

# Microbiological Criteria, Specifications and Standards

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Applications of Microbiology to Food  
Systems Monitoring

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## Microbiological Criterion Definition

- A standard, guideline or specification that defines the acceptability of a product or a food lot, based on the absence/presence or number of microorganisms per unit of mass, volume, area, or lot

## Microbiological Criteria Purposes

A MC contributes and assesses the:

- Safety of food
- Adherence to GMP's
- Self-life of certain perishable foods
- Acceptability of foods or ingredients

## Microbiological Criteria Principles

A MC should:

- Accomplish what it purports to do
- Be technically attainable through GMP's and HACCP
- Be administratively feasible

## Types of Microbiological Criteria

- Microbiological Standard
- Microbiological Guideline
- Microbiological Specification

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- Microbiological Specification
  - Part of a purchasing agreement between a buyer and a supplier of a food

## Who Establishes Criteria?

- Joint FAO/WHO
- Codex Alimentarius-WTO
- International Committee for Microbiological Specification of Foods (ICMSF)
- National Advisory Committee on Microbiological Criteria for Foods (NACMCF)

## Who Uses Microbiological Criteria?

- **Regulatory authorities – USDA, FDA**
- **Food business operator**

## Establishing Need for Micro Criteria I

- Evidence of hazard to health
- Characteristics of natural or acquired microflora and ability of food to support growth
- Effect of processing on food microflora
- Potential for contamination and/or growth during processing, storage, distribution

## Establishing Need for Micro Criteria-II

- Category of consumers at risk
- State in which food is distributed
- Potential for abuse at consumer level
- Spoilage potential, utilities, and GMPs

### Establishing Need for Micro Criteria-III

- Manner in which the food is prepared for ultimate consumption
- Reliability of methods available to detect and/or quantify microbes and toxins of concern
- Costs and benefits of application of criteria

### Main Components of Microbiological Criteria for Foods

1. Statement of the microorganisms of concern and/or their toxins/metabolites and the reason for that concern
2. Microbiological limits  $m$  and/or  $M$
3. Sampling plan defining method of sampling,  $n$  and  $c$
4. Analytical methods of detection and quantification

### Additional Components of Microbiological Criteria for Foods

1. The food which the criterion applies
2. The point(s) in the food chain
3. Actions if the criterion is not met

### Microbiological Criteria Example: Pasteurized, Liquid, Frozen, and Dried Egg Products

Microorganism or group	Analytical Method	Case			Limit per g	
		$n$	$c$	$m$	$M$	
APC	ISO 4833	2	5	2	$5 \times 10^4$	$10^6$
Coliforms	ISO 4831	5	5	2	$10^1$	$10^3$
<i>Salmonella</i>	ISO 6579	10	$5^a$	0	0 (negative/125)	
		11	$10^b$	0	0 (negative/250)	
		12	$20^c$	0	0 (negative/500)	

Handing in the product could result in <sup>a</sup>reduction, <sup>b</sup>no change and <sup>c</sup>increase in *Salmonella* numbers

### Microbiological Criteria Example: Frozen Raw Crustaceans

Microorganism or group	Analytical Method	Case			Limit per g	
		$n$	$c$	$m$	$M$	
<i>S. aureus</i>	ISO 6888	7	5	2	$10^3$	$10^4$
<i>V. parahem.</i>	BAM 9.01	8	5	1	$10^2$	$10^3$
<i>Salmonella</i>	ISO 6579	10	5	0	0 (negative/125)	
APC	ISO 4833	2	5	2	$5 \times 10^5$	$10^7$
<i>E. coli</i>	ISO 11866	5	5	2	11	500

### Microbiological Criteria: *Listeria monocytogenes* in Ready-to-eat Foods

Country	$n$	Limit per g		
		$c$	$m$	$M$
U. S. A.	5	0	0 (negative/25 g)	
U. K.	5	0	100	
Canada	Category 1,2	5	0	0 (negative/25 g)
	Category 3	5	0	100
Germany			10,000	

Microbiological Criteria: *Listeria monocytogenes*  
in Ready-to-eat Foods ICMSF recommendations

Case	<u>Limit per g</u>		
	n	c	m
10	5	0	<100 at point of consumption
11	10	0	<100 at point of consumption
12	20	0	<100 at point of consumption