



Microbiological Guidelines *for* Ready-to-eat Food

May 2007 (Revised)

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Centre for Food Safety

*This set of Guidelines is published by
The Centre for Food Safety, Food and Environmental Hygiene Department.
The technical content has been developed
in consultation with
the Expert Panel on Microbiological Safety of Food
of the Food and Environmental Hygiene Department.*

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Microbiological Guidelines for Ready-to-eat Food

Preface

According to the Codex Alimentarius Commission, an international food standard setting authority, the functions of microbiological guidelines include formulation of design requirements, indication of required and expected microbiological status of the food commodities, and the verification of efficacy of hygienic practice.

In 2002, under the advice of the Expert Panel on Microbiological Safety of Food, an expert group set up to advise the Director of Food and Environmental Hygiene, a set of microbiological guidelines for ready-to-eat food has been developed by the Food and Environmental Hygiene Department. These guidelines stipulate the safety limits of nine major food borne pathogens such as *Salmonella* species, *Listeria monocytogenes*, *E. coli* O157 and *Vibrio cholerae*, as well as providing a classification of microbiological quality of ready-to-eat food for reflecting the hygienic status of the food concerned.

In light of changing needs and latest expert views, the guidelines were revised in 2007. The revision mainly includes textural amendment of the Guidelines and revising the microbiological limits for *Listeria monocytogenes*, making reference to international practices.

With the microbiological limits explicitly set, it serves to facilitate the trade in devising measures to improve their food safety practices and to assist officers in monitoring and control of food safety. Based on the specified limits and classification of respective ready-to-eat food items as provided in the Guidelines, the food trade can draw up relevant food control plans and focus on the priority control measures.

The trade is an important partner in enhancing food safety. With better knowledge on microbiological safety of ready-to-eat food, the standards of their practices can be further improved. We hope this set of guidelines serves their needs in this area.

Centre for Food Safety
Food and Environmental Hygiene Department
May 2007

Expert Panel on Microbiological Safety of Food

Terms of Reference

- (a) To review and recommend to the Director of Food and Environmental Hygiene the microbiological criteria for the assessment of food safety;
- (b) To advise on strategies of the food surveillance programme in respect of microbiological safety of food;
- (c) To evaluate the scientific evidence, both international and local, which are relevant to the development of microbiological standards and guidelines on food; and
- (d) To propose priority issues in risk assessment in respect of microbiological hazards of food.

Membership

The Panel comprises official members from the Food and Environmental Hygiene Department and non-official members appointed by the Director of Food and Environmental Hygiene. The Panel is chaired by Consultant (Community Medicine) (Risk Assessment and Communication) with Secretariat support provided by Risk Assessment Section of the Centre for Food Safety.

The non-official members for the terms 2002 to 2007 are:

Professor IP Margaret	Professor, Department of Microbiology, The Chinese University of Hong Kong
Dr KAM Kai Man	Consultant Medical Microbiologist, Public Health Laboratory Services Branch, Centre for Health Protection, Department of Health
Dr NG Tak Keung	Consultant Microbiologist, Department of Pathology, Princess Margaret Hospital
Professor YUEN Kwok Yung	Chair Professor in Infectious Disease, University of Hong Kong

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- Recommendations for Food Safety Monitoring in Hong Kong-

Food safety control aims to safeguard public health and provide assurance on food safety. To this end, microbiological analyses are useful ways to assess the safety and quality of food involved. This paper presents the recommended microbiological guidelines for ready-to-eat food.

Purpose of the Guidelines

2. In the Hong Kong Special Administrative Region, the legal powers and instruments for the enforcement of microbiological safety of food are provided for in the Public Health and Municipal Services Ordinance (PHMSO), Chapter 132. Section 54 stipulates that it is an offence to sell food that is unfit for human consumption. General protection for purchasers of food is provided in Section 52 of the Ordinance when the food is not of the nature, substance, quality of the food demanded by the purchaser. Legal microbiological standards for some specified foods are stipulated in the legislation.

3. Microbiological Guidelines are criteria indicating the microbiological condition of the food concerned so as to reflect its safety and hygienic quality. The purpose of this set of Microbiological Guidelines is to provide assistance to officers in the interpretation of microbiological analyses of ready-to-eat food and recommendations on the appropriate follow-up action for food safety monitoring and control. It also serves to facilitate the trade in devising measures to improve their food safety practices.

Definition and Interpretation

4. “Ready-to-eat” is defined as the status of the food being ready for immediate consumption at the point of sale. It could be raw or cooked, hot or chilled, and can be consumed without further heat-treatment including re-heating.

5. “Aerobic colony count (ACC)” is a count of viable bacteria based on counting of colonies grown in nutrient agar plate. This is commonly employed to indicate the sanitary quality of foods. The incubation condition of ACC used in this guideline is **30° C for 48 hours**.

6. “Indicator organism” refers to the selected surrogate markers. The main objective of using bacteria as indicators is to reflect the hygienic quality of food. *E. coli* is commonly used as surrogate indicator. Its presence in food generally indicates direct or indirect faecal contamination. Substantial number of *E. coli* in food suggests a general lack of cleanliness in handling and improper storage.

7. “Specific pathogens” refer to bacteria that may cause food poisoning. Mechanisms involved may be toxins produced in food or intestinal infection. The symptoms of food poisoning vary from nausea and vomiting (e.g. caused by *S. aureus*), through diarrhoea and dehydration (*Salmonella* spp. and *Campylobacter* spp.) to paralysis and death in the rare cases of botulism. The infectious doses vary from less than 10 to more than 10^6 organisms.

Components of Microbiological Criteria

8. The microbiological limits of this set of guidelines are organised under the following three components:

- (a) Aerobic Colony Count;
- (b) Indicator Organism – *E. coli* count is the only indicator organism included; and
- (c) Specific Food Poisoning Pathogens – nine specific bacterial pathogens are included in this set of guidelines.

9. For assessment of hygienic quality, food items are grouped into five categories taking into account the raw ingredients used, and the nature and degree of processing before sale. The categorisation is summarised in the *Food category table for ACC assessment* in Annex I.

Classification of Microbiological Quality

10. The microbiological assessment of ready-to-eat food on the above three components will lead to the classification of the food quality into one of the following four classes:

- (a) Class A: the microbiological status of the food sample is satisfactory.
- (b) Class B: the microbiological status of the food sample is less than satisfactory but still acceptable for consumption.
- (c) Class C: the microbiological status of the food sample is unsatisfactory. This may indicate a sub-optimal hygienic conditions and microbiological safety levels. Licensees of food premises should be advised to investigate and find out the causes and to adopt measures to improve the hygienic conditions. Taking of follow-up samples to verify the improvement may be required.
- (d) Class D: the microbiological status of the food sample is unacceptable. The food sample contains unacceptable levels of specific pathogens that is potentially hazardous to the consumer. In addition to giving advice to the licensee of the food premises as stated in (c) above, warning letters as well as other enforcement actions should be considered.

Table of Microbiological Limits

11. Microbiological limits in respect of the above components, and the associated microbiological quality of the food samples concerned are summarised in the table on next page.

Guidance Notes on Sampling Plan for Microbiological Analysis

12. Guidance notes in Annex II provide information to the food trade on application of sampling plan in order to enhance food safety and improve food quality.

Microbiological Limits
for
Assessment of Microbiological Quality of Ready-to-eat Foods

Criterion		Microbiological quality Colony-forming unit (cfu) per gram unless specified			
		Class A Satisfactory	Class B Acceptable	Class C Unsatisfactory	Class D Unacceptable
Aerobic colony count (ACC) [30°C/48hours]					
Food Category (see table next page)	1	$< 10^3$	$10^3 - < 10^4$	$\geq 10^4$	N/A
	2	$< 10^4$	$10^4 - < 10^5$	$\geq 10^5$	N/A
	3	$< 10^5$	$10^5 - < 10^6$	$\geq 10^6$	N/A
	4	$< 10^6$	$10^6 - < 10^7$	$\geq 10^7$	N/A
	5	N/A	N/A	N/A	N/A
Indicator organism (applies to all food categories)					
<i>E. coli</i> (total)		< 20	$20 - < 100$	≥ 100	N/A
Pathogens (apply to all food categories)					
<i>Campylobacter</i> spp.		Not detected in 25g	N/A	N/A	Present in 25g
<i>E. coli</i> O157		Not detected in 25g	N/A	N/A	Present in 25g
<i>Salmonella</i> spp.		Not detected in 25g	N/A	N/A	Present in 25g
<i>V. cholerae</i>		Not detected in 25g	N/A	N/A	Present in 25g
<i>L. monocytogenes</i>					
	For food under refrigeration (excluding frozen food) or food intended for infants	Not detected in 25g	N/A	N/A	Present in 25g
	For other ready-to-eat food	< 20	$20 - < 100$	N/A	≥ 100
<i>V. parahaemolyticus</i>		< 20	$20 - < 100$	$100 - < 10^3$	$\geq 10^3$
<i>S. aureus</i>		< 20	$20 - < 100$	$100 - < 10^4$	$\geq 10^4$
<i>C. perfringens</i>		< 20	$20 - < 100$	$100 - < 10^4$	$\geq 10^4$
<i>B. cereus</i>		$< 10^3$	$10^3 - < 10^4$	$10^4 - < 10^5$	$\geq 10^5$

N/A denotes "Not applicable"

Annex I: Food Category Table for Aerobic Colony Count Assessment

Food group	Food item	Category
Meat	Beefburgers and kebabs	1
	Dim sum	2
	Pate (meat, seafood or vegetable)	3
	Poultry (unsliced)	2
	Preserved meat	4
	Salami and fermented meat products	5
	Sausages	2
	Smoked meat	5
	Siu-mei & lo-mei	3
	Sliced meat (ham and tongue) (cold)	4
	Sliced meat (beef, haslet, pork, poultry, etc.)	3
	Steak and kidney / meat pies	2
	Tripe and other offal	4
Seafood	Crustaceans	3
	Pickled fish	1
	Other fish (cooked)	3
	Oysters (raw)	5
	Seafood meals	3
	Shellfish (cooked)	4
	Smoked fish	4
Dessert	Cakes, pastries, slices and desserts – with dairy cream	3
	Cakes, pastries, slices and desserts – without dairy cream	2
	Cheesecake	5
	Mousse / dessert	1
	Tarts, flans and pies	2
	Trifle	3

Food group	Food Item	Category
Savoury	Bean curd	5
	Cheese-based bakery products	2
	Fermented foods	5
	Flan / quiche	2
	Dips	4
	Mayonnaise / dressings	2
	Samosa	2
	Satay	3
	Spring rolls	3
Vegetable	Coleslaw / salads (with or without meat)	3
	Fruit and vegetables (dried)	3
	Fruit and vegetables (fresh)	5
	Rice	3
	Vegetables and vegetable meals (cooked)	2
Dairy	Cheese	5
	Yoghurt	5
Ready-to-eat meals	Pasta / pizza	2
	Meals (others)	2
Sandwiches and filled rolls	With salad	4
	Without salad	3
Sushi & sashimi	Fish fillet and fish roe sashimi / sushi	3
	Sashimi other than fish fillet and fish roe	4

Annex II: Guidance Notes on Sampling Plan for Microbiological Analysis

Sampling plan

Sampling plan is a systematic way to assess the microbiological quality of food lots. A “lot” refers to a batch of products manufactured under the same conditions at the same time. During sampling, the samples should be taken from the lot independently and randomly.

In developing a sampling plan, a number of factors should be taken into consideration including properties of food, production processes, storage conditions of the final products, associated risks, targeted consumers and practical limitations. Each food product should be considered individually.

A comprehensive sampling plan includes the following elements:

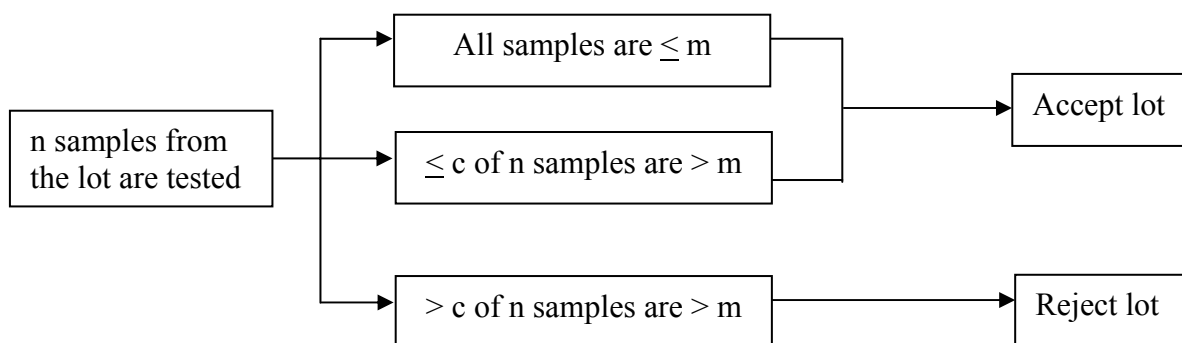
- (a) The microbe or group of microbes of concern or interest;
- (b) Number of samples to be tested (n);
- (c) Testing method(s);
- (d) Microbiological limit(s), m & M
 - Acceptable ($\leq m$)
 - Marginally acceptable ($> m$ and $\leq M$)
 - Unacceptable ($> M$);
- (e) Number of samples which fall into each category of microbiological limit (i.e. acceptable / marginal / unacceptable).

Types of sampling plan

Two types of sampling plans are commonly used in food microbiology, namely, the two-class attributes plan and the three-class attributes plan.

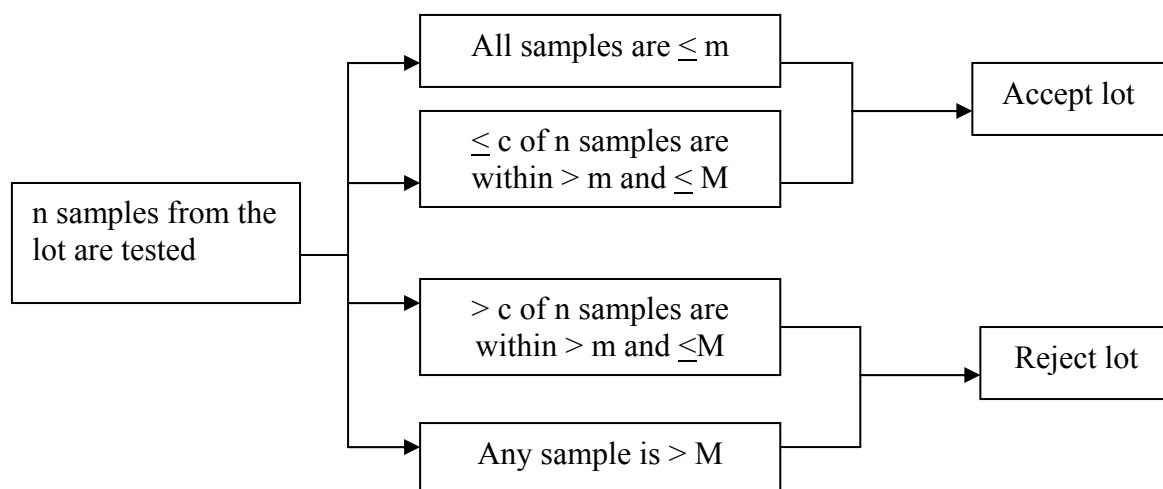
Two-class attributes plan:

Under this plan, sample(s) is (are) taken from the lot and tested. As only one microbiological limit “m” is involved in this plan, therefore two classes of attributes, $\leq m$ & $> m$, could be identified. The maximum allowable number of sample(s) that yielded unsatisfactory test results is represented by “c”. The lot will be accepted or rejected as illustrated in the following diagram:



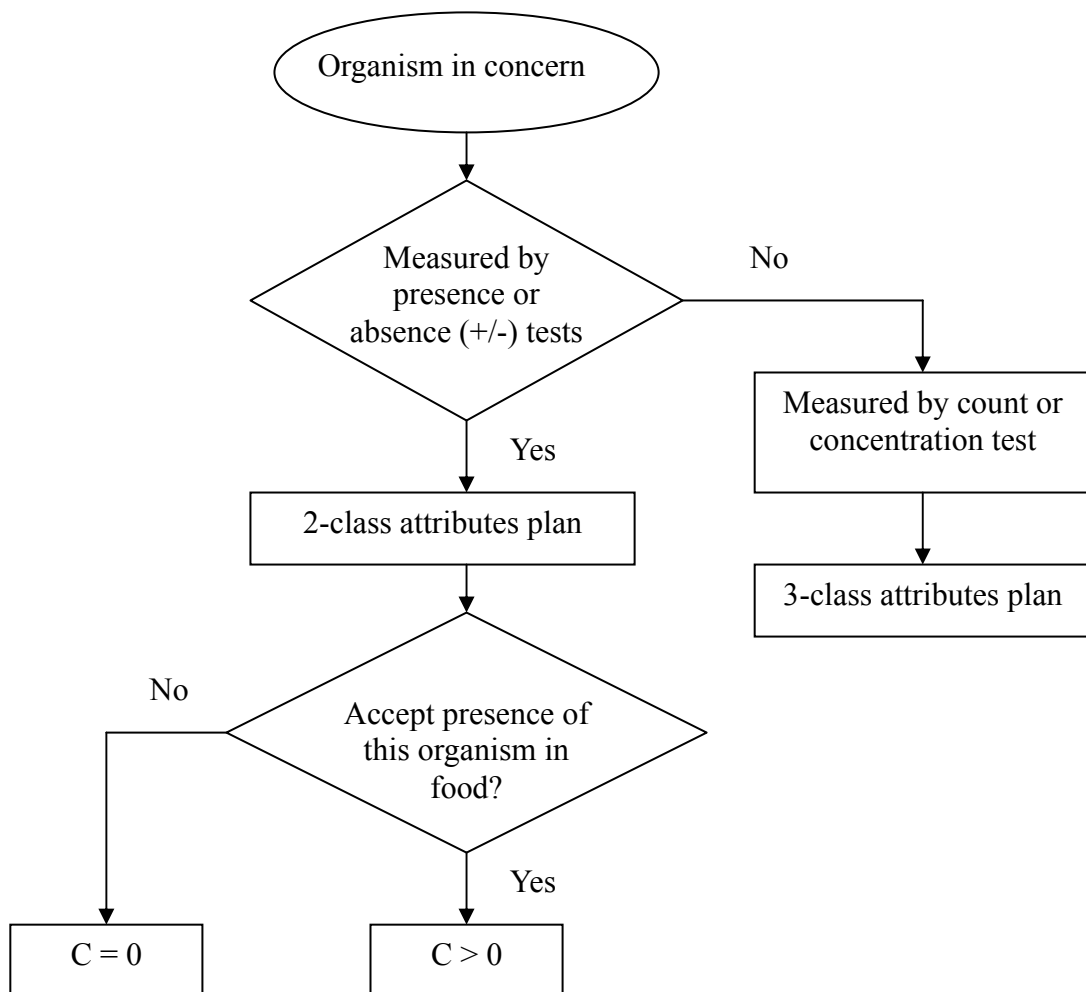
Three-class attributes plan:

For a three-class attributes plan, two microbiological limits, m & M, are set. The microbiological limit “m” commonly reflects the upper limit of a good manufacturing practice (GMP). The criterion “M” marks the limit beyond which the level of contamination is hazardous or unacceptable. The lot will be accepted or rejected as shown in the following diagram:



Choice of sampling plan

In general, a two-class attributes plan is preferred when the organism of concern is not permitted in food sample. If the number of microbes in a unit-volume is allowable, a three-class attributes plan is usually adopted. The following decision tree shows how to choose an appropriate sampling plan for a specific application.



To enhance food safety and improve food quality, more stringent microbiological limits (by decreasing values of m and/or M) should be adopted. By changing the value(s) of c and/or n , the stringency of sampling plan can also be adjusted.

International development of sampling plan

In 1981, the Codex Alimentarius Commission adopted the generic approach on sampling plan developed by the International Committee of Microbiological Specification for Foods (ICMSF). The ICMSF's sampling plan is recommended and used by the international bodies, food authorities in some countries and some international food manufacturers.

For details of the principle and application of ICMSF's sampling plan, please refer to the ICMSF publication - *Microorganisms in Foods 2, Sampling for microbiological analysis: Principles and specific applications* (2nd edition; 1986).

Remarks: Food samples are regularly taken by the Centre for Food Safety (CFS) for microbiological analysis. The presence of microorganisms found in any of the food samples taken is not allowed to exceed the microbiological limits as prescribed in the legislation nor should it exceed the microbiological guideline levels as adopted by CFS. The food trade may adopt a suitable sampling plan as discussed in the "Guidance Notes on Sampling Plan for Microbiological Analysis" to monitor the safety and quality of their food products.

**Centre for Food Safety
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