey was intended to inform the Health Protection Service (HPS) of practices and possible risks from this expanding industry sector. Through surveying the retail outlets in the ACT the HPS can be well positioned to effectively determine and as necessary control the food safety issues associated with these products.

STANDARDS

The Food Standards Australia New Zealand (FSANZ) Guidelines for the microbiological examination of ready-to-eat foods (Guideline) identify four categories of microbiological quality ranging from satisfactory to potentially hazardous. Table 1 is an extract from the Guideline. Table 1 not only reflects both the high level of microbiological quality that is achievable for ready to eat foods in Australia and New Zealand but also indicates the level of contamination that is considered to be a significant risk to public health. For this survey all ice cream products were considered as a level 2 products.

Table1

Test	Microbiological Quality (colony forming units per gram (cfu/g))			
	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> (<i>E. coli</i>)	<3	3-100	>100	**
Pathogens				
<i>Listeria monocytogenes</i> (<i>L. monocytogenes</i>)	not detected in 25g	detected but <10 ² #		≥10 ² ##
<i>Coagulase positive Staphylococci</i> (<i>Staph</i>)	<102	102-103	103-104	≥104 SET +ve

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 and October 2013. During this period sixty six samples from nineteen ACT food outlets were collected by HPS Public Health Officers (PHO) and processed by the ACT Government Analytical Laboratory. All of the samples were tested for the hygiene indicators SPC, *E. coli* and the food pathogens *L. monocytogenes* and coagulase positive *Staphylococci*. The survey collected single or multiple samples from single outlets and in general outlets were only tested once.

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

MICROBIOLOGICAL METHOD OF ANALYSIS

Samples were tested for the presence of:

- *L. monocytogenes* AS 5013.24.1 – 2009 (modified)
- Coagulase positive *Staphylococci* AS 5013.12 – 2004 (modified)
- SPC AS 5013.5 - 2004
- *E. coli* ISO 16649.2 – 2001.

The sample preparation for *E. coli*, SPC and Coagulase positive *Staphylococci* consisted of:

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

***E. coli* enumeration:** Pour plates of Tryptone Bile X-Glucuronide medium (TBX) using 1ml of 10⁻¹ dilution were prepared in triplicate and incubated at 37°C/4h followed by 44°C/20h. *E. coli* colonies appear blue/green after incubation.

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.

***L. monocytogenes* detection:** 25g of sample was weighed out aseptically and homogenised with 225mL *Listeria* enrichment broth 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.

RESULTS / DISCUSSION

SPC

All (66) samples were tested for SPC and were assessed as having to comply with the Level 2 SPC criterion. The results for the samples ranged between <50 and 180,000 colony forming units per gram (cfu/g). All of these samples were in the satisfactory category.

E. coli

All samples (66) were tested for *E. coli*. The presence of *E. coli* in ice cream gelato and soft serve ice cream 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. Sixty five (100%) samples tested in this survey had <3 cfu/g of *E. coli* and met the satisfactory criterion. If *E.coli* had been found in marginal or unsatisfactory levels then there would have been follow-up investigation and the premises issued educational information.

Coagulase positive *Staphylococci*

All samples (66) were tested for coagulase positive *Staphylococci*. All samples tested had met the satisfactory criterion i.e. <100 cfu/g.

L. monocytogenes

The detection of *L. monocytogenes* in foods indicates the food was inadequately prepared or the food was contaminated post preparation. The detection of higher levels (>10² cfu/g) of *L. monocytogenes* in RTE foods indicates a failure of food handling controls and is considered a public health risk.

All samples were analysed for *L. monocytogenes*. All sixty six (100%) of the samples were satisfactory i.e. *L. monocytogenes* was not detected in screening tests.

If *L. monocytogenes* is detected in screening then confirmation tests are performed before PHO will inspect the premises and collect a re-sample of the food item if available. This resample will be tested in a semi quantitative manner to measure the level of *L. monocytogenes* in the food.

CONCLUSION

The microbiological quality of the food from the premises sampled in the ACT is excellent. Raw results of the analysis are attached at Appendix A. Due to the popularity of these foods and this survey being the first of this nature in the ACT it may be prudent to conduct another survey in the future. In conclusion, the results of this survey show an excellent level of compliance with the Guideline.

BIBLIOGRAPHY

1. Guidelines for the microbiological examination of ready-to-eat foods FSANZ Dec 2001.
2. Foodborne Microorganisms of Public Health Significance, AIFST Inc. Food Microbiology Group.
3. Food Safety Authority of Ireland (2011). Safe Handling and Serving of Soft Ice-Cream. www.fsai.ie/Safehandlingandservingofsofticecream.html
4. https://pixabay.com/get/e834b10e2bfd073ed1534705fb0938c9bd22ffd41db412419cf3c170a4/ice-cream-1101396_1920.jpg?attachment

Appendix A

Sample	Level	SPC	<i>E. coli</i> count	<i>L. monocytogenes</i>	<i>S. aureus</i>	Assessment
Hazelnut	2	1600	<3	Absent	<50	S
Mango	2	*200	<3	Absent	<50	S
White Chocolate	2	*600	<3	Absent	<50	S
American Chocolate	2	*550	<3	Absent	<50	S
Chocolate Sorbet	2	*100	<3	Absent	<50	S
Berry pavlova gelato	2	1500	<3	Absent	<50	S
Belgian chocolate gelato	2	6600	<3	Absent	<50	S
Saffron risotto gelato	2	2600	<3	Absent	<50	S
Mango gelato	2	3100	<3	Absent	<50	S
Coffee gelato	2	1600	<3	Absent	<50	S
Mango Mania Ice Cream	2	*2000	<3	Absent	<50	S
Jamoca almond fudge ice cream	2	1800	<3	Absent	<50	S
Mint chocolate chip ice cream	2	2800	<3	Absent	<50	S
Cookies and cream ice cream	2	1600	<3	Absent	<50	S
Chocolate Ice Cream	2	*3300	<3	Absent	<50	S
Pistachio gelato	2	*500	<3	Absent	<50	S
Oreo gelato	2	*850	<3	Absent	<50	S
Chocolate gelato	2	*350	<3	Absent	<50	S
Blood orange sorbet	2	*100	<3	Absent	<50	S
Blueberry sorbet	2	*200	<3	Absent	<50	S
Lime Gelato	2	*300	<3	Absent	<50	S
Chocolate gelato	2	*1400	<3	Absent	<50	S
Hazelnut gelato	2	5200	<3	Absent	<50	S
Soft serve	2	1800	<3	Absent	<50	S
Chocolate thick shake	2	*34000	<3	Absent	<50	S
Chocolate thick shake	2	2400	<3	Absent	<50	S
Strawberry thick shake	2	5200	<3	Absent	<50	S
Hazelnut gelato	2	*29000	<3	Absent	<50	S
Macadamia gelato	2	*13000	<3	Absent	<50	S
Strawberry cream gelato	2	13000	<3	Absent	<50	S
Soft serve	2	<50	<3	Absent	<50	S
Mango Sorbet	2	<50	<3	Absent	<50	S
Raspberry Sorbet	2	*50	<3	Absent	<50	S
Bubblegum ice cream	2	*200	<3	Absent	<50	S
Baileys ice cream	2	8000	<3	Absent	<50	S
Vanilla soft serve	2	*3300	<3	Absent	<50	S
Chocolate soft serve	2	4700	<3	Absent	<50	S
Vanilla frozen yoghurt	2	*600	<3	Absent	<50	S
Mango sorbet frozen yoghurt	2	*200	<3	Absent	<50	S
Strawberry sorbet frozen yoghurt	2	*700	<3	Absent	<50	S
Belgium chocolate gelato	2	3300	<3	Absent	<50	S
Sour cream gelato	2	*12000	<3	Absent	<50	S
Dark chocolate gelato	2	*900	<3	Absent	<50	S

Sample	Level	SPC	<i>E. coli</i> count	<i>L. monocytogenes</i>	<i>S. aureus</i>	Assessment
Milk chocolate gelato	2	11000	<3	Absent	<50	S
Soft serve	2	<50	<3	Absent	<50	S
English toffee ice cream	2	9400	<3	Absent	<50	S
Choco fudge brownie ice cream	2	180000	<3	Absent	<50	S
Macadamia ice cream	2	*55000	<3	Absent	<50	S
Chocolate shake	2	*95000	<3	Absent	<50	S
Hot fudge sundae	2	*3900	<3	Absent	<50	S
Vanilla gelato	2	*65000	<3	Absent	<50	S
Toblerone gelato	2	23000	<3	Absent	<50	S
Double chocolate soft serve	2	*700	<3	Absent	<50	S
Vanilla soft serve	2	*350	<3	Absent	<50	S
Soft Serve	2	*1400	<3	Absent	<50	S
Chocolate frozen custard	2	2000	<3	Absent	<50	S
Vanilla frozen custard	2	*1200	<3	Absent	<50	S
Lemon lime gelato	2	*150	<3	Absent	<50	S
Raspberry gelato	2	*350	<3	Absent	<50	S
Mint gelato	2	*10000	<3	Absent	<50	S
Chocolate gelato	2	*1400	<3	Absent	<50	S
Blood Orange Gelato	2	*500	<3	Absent	<50	S
Mango gelato	2	*450	<3	Absent	<50	S
Biscutino gelato	2	*800	<3	Absent	<50	S
Strawberry sundae	2	9600	<3	Absent	<50	S
Chocolate sundae	2	8500	<3	Absent	<50	S

* = estimate count only