



**BC Centre for Disease Control**  
AN AGENCY OF THE PROVINCIAL HEALTH SERVICES AUTHORITY

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**Food Safety Contacts**  
**Directors of Health Protection**

## **Food Quality Sampling Program – 2006**

The intent of the Food Quality sampling program is two-fold: to provide a service to Environmental Health Officers (EHO's) that allows for collection of food and sanitation / environmental samples during inspections (especially as a result of observed infractions and complaints) and to allow a targeted "market basket survey" of products available to consumers. Results from these types of tests, largely bacteriological results on food samples and sanitation checks collected during inspections are used for various purposes including food handling and sanitation education.

The yearly reports on the Food Quality Sampling Program are designed to provide summary information to EHO's about "at risk" foods, and are entirely based on the results from foods sampled and submitted to the BCCDC Food Laboratory by EHO's, or as a result of targeted projects. The samples collected are not random and therefore not representative of all the foods consumed by the public in BC. As such, it's not recommended to make generalizations about the BC food supply based on these results.

### **EXECUTIVE SUMMARY**

The results in this report are extracted from the Food Laboratory Information System computerized database. This is the second year data has been collected and analyzed using this format, although the system is planned for replacement.

New sanitary guidelines were proposed and accepted in 2007, and food results were assessed using these standards. 33.6% of foods sampled failed to meet aerobic plate count sanitary guidelines; 1.8% failed to meet *E. coli* sanitary guidelines; and, as with previous years, foods failing to meet *S. aureus* sanitary guidelines were very low (0.4%). This will be the last year that *S. aureus* sanitary guidelines will be reported – routine testing was discontinued February 9, 2007. *E. coli* was detected in several meat and protein sources (turkey, pork, sausage, tofu) and cooked prepared dishes (asian foods, chicken caesar salad and cooked rice).

EHO's made further use of pH and water testing in 2006, a total of 230 samples were submitted. 107 (46.5%) of the tests exceeded the accepted criteria and these foods determined to be potentially hazardous (65% were meats). One set of environmental swabs assessing hygiene before and after cleaning at a seafood restaurant were submitted. Results included evidence that sanitation of sink knobs was not adequate on the premises.



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## Revised Sanitary Quality Guidelines for Ready-to-Eat Foods

New sanitary guidelines for Ready-to-Eat foods were introduced in February 2007, and these guidelines applied to 2006 result. The major difference between the old criteria and new criteria is in interpretation of Aerobic Colony Count results (details are given in Table 2 below).

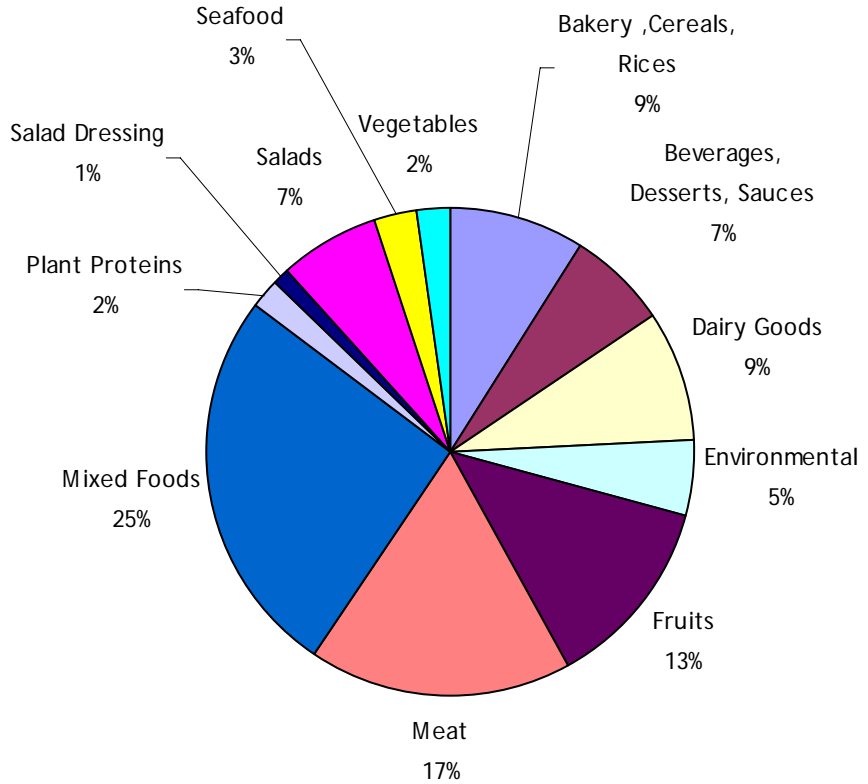
In several of the new categories there is not a definitive cut-off for satisfactory and unsatisfactory results – instead a “grey” area between the two categories exists. Should results fall between the guidelines in this zone, the recommendation is to use the laboratory results as a back up to observations taken during inspections (on food preparation, storage, handling and sanitation).

<b>Table 2: Comparison of Old and New Criteria for Sanitary Quality Guidelines</b>			
<b>Aerobic Colony Count (ACC)</b>		<b>Indicator Test Result (CFU / gram)*</b>	
		<b>Satisfactory</b>	<b>Unsatisfactory</b>
OLD Criteria	ALL FOODS except fermented.		> 100,000
NEW Criteria	FOOD GROUP		
	Canned Foods & Cooked hot-held food	< 5	> 5
	Cooked chilled food no handling	< 100	> 1000
	Cooked chilled food with handling & Preserved foods	< 100,000	> 1,000,000
	Long shelf life fish products, meat products, fruit and vegetable products	< 1,000,000	> 100,000,000
	Fermented foods & Fresh fruits and Vegetables	NOT APPLICABLE	NOT APPLICABLE
<b>Total Coliform Count (TC)</b>			
OLD Criteria			> 1000
NEW Criteria	ALL FOODS except fresh fruits & vegetables, or foods containing them	< 100	> 1000
<b>Fecal Coliform Count (FC)</b>			
OLD Criteria		< 3	> 3
NEW Criteria	ALL FOODS except fresh fruits & vegetables, or foods containing them	< 3	> 3
<b>Escherichia coli Count (EC)</b>			
OLD Criteria	ALL FOODS	< 3	> 3
NEW Criteria	ALL FOODS	< 3	> 3

\* The standard of less than 3 or 5 per gram reflects the detection limit of the test applied. For analysis purposes numerical values of <3 and <5 per gram were converted to 1, resulting in a log value of 0. It is important to state that this does not mean zero bacteria were detected. All log values reported as 0 can be interpreted as follows: ACC log 0=<5 CFU/g; TC, FC and EC log0=<3 CFU/g; SA log 0=<10 CFU/g.

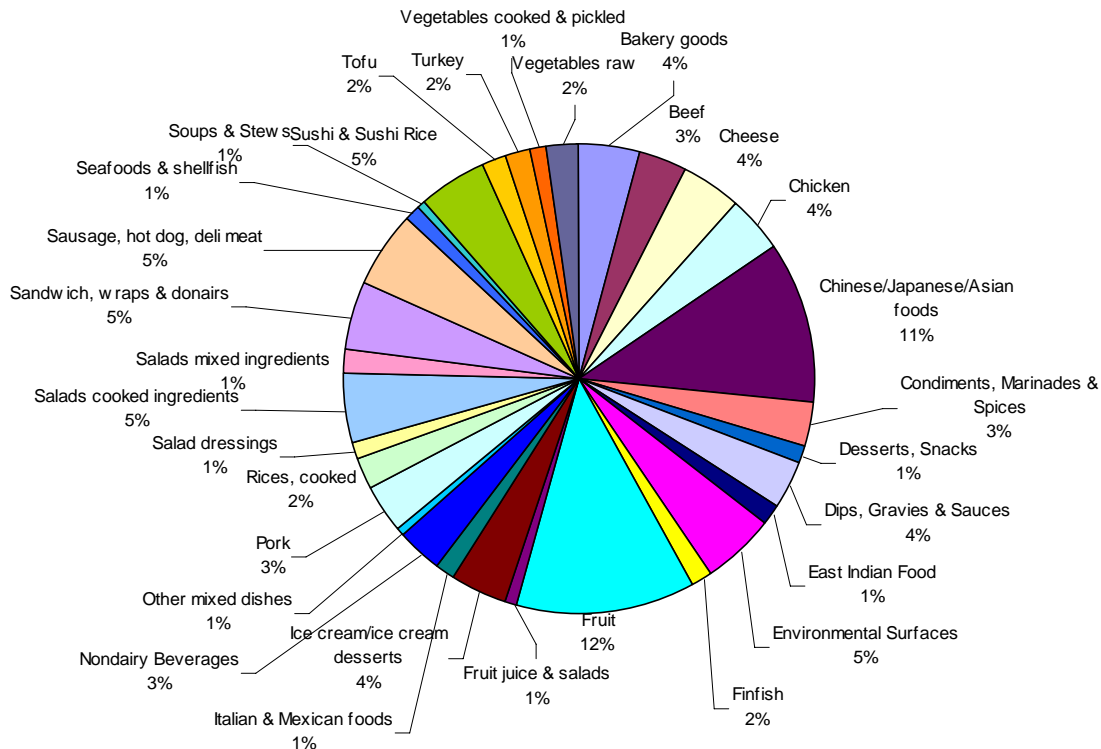
# Foods Sampled under the Food Quality Sampling Program

One quarter of all foods sampled in 2006 were "Mixed" – these include several types of ethnic foods, sandwiches, soups and gravies. The next largest category of foods sampled were meats, comprising beef, chicken, pork, sausages, deli meats and turkey (as shown in Chart 1a). A more detailed breakdown of foods is shown below.



**Chart 1a: Broad Category Breakdown of Raw and Cooked Foods Sampled in 2006**

For 2006, sampled foods fell into 46 of the 65 potential line item categories, as illustrated in Chart 1b below. Any foods sampled on less than two occasions were grouped into another like category. All line item categories are shown in Appendix 1 and the full breakdown of foods sampled is shown in Appendix 2.



**Chart 1b: Line item Categories of Foods Sampled in the Food Quality Sampling Program, 2006**

# Summary of Bacteriological Results

In 2006, 612 food samples were submitted and tested. The sanitary quality guidelines are based on 5 indicator bacteria according to the revised guidelines listed in Table 2 above. Applying these criteria across all the food categories for all foods tested demonstrates failure to meet the guidelines as follows:

Aerobic Plate Count	33.6%
Total coliform Count	10.0%
Fecal coliform Count	6.7%
<i>E. coli</i> Count	1.8%
<i>S. aureus</i> Count	0.4%

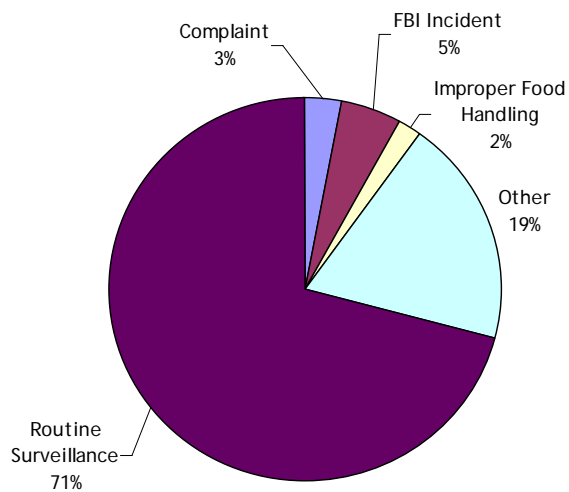
**Table 3: Percentage of foods failing to meet Sanitary Quality Guidelines**

A detailed description of values obtained for all food categories in each of these guidelines is reported in Appendix 3a and 3b.

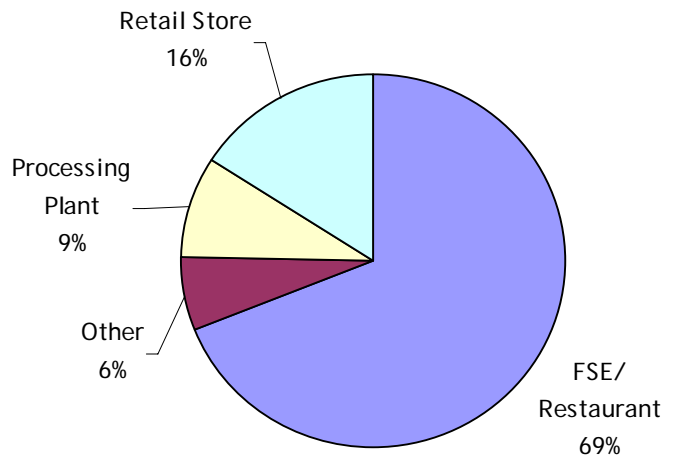
## Descriptive Data: Where and Why Foods Sampled

Data from 2006 was very similar to that collected in 2005. Most food quality samples were collected during routine surveillance of FSEs (food service establishments) and restaurants, with fewer samples taken in retail stores and processing plants. No samples were recorded taken from institutions such as schools or hospitals. Compared to 2005, fewer samples were taken in response to complaints and FBI incidents.

**Chart 2a: Sampling Reasons for foods submitted by EHOs**



**Chart 2b: Establishments where foods sampled by EHOs**



## Aerobic Colony Counts

New criteria for interpreting sanitary guidelines for ready-to-eat foods were distributed earlier in 2007, and these guidelines used to evaluate the different categories of foods. In the past, all foods with Aerobic Colony counts in excess of 100,000 CFU/gram did not meet sanitary guidelines.

Using the new criteria, foods were assessed as follows:

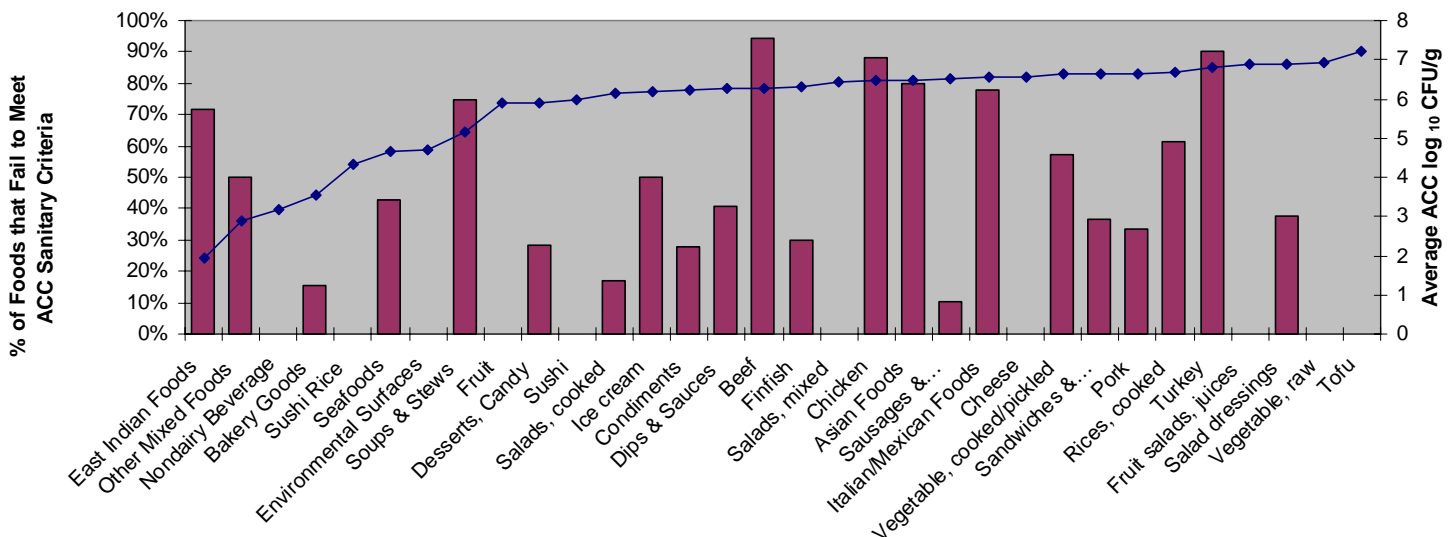
Food Group	Indicator Test Result (log <sub>10</sub> CFU / gram)	
	Satisfactory	Unsatisfactory
Canned Foods & Cooked hot-held food (eg, soup, samosa, hamburger patty)	<0.699	> 0.699
Cooked chilled food no handling (eg, sausage roll, ice cream <sup>3</sup> )	< 2	> 3
Cooked chilled food with handling (eg, sliced meat, sandwiches) & Preserved or dried foods (eg, smoked/ pickled foods, spices)	< 5	> 6
Long shelf life fish products, meat products, fruit and vegetable products (eg, MAP or vacuum packed products)	< 6	> 8
Fermented foods (eg, yoghurts, fermented sausages, soft cheese <sup>3</sup> ) & Fresh fruits and Vegetables	NOT APPLICABLE	NOT APPLICABLE

### Challenges with New Aerobic Colony Count Sanitary Guidelines:

Within some food categories several sanitary guidelines might apply. For example, within “sausages, hot dogs and deli meats” – hot dogs and breakfast sausages (cooked hot-held foods) had an unsatisfactory ACC guideline of >5 CFU/g (>0.699 log<sub>10</sub> CFU/g); deli meats such as turkey (cooked chilled food with handling) had an unsatisfactory ACC guideline of >10<sup>6</sup> CFU/g (>6 log<sub>10</sub> CFU/g) and for sausages such as pepperoni (fermented foods) an ACC guideline would not apply at all. Every attempt was made to place foods within the correct ACC criteria before deciding whether the foods did not meet the assigned criteria.

### Interpretation of Aerobic Colony Count Results

In the chart below all foods are sorted in order of increasing Aerobic Colony counts (blue line, log scale at right). The percentage of foods failing to meet the sanitary criteria within the food category are shown in the bars. Foods failing to meet the criteria most often were beef, turkey and chicken, followed by ethnic foods (Asian, Italian, East Indian). Specific details can be found in Appendix 3a or directly from Food Protection Services (on request).



## E. coli Results

*E. coli* (the best indicator of fecal contamination) was detected in both cooked and raw ready-to-eat foods (refer to Table 4 and Chart 4).

*E. coli* was detected in several categories of meat samples: pork, tofu, turkey and farmers sausage. It was also detected in Asian ethnic foods and a mixed salad (chicken Caesar). Surprisingly, cooked foods accounted for the majority of detections, such as in plain cooked rice, fried rice, cooked turkey and cooked cuttle fish. *E. coli* was also detected in flavored shredded tofu collected directly from the processing plant.

### E. coli as an Indicator

*E. coli* is in the family *Enterobacteriaceae*. Enteric bacilli (rods) from this family are in part characterized by the fermentation of **glucose**. Glucose fermenters of interest in this family include *Salmonella* and *Shigella*. *E. coli* is also called a fecal coliform (and is a **lactose** fermenter). There are four groups of fecal coliforms:

- *Enterobacter*
- *Escherichia*
- *Klebsiella*
- *Citrobacter*

It is important to remember that many fecal coliforms are found not only in the gut of warm blooded mammals, but also in the gut of insects and reptiles, and therefore become part of the natural soil microbial flora. For this reason, discussion of total & fecal coliform results in foods sampled have been eliminated in this report (results are summarized in Appendices 3a and 3b).

*E. coli* is the **best indicator of fecal sanitation problems**.

**Table 4: Detection of *E. coli* in Food Quality Sample Submissions in 2006**

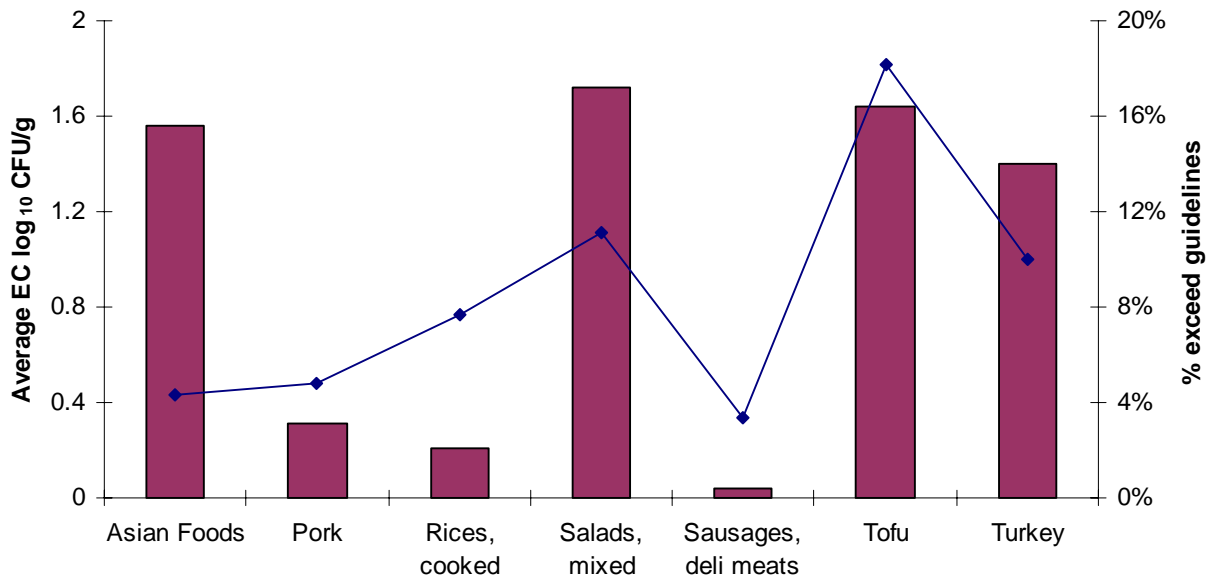
Food Category	Number of Samples	Average Counts (log10)	# exceeding guideline	% exceeding guideline
Asian Foods	69	1.56	3	4.3
Pork	21	0.31	1	4.8
Rices, cooked	13	0.21	1	7.7
Salads, mixed	9	1.72	1	11.1
Sausages, deli meats	29	0.04	1	3.4
Tofu	11	1.64	2	18.2
Turkey	10	1.40	1	10.0

This is

displayed in Chart 4 (below), average counts are shown in the bars, and the % exceeding the sanitary guideline in the blue line.

data

**Chart 4: Detection of *E. coli* in Food Quality Sample Submissions in 2006**



## S. aureus Results

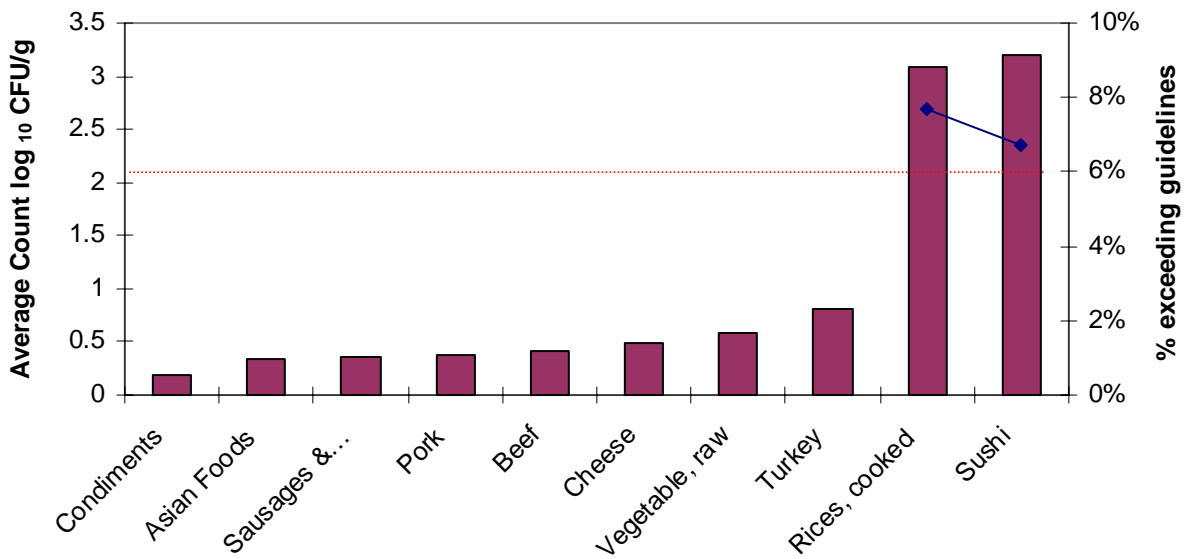
Only 2 samples exceeded the guideline of 100 *S. aureus* CFU per gram ( $>2 \log_{10}$ ), a plain cooked white rice and a California sushi roll. Smaller numbers of *S. aureus* were also detected in other food groups as depicted in Chart 5.

Food Category	Number of Samples	Average Counts (log10)	# exceeding guideline	% exceeding guideline
Asian Foods	69	0.33	0	
Beef	17	0.42	0	
Cheese	14	0.49	0	
Condiments	18	0.18	0	
Pork	21	0.38	0	
Rices, cooked	13	3.09	1	7.7%
Sausages &...	29	0.36	0	
Sushi	15	3.19	1	6.7%
Turkey	10	0.80	0	
Vegetable, raw	14	0.58	0	

**Table 5: Detection of *S. aureus* in Food Quality Sample Submissions in 2006**

This data is displayed in Chart 5 (below), average counts are shown in the bars, and the % exceeding the sanitary guideline in the blue line. Sushi continues to be a higher risk product, and although *S. aureus* testing is no longer included with regular food sample submissions, inspectors are recommended to include a request for this pathogen to be tested when submitting sushi samples. Other food types that have exceeding the guidelines for sushi this year or in the past include rice and egg salad (likely foodhandler contamination) and fish/shellfish (either foodhandler or marine environment contamination).

**Chart 5: Detection of *S. aureus* in Food Quality Sample Submissions in 2006**



## Water Activity and pH Results

There were a total of 230 pH and water activity tests conducted on foods submitted during 2006. A total of 107 tests (46.5%) exceeded expected results (either pH is >4.6 or Aw > 0.9). Paired results for selected foods receiving both pH and water activity tests are shown in Table 6, with detailed results for all testing shown in Appendices 4a and 4b.

General guidelines are that foods should either be acidified (below pH 4.6) and/or have reduced water activity (below 0.85) before they are considered safe to store at room temperature. If the foods fail to meet the criteria they are considered potentially hazardous foods (PHFs).

Many of the items in Table 6 fail to meet these criteria and are considered PHFs (result highlighted in pink columns). These foods should either be refrigerated, stored at room temperature for only short periods, or investigated further in terms of their processing and risk.

All bakery products sampled had water activities exceeding 0.9, these are PHFs with a short shelf life, and should be either refrigerated or discarded within 24 hours. Asian food chutneys submitted were acidic and non-PHF, one sample of dumpling was considered a PHF. A syrup sample and an icing sample in the condiments category failed to meet the pH and Aw standard and are considered PHFs. The chili sauces did not meet the pH or Aw standard, however, other properties of these foods may influence shelf stability and limit pathogen growth. In this case the operator must demonstrate the safety of the product. 65% of the meats tested (pepperoni, salami, sausage) are considered PHFs by paired pH/Aw testing.

**Table 6: pH and Aw results for selected Food Quality sample submissions, 2006**

Food Description	No. of samples	pH		Water Activity (Aw)			PHF (yes or no)
		pH <4.6	pH >4.6	Aw <0.85	Aw >0.85 <0.9	Aw >0.9	
Bakery Goods	12		1		1	11	Yes
Beef Jerky	5		3	5			No
Cheese	1	1					No
Asian Foods	5	4	1			1	4-No 1-Yes
Condiments	14						
Jams	8	8		3	4		No
Salsa	3	3				1	No
Icing	1					1	Yes
Syrups	2	1	1	1			1-No 1-Yes
Cream			1				Yes
Dips & Sauces	9						
Chili/Hot Sauce	3		2		2		?
Bean/Peanut	2	1			1	1	1-No 1-Yes
Mayo	1	1					No
Salsa	1	1					No
Fruit	58	57	1				1-Yes
Sausages & ...	20						
Pepperoni	8	1	7	2	1	4	3-No 5-Yes
Salami	2		2	1		1	1-No 1-Yes
Sausage	10	1	9	1	2	7	3-No 7-Yes
Snacks –							
Raincoast cracker	2		2	2			No
Sushi Rice	11	8	3			3	3-No 8-Yes
Sushi (California roll)	1		1				No
Vegetable pickled	2	2					No
Vegetable cooked – roasted onion paste	1					1	Yes

One Inspector did a project on Tapioca Pearls and Syrup (date not shown in table). There were 43 pH and Aw tests done on 14 samples, some of which were tested over the course of 48 hours. Tests for *E.coli* and pathogens in these samples were negative, but the combined results of pH / Aw testing demonstrated that the ingredients for bubble tea (tapioca pearls with or without syrup) were potentially hazardous<sup>1</sup> in the submitted samples. A 2 hour hold rule was recommended for this product, and further testing done by a BCIT student.

## Special Pathogen and Environmental Hygiene Testing

In 2006, 111 specific pathogen tests were conducted for *Bacillus* spp. *Listeria monocytogenes*, *Vibrio parahaemolyticus* and *Trichinella*. Most test results were negative, a detailed summary of special pathogen testing is located in Appendix 5. Positive results included the detection of *B. cereus* in Asian noodles and cooked rice and detection of *Bacillus thuringiensis* in a strawberry survey<sup>2</sup>.

At one Vancouver premises environmental hygiene and pathogen testing was conducted before and after premises cleaning (shortly before opening on Oct 03/2006, and after a lunch rush, Aug 30/2006). In this testing, 21 environmental swabs and sponge samples were taken at various locations in the premises, along with another 11 targeted swab/sponge samples for the detection of *Vibrio parahaemolyticus*. Hygiene testing revealed poor sanitation of specific surfaces, such as hand-washing knobs at the oyster shucking area hand-wash sink and cooler doors. Details are shown in Chart 6 below.

The *V. parahaemolyticus* testing revealed no evidence of *Vp* on environmental surfaces. The one positive sample was a swab of the OUTSIDE of an oyster from an un-opened box of oysters held below 4°C in the refrigerated cooler. The counts on this oyster were 600 per gram. The Health Canada guidelines give a limit of 100 *Vp* per 100 gram at retail<sup>3</sup> (this value exceeds this limit). It is unknown whether there was any temperature abuse of the product before refrigerated storage. In this premise, raw oysters are taken from the cooler to a separate sink where the outside of the oyster is scrubbed before it is placed on food grade ice and taken to the oyster shucking area. This result confirms the potential for cross contamination possibilities during handling at food premises.

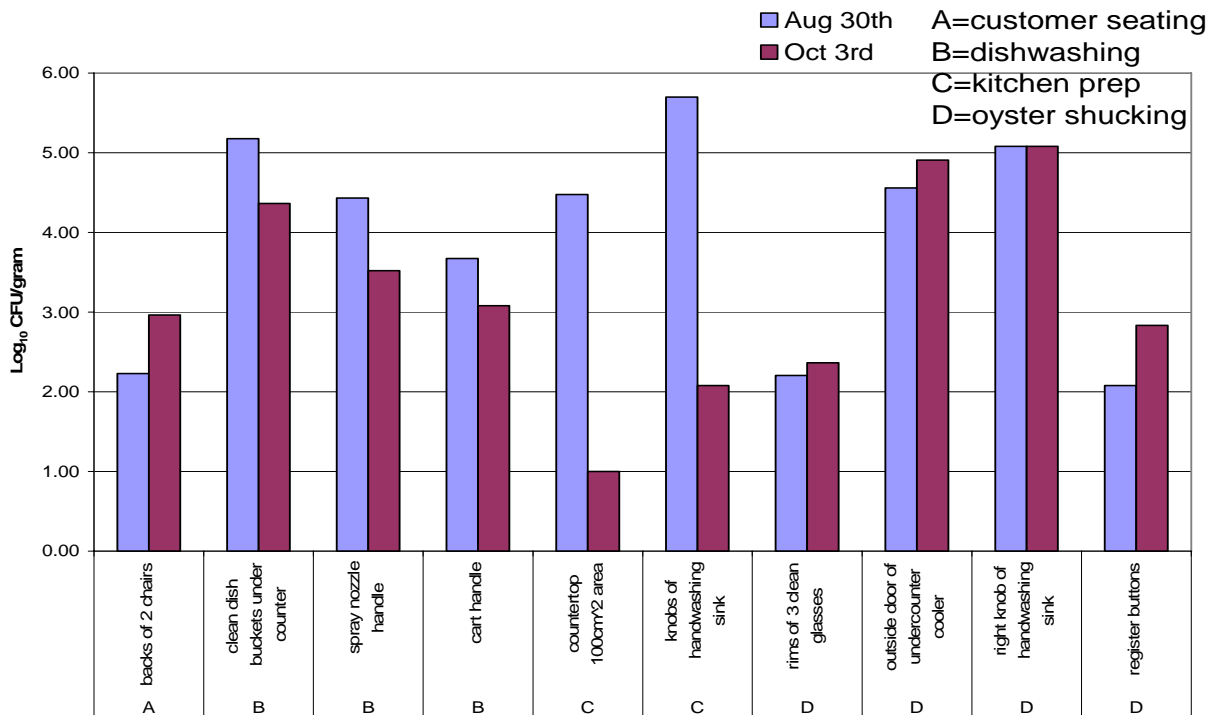
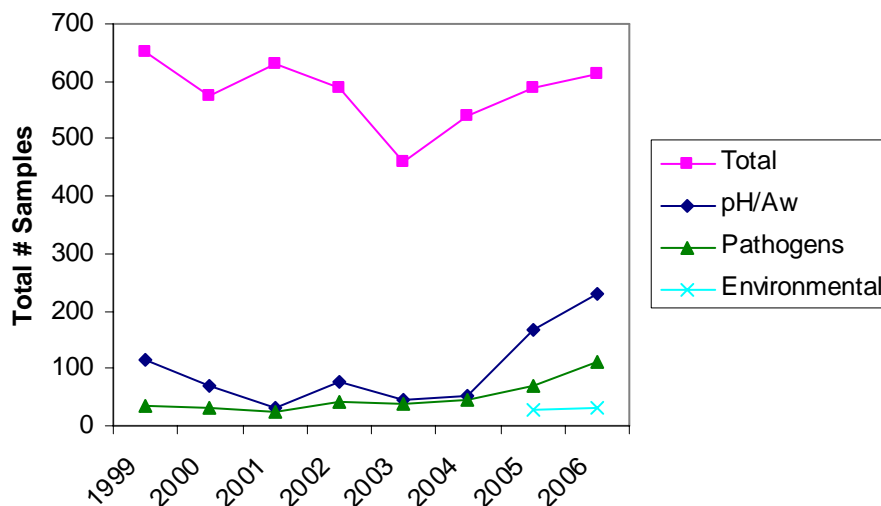


Chart 6 – Environmental Hygiene Sampling Before Sanitation (Aug 30<sup>th</sup>) and After Sanitation (Oct 3<sup>rd</sup>) at a Vancouver FSE.

## Recommendations and Conclusions

Over the last few years the number of Food Quality Check Program sample submissions has remained relatively constant. The newly introduced environmental hygiene testing program has been available but not widely used (submissions were 29 samples in 2005 and 32 samples in 2006). There has been an increase in the number of pH/Aw and pathogen sampling requests – illustrated in the chart below. This targeted approach to sampling specific food groups is positive: depending on the food group pH and water activity tests can determine whether the food is potentially hazardous without testing for microbial indicators.

**Chart 7 – Number of Food Quality Check Program Sample Submissions, 1999 to 2006**



Requests for pathogen testing in Food Quality Check samples has also increased.

Targeted pathogen sampling for specific food groups is recommended – an example list of

these can be found in Table 7. The pathogens indicated in this table were chosen on the basis of previous outbreaks and known occurrence in food categories. While it is not necessary to request pathogen testing for every sample collected in the foods below, the conditions of the inspection and questions to be answered about the food sample collected can guide the inspector's request.

**Table 7 – Foods with known associations to selected pathogens**

Pathogen	Foods
<i>Bacillus</i> spp.	Cooked Rice Milk (temp abuse or past shelf-life) Noodles
<i>Clostridium perfringens</i>	Gravy Cooked Meat Pies
<i>E. coli</i> 0157:H7	Bagged Salad Greens Sausages
<i>Listeria monocytogenes</i>	Cheese Deli Meats
<i>Salmonella</i>	Sprouts (alfalfa, mung bean)
<i>Staphylococcus aureus</i>	Egg Salad Cooked Rice Sushi Turkey
<i>Vibrio parahaemolyticus</i>	Shellfish (raw, ready to eat)

### **Recommendations:**

- Inspectors are encouraged to take Food Quality Check samples during inspections and in response to complaints –samples collected outside the assigned schedule are acceptable.
- The change in criteria for interpretation of microbial results, especially for Aerobic Colony Counts has highlighted the gaps in some food categories previously unrecognized, such as soups and cooked meats. Inspectors are reminded to carefully note the ingredients in submitted foods to allow meaningful interpretation of results.
- Although *S. aureus* testing has been discontinued as a routine indicator for poor hygiene, testing for this pathogen is recommended for sushi and any foods with extensive handling (such as turkey, cooked eggs).
- pH and Aw testing is a very useful tool to determine whether certain foods, such as sausages and jerky, jams, marinades and sauces are considered potentially hazardous. This testing is not useful for bakery items, where the Aw is always above 0.85 (and therefore defining this as a PHF).
- Environmental sampling for hygiene compliance is a useful tool for educating operators. Assistance with field testing and results analysis can be provided upon request (phone Food Protection Services at 604.660.5357).

The Food Quality Sampling Program continues to provide EHOs with an important tool in educating operators on the hazards associated with poor food handling practices. Should you have any questions on this report, or require assistance with results interpretation, please do not hesitate to contact me at 604.775.0763.

Yours truly,

Lorraine McIntyre, B.Sc., M.Sc.  
Food Safety Specialist

cc: Joe Fung  
Judy Isaac-Renton  
Perry Kendall

### **REFERENCES**

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2. McIntyre, L. Food Poisoning Outbreaks caused by *Bacillus* spp. in British Columbia, Canada. MSc Public Health Science Thesis. School of Life Sciences, University of Hertfordshire. January 2007
3. Health Products and Food Branch (HPFB) Standards and Guidelines for Microbiological Safety of Food - An Interpretive Summary. Table 3f. Accessed from [http://www.hc-sc.gc.ca/fn-an/res-rech/analy-meth/microbio/volume1/intsum-somexp\\_e.html](http://www.hc-sc.gc.ca/fn-an/res-rech/analy-meth/microbio/volume1/intsum-somexp_e.html) on November 15, 2007.

## Appendix 1: Food Category Listings

Category	Description	Category	Description			
1. Bakery, Cereals & Rices	Bakery Goods	9. Mixed Foods	Casserole			
	Cereal		Chinese / Japanes/ Asian Foods			
	Potatoes		Dips, Gravies & Sauces			
	Rices, cooked		East Indian Foods			
	Sushi Rice		Italian Foods			
2. Beverages, Desserts & Sauces	Carbonated beverages		10. Mushrooms	Mushrooms - domestic		
	Condiments, Marinades & Spices			Mushrooms - wild		
	Desserts		11. Plant Proteins	Legumes		
	Nondairy beverages			Nuts & Seeds		
	Snacks / Candy			Tofu		
3. Chemicals	Caustic chemicals		12. Salad Dressing	Salad dressing - commercial		
	Heavy metals	Salad Dressing - fresh				
	Organic chemicals					
	Other chemicals					
4. Dairy Goods	Butter	13. Salads		Salads – cooked ingredients		
	Cheese			Salads – mixed ingredients		
	Cream / cream desserts		Salads – raw ingredients			
	Ice cream / ice cream desserts	14. Seafoods	Crustacean			
	Milk		Finfish			
	Other dairy		Seafood, other			
5. Eggs	Eggs	15. Unknown	Shellfish			
			6. Environmental	Surface & Physical samples (swabs, sponges)	Unknown	
					7. Fruits	Fruit juice
Fruit salad	Vegetable – juice					
Fruit	Vegetable – pickled					
8. Meats	Beef	17. Water	Vegetable - raw			
	Chicken		Water – bottled			
	Lamb		Water - ice			
	Pork		Water - liquid			
	Sausage, hot dog, deli meat					
	Turkey					
	Wild game					

**Appendix 2: Category Breakdown for Food Quality Sample Submission in 2006**  
**Total Number Tested: 621**

Category	Sub-category Description	No. Tested
Baked Goods, cereals, rices n = 55	Bakery goods Count	26
	Potatoes Count	3
	Rices / cooked Count	13
	Sushi Rice Count	13
Beverages, Desserts & Sauces n = 41	Condiments / Marinades & Spices Count	18
	Desserts Count	2
	Nondairy beverages Count	19
	Snacks / Candy Count	2
Dairy Goods n = 54	Cheese Count	26
	Cream / cream desserts Count	1
	Ice cream / ice cream desserts Count	22
	Milk Count	3
	Other Dairy	2
Environmental, n = 31	Environmental Surface & Physical Count	31
Fruits n = 80	Fruit Count	76
	Fruit juice Count	2
	Fruit salad Count	2
Meat n = 109	Beef Count	20
	Chicken Count	25
	Pork Count	21
	Sausage / hot dog / deli meat Count	33
	Turkey Count	10
Mixed Foods n = 159	Chinese / Japanese / Asian foods Count	69
	Dips / Gravies & Sauces Count	22
	East Indian food Count	7
	Italian foods Count	6
	Mexican foods Count	1
	Pizza Count	2
	Sandwich / Wraps & Donairs Count	30
	Soups & Stews Count	4
	Sushi Count	15
Other mixed dishes Count	3	
Plant Proteins, n = 12	Tofu Count	21
	Legumes Count	1
Salad Dressing, n = 8	Salad dressing / fresh Count	7
	Salad dressing / commercial Count	1
Salads n = 41	Salads cooked ingredients Count	29
	Salads mixed ingredients Count	9
	Salads raw ingredients Count	3
Seafood n = 17	Crustacea (crab/shrimp) Count	4
	Finfish Count	10
	Seafood / other Count	2
	Shellfish (clam/oyster) Count	1
Vegetables n = 14	Vegetable COOKED Count	2
	Vegetable PICKLED Count	2
	Vegetable RAW Count	10

**Appendix 3a: Average, Median and Percentage of Foods Exceeding Guidelines for Aerobic Colony Count, *E. coli* and Total Coliforms, 2006**

Line Item Food Category	No. in category	Aerobic Colony Count				<i>E. coli</i>				Total Coliforms			
		Average (log10)	Median (log10)	no. exceeds guideline	%exceeds guideline	Average (log10)	Median (log10)	no. exceeds guideline	%exceeds guideline	Average (log10)	Median (log10)	no. exceeds guideline	%exceeds guideline
Bakery Goods	26	3.54	1.18	4	15%	0.00				0	0.00	0	0%
Beef	17	6.27	4.26	16	94%	0.00				2	0.00	1	6%
Cheese	14	6.56	4.54			0.00				1	1.53	0	0%
Chicken	25	6.45	3.20	22	88%	0.00				3	0.00	6	24%
Asian Foods	69	6.46	3.08	55	80%	1.56	0	3	4.3%	2	0.00	9	13%
Condiments	18	6.22	0.00	5	28%	0.00				0	0.82	0	0%
Desserts, Candy	7	5.91	2.11	2	29%	0.00				0	0.00	0	0%
Dips & Sauces	22	6.26	1.86	9	41%	0.00				2	0.00	2	9%
East Indian Foods	7	1.93	1.54	5	71%	0.00				0	0.00	0	0%
Environmental Surfaces	21	4.72	3.52			0.00							
Finfish	10	6.29	3.34	3	30%	0.00				2	0.60	1	10%
Fruit	73	5.89	4.20			0.00				2	0.00	1	2%
Fruit salads, juices	4	6.88	1.18			0.00				3	0.00	1	25%
Ice cream	24	6.18	2.97	12	50%	0.00				2	0.00	2	8%
Italian/Mexican Foods	9	6.54	3.65	7	78%	0.00				3	0.00	2	22%
Nondairy Beverage	19	3.18	0.00	0	0%	0.00				1	0.00	0	0%
Other Mixed Foods	4	2.88	0.00	2	50%	0.00				0	0.00	0	0%
Pork	21	6.66	4.66	7	33%	0.31	0	1	4.8%	2	0.00	2	10%
Rices, cooked	13	6.69	2.20	8	62%	0.21	0	1	7.7%	3	0.00	4	31%
Salad dressings	8	6.88	2.11	3	38%	0.00				3	0.00	2	25%
Salads, cooked	29	6.15	4.38	5	17%	0.00				3	0.60	4	14%
Salads, mixed	9	6.41	4.49	0	0%	1.72	0	1	11.1%	2	0.60	0	0%
Sandwiches &...	30	6.65	5.04	11	37%	0.00				2	0.00	3	10%
Sausages &...	29	6.51	3.78	3	10%	0.04	0	1	3.4%	1	0.00	0	0%
Seafoods	7	4.67	3.74	3	43%	0.00				1	0.00	0	0%
Soups & Stews	4	5.14	1.35	3	75%	0.00				3	0.00	1	25%
Sushi	15	5.99	4.41	0	0%	0.00				2	1.18	2	13%
Sushi Rice	13	4.33	3.11	0	0%	0.00				0	0.00	0	0%
Tofu	11	7.24	7.48	0	0%	1.64	0	2	18.2%	3	3.38	8	73%
Turkey	10	6.79	5.08	9	90%	1.40	0	1	10.0%	3	2.74	5	50%
Vegetable, cooked/pickled	7	6.63	3.04	4	57%	0.00				3	0.00	1	14%
Vegetable, raw	14	6.95	5.93			0.00				3	0.30	0	0%

**Appendix 3b: Average, Median and Percentage of Foods Exceeding Guidelines for Fecal coliforms, and *S. aureus*, 2006**

Food Category	No. in category	Fecal Coliforms				<i>Staphylococcus aureus</i>			
		Average (log10)	Median (log10)	no.exceeds guideline	% exceeds guideline	Average (log10)	Median (log10)	no.exceeds guideline	% exceeds guideline
Bakery Goods	26	0.00				0.00			
Beef	17	1.45	0	1	5.9%	0.42	0	0	0.0%
Cheese	14	0.00				0.49	0	0	0.0%
Chicken	25	1.15	0	2	8.0%	0.00			
Asian Foods	69	1.63	0	7	10.1%	0.33	0	0	0.0%
Condiments	18	0.16	0	1	5.6%	0.18	0	0	0.0%
Desserts, Candy	7	0.00				0.00			
Dips & Sauces	22	1.71	0	3	13.6%	0.00			
East Indian Foods	7	0.00				0.00			
Environmental Surfaces	21					0.00			
Finfish	10	0.11	0	1	10.0%	0.00			
Fruit	73	0.05	0	1	1.5%	0.00			
Fruit salads, juices	4	0.00				0.00			
Ice cream	24	0.00				0.00			
Italian/Mexican Foods	9	1.29	0	3	0.0%	0.00			
Nondairy Beverage	19	0.00				0.00			
Other Mixed Foods	4	0.00				0.00			
Pork	21	0.31	0	1	4.8%	0.38	0	0	0.0%
Rices, cooked	13	0.21	0	1	7.7%	3.09	0	1	7.7%
Salad dressings	8	0.00				0.00			
Salads, cooked	29	0.08	0	2	6.9%	0.30	0	0	0.0%
Salads, mixed	9	1.72	0	1	11.1%	0.00			
Sandwiches &...	30	2.02	0	3	10.0%	0.00			
Sausages &...	29	0.04	0	1	3.4%	0.36	0	0	0.0%
Seafoods	7	0.11	0	1	14.3%	0.00			
Soups & Stews	4	2.06	0	1	25.0%	0.00			
Sushi	15	0.00				3.19	0	1	6.7%
Sushi Rice	13	0.00				0.00			
Tofu	11	2.38	0	4	36.4%	0.00			
Turkey	10	2.72	0	3	30.0%	0.80	0	0	0.0%
Vegetable, cooked/pickled	7	2.38	0				0	0	0.0%
Vegetable, raw	14	1.26	0	1	7.1%	0.58	0	0	0.0%

#### Appendix 4a: Summary of Water Activity Results for Foods Tested in 2006

Line Item Food Category (food names indicated in brackets when n=1)	Number tested	< 0.85	> 0.85 < 0.9	> 0.9
Bakery goods	12		1	11
Beef	5	5		
Asian Foods (dumplings)	1			1
Condiments	11	4	4	3
Dips, gravies, sauces	4	1	2	1
Nondairy beverage	19			19
Cooked Rice (rice bowl)	1			1
Sausage, hot dogs, deli meats	20	4	2	14
Snacks/candy (cracker)	1	1		
Sushi Rice	4			4
Vegetables, cooked (onions paste)	1			1

#### Appendix 4b: Summary of pH Results for Foods Tested in 2006

Line Item Food Category (food names indicated in brackets when n=1)	Number tested	< 4.6	> 4.6
Asian foods	5	4	1
Bakery goods (sausage rolls)	1		1
Beef (beef jerky)	3	1	2
Cheese (cheddar)	1	1	
Condiments	13	11	2
Cream	1		1
Dips, gravies, sauces	7	5	2
Fruit	54	53	1
Fruit juice	2	2	
Fruit salad(compote)	1	1	
Nondairy beverages (strawberry ginko)	1	1	
Nondairy beverage	24	6	18
Rice, cooked	2	2	
Salad dressings, fresh (jalapeno ranch)	1	1	
Sausage, hot dogs, deli meats	20	1	19
Snacks (cracker)	1		1
Sushi (California roll)	1		1
Sushi Rice	11	8	3
Vegetables, pickled (5 veggie pickle)	1	1	
Vegetables, raw (chipotle cilantro)	1	1	

## Appendix 5: Special Pathogen Testing for Foods Tested in 2006

Line Item Food Category (food names indicated in brackets when n=1)	Number tested	Pathogen	Not detected (L10 CFU/g)	Not detected (enrichment)	Detected
Cheese	12	<i>Listeria monocytogenes</i>		12	
Bear Sausage	1	<i>Trichinella</i>	1		
Bakery Good (sausage roll)	1	<i>B. cereus</i>	1		
Cheese (Feta)	1	<i>B. cereus</i>		1*	
Asian Foods	6	<i>B. cereus</i>	5		1
Dips...(BBQ sauce)	1	<i>B. cereus</i>	1		
Fruits-strawberries (study)	66	<i>B. thuringiensis</i>	21		45
Ice cream (vanilla)	1	<i>B. cereus</i>	1		
Nondairy beverage(hot chocolate powder)	1	<i>B. cereus</i>	1		
Rice, cooked	4	<i>B. cereus</i>	2		2
Rice, sushi	2	<i>B. cereus</i>	2		
Sausages &...(pepperoni)	3	<i>B. cereus</i>	3		
Sushi (avocado roll)	1	<i>B. cereus</i>	1		
Environmental Surfaces	11	<i>Vibrio parahaemolyticus</i>	9	1	1

\* Enterotoxin detection by BCET-RPLA kit.