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# Microbial Guidelines for Ready-to-Eat Foods – A Guide for the Conveyance Industry and Environmental Health Officers (EHO)



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# **Microbial Guidelines for Ready-to-Eat Foods: Guide for the Conveyance Industry and Environmental Health Officers (EHO)**

by

**Health Canada  
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**2010**

## **INTRODUCTION**

Food samples may be required for risk assessment, monitoring purposes, or to be obtained as part of suspected foodborne illnesses investigations. The purpose of these guidelines is to provide assistance to the conveyance industry and for Health Canada Environmental Health Officers (EHO) in the interpretation of microbial analyses for single samples of ready-to-eat foods, sampled at the point of sale where no other microbiological criteria exist.

These microbial guidelines for ready-to-eat foods utilize a scale rather than a single threshold value for food sample interpretation. The guidelines identify four categories of microbiological quality for ready-to-eat foods ranging from satisfactory to potentially hazardous. These categories correspond to the appropriate level action to be taken based on the level of contamination identified and risk to public health.

Ready-to-eat foods for distribution to consumers would include those provided by food caterers, airport and passenger terminal food concessions and conveyances such as airlines, cruise ships, passenger trains and passenger ferries.

### **Ready-to-eat foods**

Ready-to-eat food is a food that is natural or synthetic and which requires temperature control because it is capable of supporting the rapid and progressive growth of infectious or toxigenic micro-organisms. (International Flight Service Association [IFSA] & Association of European Airlines [AEA], 2010).

The Health Canada guidelines are modeled after guidelines developed by Hislop & Phan (2007), Australia New Zealand Food Authority (2001), Gilbert et. al (2000), UK Health Protection Agency (2009) and the Hong Kong Center for Food Safety – Food and Hygiene Department (2007). General food microbiological limits, though not specific for ready-to-eat foods, developed by the Ontario Agency for Health and Promotion (2010) and the Government of Quebec (2009) were used in a comparative analysis to determine the most stringent guidelines nationally. The Health Canada guidelines have been reviewed by Health Canada’s Bureau of Microbial Hazards.

## **SAMPLING**

As a base testing panel, the following parameters are recommended when testing a food sample: *Escherichia coli*, *Salmonella* spp., *E.coli* 0157, *L. monocytogene* and Coagulase positive staphylococci. Based on the results of this panel and consultation with the laboratory, further testing may be conducted for specific indicator organisms or pathogens listed in Table 1, as required.

Food samples may be submitted for laboratory analysis for a number of reasons and may be limited in size and number. While these guidelines will allow for an assessment of the microbiological quality of a single sample of ready-to-eat food to be made, the results may not be representative of the lot from which it is derived, unless the sample has been individually prepared. The guidelines do not provide sampling regimes necessary to accept or reject batches or lots. Further samples may be required for a Health Risk Assessment of a specific lot to determine the microbiological status of the lot. When required, such assessments will be conducted by Health Canada.

The collection and transportation of samples should be conducted according to Appendix B, Volumes 1-3, *Compendium of Analytical Methods*:

[http://www.hc-sc.gc.ca/fn-an/alt\\_formats/hpfb-dgpsa/pdf/res-rech/appendix-annexe\\_b-eng.pdf](http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/res-rech/appendix-annexe_b-eng.pdf)

Note that one sample unit might not be representative of the whole lot. In certain situations, a request for a health risk assessment may be requested from the Evaluation Division of the Bureau of Microbial Hazards, Health Canada.

## **FOOD EXAMINATION**

The microbial guidelines for ready-to-eat foods consist of three sections (see Table 1):

1. An Aerobic Colony Count (ACC) for food microbial quality and effectiveness of sanitation;
2. Indicator organisms; and

### 3. Foodborne pathogens for food safety evaluation.

The microbiological testing for ready-to-eat foods should be appropriate to the type of food sample being examined and to processing it has received. Not all the organisms listed in Table 1 are equally applicable to all food groups, nor should all the organisms listed be tested for routinely. Interpretation of results should be based on knowledge of the product components and the production process.

Proper interpretation requires the EHO to take into account several factors:

- the ingredients used in the preparation of the specific food product(s);
- methods of preparation of food product(s);
- the condition under which foods were stored prior to sampling; and
- other mitigating factors specific to the product(s).

### **Aerobic Colony Count**

The Aerobic Colony Count (ACC), also referred to as the standard plate count or the total viable count, is one of the most common tests applied to indicate the microbiological quality of food. The significance of ACCs, however, varies markedly according to the type of food product and the processing it has received. When ACC testing is applied on a regular basis it can be a useful means of observing trends by comparing ACC results over time. Testing for ACC may be required to measure the level of sanitation in a food handling facility in combination with the compliance history of the facility and to measure the compliance of the food facility to Sections 4 and 7 of the *Food and Drugs Act*.

Additional microbial testing is still required to determine if indicator organisms or known human pathogens are present.

Three categories of ACC are listed in Table 1 based on food type and the processing/handling the food has undergone.

#### **Category 1**

These foods are ready-to-eat and are comprised entirely of components that have been cooked in the preparation of the final product without subsequent handling or processing of any kind prior to distribution or sale (ex. soups, bread, quiche, cooked meat, fish & seafood and vegetables).

#### **Category 2**

These foods contain some components that have been cooked, but may have been further handled prior to or during the preparation of the final product. This category also applies to any foods that are assembled from ready-to-eat foods (excluding those in category 3) that are not subsequently cooked (ex. hot dogs, sandwiches, burgers).

### Category 3

Examples of foods in this category are foods such as fresh fruits or vegetables, deli meats, fermented foods, chicken salad, taboulé, all kind of sprouts and cultured dairy products or any food product incorporating these foods (such as sandwiches), where it is expected that high standard (aerobic) colony counts would be present due to the normal microbial flora associated with these items. As such, ACC does not apply (ex. pitas, potato or pasta salad, salad rolls).

### CATEGORIES OF MICROBIOLOGICAL QUALITY

The microbial guidelines for ready-to-eat foods utilize a scale rather than a single threshold value for food sample interpretation. Potentially hazardous values generally incorporate a 1-log safety margin from values generally accepted in the medical literature to cause illness in humans.

Four categories of microbiological quality have been assigned based on standard plate counts, levels of indicator organisms and the number or presence of pathogens. These are satisfactory, marginal, unsatisfactory and potential hazardous.

**Satisfactory:** test results below this value indicate good microbiological quality, and further action is not required. For pathogens, expressed limits are representative of threshold values and therefore may vary depending on which diagnostic tests are used.

**Marginal/ Borderline:** test results are borderline, but fall within accepted microbiological limits. These results may indicate poor quality of source ingredients, improper food handling during preparation or storage, and/or unsanitary conditions within the establishment(s) at which the food (or ingredients) were processed. Re-sampling, a review of food handling practices, and an inspection of the implicated food establishment may be warranted, particularly if marginal results are routinely found.

**Unsatisfactory:** test results are outside of the accepted microbiological limits and are indicative of problems with sanitation, maintenance, food handling and/or food storage practices. Immediate action is required. Actions may include, but should not be limited to: the withdrawal of food from the same lot, the same day production and perhaps the same nature depending on results. Further sampling is required and an investigation of food handling and sanitation controls is warranted.

**Unacceptable/Potentially Hazardous:** test results in this range approach those implicated in outbreaks of foodborne illness and immediate action is required. Actions may include, but should not be limited to: the withdrawal of any food still available for sale or distribution, the recall of foods already sold or distributed to the public; the re-sampling of food(s); an investigation of food handling, storage, display and/or receiving practices; a review of sanitation, maintenance, hygiene, exclusion, and/or pest control measures, and any other action the EHO deems necessary to determine the source of the contamination and mitigate further risk to the public.

## RECOMMENDED TESTING METHOD

The values and limits are described in the *Interpretive Summary - Standards and Guidelines for Microbiological Safety of Food* from the *Compendium of Analytical Methods*. The Interpretive Summary uses a three class sampling plan that would reflect requirements prescribed by the *Food and Drug Act and Regulations* for some standardized food commodities and those values and limits are achievable.

Table 1

## Microbial Guidelines for Ready-to-Eat Foods

| Test                                  | Microbial Guideline (CFU per gram unless otherwise stated) |                        |                                  |                  |
|---------------------------------------|--|------------------------|----------------------------------|------------------|
|                                       | Satisfactory   | Marginal               | Unsatis                          | Potentially      |
| Aerobic Colony Count                  |  |                        |                                  |                  |
| Category 1                            | <10 <sup>4</sup>   | <10 <sup>5</sup>       | ≥10 <sup>5</sup>                 |                  |
| Category 2                            | <10 <sup>6</sup>   | <10 <sup>7</sup>       | ≥10 <sup>7</sup>                 |                  |
| Category 3                            | N/A  | N/A                    | N/A                              |                  |
| Indicator Organisms                   |  |                        |                                  |                  |
| Coliforms <sup>(a)</sup>              | <10 <sup>2</sup>   | <10 <sup>3</sup>       | ≥10 <sup>3</sup>                 |                  |
| Escherichia coli                      | <10  | <100                   | ≥100                             | See VTEC         |
| Pathogens                             |  |                        |                                  |                  |
| Salmonella spp.                       | Not detected in  |                        | Detecte                          |                  |
| Campylobacter spp.                    | Not detected in  |                        | Detecte                          |                  |
| Shigella spp. *                       | Not detected in  |                        | Detecte                          |                  |
| E.coli O157: H7 & VTEC                | Not detected in  |                        | Detecte                          |                  |
| L. monocytogenes                      | Not detected in  | 10-≤100 <sup>(c)</sup> | ≥100 <sup>(d)</sup>              |                  |
| V. cholerae **                        | Not detected in  |                        | Detecte                          |                  |
| V. parahaemolyticus <sup>(b)</sup>    | Not detected in  | Detected but           | 10 <sup>2</sup> -10 <sup>3</sup> | ≥10 <sup>3</sup> |
| Clostridium perfringens               | <10  | 20-100                 | 100-                             | ≥10 <sup>4</sup> |
| Coagulase positive staphylococci      | <205   | <10 <sup>2</sup>       | 100-                             | ≥10 <sup>4</sup> |
| B.cereus and other pathogens Bacillus | <50  | <10 <sup>3</sup>       | <10 <sup>4</sup>                 | ≥10 <sup>4</sup> |

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

Detected – Immediate action on the product is required

- (a) Not applicable for fresh fruit, raw vegetables or food containing these.
- (b) Should not be present in seafood that has been cooked. Products intended for consumption in their raw form should contain less than 100 CFU per gram. Potentially hazardous levels of *V.parahaemolyticus* relates to Kanagawa-positive strains. *V. parahaemolyticus* and *V. cholerae* should be considered when analysing fish and seafood products.
- (c) Foods intended to have a prolonged shelf-life should contain no detectable level of *L. monocytogenes* (e.g. cheese, processed deli meats, etc).
- (d) Detection of *L. monocytogenes* is also considered to be potentially hazardous if the food is to be served to “high risk” populations, such as the young, the elderly, or the immunocompromised (e.g. baby food, hospital food, and food served at seniors’ centers).

\* Microbiological criteria for *Shigella* spp. was added for consistency with UK guidelines. *Shigella* spp. have not been included in the guidelines developed by other countries for ready to eat foods.

\*\* Microbiological criteria for *Vibrio cholerae* have been added to UK guidelines because the European Commission has made several decisions in response to the isolation of this organism from various ready-to-eat foods, mainly fishery products and fruits and vegetables, imported into countries of the European Union.



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