

Reprinted from
J. Milk Food Technol. Vol. 39, No. 1, Pages 55-58 (January, 1976)
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Microbiological Criteria for Food in Military and Federal Specifications

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(Received for publication May 1, 1975)

ABSTRACT

Microbiological criteria in military and federal food specifications are presented. Approximately 10% of more than 600 specifications for food contain microbiological requirements which are applied in procurement of food for military and federal agencies. Foods were grouped into four categories which include dehydrated foods, milk and milk products, miscellaneous dairy products, and frozen foods. Microbiological requirements vary with the food item and include criteria for the aerobic plate count, coliforms, *Escherichia coli*, salmonellae, yeast and mold, proteolytic bacteria, lipolytic bacteria, psychrotrophs and direct microscopic count. Specifications may be obtained by writing to the U.S. Naval Publications and Forms Center, NPFC Code 1032, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19130.

Microbiological specifications for foods purchased by Military and Federal Agencies for their own use specify the maximum acceptable number of microorganisms, or of specific types of microorganisms as determined by prescribed methods. These specifications are used by food manufacturers, procurement agencies, and testing laboratories to determine compliance with military and federal requirements for food items and to improve the food supply by standardizing the quality and assuring the safety of the food. The chief purposes of microbiological specifications are to give assurance that: (a) the foods will not be responsible for spread of infectious disease, or for food poisoning; (b) the foods consist of high quality materials that have not deteriorated or become unduly contaminated during processing, packaging, storage and handling; (c) filth has not been introduced into the food; and (d) the foods have the keeping quality expected of the product (7).

Of the approximately 600 military and federal food specifications, 59 contain microbiological requirements. Attempts are being made to standardize methodology and criteria in these specifications so that the best possible method is used to isolate a specific organism or group of organisms. In addition, indices are chosen which can be used to evaluate health hazards or poor sanitary practices. It is recognized that specifications must be attainable under conditions of good commercial practice and must be easily administered and technically feasible. Microbiological requirements in these specifications are based on research data or information gathered from surveys of foods purchased by military or federal agencies whenever possible.

The microbiological criteria in Military and Federal Specifications for food reported here were compiled to inform industry and other Government agencies of the current military standards used for the examination of foods. Specifications for food and Technical Reports may be obtained by writing to the U.S. Naval Publications and Forms Center, NPFC Code 1032, 5801 Tabor Avenue, Philadelphia, PA 19120.

MICROBIOLOGICAL CRITERIA FOR DIFFERENT FOODS

Microbiological examination of food in the Military and Federal Subsistence system is made in accordance with standard procedures recommended by leading authorities (1-6, 9-11). The methods are presented in military and federal specifications for each product. Methods and criteria for all products are presented in U.S. Army Technical Report 73-33-FL (8). Sampling plans and procedures for inspection were in accordance with Military Standard 105D, entitled *Sampling Procedures and Tables for Inspection by Attributes*.

The microbiological criteria for cooked, dehydrated foods are presented in Table 1. The aerobic plate count (APC) limits range from 10,000/g to 200,000/g depending on the food item and the processing it receives. The limitation for coliforms is 40/g or less and *Escherichia coli* must be negative per gram. Because three of the food items are high risk items, they are required to be negative for salmonellae in 25 g.

The microbiological criteria for milk and milk products comply with Public Health Service requirements and are presented in Table 2. These products were separated from other miscellaneous dairy products listed in Table 3 for convenience and ease of presentation. The APC limitations per ml(g) range from 5,000 to 50,000. Coliforms are limited to 10/ml(g), except for dry whole milk and filled milk (90/g). Dry, flavored dairy drinks and nonfat dry milk must be negative for salmonellae in 100 g and dry filled milk must be negative for salmonellae in 25 g. Only milk fat has a yeast and mold limitation (<30/ml or g).

Table 3 presents the microbiological criteria for miscellaneous dairy products. The APC limitations range from 10,000/g to 300,000/g. The type of product is

TABLE 1. *Microbiological criteria for dehydrated food*

Dehydrated food item	Spec. No.	Maximum count per gram				Method ref.
		APC ^a	Coliform	E. coli	Salmonellae ^b	
Beef, cooked	MIL-B-4344A	150,000	40	—	—	3
Beef stew, cooked	MIL-B-43404B	75,000	—	Neg	—	5
Beef with rice, cooked	MIL-B-43750A	75,000	—	Neg	—	5
Chicken and chicken products, cooked	MIL-C-0043135D	75,000	—	Neg	—	5
Chicken with rice, cooked	MIL-C-43289B	75,000	—	Neg	—	5
Chili con carne, cooked	MIL-C-43287C	75,000	—	Neg	—	5
Egg mix	MIL-E-43377B	25,000	10	—	Neg ^b	2,3,11
Escalloped potatoes with pork, cooked	MIL-E-43749A	75,000	—	Neg	—	5
Hash, beef, cooked	MIL-H-43224B	75,000	—	Neg	—	5
Macaroni, instant	MIL-M-35067A	50,000	10	—	—	3
Meat balls and meat ball products, cooked	MIL-M-43506	150,000	40	—	—	3
Pork sausage, cooked	MIL-P-43383A	200,000	40	—	—	3
Pork slices, cooked	MIL-P-43629	110,000	20	—	—	3
Potato and cheese bar, survival	MIL-P-35087C	—	—	—	Neg ^b	6
Spaghetti with meat sauce	MIL-S-43275B	75,000	—	Neg	—	5
Topping, dessert and bakery products	MIL-T-35038C	10,000	10	—	Neg ^b	3,6
Tuna, cooked	MIL-T-43443	200,000	40	—	—	3
Turkey, cooked	MIL-T-43451	200,000	40	—	—	3

^aAerobic plate count (APC).^bNegative per 25 g.TABLE 2. *Microbiological criteria for milk and milk products*

Finished milk product	Spec. no.	Maximum count per ml (g)					Method ref.
		APC ^a	Coliforms	Salmonellae	Yeast and mold	DMC ^d	
Cream substitute, dry or liquid non-dairy	MIL-C-43338C	20,000	10	—	—	—	3
Flavored dairy drink, dry chocolate-coffee flavored	MIL-F-35100B	20,000	10	Neg ^b	—	—	3,6
Malted milk	C-M-50A	30,000	10	—	—	—	3
Milk and milk products, fresh, fluid, concentrated and frozen	C-M-1678	20,000	10	—	—	—	2,3
Milk (plain or chocolate flavored), cream, half and half, filled and cheese, cottage and filled	MIL-M-35082B	20,000	10	—	—	—	3
Milk fat	MIL-M-1036E	5,000	10	—	30	—	3
Milk, nonfat, dry	C-M-3050B	50,000	—	Neg ^b	—	—	3,5
Milk: milk, skim, half and half							
Cream: reconstituted or recombined	MIL-M-1022D	20,000	10	—	—	—	3
Milk, whole, dry	C-M-355a	30,000	90	—	—	40,000,000	3
		Premium 50,000					
		Extra grade	90	—	—	75,000,000	3
Milk, filled, dry, plain or chocolate, fortified	MIL-M-43241	30,000	90	Neg ^c	—	—	3,11

^aAerobic Plate Count (APC).^bNeg per 100 g.^cNeg per 25 g.^dDMC-Direct Microscopic Count.

indicated by Roman numerals in parenthesis. Butter is analyzed for proteolytic and lipolytic bacteria which may not exceed 100/g and cottage cheese is analyzed for psychrotrophic bacteria which may not exceed 100/g. The coliform limitation ranges from 10/g to 90/g. Ice cream mix is the only item which must be analyzed for salmonellae (neg. per 25 g). The yeast and mold count for four products is limited to 20/g or less.

Table 4 presents the microbiological criteria for

precooked frozen foods. The limitations for precooked frozen foods are: APC, 100,000/g; coliforms, 100/g; *E. coli*, neg/g; and Salmonellae, neg/25 g. The APC for uncooked frozen foods range from 30,000/g to 500,000/g and the coliform limit ranges from 10/g to 230/g. Testing for *E. coli* and salmonellae is not required for uncooked frozen food.

These criteria are current and are presented as they appear in the specifications. However, revision and

TABLE 3. Microbiological criteria for miscellaneous dairy products

Finished dairy product	Spec. no.	Maximum count per gram (ml)				Method ref.
		APC ^a	Coliforms	Salmonellae	Yeast and mold	
Butter	C-B-801G	b	10	—	20	3
Buttermilk, Fluid and milk, whole, fresh cultured	C-B-816F	—	10	—	—	3
Buttermilk solids; dry cultured and uncultured	C-B-825a	50,000(I-1) ^c	90	—	—	3
		300,000(I-2,II) ^c	90	—	—	3
Cheese, cottage	C-C-281E	e	10	—	10	3
Cheese, processed, American, dehydrated	MIL-C-35053B	50,000	90	—	—	3
Cream, sour; cultured	C-C-678a	—	10	—	10	3
Ice cream, ice milk and sherbert imitation; ices and novelties	MIL-I-35027B	50,000(I-IV) ^c	20	—	—	3
		10,000(V) ^c	—	—	—	3
Frozen fudge bar	MIL-I-35027B	50,000	20	—	—	3
Ice cream mixes, dehydrated	MIL-I-00705D	30,000	10	Neg ^d	20	3,6
Ice cream, sherberts, ices	EE-I-116B	50,000(I,II,III) ^c	10	—	—	3
		10,000(IV) ^c	10	—	—	3

^aAerobic Plate Count (APC).

^bProteolytic and lipolytic count ≤ 100 per gram.

^c(I-V) Type of product.

^dNeg per 25 g.

^ePsychrotrophs ≤ 100 per gram.

TABLE 4. Microbiological criteria for frozen foods

Food Item	Spec. No.	Maximum count per gram				Method ref.
		APC ^a	Coliforms	<i>E. coli</i>	Salmonellae ^b	
<i>Precooked Frozen</i>						
Chicken a la king	LP/P DES 12-70	100,000	100	Neg	Neg	2,3,10
Chicken cacciatore	LP/P DES 20-70	100,000	100	Neg	Neg	2,3,4,10
Macaroni and cheese	LP/P DES 15-70	100,000	100	Neg	Neg	2,3,4
Meal, precooked	MIL-M-13966D	100,000	100	Neg	—	2,3,4
Pork and beef chop suey	LP/P DES 34-70	100,000	100	Neg	Neg	2,3
Pork loin, sliced with gravy	LP/P DES 27-70	100,000	100	Neg	Neg	2
Shrimp creole	LP/P DES 37-30	100,000	100	Neg	Neg	2
Swiss steak w/gravy	LP/P DES 21-70	100,000	100	Neg	Neg	2,3,4,10
Turkey w/gravy	LP/P DES 22-70	100,000	100	Neg	Neg	2,3,10
<i>Frozen Uncooked</i>						
Eggs and egg products ^d	C-E-230C	50,000 ^c	—	—	Neg	2
Oysters, fresh, shucked	PP-0-956F	500,000	230(MPN) ^e	—	—	1
Shrimp, raw, breaded	PP-S-315C	500,000	50(MPN)	—	—	5
Topping, dessert and bakery products	MIL-T-35024A	30,000	10	—	—	3

^aAerobic Plate Count (APC).

^bPer 25 g.

^cTable grade, 20,000 per gram.

^dYeast and mold 50 per gram.

^eFecal coliforms per 100 g at 44.5 C.

updating of some specifications is currently underway and new specifications are being developed. Since only the microbiological criteria are presented, the original specification should be consulted for information regarding quality assurance, inspection, sampling, packaging, microbiological and chemical analysis, storage and material requirements. Specifications may be obtained by writing to the U.S. Naval Publications and Forms Center, NPFC Code 1032, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19130.

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