

Additional information related to this contract item can be found in Chapters 4 and 9.

VIII. The contractor will define the purposes for microbiological criteria and will make cost vs. benefit assessment for their use in regulatory control of raw and heat-processed foods.

The overall purposes of microbiological criteria for foods have been discussed in Chapter 2. This contract item requests that purposes of criteria for (1) raw and (2) heat-processed foods be defined. The subcommittee's response to this contract item is presented in Chapters 2, 3, 10, and particularly in Chapter 9. No summary response can do justice to this contract item; thus only a few isolated examples are given below.

Raw Foods

The usefulness of criteria for raw foods will vary depending upon food type (see Chapters 3 and 9). For example, sound raw fruits and vegetables may harbor high populations of microorganisms. Within reason, however, these numbers have little relationship to quality or production practices. Even when eaten raw, they have not presented a serious health problem in the United States. The routine testing of these foods for viable microorganisms offers few benefits. Microbiological standards for raw meat and poultry would prevent neither spoilage nor foodborne illness. On the other hand, the application of criteria to raw foods such as shellfish can be extremely useful. Shellfish harvested from polluted waters present a potential public health problem because they often are eaten raw. Criteria that include limits on fecal indicator organisms provide a very necessary safeguard for this class of food.

Heat-Processed Foods

There are a variety of thermal processes for foods ranging from the pasteurization of wines at relatively low temperatures to the use of retorts for the commercial sterilization of low-acid canned vegetables. The usefulness of microbiological criteria for regulatory control will vary with the process and the type of food. The application of criteria to foods such as pasteurized milk and egg products aids in assessing adequacy of the process and in the detection of contamination following heat treatment (see Chapter 9, parts A and F). Guidelines are useful for frozen vegetables to detect poor manufacturing practices following blanching. If proper action is taken, application of microbiological criteria to precooked ready-to-eat products can lead to rejection of product that has the potential to

cause a public health problem. Criteria based on microscopic mold counts for certain canned fruits and vegetables aid in detecting poor quality raw materials and insanitary processing lines.

Cost/Benefits

Foods most amenable to microbiological criteria are those that have relatively stable microbial populations such as certain dried, heat-processed, and frozen products.

Benefits to be derived from microbiological criteria and appropriate actions on test results include:

1. An improvement in food safety by rejecting unsafe product on the basis of detection of pathogens or toxins.
2. Results indicating poor manufacturing practices may lead to action resulting in good manufacturing practices (better sanitation, improved process control, and monitoring of critical control points).

A disadvantage to the expanded use of microbiological criteria for finished products is increased costs that undoubtedly would be passed on to the consumer. Two of the sources of the costs are:

1. The costs of conducting a greater number of analyses by the processor and by regulatory agencies.
2. An increased holding time becomes a disadvantage when the manufacturer must delay shipments pending availability of test results.

It is extremely difficult to make an accurate assessment of the cost/benefit of the use of microbiological criteria. A few attempts have been made to establish the economic losses of foodborne illness. For example, some information has been presented relative to the economic losses of human salmonellosis (NRC, 1969).

Additional information related to this contract item can be found in Chapters 2, 3, 9, and 10.

IX. The contractor will evaluate at which level in the food chain microbial pathogens should be tested for in foods, by food class.

As indicated previously, small numbers of certain pathogens can be expected on part of our raw foods of animal origin. With few exceptions there is little merit in testing these foods for pathogens. In some instances raw imported foods (shrimp and frog legs, for example) are tested for *Salmonella* to detect gross mismanagement of these foods or the harvesting from fecal-polluted waters. In the case of shellfish, the water and the product are checked for either coliform or fecal coliform bacteria, which are used as an index of potential fecal contamination. In processed foods,

relevant tests for pathogens are best conducted at the processing level, before the foods leave the processing plant, or at least before control of the product is lost by the manufacturer in trade channels. In addition to microbiological tests to check for effective processing at critical control points, "control at source" requires that control be exercised over inspection and maintenance of equipment and practice of sanitation in the processing plant, i.e., HACCP supplemented with appropriate finished product testing. When conditions related to a food after it has left the processing plant result in the introduction of pathogens and/or growth of pathogens, and in some cases production of toxin, then tests for pathogens might be necessary during transportation, warehousing, or at the retail level. Tests for pathogens might even be appropriately made in food service establishments such as a large food preparation and catering establishment where mishandling may result in growth of pathogenic organisms and in some cases attendant toxin production. In most cases, "control at source" will be most effective, but for certain foods and in certain uses of foods it may be necessary to conduct tests for pathogenic microorganisms at other points in the food chain. Regulatory agencies might appropriately test foods at any point along the food chain.

The presence and growth of pathogens in a food depends upon many factors, including the nature and source of the food, the physical-chemical properties of the food, and the conditions of processing, packaging, storage, and distribution. Therefore, only those pathogens should be tested for that are of public health relevance in a particular food. Chapter 9 of this report presents the relevant pathogens for which specific groups of foods should be tested and at which level in the food chain tests should be applied.

X. The contractor will examine relationships between food quality and microbiological characteristics and criteria of foods.

Food quality in the broad sense includes flavor, color, texture, nutritional value, and safety. At some point sufficient microbial growth will occur on a perishable food to affect its organoleptic properties, usually adversely. Volatile compounds may be generated that change flavor; pigments may be degraded or new colors produced; texture may be altered due to the activity of microbial proteases, pectinases, cellulases, and other hydrolytic enzymes; the utilization of food constituents and the release of metabolic products may influence nutritive properties.

The numbers needed to produce detectable changes will be influenced by food type and the predominant microorganisms. In terms of criteria established according to the principles of this report, the value of *m* represents levels consistent with Good Manufacturing Practices and is set

at a level below that at which these characteristics become evident. The value of *M* relates to a point, and approaches to it, where the changes are or soon will be evident. Foods meeting these criteria will not show manifestations of quality deterioration (see Chapters 6 and 9).

When high microbial populations originate from contaminated equipment only, rather than from actual microbial growth on the food, fewer changes, either detectable or nondetectable, will occur. The types of microorganisms also can be important. Growth of lactic acid bacteria on meats, for example, produces less flavor change than comparable growth of certain pseudomonads.

While high counts may reflect lower quality or poor processing conditions, the opposite is not necessarily true. Low counts may result because the food was given a lethal treatment at a stage near the end of the process, or because many of the contaminating microorganisms had died off during storage of the food. The presence of pathogenic microorganisms, especially on ready-to-eat foods, is of course evidence of poor quality. The finding of excessive numbers of mold mycelia in certain foods such as catsup is evidence that it was made from raw materials containing rots. Additional information related to this contract item can be found in Chapters 2, 6, and 9.

XI. The contractor will evaluate at which level during harvesting, processing, storage, and distribution needed microbiological criteria can be best applied.

The objective of the criterion will determine when microbiological analyses should be performed.

If the criterion is a purchase specification that, for example, limits the number of heat-resistant mold spores in an ingredient, analyses usually are conducted by the purchaser when the shipment is first received at the plant. Frequently, the supplier analyzes the product before it is shipped to the purchaser.

If the criterion is a guideline designed to monitor a critical control point in a process, samples collected immediately after the unit operation might be analyzed.

If the objective is to assess good manufacturing practices, the level(s) at which microbiological testing should be conducted depends upon the processes to which such food is subjected. For some foods, microbiological testing of finished product after packaging may be appropriate to assess good manufacturing practices. With certain processes the analysis of the finished product would not be particularly useful to assess good manufacturing practices, for example, with a product subjected to a heat treatment. There are many situations where evaluating manufacturing practices would require microbiological testing at points other than finished products, for example, sanitary conditions of equipment.

If the concern is abuse or contamination during transport of the food or while it is held in the marketplace or food service establishment, samples collected at the retail level should be analyzed. Furthermore, samples may be collected to monitor critical control points in food service establishments as well as in processing plants. Additional information related to this contract item can be found in Chapters 2 and 9.

XII. The contractor will determine the validity of aerobic and coliform plate counts as indicators of insanitation and of time-temperature abuse of foods.

High aerobic plate counts (APCs) in finished products or in products during processing may be caused by either poor sanitation or time-temperature abuse or both. Several other conditions, however, may be involved, such as the quality of raw materials and ingredients and adequacy of a heat-processing procedure if one is used. Hence, the APC can be a valid indicator of insanitation or of time-temperature abuse (primarily in perishable foods) if other potential causes are eliminated. The relationship of APC to insanitation or to time-temperature abuse can be determined best by a thorough understanding of the microbiology of the product (hazard analysis) and examination of line samples taken at critical control points. For example, a high APC of packaged ground beef may have resulted from (a) poor-quality trimmings, (b) poor sanitation of equipment (for example, grinder), and (c) holding of the product for too long or at marginal temperatures at which normal aerobic, psychrotrophic, gram-negative rods continue to multiply.

Coliform bacteria are particularly valuable as indicators of postprocessing contamination of foods treated for safety. The validity of coliform counts as an indicator of insanitation and of time-temperature abuse requires a thorough understanding of the microbiology of a food. In some foods they have little relationship to the above-mentioned conditions, in others they have more. Coliforms can be a valid indicator of poor sanitation if it can be shown that their presence at a particular point in the processing and handling of a food is not expected or their numbers are at a level beyond what is considered normal. For example, small numbers of coliforms are common in raw milk, vegetables, and meats. Large numbers in raw milk indicate insanitation and likely time-temperature abuse. Even small numbers of coliforms in pasteurized milk indicate postpasteurization contamination. In heat-processed foods, the presence of coliforms indicates most likely contamination (poor sanitation) after heating that may be accentuated by time-temperature abuse of the food.

Additional information related to this contract item can be found in Chapter 5.

XIII. The contractor will determine the validity of aerobic and coliform counts as significant or useful indices as one facet of food "quality."

This question has been discussed extensively in Chapter 2 of this report. Appropriate sections are repeated here to emphasize certain aspects of this question.

The term quality as commonly applied to food summarizes its desirable characteristics. Quality of a food as perceived by the public can be described as a value related to flavor (taste and odor), color, and texture. It also includes imperceptible traits such as nutritional value and safety. Excluding safety and utility from this discussion, from the microbiological viewpoint quality includes: (a) shelf-life, as perceived by attributes such as flavor and appearance, and (b) adherence to Good Manufacturing Practices.

Each of these attributes is measurable to some extent microbiologically; the decisive question, however, is to what extent.

The ultimate shelf-life of a perishable food can be estimated to some degree through the application of microbiological criteria. Assuming that storage conditions are the same, a perishable food with a low number of spoilage microorganisms will have a longer shelf-life than the same product with larger numbers of such organisms. However, relationships between common microbiological parameters such as aerobic plate counts and coliform counts and the shelf-life of a food are inexact. Some types of microorganisms, because of enzyme systems acting upon the constituents of a food, cause marked changes in perceptible quality characteristics of a food while others are relatively inert biochemically and thus produce little change. In addition, the effect of certain levels and/or types of microorganisms on perceptible quality characteristics often differs from food to food and is also subject to changes in environmental conditions such as temperature and gaseous atmosphere.

Lack of adherence to Good Manufacturing Practices often can be related to APC and/or coliform counts in excess of those present in a food produced under good conditions. The use of poor-quality materials, inadequate heat processing, careless handling, or insanitation may result in a higher bacterial count in the finished product. This relationship may not always be valid, however, because a heat treatment or other lethal treatment in the process can cover up the grossest evidence of malpractice, and organisms may die off during storage of frozen, dried, or fermented foods. Low counts in a finished product or ingredient, therefore, do not necessarily indicate good manufacturing practices or even food safety. High aerobic plate counts, on the other hand, do not necessarily mean careless handling or lack of wholesomeness. For example, ground beef prepared from the trimmings from carcasses may yield a high aerobic plate count, but this may merely reflect the growth of harmless psychrotrophic bacteria during refrigerated storage. On the other hand, it could also represent poor sanitary conditions and/or time-temperature abuse.

The relationship between the microbiology of a food and adherence to good manufacturing practices must be established by conducting repeated surveys of processing lines to obtain statistically valid data. The critical control points must be identified and the microbiology of the food at the different stages of processing must be determined. Through these studies one can arrive for some foods at numbers and types of organisms that characterize the flora of a food produced under a given set of conditions, and thus provide a basis for the establishment of a microbiological criterion. Even then an allowance has to be made for variations because of differences in processing procedures and equipment. Finished foods that exceeded the criterion might reasonably be expected to have been mis-handled somehow during production and/or storage.

In recent years microbiological quality standards (APC and coliform counts) have been proposed for various foods under Section 401 of the Food, Drug and Cosmetic Act. Recently, they have been recommended for frozen fish sticks, fish cakes, and crab cakes. This has been discussed extensively in Chapter 2.

Additional information related to this contract item can be found in Chapters 2 and 5.

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Exhibit 1026
Mullins Decl. Appendix C-2
(NRC from Internet Archive)

An Evaluation of the Role of Microbiological Criteria for Foods and Food Ingredients



An Evaluation of the Role of Microbiological Criteria for Foods and Food Ingredients

Subcommittee on Microbiological Criteria
Committee on Food Protection
Food and Nutrition Board
National Research Council

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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Contents

Executive Summary	1
Introduction, 2	
Basic Considerations, 3	
Application of Microbiological Criteria to Foods and Food Ingredients, 6	
Expansion of the HACCP System in Food Protection Programs, 13	
Plans of Action, 14	
 Recommendations	 15
 1 Introduction	 41
Sources of Microorganisms in Foods, 41	
Microbial Activities in Foods, 41	
Historical Aspects, 41	
Spoilage, Pathogenic, and Useful Microorganisms, 42	
Food as a Selective Environment, 43	
Microflora of Processed Foods, 44	
Control of Microorganisms in Foods, 46	
Approaches to Microbiological Control in Foods, 48	
Education and Training Programs, 48	
Inspection of Facilities and Operations, 48	
Microbiological Testing, 50	
Composite Programs, 50	
The Hazard Analysis Critical Control Point (HACCP) System, 50	

The Current Role of Criteria in Microbiological Control in Foods, 51	
Considerations in Establishing Criteria, 53	
The Current Report, 54	
References, 54	

2 Definitions, Purposes, and Needs for Microbiological Criteria	55
Definitions, 55	
Components of a Microbiological Criterion, 55	
Mandatory and Advisory Criteria, 56	
Types of Microbiological Criteria, 56	
Standard, 56; Guideline, 56; Specification, 57	
Purposes, 57	
Need for Establishment, 58	
Applications of Criteria, 59	
Standards, 59; Guidelines, 59; Specifications, 60	
Relationship to Codex, 60	
Attributes of Quality Amenable to Measurement by Microbiological Criteria, 61	
References, 64	
3 Selection of Foods for Criteria Related to Safety	65
Epidemiological Experience, 66	
Opportunities for Contamination, 67	
Opportunities for Growth, 67	
Opportunities for Survival, 69	
Processing Conditions, 69	
Susceptibility of Probable Consumers, 70	
Ultimate Treatment, 70	
References, 70	
4 Selection of Pathogens as Components of Microbiological Criteria	72
Introduction, 72	
Pathogens, 73	
Severe Hazards, 78	
<i>Clostridium botulinum</i> , 78; <i>Shigella</i> , 79; <i>Vibrio cholerae</i> , 80; <i>Salmonella</i> , 81; <i>Brucella abortus</i> , <i>Brucella melitensis</i> ,	

CONTENTS

xi

- Brucella suis*, and *Mycobacterium bovis*, 81; Viruses, 82;
- Fish and shellfish toxins, 83; Mycotoxins, 84
- Moderate Hazards, Potentially Extensive Spread, 85
- Salmonella*, 85; Pathogenic *Escherichia coli* (PEC), 87;
- Streptococcus pyogenes* (Lancefield Group A, beta hemolytic), 87
- Moderate Hazards, Limited Spread, 88
- Staphylococcus aureus*, 88; *Clostridium perfringens*, 89;
- Bacillus cereus*, 90; *Vibrio parahaemolyticus*, 91; *Coxiella burnetii*, 91; Histamine poisoning, 92; *Yersinia enterocolitica*, 93 *Campylobacter*, 94; *Trichinella spiralis*, 95

References, 96

5 Selection of Indicator Organisms and Agents as Components of Microbiological Criteria 104

- Assessment of Numbers of Microorganisms and/or Microbial Activity, 105
- Estimating Numbers of Microorganisms, 105
- Aerobic Plate Count, 105; Thermotolerant, Psychrotrophic, Thermophilic, Proteolytic, and Lipolytic Counts, 107;
- Direct Microscopic Count, 108; Microscopic Mold Counts, 109; Yeast and Mold Counts, 110; Heat-resistant Molds, 110; Thermophilic Spore Count, 110
- Measuring Metabolic Products, 111
- Organoleptic Examination, 111; Dye or Indicator Reduction Time, 113; pH, 113; Trimethylamine and Total Volatile Nitrogen, 116; Indole, 117; Ethanol, 118; Diacetyl, 118; Histamine, 119; *Limulus* Amoebocyte Lysate Test, 119; Extract Release Volume, 120; Adenosine Triphosphate, 120
- Assessment of Indicators, 120
- Indicators of Potential Human or Fecal Contamination or Possible Presence of Pathogens, 120
- Staphylococci*, 120; *Escherichia coli*, 121; Fecal Coliforms, 122; Enterococci, 123; *Pseudomonas aeruginosa*, 124
- Indicators of Post-Heat Processing Contamination, 124
- Coliform Bacteria, 124; *Enterobacteriaceae*, 125
- Tests for Other Components, 126
- Tests for Metabolic Products of Pathogens That Indicate a Health Hazard, 126
- Thermomucilage Test for Evidence of Growth of *Staphylococci* and Presence of Enterotoxins, 126; Aflatoxin Detection by Ultraviolet Light, 126
- Test for Phosphatase, 127

6	Consideration of Sampling Associated With a Criterion	132
	2-Class Attributes Sampling Plans, 134	
	3-Class Attributes Sampling Plans, 136	
	Variables Sampling Plans, 136	
	Operating Characteristic Curves, 137	
	Establishing Limits, 140	
	Resampling, 141	
	Applications, 142	
	References, 143	
7	Consideration of Decision (Action) to be Taken When a Criterion (Limit) is Exceeded	145
	Decision Categories, 146	
	Evidence of Existence of a Direct Health Hazard, 146	
	Evidence That a Direct Health Hazard Could Develop, 148	
	Indications That a Product Was Not Produced Under Conditions Assuring Safety, 148	
	Indications That a Raw Material May Adversely Affect Shelf-Life, 149	
	Evidence That a Critical Control Point Is Not Under Control, 149	
	References, 150	
8	Current Status of Microbiological Criteria and Legislative Bases	152
	Introduction, 152	
	Early Programs in the United States, 152	
	Current Levels of Concern and Application, 153	
	International Activities, 154	
	Joint FAO/WHO Food Standards Program, 154	
	European Economic Community, 156	
	International Commission on Microbiological Specifications for Foods (ICMSF), 157	
	Canadian Microbiological Standards for Foods, 157	
	U.S. Federal Agencies, 158	
	Food and Drug Administration (FDA), 158	
	Compliance Policy Guides, 159; Food Defect Action Levels, 159; Efforts for Microbiological Standards, 163; Cooperative Programs, 164	

CONTENTS

xiii

United States Department of Agriculture (USDA), 166	
Dairy Products, 167; Dry Milk Products, 167; Egg	
Products, 168; Meat and Poultry Products, 168	
National Marine Fisheries Service (NMFS), 174	
History, 174; Current Cooperative Agreements, 175;	
Research, 176	
U.S. Army Natick Research and Development	
Center, 176	
Federal and Regional Level Cooperation, 178	
State Level, 178	
City-County (Local) Level, 179	
Industry, 180	
References, 181	

9 Application of Microbiological Criteria to Foods and Food	
Ingredients	184
Introduction, 184	
Dairy Products, 185	
Raw Meats, 193	
Processed Meats, 199	
Raw (Eviscerated, Ready-To-Cook) Poultry, 221	
Processed Poultry Products, 230	
Eggs and Egg Products, 239	
Fish, Molluscs, and Crustaceans, 249	
Fruits and Vegetables, 257	
Fruit Beverages, 261	
Low-Acid Canned Foods, 264	
Acid Canned Foods, 268	
Water Activity-Controlled Canned Foods, 270	
Cereals and Cereal Products, 272	
Fats and Oils, 277	
Sugar, Cocoa, Chocolate, and Confectioneries, 283	
Spices, 287	
Yeasts, 289	
Formulated Foods, 290	
Nuts, 295	
Miscellaneous Additives, 297	
Bottled Water, Processing Water, and Ice, 299	
Pet Foods, 304	

10	Expansion of the HACCP System in Food Protection Programs	308
	Factors to be Considered For Implementation of HACCP, 308	
	Problems Associated with Implementation of the HACCP Approach, 311	
	The Need For Application of HACCP at All Points in the Food Chain, 313	
	Cost/Benefit Aspects of Regulatory Control Through HACCP Inspections, 327	
	References, 327	
11	Plans of Action for Implementation of the HACCP System and of Microbiological Criteria for Foods and Food Ingredients	329
	Implementation of HACCP, 329	
	Implementation of Microbiological Criteria For Foods and Food Ingredients, 330	
	Introduction, 330	
	The Plan, 333	
	References, 335	
	Appendixes	337
A	Summary Responses to Specific Contract Items, 339	
B	General Principles for the Establishment and Application of Microbiological Criteria for Foods, 366	
C	International Microbiological Specifications, 372	
D	Excerpts from the Regulations Pursuant to the Food and Drugs Act, a Statute of the Government of Canada, 377	
E	Microbiological Criteria for Foods Purchased by the Military, 387	
F	Raw Milk—An Editorial, 395	
G	Report of the WHO/ICMSF Meeting on Hazard Analysis: Critical Control Point System in Food Hygiene, 399	
	Index	421

Appendix A

Summary Responses to Specific Contract Items

The following comprises summary responses to the explicit requests included in the Scope of Work as defined by the Contracting Agencies. The responses are addressed more comprehensively in Chapters 1–11 of this book.

I. The contractor will initiate a reevaluation of sampling plans employed for various classes of foods and food ingredients that are determining *Salmonella* presence in raw and finished food and food ingredients that are subject to *Salmonella* contamination.¹

The Committee on *Salmonella* of the National Research Council (NRC, 1969) emphasized that the sale of foods containing salmonellae cannot be condoned but at the same time recognized that salmonellae can be found in many products if a sufficient number of tests are made. The report called attention to confusion and uncertainty that existed then in the food-processing industry due to lack of a definitive sampling and testing plan. The following question was posed: When should we stop testing and conclude that a product is *Salmonella*-free (which may simply mean that the contamination level is below the sensitivity of the sampling plan and the analytical procedure)?

In recognition of the fact that there is no way to be absolutely certain that a particular lot of nonsterile food is free of salmonellae, the Committee on *Salmonella* recommended two specific actions: (1) evolve a realistic

¹ Excluded from these considerations were raw meats and poultry from which, given existing technology, salmonellae cannot be eliminated.

assessment of the degree of hazard imposed by various foods, feeds, and drugs, and (2) develop sampling plans that will provide adequate assurance that the number of salmonellae present, if any, is below a statistically defined limit that offers minimal hazard to the consumer. The committee suggested a system by which the degree of hazard presented by any food could be assessed and it recommended a sampling and testing plan that could lead to a decision whether to accept or reject a particular lot of food.

Assessment of the degree of hazard presented by various foods was based upon three questions: (1) does the food contain a sensitive ingredient, (2) does the processing of the food include a controlled procedure that will destroy salmonellae, and (3) will salmonellae grow in the product if it is abused during distribution or after preparation for consumption? Based upon answers to the foregoing questions, eight different configurations of hazard characteristics are possible. These are delineated in Table A-1.

Five risk categories were recognized by the Committee on *Salmonella*:

Category I—foods that are intended for infants, aged, and the infirm, and that contain a sensitive ingredient.

Category II—foods with all three hazard characteristics.

Category III—foods with two hazard characteristics.

Category IV—foods with one hazard characteristic

Category V—foods with none of the three hazard characteristics.

TABLE A-1 Categories of Food Products Based on Product Hazard Characteristics

Type of Food	Hazard characteristic ^a			Category
	A	B	C	
Intended for infants, aged, and infirm	+	+ or 0	+ or 0	I
Intended for general use	+	+	+	II
	+	+	0	III
	+	0	+	III
	0	+	+	III
	+	0	0	IV
	0	+	0	IV
	0	0	+	IV
	0	0	0	V

^a A = Product contains sensitive ingredient.

B = No destructive step during manufacture.

C = Likelihood for growth if abused.

+ = Hazard present; 0 = Hazard not present.

SOURCE: Olson, 1975.

The Committee on *Salmonella* recommended testing and acceptance criteria for "questioned" lots of food. These are summarized in Table A-2. Application of these criteria contemplates the collection of random sample units from the lot in question. Multiple 25-g analytical units, the number based upon the risk category of the product, are then analyzed for *Salmonella*. The intensity of sampling and analysis is related to the degree of risk (hazard category) presented by the product. The objective was to have a sampling and testing plan that would provide adequate assurance that the number of salmonellae, if present, would be below a statistically defined limit offering minimal hazard to the consumer. The limit for each category is given in the last column of Table A-2, i.e., 95% confidence that the *Salmonella* contamination level is no more than 1 in 500 g for Category I; no more than 1 in 250 g for Category II; and no more than 1 in 125 g for Categories III, IV, and V. It will be noted that within each category, two sampling plans are provided, one permitting acceptance only if all analytical units tested are found negative for *Salmonella*, the other permitting a single positive result. For example, for products in Category I, one sampling plan permits acceptance if each of 60 25-g analytical units is analyzed and found negative. The other sampling plan permits acceptance if one of 92 25-g units is positive. Justification for the two different sampling plans was based upon the fact that one positive result from 92 analytical units or zero positive results from 60 analytical units provides the same probability (95%) that the level of salmonellae as shown in the last column of Table A-2 is not exceeded.

It should be emphasized that the sampling and testing plan recommended by the Committee on *Salmonella* was intended for application to (1) processed foods or ingredients as contrasted to, e.g., raw meats and poultry; (2) lots that conform to specific criteria that establish their integrity; and (3) lots

TABLE A-2 Acceptance Criteria

Product Category	Number of Units Tested with No Positives	Number of Units Tested with No More than One Positive	Significance ^a 95% Probability of One Organism or Less in
I	60 (1,500 g)	92 (2,300 g)	500 g
II	29 (725 g)	48 (1,200 g)	250 g
III	13 (325 g)	22 (550 g)	125 g
IV	13 (325 g)	22 (550 g)	125 g
V ^b	13 (325 g)	22 (550 g)	125 g

^a Accuracy of Attribute Sampling, USDA Consumer and Marketing Service, March 1966.

^b Not normally applicable.

SOURCE: NRC, 1969.

that have been questioned because of the possible presence of salmonellae. The sampling plan was not designed or intended to replace routine surveillance operations, including testing, that a food manufacturer or a regulatory agency might employ. The plans were intended to be used in arriving at a final decision in order to accept or reject a particular lot in question.

After reviewing the report of the Committee on *Salmonella*, the FDA began to consider ways of responding to the various committee recommendations (Olson, 1975). It invited Dr. E. M. Foster, Director of the Food Research Institute, University of Wisconsin, to assemble a group of knowledgeable people representing both government and industry to develop a classification system and a sampling plan along the lines envisioned by the Committee on *Salmonella*. The Interagency-Industry Committee on *Salmonella* Control in Foods submitted its report to the FDA in October 1970, and the report was published in March 1971 (Foster, 1971). This report embraced the recommendations of the Committee on *Salmonella* both with respect to the establishment of categories of food products based upon product hazard characteristics and the sampling and analytical plans for determination of the acceptability of questioned lots. Further, it provided guidance on the assessment of hazard characteristics.

Subsequently FDA announced its position on *Salmonella* sampling and testing plans (Olson, 1975). Basically, FDA accepted the recommendations of the Committee on *Salmonella* (NRC, 1969) and the Interagency-Industry Committee (Foster, 1971) with the following exceptions. First, a sample lot would be accepted only if analyses of all analytical units were negative for salmonellae. The FDA position was that acceptance of any lot of food in which salmonellae were shown to be present would not be administratively feasible. Thus, the sampling plan shown in the second column of Table A-2 would be employed and the sampling plan shown in the third column (permitting a single positive among the analytical units tested) would not be utilized. Second, FDA provided for the compositing of multiple analytical units, the maximum size of a composite unit being 375 g. The composite unit was to consist of a series of 25-g analytical units. Finally, the FDA indicated that the acceptance criteria would be applied to any lot of product tested in connection with any of its surveillance or compliance programs. As previously noted, the two committees (NRC, 1969; Foster, 1971) had indicated that the sampling plan was not designed to replace routine surveillance operations, but was intended to be used in arriving at a final decision whether to accept or reject a particular lot in question. FDA's position on this point was made clear: "If we sample a lot we question it; otherwise why sample it?"

The fourth edition of the *Bacteriological Analytical Manual for Foods*

(BAM) (FDA, 1976) reflected Olson's position paper (Olson, 1975). The classification of products by hazard categories and the attendant sampling plans were consistent with the report of the Committee on *Salmonellae* and the recommendations of the Interagency-Industry Committee on *Salmonella* Control in Foods. Indeed, a vast number of industry quality control programs utilized the sampling plans routinely in their *Salmonella* control programs, not just for determining the status of suspect lots.

The fifth edition of the BAM (FDA, 1978), set forth a revised *Salmonella* sampling plan, one that departed radically from the recommendations of the Committee on *Salmonella*. Three categories of food were identified as follows:

Food Category I—foods that would normally be in Category II except they are intended for consumption by the aged, the infirm, and infants.

Food Category II—foods that would not normally be subjected to a process lethal to *Salmonella* between the time of sampling and consumption.

Food Category III—foods that would normally be subjected to a process lethal to *Salmonella* between the time of sampling and consumption. The following tabulation shows the number of sample units to be collected in each food category:

Food Category	Number of Sample Units
I	60
II	30
III	15

The categorization of foods and the sampling plans prescribed in the 1978 edition of the *Bacteriological Analytical Manual* depart both in philosophy and substance from those contained in the 1976 edition of the BAM. Likewise, of course, they depart from the recommendations of the NAS Committee on *Salmonella* and those of the Interagency-Industry Committee on *Salmonella* Control in Foods. The present system employed by the FDA for categorizing foods, as well as the sampling plans tied to such categorization, are unrelated to risk. The key issue, rather, is whether the food would normally be subjected to a process lethal to *Salmonella* between the time of sampling and consumption. This parameter played no role in the designation of food categories by the Committee on *Salmonella*, the recommendations of which were embraced by the Interagency-Industry Committee on *Salmonella* Control in Foods and the FDA. Ignored in the present classification system are: risk A: the product or an ingredient of the product has been identified as a significant potential source of salmonellae (i.e., it is "sensitive"); risk B: the *manufacturing* process does

not include a controlled step that will destroy salmonellae; and risk C: there is a substantial likelihood of microbial growth if the product is mishandled or "abused" in distribution or consumer usage. The present system utilized by the FDA recognizes, only, that if a product were to be classified in "new" Category II, it would be classified in Category I if the product were to be consumed by high-risk groups. It is of interest to note that the Committee on *Salmonella* of the NAS classified any food consumed by high-risk groups in Category I if it contained a sensitive ingredient (risk factor A). Under the present system, such a product would be assigned to Category III if the food would normally be subjected to a process lethal to *Salmonella* between the time of sampling and consumption. Table A-3 lists examples of foods in Categories II and III as presented in the 1978 edition of the BAM. Table A-4 shows examples of "interesting shifts in classification" that have occurred as a result of the revised *Salmonella* sampling plan introduced in that edition.

It is difficult for this subcommittee to understand the rationale for the changes in food category classification and sampling plans between the 1976 and the 1978 editions of the BAM and thus, in effect, the rationale for the FDA rejection of the recommendations of the NRC Committee on *Salmonella*. In section A, Sampling Plans for *Salmonella* of Chapter 1 of the 1978 BAM the following statements are made: "Generally, the assignment of food categories has depended on the sensitivity of a consumer group (e.g., the aged, the infirm and infants), the history of the food, and whether there was a step lethal to *Salmonella* during the manufacturing process or in the home. Of these criteria the sensitivity of the consumer group and whether the food normally underwent a process lethal to *Salmonella* either at the manufacturing or consumer level appeared to be the most important considerations in the selection of a sampling plan. The history of the food would be more important in a decision on whether to sample rather than how many sample units to take." This subcommittee offers the following comments on these statements:

1. As stated, the sensitivity of the consumer group influences the assignment of food categories. But, as indicated above, the present FDA system would classify foods containing sensitive ingredients in Category III if such foods were normally subjected to a process lethal to *Salmonella* between the time of sampling and consumption. The NRC Committee on *Salmonella* would classify the same foods in Category I if they contained a sensitive ingredient regardless of their "normal" subsequent handling. The present FDA system simply assigns products in Category II to Category I if high-risk groups are involved. But if the same foods were "normally" subjected to a process lethal to *Salmonella* between the time of sampling

TABLE A-3 Food Categories II and III

Food Category II—Foods that would normally be subjected to a process lethal to *Salmonella* between the time of sampling and consumption.

Product Code	Food
03	Bread, rolls, buns, sugared breads, crackers, custard and cream-filled sweet goods
05	Breakfast cereals, ready-to-eat
07	Pretzels, chips, and specialty items
09	Butter and butter products; pasteurized milk and raw fluid milk and fluid milk products for consumption; pasteurized and unpasteurized concentrated liquid milk products for consumption; dried milk and dried milk products for consumption
12	Cheese and cheese products
13	Ice cream from pasteurized milk and related products that have been pasteurized; raw ice cream mix and related unpasteurized products for consumption
14	Pasteurized and unpasteurized imitation dairy products for consumption.
15	Pasteurized eggs, egg products from pasteurized eggs; unpasteurized eggs and egg products from unpasteurized eggs for consumption without further cooking
16	Canned and cured fish, vertebrates; other fish products; fresh and frozen raw oysters and raw clams, shellfish and crustacean products; smoked fish, shellfish, and crustaceans for consumption
17	Unflavored gelatin
20–22	Fresh, frozen, and canned fruits and juices, concentrates, and nectars; dried fruits for consumption; jams, jellies, preserves, and butters
23	Nuts and nut products for consumption
26	Oils consumed directly without further processing; oleomargarine
27	Dressings and condiments (including mayonnaise), salad dressing, vinegar
28	Spices, including salt; flavors and extracts
29	Soft drinks and water
30	Beverage bases
31	Coffee and tea
33	Candy, chewing gum
34	Chocolate and cocoa products
35	Pudding mixes not cooked prior to consumption, gelatin products
36	Syrups, sugars, and honey
38	Soups
39	Prepared salads

Food Category III—Foods that would normally be subjected to a process lethal to *Salmonella* between the time of sampling and consumption.

Product Code	Food
02	Whole grain, processed grain, and starch products for human use
04	Macaroni and noodle products
16	Fresh and frozen fish; vertebrates (except that eaten raw); fresh and frozen shellfish and crustaceans (except raw oysters and raw clams for consumption); other aquatic animals (including frog legs)
24	Fresh vegetables, frozen vegetables, dried vegetables, cured and processed vegetable products normally cooked before consumption
26	Vegetable oils, oil stock, and vegetable shortening
35	Dry dessert and pudding mixes that are cooked prior to consumption
37	Frozen dinners, multiple food dinners
45–46	Food chemicals (direct additives)

SOURCE: FDA, 1978.