

Food Quality Check Program

Microbiological Recommendations

**Food Laboratory,
Environmental Microbiology
BC Public Health Microbiology & Reference Laboratory**

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Food Quality Check Program

Microbiological Recommendations and Sampling Schedule

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Food Quality Check Program

Revised Information

1. General Information

The Food Quality Check Program is primarily intended to be a proactive initiative for Environmental Health Officers (EHOs) to educate their operators on the hazards associated with poor food handling practices.

The program provides EHOs with an objective measurement to assess the level of sanitation in food premises and to provide information which aim to correct poor food handling practices and ultimately prevent food poisoning incidents from occurring. The Food Quality Check Program is not intended to replace sampling associated with foodborne illnesses. However, if a food poisoning incident occurs and no leftover food is available for examination, the EHO can utilize this program to inspect food quality/sanitation from the implicated premises.

Health Authorities are permitted to submit a total of 20 samples per week and these can be any combination of ready-to-eat food and/or environmental surface swab/sponge samples.

Under exceptional circumstances, the laboratory may be able to accommodate the Health Authority that wishes to sample outside of their allocated sampling week or wishes to exceed the 20 samples/week limits. Please consult the laboratory for preauthorization prior to submitting such samples.

When situations warrant, the laboratory can also provide special tests such as water activity, pH and pathogen testing relating to foodborne disease investigation or food control. Again, approval must be obtained prior to submission of samples.

Microbiological Analysis

Microbiological analysis carried out for approved samples includes:

Screening for indicator bacteria:

- Total Coliforms
- Fecal Coliforms
- *E. coli*
- Aerobic Colony Count (ACC)

- Aerobic Colony Count will be performed on submitted environmental surface samples such as sponges or swabs.
- Additional special tests may be requested (and must be approved prior to submission) as circumstances warrant:
 - pH and a_w
 - Foodborne pathogens (e.g., *E. coli* O157:H7, *Salmonella* species, *Bacillus cereus*, *Staphylococcus aureus*, *C. perfringens*, *L. monocytogenes*, or other).

Special Surveys

Special surveys and other projects may be carried out with prior agreement and joint planning with the Food Laboratory.

2. Sampling Requirements

- Submit all samples according to the prearranged schedule.
- Contact the Food Laboratory for approval before submitting any unscheduled or additional samples.
- Contact the Food Laboratory before submitting samples for pH, water activity or culture for foodborne pathogens.

Types of Foods Appropriate for Food Quality Testing

- All ready-to-eat foods (cooked and raw) including:
 - Solid - Frozen
 - Liquid - Canned
 - Dry

Containers for Sampling and Submission

1. Sterile Food Microbiology jars provided by BC Public Health Microbiology & Reference Laboratory.
2. Sterile whirl-pak bags with wire closure.
3. Food samples can be shipped in the original packaging as long as it is air tight and will not leak during transit. If not, transfer to either a sterile Food Microbiology jar or whirl-pak bag.

4. Sponges and swabs for environmental surface sampling in sterile bags or transport tubes.

Requisition Form

- Every sample must be accompanied by a completed Food Quality Sampling Requisition form.
- Complete all applicable fields on the requisition. Incomplete or improperly filled out information can affect result interpretation and data analysis.
- Hard copies of the Food Quality Sampling Requisition form can be ordered from the laboratory by submitting the Sample Container Order form and indicating the number of requisitions required.

3. Food and Environmental Surfaces Sampling Procedures

Food

1. Take representative samples aseptically with sterile implements (knife, spoon, tongs, spatula, etc.) and place them in sterile food microbiology jars or other sterile, leak proof containers.
2. Sample at least 200 grams of food for microbiological analysis.
3. Label the sample container legibly.

Environmental Surfaces

1. Wash hands before sampling.
2. Label the outside of the tube/bag with a description of the surface sampled.
3. If the sponge or swab is dry, pour vial containing sterile buffer into the bag containing the swab or sponge and allow to rehydrate.
4. Put on a disposable glove and remove the sponge or swab aseptically.
5. **SPONGE:** Drag sponge (with excess liquid gently squeezed out) across a defined area (preferably 5 cm x 5 cm) using a back and forth motion to entirely cover the area. Repeat perpendicular to the first sampling in the same 25 cm² area.

SWAB: Moisten swab and press against container to express excess liquid. Using a slight rolling motion, sample a 10 cm² area. After the grid is done, place swab back in liquid and shake gently in the liquid. Express excess

liquid into vial before repeating as follows: repeat twice, once perpendicular and once more diagonal to the first same area sampled.

6. Place sponge or swab in original whirl-pak bag or vial and close tightly. Discard glove.
7. Enclose a completed Food Quality Sampling Requisition form with every sample and note the area sampled. If the area sampled is not noted, results will be reported in cfu/sponge or cfu/swab as compared to cfu/area².

4. Storage and Transportation of Samples

- It is preferable to deliver samples to the laboratory as soon as possible after collection.
- Refrigerate perishable foods which are not frozen at time of collection at 4°C or lower.
- Shelf stable foods should be stored in a dry location.
- Frozen samples should be stored as close to the temperature at which they were sampled and shipped under proper conditions to maintain temperature.
- Send samples by courier and use refrigeration (e.g. Cooler containing ice packs).
- Shipping by mail is not recommended.
- The Food Laboratory is able to accept Food Quality Samples five days a week but would prefer samples to be submitted Monday through Wednesday. By special arrangement the laboratory will be able to receive samples on weekends. Please consult the laboratory prior to shipping.

5. Significance of Aerobic Colony Count and Indicator Bacteria

Aerobic Colony Count

Aerobic Colony Count (ACC) is defined as the total number of bacteria able to grow in an oxygenated or aerobic environment. It is one of the most common tests applied to indicate the microbial quality, not safety, of food.

The significance of ACC can vary according to the type of food product and the processing it has received. A good understanding of the product type is important in order to fully interpret ACC especially given the diversity of food products and production methods used in BC.

When sampling, notes should be made on the requisition form about the product to indicate if the food consists of only fully cooked ingredients or contains a mixture of cooked and raw ready-to-eat components. Knowing what ingredients a food is comprised of and how it has been cooked or prepared will help to determine how to properly interpret the testing results. Without this knowledge, interpretation of the ACC results can be tricky. Another factor to consider is the shelf-life of the product since foods sampled close to their shelf-life will likely have an ACC that will approach the upper limit.

Aerobic colony count results are not applicable to raw ready-to-eat foods, such as fruits and vegetables, cultured products or fermented foods as these foods will inherently have a high count. Foods that are produced by adding starter bacteria will not generally have a significant count of other bacteria mainly due to the acidity produced during the fermentation. Fruits and vegetables which are not cooked before consumption are expected to have bacterial organisms present from the environment that they are grown in and as such will have a high aerobic colony count. For other foods, elevated counts of ACC may be due to:

- the food being past its shelf life (code)
- poor sanitation
- non-hygienic packaging materials
- inadequate processing or post-processing contamination such as poor food handling or hygiene practices

When sampling foods it is important to consider that comparing a series of results for ACC over time is more valuable than assessing a single sample.

Food Categories

To properly interpret ACC results, knowledge of the food ingredients and processing are required and must be determined at the time of sampling. Using this knowledge, foods can be divided into the three following categories. Please refer to Table of Food Category Examples (Appendix A) for a further detailed explanation of the food categories.

Category 1

These foods are ready-to-eat and all components are fully cooked in preparation of the final product without any subsequent handling prior to sale or distribution. It is reasonable to expect that foods falling within this category which have been properly handled and prepared to have an ACC less than 10,000/g. The only exception to this acceptable limit would be for foods that are canned or have gone through a retort process. It is expected that these foods should be relatively close to sterile, but occasionally thermotolerant spores can survive. Canned or retorted foods are not expected to be close to the acceptable limits.

Category 2

These foods contain components that are fully cooked and ready-to-eat but may have undergone some additional handling (storage, slicing or mixing) prior to the sale, distribution or consumption. This category also applies to foods that are assembled from ready-to-eat foods (excluding those in Category 3) and do not undergo a final cook step (eg. hot dogs, sandwiches, burgers).

Category 3

These foods are exempt from microbial recommendations because it is expected that high aerobic colony counts would be present due to the normal microbial flora associated with these food items. Examples of foods in this category are fresh fruits and vegetables, fermented foods, all types of sprouts, cultured dairy products or any foods that contain these as an ingredient, such as sandwiches, pasta salads or salad rolls.

Total Coliforms

Total Coliforms are bacteria that are found naturally in the environment and are generally harmless. They can grow at body temperature and the presence of total coliforms in cooked ready-to-eat foods can be indicative of poor handling practices. For example, the presence of coliforms following pasteurization could indicate inadequate pasteurization or post pasteurization contamination.

Elevated counts of Total Coliforms may be due to:

- inadequate processing
- extended shelf-life
- post processing contamination

Fecal Coliforms

Fecal coliforms are found in the environment and can appear in large quantities in the intestines and feces of humans and animals. Caution has to be exercised when interpreting a fecal coliform result in certain foods. Finding fecal coliforms in cooked ready-to-eat foods is indicative of recent contamination and indicates that there is a greater risk that pathogens may also be present. However, the presence of fecal coliforms in fresh fruits or vegetables may not be an indication of fecal contamination since some genera of bacteria in the fecal coliform group are from non-fecal sources in the environment.

Elevated counts of Fecal Coliforms may be due to:

- fecal contamination
- post processing contamination
- extended shelf-life
- poor sanitation
- inadequate processing

E. coli

E. coli bacteria live in the gut of warm blooded mammals and can grow at elevated temperature. They are almost exclusively of fecal origin and their presence is an effective confirmation of fecal contamination. The presence of *E. coli* in foods is indicative of direct or indirect contamination with feces and therefore indicates the potential for enteric pathogens to also be present.

Note: Certain serotypes of *E. coli* are pathogenic and are capable of causing outbreaks of diarrhea.

6. Microbiological Recommendations for Ready-to-eat Foods

Aerobic Colony Count ^a (CFU/g)			
Food Category*	Satisfactory	Cautionary	Unsatisfactory
Category 1	< 10,000	< 100,000	≥ 100,000
Category 2	< 100,000	< 1,000,000	≥ 1,000,000
Category 3	N/A	N/A	N/A

^a Results determined after 48 hours incubation at 35°C

*Refer to Appendix A for a detailed explanation of each food category

CFU/g – Colony forming units per gram

< Less than

≤ Less than or equal to

> Greater than

≥ Greater than or equal to

N/A – Not applicable because the food, or a component of it, naturally contains high numbers of bacteria (eg. raw fruits or vegetables, fermented or cultured foods)

Indicator Organisms (MPN/g)			
Test	Satisfactory	Cautionary	Unsatisfactory
Total Coliforms	< 100	< 1,000	≥ 1,000
Fecal Coliforms	< 3	N/A	≥ 3 ^c
<i>E. coli</i>	< 3	N/A	≥ 3

^c Exception: Fresh fruits and vegetables, including sprouts or foods containing these as an ingredient.

Aerobic Colony Count Recommendations for Environmental Surfaces				
Swab		Sponge		Interpretation
Total Count (per cm ²) based on 10 cm ² area	Total Count Per Swab	Total Count (per cm ²) based on 25 cm ² area	Total Count Per Sponge	
< 5	< 50	< 2	< 50	Satisfactory
5 - 27	50 - 270	2 - 10	50 - 250	Cautionary
> 27	> 270	> 10	> 250	Unsatisfactory

Pathogen Tests ^a (/g)			
Organism	Satisfactory	Cautionary	Unsatisfactory
<i>B. cereus</i>	< 50	< 1,000	≥ 1,000**
<i>S. aureus</i>	< 25	< 100	≥ 100**

^a Refer to Health Canada Microbial Guidelines for Ready-to-Eat Foods: A Guide for the Conveyance Industry and Environmental Health Officers (EHO).

**Any result higher than 10,000 CFU/g is considered potentially hazardous.

Supplementary Tests*	
pH ≤ 4.6	a _w ≤ 0.85

*Generally for a food to be considered safe to store at room temperature it should meet one of these criteria.

7. STAT Reports

When the laboratory detects positive results for Fecal Coliform or *E. coli* tests, the submitting EHO and supervisor will be notified by email with an attached report detailing the food sample information and the preliminary laboratory findings. No STAT reports will be issued for foods that exceed the recommended microbiological aerobic colony counts.

8. Reference Material

Food Monitoring Website:

www.bccdc.ca/foodandyourhealth/foodmonitoring

PHSA Labs Food Quality Annual Reports:

www.phsa.ca/AgenciesAndServices/Services/PHSA-Labs/Publications-Reports/default.htm

Environmental Hygiene Monitoring A Guide for Public Health Inspectors, Feb 2008 v. 2.

www.bccdc.ca/foodandyourhealth/foodmonitoring

BCCDC Public Health Microbiology & Reference Laboratory Guide to Programs and Services

www.phsa.ca/NR/rdonlyres/D632D356-8E8F-4917-BC3D-463EB5F8A14B/0/GuidetoProgramServices.pdf

Hislop N., Phan P. (2007). Microbiological guidelines for ready-to-eat foods: A Guide for Environmental Public Health Professionals. *Environmental Health Review*, 37-42.

Health Canada (2010). Health Canada Microbial Guidelines for Ready-to-Eat Foods: A Guide for the Conveyance Industry and Environmental Health Officers (EHO).

Ontario Agency for Health Protection and Promotion. (2010). Public Health Inspector's Guide to the Principles and Practices of Environmental Microbiology. <http://www.oahpp.ca/>

Doyle, MP. MC Erickson. 2006. Closing the Door on the Fecal Coliform Assay. *Microbe* 1(4):162-163.

Health Products and Food Branch (HPFB) Standards and Guidelines for Microbiological Safety of Food – An Interpretive Summary, April 2008

<http://www.hc-sc.gc.ca/fn-an/res-rech/analy-meth/microbio/volume1/intsum-somexp-eng.php>

9. Contact Information

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Appendix A:

Table of Food Category Examples

This document is a guide to assist Environmental Health Officers (EHOs) to determine the food category that a ready-to-eat food sample submitted for testing under the Food Quality Check program falls into. This list is not exhaustive and if a food is not listed here EHOs should use their own judgment to determine where a product would fit, based upon the processing it has received, the product type and the shelf stability.

Category 1	Example	
	Soups	Cooked vegetables
	Meat Pies	Stews
	Quiche	Chili
	Cooked meats	Fried rice
	Cooked fish	Samosa
	Cooked seafood	Rice
	Hamburger patties	Pizza
Category 2	Example	
	Sliced meats	Custard filled pastry
	Paté	Desserts
	Sandwiches (containing cooked ingredients)	Long shelf life fish or meat products (Vacuum or MAP)*
	Hot and cold smoked fish and meats	Ice cream, milk shakes
	Donairs	Sushi rice
	Dips, dressing or sauces	Spices
Category 3	Example	
	Sprouted seeds	Cheese
	Fresh fruits and vegetables	Pickled foods
	Yogurt	Sandwiches (containing raw ingredients)
	Mixed salads (containing raw ingredients)	Dried foods
	Fermented meats	

*These products can have an ACC of 10^7 - 10^8 CFU/g and still be considered safe. A result over 10^8 CFU/g is considered unacceptable.