

CONTENTS

TECHNICAL COMMITTEE	ix
CONTRIBUTORS	xi
CONSENSUS REVIEWERS	xv
PREFACE	xvii
CHAPTER 1 STANDARD METHODS	1
1.1 Introduction	1
1.2 Function of Standard Methods	1
1.3 Classification of Procedures	2
1.4 Adopting New Methodology	3
1.5 Collaborative Studies	4
1.6 Uniformity of Methods	4
1.7 Split-Sample Test Program	5
1.8 Precision Parameters	5
1.9 Relation of Farm and Plant Inspections to Laboratory Control	16
1.10 Suitability of Methods for Measuring Sanitary Quality	16
1.11 References	17
CHAPTER 2 LABORATORY QUALITY ASSURANCE AND SAFETY	19
2.1 Introduction	19
2.2 Laboratory Operational Management	19
2.3 Laboratory Facilities	26
2.4 Laboratory Equipment and Supplies	28
2.5 Control Tests and Record Keeping	37
2.6 Laboratory Safety	38
2.7 References	56
CHAPTER 3 SAMPLING DAIRY AND RELATED PRODUCTS ..	59
3.1 Introduction	59
3.2 Equipment	61
3.3 General Requirements	65
3.4 Sampling Raw Milk	68

3.5	Sampling Pasteurized Products	72
3.6	Sampling Other Products	73
3.7	Sampling Product Containers, Closures, Packaging Materials, Equipment, Water, and Air	78
3.8	Radionuclides in Milk and Dairy Products	82
3.9	References	82
CHAPTER 4	MEDIA	85
4.1	Introduction	85
4.2	Suitability of Water for Microbiological Applications	85
4.3	Preparation of Dilution Water	87
4.4	Water Toxicity Tests	88
4.5	Cleaning Glassware and Testing for Detergent Residues	88
4.6	Media	89
4.7	Basic Steps in Media Preparation	90
4.8	Adjustment of pH	91
4.9	Formulas and Directions for Preparation of Culture Media	92
4.10	Sterilization	98
4.11	Quality Control	100
4.12	References	100
CHAPTER 5	PATHOGENS IN MILK AND MILK PRODUCTS	103
5.1	Introduction	103
5.2	Pathogens and Toxins of Significance in Dairy Products	104
5.3	Sampling for Analysis of Pathogens or Toxins ...	124
5.4	Methods of Analysis	128
5.5	Other Pathogens and Toxins	200
5.6	References	200
CHAPTER 6	MICROBIOLOGICAL COUNT METHODS	213
6.1	Introduction	213
6.2	Standard Plate Count	213
6.3	Alternative Methods for Standard Plate Counts .	225
6.4	References	244
CHAPTER 7	COLIFORM AND OTHER INDICATOR BACTERIA	247
7.1	Introduction	247
7.2	Definitions	248

7.3	General Interpretations	248
7.4	Sampling	249
7.5	Equipment, Supplies, Media, and Reagents	249
7.6	General Procedure	250
7.7	Relative Values of Plate and Tube Methods	250
7.8	Coliform Tests with a Solid Medium	251
7.9	Coliform Tests with a Liquid Medium	252
7.10	Completed Test with a Liquid Medium	253
7.11	Reporting Results	253
7.12	Confirmed Test for <i>Escherichia coli</i>	259
7.13	Dry Rehydratable Film Method	261
7.14	Pectin Gel Method	262
7.15	Impedance Coliform Detection Method	264
7.16	Hydrophobic Grid Membrane Filter Method	264
7.17	Fluorogenic Assay (MUG Test) for Detection of <i>Escherichia coli</i>	266
7.18	<i>Enterobacteriaceae</i> Test	267
7.19	References	267
 CHAPTER 8 TESTS FOR GROUPS OF MICROORGANISMS ... 271		
8.1	Psychrotrophic Bacteria	271
8.2	Gram-Negative Bacteria	272
8.3	Thermoduric Bacteria	273
8.4	Thermophilic Bacteria	275
8.5	Proteolytic Microorganisms	275
8.6	Lipolytic Microorganisms	276
8.7	Lactic Acid Bacteria	277
8.8	Enterococci	279
8.9	Aerobic Bacterial Spores	280
8.10	Yeast and Mold Counts	281
8.11	References	283
 CHAPTER 9 MICROBIOLOGICAL METHODS FOR DAIRY PRODUCTS 287		
9.1	Introduction	287
9.2	Fluid Milk Products: Shelf Life	287
9.3	Evaporated, Concentrated, and Sweetened Condensed Milks and Liquid Infant Formulas	291
9.4	Ultrahigh-Temperature Processed, Aseptically Packaged, Low-Acid Products	294
9.5	Dry Dairy Products	295
9.6	Butter, Margarine, and Related Products	298

9.7	Cheese and Other Cultured and Culture-added Products	299
9.8	Ice Cream and Related Food Products	304
9.9	References	306
CHAPTER 10	DIRECT MICROSCOPIC METHODS FOR BACTERIA OR SOMATIC CELLS	309
10.1	Introduction	309
10.2	Application to Raw Milk	310
10.3	Application to Somatic Cells	310
10.4	Application to Dry Milk	310
10.5	Sources of Error in the Microscopic Method	310
10.6	Procedure for Collecting Samples	311
10.7	Equipment and Supplies	311
10.8	Materials	315
10.9	Adjustment and Calibration of Microscope	316
10.10	Using Transfer Instruments and Preparing Films	316
10.11	Handling of Slides during Staining	318
10.12	Preparation and Use of Stains	318
10.13	Storage of Slides	319
10.14	Examining Films for Bacteria or Somatic Cells	320
10.15	Field-wide Single-Strip Method	320
10.16	Reporting Counts	321
10.17	Direct Epifluorescent Filter Technique (DEFT) ...	321
10.18	References	323
CHAPTER 11	METHODS TO DETECT ABNORMAL MILK	327
11.1	Introduction	327
11.2	Cowside Screening Tests	327
11.3	Laboratory Screening Test: Wisconsin Mastitis Test	331
11.4	Confirmatory Tests	334
11.5	Methods to Detect Abnormal Goat's Milk	343
11.6	References	344
CHAPTER 12	DETECTION OF ANTIBIOTIC/DRUG RESIDUES IN MILK AND DAIRY PRODUCTS	347
12.1	Introduction	347
12.2	Qualitative <i>Bacillus stearothermophilus</i> var. <i>calidolactis</i> Disc Assay	347
12.3	Quantitative <i>Bacillus stearothermophilus</i> var. <i>calidolactis</i> Disc Assay	352

12.4	Delvotest^(R) -P-Ampule and Multi Test Procedures	354
12.5	Charm I^(R) Screening Assay for Beta Lactam Residues	357
12.6	Charm II^(R) Screening Assay for Seven Families of Antimicrobial Drugs	359
12.7	Charm II^(R) Screening Assay: Competitive Tablet ..	363
12.8	Charm II^(R) Screening Assay: Sequential Tablet ..	366
12.9	Charm^(R) Cowside Test for Beta Lactam Residues and Sulfonamides	367
12.10	Charm^(R) Inhibition Assay: Farm Test Version	369
12.11	Charm I/Cowside II^(R) Screening Assay for Antibiotics	371
12.12	Penzyme^(R) and Penzyme^(R) III	373
12.13	Spot^(R) Test	376
12.14	Modified Sarcina <i>lutea</i> Cylinder Plate Method for Detecting Penicillin in Nonfat Dry Milk	379
12.15	Specific Antimicrobial Cylinder Methods	383
12.16	Rapid High-Pressure Liquid Chromatographic Analysis of Sulfamethazine in Milk	384
12.17	Brilliant Black Reduction Test for Detecting Residues of all Antibiotics and Sulfonamides (BR TEST AS)	389
12.18	"Recently Developed" Immunoassays	391
12.19	References	394
CHAPTER 13 MICROBIOLOGICAL TESTS FOR EQUIPMENT. CONTAINERS. WATER. AND AIR 397		
13.1	Introduction	397
13.2	Sample Collection	397
13.3	Tests for Equipment and Containers	397
13.4	Tests for Water Supplies	407
13.5	Tests for Microbiological Quality of Air	407
13.6	References	410
CHAPTER 14 ALKALINE PHOSPHATASE METHODS 413		
14.1	Introduction	413
14.2	Principle of Methods	414
14.3	General Precautions for Methods Using Disodium Phenyl Phosphate	415
14.4	Controls Applicable to All Phosphatase Procedures	415
14.5	Scharer Rapid Phosphatase Test (Visual)	418
14.6	Rapid Colorimetric Phosphatase Test	424

14.7	Rutgers Phosphatase Test (Visual)	425
14.8	Fluorophos Alkaline Phosphatase Assay (Class A2)	427
14.9	References	430
CHAPTER 15	CHEMICAL AND PHYSICAL METHODS	433
15.1	Introduction	433
15.2	Acid Degree Value (Hydrolytic Rancidity)	434
15.3	Acidity	435
15.4	Ash and Alkalinity of Ash	443
15.5	Chloride (Salt)	446
15.6	Chlorine, Available	451
15.7	Extraneous Material	452
15.8	Fat	456
15.9	Lactose in Milk	483
15.10	Moisture and Solids	487
15.11	Multicomponent Methods	496
15.12	Protein	504
15.13	Water: Added to Milk	516
15.14	Iodine: Selective Ion Procedure	519
15.15	Vitamins A and D in Milk Products	521
15.16	Pesticide Residues in Milk	527
15.17	Radionuclides	528
15.18	References	529
INDEX	533	