Illustrations are comprehensively referred to from the text. Therefore, significant items in illustrations (figures and tables) have only been given a page reference in the absence of their concomitant mention in the text referring to that illustration.

AB and ABC starter cultures, 253
acesulfame K, puddings and desserts, 404
acetoin, 242, 245
acetylmethylcarbinol, 611
acid coagulation, 300
acid milk (flavor defect), 471–2
acid whey, 349, 350
dry, 29, 215, 455–6
acidity, 104
determination, 610–11
in fermentation, 94
starter cell damage caused by, in
cheese-making, 303–4
titratable see titratable acidity
U.S. product standards of identity, 159
acidifying agents, 156
see also pH
Acinetobacter, 107
Actinomyces, 113
activity testing, yogurt, 644
added water, determination, 606
additives and supplements, 166
butter, for flavor, 280
color see coloring agents
fat spreads, 283
fermented milk, Codex Standard, 176
probiotics, 254–5
U.S. standards of identity, 156, 166
advantame, puddings and desserts, 404, 405
aerated dessert, 417
aeration effects on fermentation, 243–5
aerobic Gram-negative bacteria, 107
aerobic plate counts (heterotrophic; standard plate
counts; SPC), 104, 119, 138, 233, 621
Aeromonas, 108
affective sensory testing, 467
aflatoxin, 136, 625
agar diffusion test for antibiotics, 612–13
age, milk composition affected by, 89
age gelation, 100, 323, 324, 325–6
age thickening, evaporated milk, 325, 328, 331
agglomeration, 14, 210, 344
aging
cheese, 142, 304–7
cream (for butter-making), 271
churning and, 274
ice cream/frozen desserts, 383
agitation in silos, 181
air supply, 561
airborne microbial contamination, 140–1
AISI-300, 195
albumin, bovine serum see bovine serum albumin
Alcaligenes, 107
alcoholic butter, 280
algae, 117
  mastitis caused by, 121
Algeria, per capita consumption of various products, 51
alginate and alginates, desserts and puddings, 408
alkaline phosphatase (referred to sometimes as phosphatase), 88, 195, 233, 612
determination, 612
standards, 189, 565
allergens, 600–1
  control plan, 557
  labeling, 169–70
Alteromonas, 107
aluminium packaging, 508
American Dairy Science Association (ADSA) in sensory evaluation, 468
  scorecards, 233, 469–70
  Cheddar cheese, 469, 478
American Heart Association dietary recommendations, 440
amino acids
  in casein, 432
  essential, 431, 432, 435, 436
  profiles in various products, 453–62
  in whey proteins, 435
amylopectin, puddings and desserts, 407
amylose, puddings and desserts, 407
anaerobic Gram-negative rods, facultative, 108–9
analytical units, 620
angiotensin-converting enzyme inhibition, 92, 435, 437, 447
anhydrous milk fat, 11, 206
animal feed
  mycotoxins, 136, 625
  whey permeate as, 356
anionic resins
  whey demineralization, 351–2
  whey protein isolate, 355
annatto coloring
  butter, 274
  cheese, 291
antibiotics see antimicrobial drugs
antibodies (immunoglobulins), 92, 434, 436
anticancer components, 74, 448, 450
antigen testing using ELISA see enzyme-linked immunosorbent assay
antihypertensive components, 75, 447
antimicrobial drugs (incl. antibiotics), 79
  food-grade, 140
  present in milk at receiving bay, 180, 222
  cheese-making and, 288
testing for, 612–13
antimicrobial properties
  immunoglobulins, 436
  vitamins, 451
AOAC International (methods of analysis)
  acidity, 611
  aflatoxin, 605
  antibiotics, 612, 613
  fat, 603
  free fatty acids, 604
  lactose, 610
  peroxide value, 604
  protein, 608–9
  total solids, 605
  water
    activity, 608
    added, 606
appearance, sensory evaluation for defects
  butter, 474
  cottage cheese, 481
National Collegiate Dairy Products Evaluation Contest, 409–10
  yogurt, 477–8
Appert and Appertization, 310
Argentina
  butter production and consumption, 47
  cheese production and consumption, 48
  fluid cow’s milk production and consumption, 45
  nonfat dry milk production and consumption, 49
  per capita consumption of various products, 51
  total milk production, 43
  whole milk powder production and consumption, 50
  yield of milk per cow, 44
arithmetic method of ice cream/frozen desserts mix calculations, 375, 377–8
aroma see flavor
Arthrobacter, 113
ascorbic acid (vitamin C), 87, 446
aseptic procedures, 231, 523
  packaging, 199, 523–4
  puddings and desserts, 411–14
  starch-based milk pudding, 411–14
  sampling (for microbiological tests), 620
  standards, 565
see also sterilization
aseptically processed, 176
  rice pudding, 420
ash content, 202
  cheese, 22, 211
condensed milk products, 12, 209
cream, 7, 202
dry milk products, 13, 209
dry whey/whey products and other dairy products, 29, 214
fat products, 9
fluid/raw milk, 7, 80, 202
mammalian species comparisons, 42, 61, 429
puddings and desserts, 400
ultrafiltered milk, 7
Asiago cheese, U.S. standards of identity, 160
aspartame, desserts and puddings, 404, 405
frozen (incl. ice cream), 374
Aspergillus, 117
A. flavus toxin (aflatoxin), 136, 625
ATP tests, 289
audit
HAACP, 38, 102
samples (for microbiological tests), 619
Aureobacterium, 113
Australia
butter production and consumption, 47
cheese production and consumption, 48
fluid cow’s milk production and consumption, 45
microbiological standards for raw and pasteurized milk, 137
nonfat dry milk production and consumption, 49
per capita consumption of various products, 51
total milk production, 43
whole milk powder production and consumption, 50
yield of milk per cow, 44
automated methods
fat determination, 603
sampling (for microbiological tests), 618
Babcock method of fat determination, 602
Bacillus, 115, 135
B. stearothermophilus, 115, 135, 322, 324
in tests for antibiotic presence, 612
probiotics, 252
spore inactivation by nonthermal processes, 542
bacteria, 106–20
associated with milk and milk products, 106, 107–15, 118–20
biofilms, 141
cheese ripened by, 23
coliform tests, 104
direct microscopic count, 104, 180, 222, 612
mastitis caused by, 121
milk quality affected by, 79
pathogenic, 123–31
probiotic see probiotics
spore inactivation by nonthermal processes, 542
standard plate counts (SPC), 104, 119, 138, 233
total bacterial count (TBC), 137, 138
udder interior and, 121
viruses infecting see bacteriophages
see also microbes; microbiology; pathogens
Bacteriological Analytical Manual (FDA BAM)
coliforms/E. coli, 622
E. Coli O157, 637
Listeria, 635
S. aureus, 639, 640
Salmonella, 628
yeasts and molds (YMs), 625
bacteriophages, 641, 645
spraying for Salmonella and Listeria control, 641
starter culture infection/attack, 302–3, 645
resistance, 302
Baird Parker plates, S. aureus, 639
baked pieces in ice cream/frozen desserts, 385
banana-flavor high-protein low-carbohydrate pudding, 416
bar codes, universal product, 174
barns, milking, requirements and standards, 182–3
barometric leg, 315
batch operation/system/process, 224–5
butter-making, 272–4, 277
desserts and puddings, 410–11
frozen (incl. ice cream), freezing of ice cream/frozen desserts, 386–7
rice pudding, 420
pasteurization, 227–8
ice cream/frozen desserts, 382
Bauman, Howard, 562–3
BCP broth, Listeria, 634
beef patties and E. coli, critical control point determination, 578
beet sugar, puddings and desserts, 402
beverages see drinks and beverages
Bifidobacterium, 113
probiotics, 244, 251–2
culturing, 642–3
enumerations, 643–4
bioactive peptides, 74–5, 92–3, 433–7
in casein, 433–5
functional properties, 433–7
high-pressure effects, 536
in whey proteins, 92, 434
biodegradation of packaging, 518, 520
biofilms, microbial, 141
biological and biochemical hazards
monitoring in HACCP, 584
spoilage/defects
  new products and, 497
  off-flavors, 200
standards relating to, 189–90, 570
biotin, 445–6
blends (and blending/mixing)
  blended butter–vegetable oil, 206
  blended spreads, 282–3
  blended yoghurt, manufacturing process, 18
dry pudding and dessert mixes, 424
ice cream/frozen dessert manufacturing process, 380–1
see also mixes
bloating
  evaporated milk, 323
  sweetened condensed milk, 330, 331
blood nutrients
  composition, 63–4
  lipid, 69
  food lipid contributions to, 440
  milk components derived from, 62
  lipid, 69
blood pressure-lowering (antihypertensive) components, 75, 447
blowing, late (cheese-making), 115, 135, 289
blue cheese
  nutrient profile, 458
  U.S. standards of identity, 160
blue mold and blue mold cheese from sheep’s milk, U.S. standards of identity, 164
body
  classification of cheese based on, 23
  sensory evaluation for defects
    butter, 474
    Cheddar cheese, 479
    cottage cheese, 480–1
    ice cream, 476
  National Collegiate Dairy Products Evaluation Contest, 409–10
  yogurt, 477
boiling point, 97
bone health/structure, 46–7
  cultured products and, 449–50
books on packaging, 512–13
Borden, Gail, 310
Bosch aseptic packing systems, 523, 524
bovine fat globules see fat globules
bovine serum albumin (BSA), 67, 351, 360, 434, 436

Index

analysis, 363, 364
bioactivity, 434, 436
brain–heart infusion broth, S. aureus, 640
Brazil
  butter production and consumption, 47
  cheese production and consumption, 48
  fluid cow’s milk production and consumption, 45
  nonfat dry milk production and consumption, 49
  per capita consumption of various products, 51
total milk production, 43
  whole milk powder production and consumption, 50
  worldwide production and consumption, 48
  yield of milk per cow, 44
breast milk (human)
  composition, 61
  fecal bacteria in babies fed on, 235
  breed affecting milk composition, 88
Brevibacterium, 113
  B. linens, 120
brick cheese, U.S. standards of identity, 160
British Retail Consortium (BRC) certification schemes, 561
bromocresol Purple (BCP) broth, Listeria, 633–5
browning (incl. Maillard reaction), 5, 85, 98
evaporated milk, 323, 324
  lysine and, 432
  sweetened condensed milk, 328, 331
sweetened condensed milks made from, 330
Brucella, 107
buffalo milk, 41–2, 429
  butter made from, 274
  composition, 42, 61
dahi made from, 21
  physicochemical characteristics, 81
  sweetened condensed milks made from, 330
Bulgarian buttermilk, 259
bulk milk
  cheese-making and, 288
  cooling tank, 179
  handling, 5
  products, heat stability and properties of, 100–1
  transportation (farm to plant), 179, 183–4
bulk starter media for cheese-making, 303–4
bulk starter tanks for cheese-making, 303
bulk tank unit, definition, 195
butter, 9–11, 266–85, 472–4
  cultured cream butter, 10, 203
definition, 267
  nutrient profile, 456–7
packaging, 279–80, 525
<table>
<thead>
<tr>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>production, 9–10, 201–5, 267–80</td>
</tr>
<tr>
<td>continuous, 9–10, 202–3, 277–9</td>
</tr>
<tr>
<td>flow diagram, 279</td>
</tr>
<tr>
<td>products, 11</td>
</tr>
<tr>
<td>quality assurance, 283–5</td>
</tr>
<tr>
<td>salted, 276, 456–7</td>
</tr>
<tr>
<td>nutrient profile, 35</td>
</tr>
<tr>
<td>sensory evaluation for defects, 472–4</td>
</tr>
<tr>
<td>National Collegiate Dairy Products Evaluation Contest of the ADSA, 469–70</td>
</tr>
<tr>
<td>special, 280</td>
</tr>
<tr>
<td>spreadability, 280–2</td>
</tr>
<tr>
<td>types, 267</td>
</tr>
<tr>
<td>unsalted, 267, 371, 456–7</td>
</tr>
<tr>
<td>in U.S. see United States</td>
</tr>
<tr>
<td>working, 9, 202, 268, 273, 276–8</td>
</tr>
<tr>
<td>worldwide production and consumption, 46, 47</td>
</tr>
<tr>
<td>per capita consumption, 51</td>
</tr>
<tr>
<td>butterfat, clarified, 11, 206</td>
</tr>
<tr>
<td>buttermilk</td>
</tr>
<tr>
<td>Bulgarian, 259</td>
</tr>
<tr>
<td>condensed evaporated, U.S. production, 56</td>
</tr>
<tr>
<td>cultured, 15, 16–17, 211</td>
</tr>
<tr>
<td>formulation/composition, 16, 35</td>
</tr>
<tr>
<td>starter cultures, 247</td>
</tr>
<tr>
<td>dry, 14, 210</td>
</tr>
<tr>
<td>flow diagrams for production, 10, 204</td>
</tr>
<tr>
<td>nutrient profile, 455–6</td>
</tr>
<tr>
<td>flow diagram for production, 205</td>
</tr>
<tr>
<td>buttermilk product, dry (buttermilk powder), 14, 210</td>
</tr>
<tr>
<td>dry pudding and dessert mixes, 423–4</td>
</tr>
<tr>
<td>ice cream/frozen desserts, 375</td>
</tr>
<tr>
<td>butteroil, 206</td>
</tr>
<tr>
<td>flow diagrams for production, 10, 204</td>
</tr>
<tr>
<td>ice cream/frozen desserts, 371</td>
</tr>
<tr>
<td>nutrient profile, 456–7</td>
</tr>
<tr>
<td>butterscotch-flavor puddings and desserts, 410, 412, 416</td>
</tr>
<tr>
<td>dry mixes, 423</td>
</tr>
<tr>
<td>butyric acid, 441, 442</td>
</tr>
<tr>
<td>camel milk, composition, 42, 61</td>
</tr>
<tr>
<td>CAMP test, Listeria, 633, 634, 635</td>
</tr>
<tr>
<td>Campylobacter (C. jejuni and C. coli), 107, 128</td>
</tr>
<tr>
<td>can(s) (and canning), 508, 522</td>
</tr>
<tr>
<td>evaporated milk, 321</td>
</tr>
<tr>
<td>historical development, 310</td>
</tr>
<tr>
<td>Canada</td>
</tr>
<tr>
<td>butter production and consumption, 47</td>
</tr>
<tr>
<td>cheese production and consumption, 48</td>
</tr>
<tr>
<td>fluid cow’s milk production and consumption, 45</td>
</tr>
<tr>
<td>nonfat dry milk production and consumption, 49</td>
</tr>
<tr>
<td>per capita consumption of various products, 51</td>
</tr>
<tr>
<td>total milk production, 43</td>
</tr>
<tr>
<td>worldwide production and consumption, 48</td>
</tr>
<tr>
<td>yield of milk per cow, 44</td>
</tr>
<tr>
<td>cancer, protective factors, 74, 448, 450</td>
</tr>
<tr>
<td>Candida, 116</td>
</tr>
<tr>
<td>C. lacticondensi, 116, 136</td>
</tr>
<tr>
<td>candy in ice cream/frozen desserts, 385</td>
</tr>
<tr>
<td>capillary electrophoresis, whey proteins, 364</td>
</tr>
<tr>
<td>capillary zone electrophoresis, whey proteins, 364</td>
</tr>
<tr>
<td>capital costs of nonthermal technology implementation, 537, 538, 539</td>
</tr>
<tr>
<td>capric acid, 441, 442</td>
</tr>
<tr>
<td>caproic acid, 441, 442</td>
</tr>
<tr>
<td>caprylic acid, 306, 441, 442</td>
</tr>
<tr>
<td>carbohydrate(s), starter cultures and, 242</td>
</tr>
<tr>
<td>see also low-carbohydrate high-protein pudding</td>
</tr>
<tr>
<td>carbohydrate sweeteners, nutritive see nutritive</td>
</tr>
<tr>
<td>carbohydrate sweeteners</td>
</tr>
<tr>
<td>carboxymethyl cellulose (CMC), desserts and puddings, 409</td>
</tr>
<tr>
<td>frozen (incl. ice cream), 374–5</td>
</tr>
<tr>
<td>cardboard see paper/paperboard/cardboard/cartonboard packaging</td>
</tr>
<tr>
<td>cardiovascular disease (CVD)</td>
</tr>
<tr>
<td>components preventing (improving cardiovascular health), 75</td>
</tr>
<tr>
<td>in cultured products, 449</td>
</tr>
<tr>
<td>food lipids and, 440–1</td>
</tr>
<tr>
<td>caries, 447</td>
</tr>
<tr>
<td>carob gum, desserts and puddings, 408</td>
</tr>
<tr>
<td>carotene/β-carotene</td>
</tr>
<tr>
<td>butter, 274</td>
</tr>
<tr>
<td>cheese, 291</td>
</tr>
<tr>
<td>carrageenan, desserts and puddings, 408</td>
</tr>
<tr>
<td>frozen (incl. ice cream), 375</td>
</tr>
<tr>
<td>cardboard see paper/paperboard/cardboard/cartonboard packaging</td>
</tr>
</tbody>
</table>
casein(s), 67, 90, 216, 297–8, 431–5
  bioactive peptides derived from, 433–5
in cheese
  content, 297–8
  hydrolysis, 304–5
content in different mammals, 42
dry milk products, 337–8, 340, 342, 343, 344
heat effects, 5, 99
high-pressure effects, 536–5
manufacture, 31
micelles see micelles
nutritional role/value, 431–5
phosphopeptides, 68, 90, 435, 437
subdivisions, 67
κ-casein, 431, 432
  genetic polymorphisms/variants, 74, 99
  rennet coagulation and, 300
casein-to-fat ratio, cheese-making, 288, 289, 290, 296, 297
caseinates, 90, 216
dry pudding and dessert mixes, 424
  manufacture, 31, 216
Caseobacter, 113
casokinin, 75, 435, 437
casoplatelins, 435, 437
casoxins, 435, 437
cationic resins
  whey demineralization, 351–2
  whey protein isolate, 355
centrifugal separation
  cream, 8, 200, 224, 270, 400
  whey, 350
certification schemes, food safety and quality
  management systems, 561–2
characterizing of dairy products, ultrasound use, 532–3
check samples (for microbiological tests), 619
Cheddar cheese, 306
  manufacturing process, 25, 205
  nutrient profile, 35, 458–9
  pressing, 295
  salting, 295
  sensory evaluation for defects, 478–9
    National Collegiate Dairy Products Evaluation
    Contest of the ADSA, 469–70
  titratable acidity, 299
U.S. standards of identity, 160
Cheddaring, 294–5
cheese, 21–7, 211–13, 287–309
  chemistry, 296–300
  hazards and standards relating to, 189–90, 570
diversity/types/categories, 21–3, 305
genetic polymorphisms enhancing quality and yield of, 99
grading see grading
high-pressure effects, 535, 537
manufacture, 287–96
  aging, 142, 304–7
  problems, 135, 289
  ripening see ripening
nutrient profile, 35, 458–62
outbreaks linked to, 125, 571–2
packaging, 525
quality issues, 104, 287–9, 306–7
  safety tests and, 104
  starter cultures and, 134
  sensory evaluation for defects, 478–85
    National Collegiate Dairy Products Evaluation
    Contest, 469–70
spoilage issues relating to starter cultures, 134
worldwide production and consumption, 46, 48
  per capital consumption, 51
U.S. see United States
cheese products, 21–7, 212–13
enzyme-modified cheese, 27, 198, 213–14
U.S. product standards of identity, 160–5
chemical composition and properties see content;
  physical/physicochemical characteristics
chemical contamination of milk, 79–80
chemical inspection/testing, 189–90, 232
  flavorful substances, 611
  at receiving bay, 80
chemistry
  cheese see cheese
  hazards (and causes of spoilage) due to, 189–90, 570
    new products, 497
    off-flavors, 200
  milk see milk
  see also physical/physicochemical characteristics
chicken, S. aureus, 578
China
  fluid cow’s milk production and consumption, 45
  nonfat dry milk production and consumption, 49
  per capita consumption of various products, 51
  whole milk powder production and consumption, 50
  yield of milk per cow, 44
Chlamydiads, 115
chloride ions (Cl+) in milk, 64–5, 444
chocolate flavor (and use of cocoa)
desserts and puddings (and use of cocoa), 409, 410, 411, 412, 416, 417, 418
  dry mixes, 423
  frozen (incl. ice cream), 384
  whole milk, nutrient profile, 33
  cholesterol, 69, 83, 443
  blood, 440
  chromatographic methods of whey protein analysis, 353
  Chromobacterium, 108
  churning (cream) in butter production, 9–11, 201–3, 268, 272–5
  continuous butter churns, 9–10, 202–3, 277–9
  mechanistic basis, 276
  citrate metabolism and fermentation, 242
  diacetyl and, 611
  Citrobacter, 108
  Cladosporium, 117
  clarification (milk powder processing), 334
  clarified butterfat, 11, 206
  classified pricing, 193, 195
  cleaning, 184–5
  cheese-making, 288–9
  employee personal cleanliness, 186, 561
  improper, 122
  milk storage silos, 181
  in place (CIP), 123, 185, 195
  Clostridium, 115, 135
    C. tyrobutyricum, 115, 135, 289
  thermoduric properties, 118, 135
  closure and capping
    glass bottles, 522–3
    pasteurized products, 186
    plastic bottles, 525
    standards for closures, 187–8
  club cheese see cold pack
  coagulase test for S. aureus, 638, 639, 640
  coagulum and coagulation see curd
  cobalamin (vitamin B₁₂), 445
  cocci
    Gram-negative aerobic, 107
    Gram-positive, 110–11
    endospore producing, 115
  cocoa see chocolate flavor
  evaporated and sweetened condensed milk definitions, 311–12
  coded information
    dating, 174
    universal product bar codes, 174
  Codex (Alimentarius Commission), 174, 176, 311, 595–7
  commodity committees, 597
  functional structure, 596–7
  general committees, 597
  historical milestones, 596
  main functions, 595
  standards, 174–6, 595
    concentrated (condensed and evaporated) milks, 311, 312
    global food trade and, 595
  coffee cream, nutrient profile, 33
  cohesion, puddings and desserts, 422
  Colby cheese
    nutrient profile, 458–9
    U.S. standards of identity, 161
  cold common, probiotics, 451
  cold pack (club) cheese, 27, 213
    nutrient profile, 459–61
    sales in U.S., 54
    standards of identity, U.S., 161–2
  cold pack cheese food, 27
    U.S. standards of identity, 162
  cold storage of cheese milk, 289
  cold temperatures, microorganisms growing in see psychrotrophic microorganisms
  coliform bacteria, 119, 195
    fecal, 621–3
    preliminary incubation (PI) count, 138
    quality and spoilage issues, 133
    tests and standards, 104, 189–90, 565–6, 621–3
  colligative properties, 97
    lactose, 85–6
  colloidal dispersion/state, 65, 94, 429
  minerals, 71, 72, 86
  see also hydrocolloids
  colon cancer and calcium, 337
  colony forming units, 177
  color
    milk (normally), 1–2
    sensory evaluation for defects
      butter, 474
      cottage cheese, 481
      milk, 477–8
    National Collegiate Dairy Products Evaluation Contest, 409–10
  coloring agents/additives, 156, 176
    butter, 273
    cheese, 291
  puddings and desserts, 409
colostrum, 60–1, 221
functional ingredients marketed from, 436
commerce see industry and commerce and corporate
businesses
common cold, probiotics, 451
complaint samples (for microbiological tests), 619
composition see content
concentrated products (concentrates), 206–9, 310–32
definitions and standards, 311
fluid milk, 11–13, 206
roller drying, 13–14, 210, 340, 343
standards, 153, 189, 565
history, 310
milk fat (fat-rich products), 9–11, 199, 201–6
milk protein (MPC), 31, 216, 334
applications, 344
flow diagram for manufacture, 335
milk protein interactions in, 343
in puddings and desserts, 401–2
reconstitution properties, 343–4
in puddings and desserts, 400
whey protein see whey protein
see also entries under condensed; evaporated
concentrated products (concentrates) nutrient
profile, 455–6
concentrated sources for ice cream/frozen desserts
milk fat, 370–1
serum solids, 371–2
concentration (process)
by reverse osmosis see reverse osmosis
by ultrafiltration see ultrafiltration
of whey, 350–1
condensed evaporated buttermilk, U.S. production, 56
condensed fluid milk products (in general), 11–13, 199,
206–9
biological/chemical/physical hazards, 570
production in U.S., 56
condensed milk (whole milk) or concentrated whole
milk, 11, 206, 310–32
definition and standards, 311
ice cream/frozen dessert manufacture, 372
production, 326–30
in U.S., 56
sweetened see sweetened condensed milk
condensed skim milk (or concentrated milk), 11–12,
206–7
Codex Standards, 312
desserts and puddings, 400
frozen (incl. ice cream), 372
ice cream, 372
puddings and desserts, 400
spray drying, 13
condensed whey
spray drying, 20, 215
standards, 190, 566
sweet U.S. production, 56
condition affecting milk composition, 89
conductivity
electrical, 94
thermal, 96–7
confectionery pieces in ice cream/frozen desserts, 385
confirmation testing
coliforms, 622
Listeria, 637
Salmonella, 628
conjugated linoleic acids see linoleic acids
consumers/customers, 498–9
-describing intended use by (in HACCP), 568
-as drivers of new product development, 498–9
in HACCP
-describing intended use by, 568
-mishandling/abuse, 569
-needs and demand, 489
-new products and, 495
-new technologies and the perceptions and concerns of, 533
-trends towards food purchase, 489
consumption and sales/purchase (raw/liquid milk and
products), 41–59, 141–2
microbiological issues, 141–2
pathogen exposure modeling and anticipated
consumption pattern, 576
puddings and desserts, 397
trends, 41–59
worldwide comparisons, 42–6, 51
U.S., 45, 52–6, 59, 267
see also reference amount (customarily consumed)
containers see packaging
contains statement, 170–1
contamination of milk, 79–80
biological see microbes
cheese-making, 288
content/composition/components/ingredients (incl.
formulation), 202, 428–9
assessment/determination, 601–11
cheese, 22, 211, 296–9
condensed milk products, 12, 208, 313
cultured buttermilk and sour cream, 16
dry milk products, 13, 209, 334
fat-rich products (fat concentrates), 9, 203
fluid dairy ingredients, 7, 202
high-pressure effects, 535
labeling see labeling
milk see milk
novel ingredients, 490
nutrient profile of various products, 32–6, 452–62
puddings and desserts, 399–423
dry, 422–4
frozen (incl. ice cream), 32, 368–79
U.S.
product standards, 153–66
role in American diet, 429–30
whey, 349–50
yoghurt bases, 16
Continab butter-making machine, 277, 278
continuous improvement (Kaizen), 592–5
continuous processes
butter making/churning, 9–10, 202–3, 277–9
freezing of ice cream/frozen dessert
pasteurization, 387–8
heat treatment/pasteurization, 228–9
ice cream/frozen dessert pasteurization, 382
non-frozen puddings and desserts, 420–1
critical points, critical see critical control points
converters, 510
conveying see transportation and conveying
cook cheese, U.S. standards of identity, 160
cooking, sensory analysis of Mozzarella performance
after, 482
cooling, 7, 178–9, 183
in butter-making
in continuous production, 277–8
cream, 271, 272
in cheese-making, bulk milk, 288
maintenance of cooled raw milk and milk products till
processing, 186
practices, contamination risk regarding, 122–3
sweetened condensed milk, 329–30
copper, 444
corn sweeteners, ice cream/frozen desserts, 373
corporate businesses see industry
corrective actions in HACCP, 38, 102–3, 556, 583–6
corrugated fiberboard, 508, 510, 515
*Corynebacterium*, 113
cost see economics
cottage cheese (creamed), 211
manufacturing process, 15
nutrient profile, 35, 461–2
sensory evaluation for defects, 479–81
National Collegiate Dairy Products Evaluation
Contest of the ADSA, 469–70
U.S.
sales, 54
standards of identity, 160
countercurrent flow in continuous pasteurization, 228
cow(s) (milk cows)
infections from man to, 78
infections of milk directly from, 78
numbers worldwide, 42, 44
U.S., 44, 52
cow milk see milk
“cow” odor of cows’ milk, 2*Coxiella*, 115, 233
cream, 8–9, 199, 200–1
in butter production, 270–5
churning see churning
composition, 7, 202
fat, 7, 154, 202
composition of products made from, 33
cultured see sour cream
desserts and puddings, 401
dried, 423
frozen (incl. ice cream), 370, 370–1
manufacture, 8–9
plastic, 9, 200, 203
receiving see receiving
separation from skim milk see separation
U.S. product standards of identity, 154
*see also* half-and-half
cream cheese
manufacturing process, 15, 24
nutrient profile, 35, 461–2
U.S. standards of identity, 162
creamed cottage cheese see cottage cheese
creaming of fat, 323, 324–5, 329
creative products, 492
critical control points (CCP), 36–8, 101–4, 556, 574–83
monitoring, 38, 102–3, 556, 582–3
critical limits, 584
deviation, 585
establishing, 556, 579–82
critical records, 558
Crohn’s syndrome, 114, 142*Cronobacter*, 108–9, 130–1
crystallization
fat (butter-making), 9, 10, 203, 271, 272, 281
lactose see lactose
culture (microbial)
  live and active see live and active cultures
  milks containing, 17–18
  probiotic see probiotics
  starter see starter culture
  for testing
    E. coli, 636, 637
    Listeria, 632, 633, 635
  probiotics, 642–3
    S. aureus, 640
    Salmonella, 627–8
  yeasts and molds, 624

culture (people), corporate business, 555

cultured butter, 267, 271

cultured cream see sour cream

cultured milks (fermented milks), 235–65, 448–52
  Codex Standards, 174–6
  health benefits, 448–52
  probiotics, 448–52
    commercial, 253
  U.S. product standards of identity, 156
  varieties, 236–7

cultured products (fermented products in general), 14–21, 199, 210–13, 235–65
  acidity, 94
  bioactive peptides, 92–3
  Codex standards and definitions for, 174–6
  definition, 177
  flow diagram for manufacture, 205
  manufacture, 245–7
  milk pricing, 195
  nutrient profile, 35
  oxidation–reduction (redox) potential or level, 95, 243–5

culture (people), corporate business, 555

cultured butter, 267, 271

cultured cream see sour cream

cultured milks (fermented milks), 235–65, 448–52
  Codex Standards, 174–6
  health benefits, 448–52
  probiotics, 448–52
    commercial, 253
  U.S. product standards of identity, 156
  varieties, 236–7

cultured products (fermented products in general), 14–21, 199, 210–13, 235–65
  acidity, 94
  bioactive peptides, 92–3
  Codex standards and definitions for, 174–6
  definition, 177
  flow diagram for manufacture, 205
  manufacture, 245–7
  milk pricing, 195
  nutrient profile, 35
  oxidation–reduction (redox) potential or level, 95, 243–5

quality
  assurance, 256–7
  starter cultures and, 134
  spoilage, starter cultures and, 133–4
  see also yoghurt

curd (=coagulum; curd fraction), 290–4
  cutting, 287, 292
  production (coagulation), 290–2, 300
    flow diagram, 10, 204
  treatments, 292–4

curd (=dahi), 21

cured (ripened) cheese, 23

customers see consumers
cyclamates, 491
cysteine in whey protein, 435
cytokines, 434, 437
dahi, 21, 249–50
daily reference values, 171, 176
daily values (DV), 171
dating codes, 174
Debaryomyces, 116
decision-making
  critical control point determination, 576, 580, 581, 582
  new product introduction, 498
declarations and statements
  of ingredients, 168–9
  of shipments from farm to plant, 184
defence mechanisms, lactic acid bacteria, 245
degradation (packaging), 520–1
  biological, 518, 520
  Deming Laboratories Client Education Manual, 613–16
  Listeria, 628–36
  Salmonella, 625–8
demand, consumer see consumer
demi-Fraser broth for Listeria, 632
demineralization
  milk, 99
  whey (reduced-minerals whey powder), 30, 215–16, 251–4, 351–4, 356
  U.S. production, 56
Deming, Edward, and his quality doctrine, 587–92, 593
Denmark
  factors influencing success of new product development, 499
  ymer, 19, 248
density, 97–8
dental/oral health, 447–8
Department of Agriculture (USDA) microbiological tests
  E. Coli O157, 637
  Listeria, 630, 632, 636
  Salmonella, 628
deposit/fill/seal systems, 523, 524
descriptive analysis in sensory testing, 467–8
design
  equipment, relationship with processing performance, 541
  graphic, 507, 510, 511, 516–17
  product, 494, 496, 497
  structural, 507
desserts and puddings (frozen) see ice cream and frozen desserts
desserts and puddings (nonfrozen and refrigerated products), 31, 397–427
dry mixes, 422–5
Index

market value, 397
quality control, 421–2
ready-to-eat, 398–422
composition/formulation, 399–423
processing procedures, 410–21
types/classification, 398
development
new products (PD/NPD), 488–505, 540–3
challenges, 499–501, 540–3
functional foods, 499–501
HACCP-based food safety and quality management systems, 560
improving chances of success, 498–9
nonthermal technologies and, 540–3
opportunities, 494–5, 499–501
process of, 494–8
reasons for, 489–91
strategy, 492–3
team, 493–4
packaging, 510–12
dew point, 608
diabetes type 2, 446
diacetyl, 119, 134, 245, 248, 480, 483, 611
measurement, 611
diarrhea, probiotics, 450
diet
American, role of milk constituents, 429–30
fat intake see fat
digestion, cultured products assisting, 449
diglycerides, ice cream/frozen desserts, 375
direct microscopic count, 104, 180, 222, 612
direct set cultures in cheese-making, 304
disc diffusion test for antibiotics, 612–13
discriminant sensory testing, 467
disease and illness
cow, milk composition affected by, 88
human see humans
infectious see infections
display equipment, ice cream/frozen desserts, 390–3
dissolved (solution) state, minerals in milk, 71, 72, 86
distribution, 510, 515–16
describing distribution dynamic (in HACCP), 568
of ice cream/frozen desserts, 389–93
packaging, 507, 512, 515–16, 521, 522, 524, 525, 526
product development and, 494
see also transportation
DNA transcription, 66
documentation/record-keeping/written records/log in good manufacturing practice, 557–8
in HACCP, 38, 556, 560, 584, 587
dog milk composition, 61
donkey milk, composition, 41, 42, 61
double-effect evaporators, 314, 316
drinks and beverages
milk for, 220
drugs
cheese-making and testing for, 288
milk composition affected by, 89
standards, 189
“dry” ice cream, 386
dry milk products (milk powders), 13–14, 46, 199, 209–10, 333–48
applications, 344
buttermilk see buttermilk manufacture/processing, 334–42
nonfat see nonfat dry milk
reconstitution properties, 343–4
skim see skim milk powder
whole see dry whole milk
dry pudding and dessert mixes, 422–5
dry salting of butter, 276
dry whey
acid, 29, 215, 455–6
sweet, 28–9, 214–15, 455–6
U.S. production, 56
dry whole milk (powder-WMP), 333, 334, 336, 338, 340, 341, 342
biological/chemical/physical hazards, 570
flow diagrams for production, 10, 204, 335
heat stability, 100
L. monocytogenes transmission by, risk analysis, 577
nutrient profile, 455–6
pudding and dessert mixes, 422–3
U.S. product standards of identity, 154
worldwide production and consumption, 46, 50, 51
drying
in risk analysis matrix for transmission of L. monocytogenes by dry milk, 577
whey concentrate, 351
see also roller drying; spray drying
Eastern European fermented milks, 18–21
economics (costs)
nonthermal technologies and their implementation, 537–40
packaging, 512, 517, 519, 520
see also finance criteria; finance department
Index

in milk, 68, 87–8, 437
nonthermal technologies in inactivation of, 542–3
pulsed electric fields, 529–30
ultrasonication, 532
enzyme-linked immunosorbent assay (ELISA) for pathogens and toxins, 644
*E. coli* O157:H7, 637
limitations, 644
*S. aureus*, 639
epithelial cells of mammary gland, 61, 62, 63, 65
lipid synthesis, 69–70
equipment and utensils
design, relationship with processing performance, 541
milking, requirements and standards, 183, 191–2
packaging, 510
plant, 185, 191–2
pasteurizing, 186
surfaces see surfaces
ERCA system, 523
*Escherichia coli*, 109, 128–9, 621–3, 636–8
beef patties and, critical control point
determination, 578
verotoxigenic (incl. O157:H7) see verotoxigenic *E. coli*
esential amino acids, 431, 432, 435, 436
essential fatty acids, 69, 438, 442
ethylene vinyl alcohol (EVOH), 509
*Eupenicillium*, 117
European Union-28/EEC
butter
production and consumption, 47
regulations, 267
cheese production and consumption, 48
fluid cow’s milk production and consumption, 45
microbiological standards for raw and pasteurized milk, 137
nonfat dry milk production and consumption, 49
per capita consumption of various products, 51
retorting of milk, 523
total milk production, 43
whole milk powder production and consumption, 50
yield of milk per cow, 44
evaporated buttermilk, condensed, U.S. production, 56
evaporated milk (evaporated whole milk), 12–13,
100–1, 208–9, 310–26
classification of evaporators, 314
defects and problems, 323–6
definition and standards, 311
heat stability, 100–1, 317–18, 321

Edam cheese, U.S. standards of identity, 162
egg(s), salmonellosis, critical control point
determination, 578
egg products, desserts and puddings, 409
frozen (incl. ice cream), 375
egg nog
pasteurization temperature vs times, 186
sales in U.S., 54
electric fields, pulsed see pulsed electric fields
electrical conductivity, 94
electrodialysis, whey, 30, 215, 352–4
electrophoretic methods of whey protein analysis, 363, 364
elephant milk composition, 61
ELISA see enzyme-linked immunosorbent assay
Emmentaler cheese, U.S. standards, 164–5, 484
employees see personnel; team
emulsion (and its formation)
butter as, 267–8, 274, 277, 279, 282, 283
desserts and puddings, 409
frozen (incl. ice cream), 369, 375
emulsion phase in milk, 94
new technologies, 533
whey protein, 361–2
endospore-forming organisms see spore/endospore-forming microorganisms
energy efficiency of vacuum evaporators, 315–16, 317
engineering department, 494
*Enterobacter*, 109
Enterobacteriaceae testing, 621–2
*Enterococcus*, 110
*E. faecium*, probiotic, 252
enterohemorrhagic *E. coli*, 128–9
enterotoxigenic strains
*E. coli*, 128–9
*S. aureus*, 577, 639
enterotoxin, *S. aureus*, 130, 625, 638, 639
cheese manufacture, 577
environment (plant/production/processing)
as microbial contamination sources, 122
microbial sampling from, 618
environmental considerations/friendliness
packaging, 511, 518–21
recycling, 507–8, 510, 518–20
processes, 490
enzyme(s)
enzyme-modified cheeses, 27, 198, 213–14
microbiological, affecting quality and spoilage, 132–3
evaporated milk, 324
Index

history, 310
manufacture, 317–23
flow diagram, 319
U.S. production, 56
vacuum, 313–17
evaporated skim milk
Codex Standards, 312
production volume, 56
evaporation
dry milk products, 335, 338–40
vacuum see vacuum evaporation
examination see inspection and examination
excitation affecting milk composition, 89
exporters of butter/cheese/milk powders, 191
extended ice cream novelties, 394
extended shelf life (ESL), 139–40, 222, 230–1, 524–5
evaporated milk, 311
ice cream/frozen desserts, 396
nonthermal technologies
high-pressure treatment (cheese), 535, 537
pulsed electric fields, 529–30
ultrasonication, 532
packaging, 524–5
extracellular polymeric substances (EPS)
biofilms and, 141
cultured dairy products and, 241, 242, 247
extracellular polysaccharides (LAB cultures), 241
eye defects in Swiss cheese, 484–5
factories see plants
facultative anaerobic Gram-negative rods, 108–9
Failure Mode Effect Analysis (FMEA), 562, 569, 573
farms
journey to plant and supermarket from, 4, 178–96, 220–34
as microbial contamination sources, 120–3
requirements and standards, 182–3
fat (lipid), 437–43
cheese-making, hydrolysis, 305
cream (in butter-making), 9, 10, 203, 271, 272, 281
creaming, 323–5, 329
dietary intake
blood lipids and, 440–1
cardiovascular disease and, 440–1
contribution of common foods to, 438, 439
ice cream/frozen desserts, 371
sources, 370–1
melting point temperature see melting point temperature
milk, 68–70, 93
biosynthesis, 68–70
healthy, 74
secretion into lumen space see secretion
nutritional role, 437–53
oxidation
determination, 604–5
dry dessert and pudding mixes, 425
sweetened condensed milk, 331–2
separation, evaporated milk, 320, 323–5, 329
see also glycolipids; phospholipids; sphingolipids
fat content (lipid), 202, 437–8, 601–3
cheese, 22, 211, 289–90, 297
condensed milk products, 12
cream, 7, 154, 202
desserts and puddings, 400
frozen (incl. ice cream), 359
determination, 602–3
dry milk products, 13, 209
dry whey/whey products and other dairy products, 29, 214
fat products, 9
fluid/raw milk, 7, 80–4, 202, 437–8
mammalian species comparisons, 42, 61, 429
standardization, 5
pasteurized process cheese, U.S. standards of identity, 163–4
ultrafiltered milk, 7
see also casein-to-fat ratio
fat globules, bovine, 81, 297
butter manufacture, 202, 266, 268, 274, 275, 276, 281
cheese, 297
dry milk products, 335, 340, 341, 343
membrane (FGM), 72–3, 443
fat-reduced products, see entries under low-fat; nonfat; reduced-fat
fat-rich (concentrated milk fat) products, 9–11, 199, 201–6
fat-soluble vitamins, 87, 96, 438, 445
fat spreads, 266–7, 282–3
flow diagrams of manufacture, 284
quality assurance, 285
fatty acids, 68–80, 83–4, 439, 441–2
essential, 69, 438, 442
free, determination, 603–4
in probiotics, supplementation, 254–5
trans-, 437
types, 69, 83–4
unsaturated, 69
fatty liver disease, probiotics in, 451
FDA see Food and Drug Administration
fecal coliform testing, 621–3
Federal Food, Drug and Cosmetic Act, 166, 169, 177, 195
Federal Milk Marketing Orders, 192–3
feeding affecting milk composition, 88
fermentation
cheese-making, 290, 293, 299–301
commercially available cultured milks and their cultures involved in, 236
Listeria, testing for, 634, 635
probiotic, improvements, 255
products of see cultured products
reactions in lactic acid bacteria, 119
role for milk preservation, 235
filling of containers
with pasteurized products, 186
retorting after, 522–3
finance criteria in product development, 496
finance department (in product development), 494
finished products samples (for microbiological tests), 617–18
Finland
new functional dairy products, 500–1
villi, 18–19, 250–1
flagellar antigens see H (flagellar) antigens
flan-type pudding, 415–17
Flavobacterium, 107
flavor (taste/aroma/odor/smell/olfaction) and flavoring, 2, 221, 467–87
butter, 28
cheese, 306
desserts and puddings, 409–10, 422
frozen (incl. ice cream), 370, 383–5
fermentation and starter cultures and, 242, 245
heat treatment effects, 5–6
U.S.
cultured products, product standards of identity, 156, 157
labeling, 167–8
sales of flavored milk and drinks, 54
see also organoleptic inspection
flavor defects (off-flavors), 199, 200
butter, 285, 469–70, 473
evaporated milk, 323
ice cream/frozen dessert manufacture, 370, 383, 469
sensory evaluation
butter, 473–4
Cheddar cheese, 478–9
cottage cheese, 480

ice cream, 467–8
milk, 233, 471–2
National Collegiate Dairy Products Evaluation Contest, 409–10
Swiss cheese, 484
yogurt, 476–7
flow diagrams in HACCP, 568, 569
flow diversion device, 229–30, 382
fluid dairy ingredients, composition, 7, 202
fluid milk see milk
foam theory, churning, 275
foaming, whey protein concentrates, 361
folic acid, 445
follow-up actions in HAACP, 38
food(s)
additives see additives
allergens see allergens
describing (in HACCP), 568
fat-contributing see fat
functional, 143, 499–501
see also bioactive peptides
global trade in, Codex standards and, 595
milk as, 77
new products see new food products
production of dairy-based foods see processing
purchase and consumption see consumption and sales/purchase
quality see quality
safety see food safety and quality management systems; safety
warning labels, 174
see also animal feed; nutrient
Food, Drug and Cosmetic Act, 166, 169, 177, 195
Food Allergen Labeling and Consumer Protection Act (2004), 169
Food and Drug Administration (FDA), 559
Bacteriological Analytical Manual see
Bacteriological Analytical Manual
good manufacturing practice and, 556
labeling and, 166–7, 170, 171, 173
packaging and, 517–18
product standards of identity, 158, 159, 160, 165, 166
Public Health Service branch of (USPHS), 181, 182, 220
food poisoning see gastrointestinal tract
food safety and quality management systems (FSMS/FSQMS), 553–99
basic elements, 560
certification schemes, 559, 561–2
good manufacturing practice-based elements, 560–1  
HACCP in see hazard analysis and critical control points  
Food Safety Modernization Act (FSMA), 558  
Food Safety System Certification 22000 (FSSC 22000), 561–2  
forced circulation evaporators, 315, 316  
forewarming see preheating  
formulation see content  
fractionated whey products, 29–31, 215  
France, aseptic packing systems, 523  
Fraser broth for Listeria, 632  
free fatty acid determination, 603–4  
freezing, ice cream/frozen desserts, 385–8  
new way, 394–6  
thawing and (of ice), 391–2  
freezing point, 97  
Fritz butter-making machine, 277, 278  
frozen cream for ice cream/frozen dessert manufacture, 370  
frozen desserts see desserts  
fructose, desserts and puddings, 403, 404  
frozen (incl. ice cream), 372–3  
fruit, cold pack cheese food with, 162  
fruit flavor  
iceland, 384–5  
yoghurt, 16, 34  
lacking fruit, 478  
nutrient profile, 34  
FSSC 22000 (Food Safety System Certification 22000), 561–2  
full-fat plain yoghurt, composition, 16  
functional foods, 143, 499–501  
see also bioactive peptides  
functional ingredients (ingredients with functional/physiological properties), 437  
colostrum, 436  
fluid milk, 89–94  
fluid milk products, 206  
caseins, 437  
milk powders, 343  
whey proteins, 360–1, 437  
ultrasound treatment and modification of functional properties, 531–2  
functional properties  
of dairy systems, pulsed electric fields improving, 530–1  
ingredients with see functional ingredients  
functionality testing of packaging, 511  
fungi, 116–17  
score inactivation by nonthermal processes, 542  
testing, 624–5  
toxins (mycotoxins), 136, 625  
see also molds; yeasts  
gable top cartons, 522, 523  
galactose–oligosaccharide, 93  
Gammelost cheese, U.S. standards of identity, 162  
garlic/onion defect  
buttermilk, 473  
Cheddar cheese, 479  
milk, 472  
Swiss cheese, 484  
gastroenteritis see gastrointestinal tract  
gastrointestinal tract  
infection (incl. intoxication; gastroenteritis; food poisoning), 124  
Salmonella, 132, 626  
Staphylococcus aureus, 639  
probiotics and, 256  
see also digestion  
gelatin, ice cream/frozen desserts, 374  
gelatinization, puddings and desserts, 419–20  
temperature, 407  
gelation, whey protein, 362–3  
gellan gum, desserts and puddings, 409  
genetic polymorphism/variation, 99  
cheese quality and yield and, 74  
heat stability and, 99  
Geotrichum, 117  
ghee, 11, 206  
glass packaging (incl. bottles), 231–2, 508  
closure, 522–3  
evaporated milk, 321  
pasteurized milk, 521  
recycling, 519  
global dimensions (worldwide)  
comparisons of milk/milk product production and consumption, 42–51  
food trade and the Codex standards, 595  
Global Food Safety Initiative (GFSI), 559  
glucose  
in ice cream/frozen desserts, 372–3  
lactose synthesis from, 70–1  
glycerides see diglycerides; monoglycerides; triglycerides  
glycerol, ice cream/frozen desserts, 373  
glycolipids, 434, 437  
glycoconjugate released from κ-casein, 435  
glycosylation, protein, heat stability and effects of, 99
goat milk composition, 61
good manufacturing practices (GMP), 36, 556–8
current (cGMP), 554, 555, 557, 558
history/milestones, 557
principles and essential elements, 556–8, 561–2
Gorgonzola cheese, U.S. standards of identity, 162
Gouda cheese, 306
U.S. standards of identity, 162–3
government
legislation see regulations and legal requirements
policy, 491
grading of cheese, 307
sensory analysis of Mozzarella for, 482
Gram-negative bacteria
count (GNC), 138
non-spore forming, 107–9
rods see rods
Gram-positive non-spore forming bacteria, 110–13
graphic design, 507, 510, 511, 516–17
grey seal milk composition, 61
growth factors, 434, 437
Gruyere cheese, U.S. standards of identity, 163
guar gum, desserts and puddings, 409
frozen (incl. ice cream), 374
H (flagellar) antigens
E. coli (V_{TEC}/E. coli O157:H7), 636
Listeria, 635, 636
Salmonella, 628
HACCP see hazard analysis and critical control points
half-and-half, 8, 9, 154, 221
nutrient profile, 33
U.S. product standards of identity, 154
half-Fraser broth for Listeria, 632
Hamba aseptic packaging system, 524
handling
bulk milk, 5
in good manufacturing practice, construction of
control of areas involving, 560
ice cream/frozen desserts on retail premises, 391
microbiological interventions, 139–40
Hansenula, 116
hard cheese, 23
packaging, 525
hardening of ice cream, 388
hardness evaluation
butter, 281–2
puddings and desserts, 422
harvesting see milking
Hassia thermoform/fill/seal systems, 523–4
Hayssen RT horizontal form/fill/seal, 525
hazard analysis, 37, 556, 568–74
generic example, 575
hazard analysis and critical control points
(HACCP), 36–8, 101–4, 140, 187, 195, 232,
558, 562–87
evolving concept, 562
history, 187, 562, 563
prerequisite programs/PP prior to, 36, 187, 558, 562,
564–7, 576, 587, 589–90
principles/elements, 36, 101, 560, 564–92
samples (for microbiological tests), 619
team, 567
voluntary participation, 187
health, 428–66
beyond nutrition, 446–7
bioactive peptides and, 74–5
fats and, 74–5
functional foods and, 500
nutritional dimensions see nutritional value
public, 77–8
heat coagulation, 300
heat effects, 98–101
lactose, 86
milk proteins, 5, 84, 99
heat exchangers (in pasteurization)
butter-making, 271
in continuous pasteurization, 228, 230, 231
dry milk products, 336
in evaporation, 313, 314, 315, 322
ice cream/frozen desserts, 382
puddings and desserts (non-frozen), 411–12
scraped surface (SSHE), 406, 411, 412,
420–2
whey products, 351
heat-resistant microorganisms see thermoduric
microorganisms
heat shock, ice cream/frozen desserts, 389, 391–2
heat stability, 97–101
dry milk products, 336
evaporated milk, 100–1, 317–18, 321
heat transfer rate (thermal conductivity), 96–7
heat treatment (thermal processing incl.
pasteurization), 5–6, 186–7, 226–31, 535–6
batch see batch operation
in butter-making, cream, 271, 275, 281
in cheese-making, 289
continuous see continuous processes
for cultured milk, 246
definition, 195
HACCP
    audit charts, 103
    critical limit determination, 583, 585
high-temperature short-time see high-temperature short-time pasteurization
ice cream/frozen desserts, 381–2
    cream, 370–1
microbiology
    interventions, 139
    *Mycobacterium avium* subsp. *paratuberculosis* (MAP), 114, 142–3
    standards for pasteurized milk, 137
nonconventional methods in development, 490
pressure combined with, 541–2
process cheese see process cheese
process cheese food see process cheese food
puddings and desserts (non-frozen), 400–1, 411–12, 414
    rice pudding, 418–19, 420–2
    puddings/desserts, 411, 421
in risk analysis matrix for transmission of *L. monocytogenes* by dry milk, 577
standards, 159, 189–90
see also laboratory pasteurized count; preheating;
    superheated condensed milk; thermoduric (heat-resistant) microorganisms; ultraheat treatment; vat pasteurization and specific pasteurized products
heating of curd, 292–3
heavy cream, 8
    U.S. product standards of identity, 154–5
helical Gram-negative bacteria, 107
hemolysis (CAMP) assay, *Listeria*, 633, 634, 635
heterofermentative lactic acid bacteria, 119
heterotrophic (standard; aerobic) plate counts (SPC), 104, 119, 138, 233, 621
high-density lipoprotein (HDL), 440
high-density polyethylene (HDPE), 508–9
    pasteurized milk, 522
high fructose corn syrup (HGCS), desserts and puddings, 404
    frozen (incl. ice cream), 373
high performance liquid chromatography (HPLC) lactose, 610
    whey proteins, 363–4
high-pressure (HP) processes, 533–7
    combined with thermal treatments, 541–2
    homogenization, 533
high-protein low-carbohydrate pudding, 415, 416
high shear mixer, ice cream/frozen desserts, 380
high-temperature short-time (HTST) pasteurization, 140, 201, 206, 228, 229, 230, 583, 585
    evaporated milk, 322
    ice cream/frozen desserts, 374, 382, 383
    sweetened condensed milk, 328
homofermentative lactic acid bacteria, 119
    starter cultures, 240
    cheese-making, 302
homogenization, 6–7, 226
    for cultured milk, 245–6
    definition, 6, 177
    in dry milk product manufacture, 335
    evaporated milk, 320–1
    HACCP audit charts, 103
    high-pressure, 533
    ice cream/frozen desserts, 382–3
    sweetened condensed milk, 329
    ultrasound use, 531–2
    U.S. product standards of identity, 159
    honey, ice cream/frozen desserts, 373
hormones affecting milk composition, 89
hot pack process, puddings, 410–11
humans
    corporate business culture, 555
    infections to cow and milk from, 78
    milk see breast milk
    milk-borne/food-borne disease
    impact on industry practices and regulations, 131–2
    pathogens causing see pathogens hurdle treatments and technologies, 532, 541
hydrocolloids, puddings and desserts, 407–8
hydrolysates
    lactose, 85, 89
    proteins, 90–1
hygrometers, 608
hypertension and antihypertensive components, 75, 447
ice cream and frozen desserts, 31–2
    biological/chemical/physical hazards, 570
    concentrated sources for see concentrated sources evolution, 367
    frozen yoghurt, 31, 55, 165, 170, 173, 403, 644
    manufacture, 379–88
    flow diagram, 380
    novelties, 393–4
    recent developments, 394–6
    mix calculations, 375–9
ice cream and frozen desserts (Continued)
packaging, 388–9, 393, 523
quality and safety tests, 104
sensory evaluation for defects, 476–7
   National Collegiate Dairy Products Evaluation
   Contest of the ADSA, 469–70
trade classification, 368–9
U.S.
   sales/consumption, 53–5, 59, 368
   standards of identity, 165–6
ice supply, 561
Iceland, skyr, 19, 250
illness see disease and illness
immunoasays for pathogens and toxins, 644
   ELISA passim see enzyme-linked immunosorbent
   assay
immunoglobulins, 92, 434, 436
immunomodulatory role of probiotics, 450
immunoturbidimetric methods of whey protein
   analysis, 363
imports, 191
   butter/cheese/milk powder importing countries, 191
in-process samples (for microbiological tests), 617
incineration of packaging, 520
India
   butter production and consumption, 47
   fluid cow’s milk production and consumption, 45
   nonfat dry milk production and consumption, 49
   per capita consumption of various products, 51
   total milk production, 43
   yield of milk per cow, 44
   see also South Asia
Indonesia
   per capita consumption of various products, 51
   whole milk powder production and consumption, 50
industrial products
   consumption, U.S., 59
   dry milk products, 344
   production, 198
   U.S., 55–6
industry and commerce and corporate businesses
   (dairy/dairy product), 41–59
   culture, 555
   impact of food-borne illness on, 131–2
   nonthermal technologies and their
   implementation, 537–40, 543
   product development and role of, 491
infections
   gastrointestinal see gastrointestinal tract
   intramammary see mammary gland
   milk-acquired, 77–8
   see also pathogens
   infectives doses in pathogen exposure modeling, 576
   information sources on packaging, 512–13
   ingredients see content
   injection stretch blow molded PET bottles, 522
   innovation, 492, 493
   inoculation, starter culture, 242
   inspection and examination (and other tests of milk
   safety), 101–3, 182–7
   products, 188–91
   receiving bay, 80, 180, 222–3
   typical schedule, 555
   see also testing
   instantization of dry milk products, 342, 344
   nonfat dry milk, 14, 210
   intermediate-chain saturated fatty acids, 441
   International Certification Program (ICP), 191
   International Dairy Foods Association, 177
   international dimensions see global dimensions
   International Food Standard (IFS), 562
   Interstate Milk Shipments (IMS), 182, 184, 191
   National Conference on see National Conference on
   Interstate Milk Shipments
   introduction (launch) of new product, 494, 497, 498
   iodine, 444
   ion(s)
   in milk, content, 64
   whey protein gelation and, 362
   ion-exchange process, whey demineralization, 30, 215,
   351–2
   see also resins
   iota carrageenan, desserts and puddings, 408
   iron, 444
   metabolism and lactoferrin, 436
   irritable bowel syndrome, probiotics, 451
   isolates, whey protein, 30–1, 216, 355
Japan
   butter production and consumption, 47
   cheese production and consumption, 48
   fluid cow’s milk production and consumption, 45
   nonfat dry milk production and consumption, 49
   per capita consumption of various products, 51
   safety and quality management, 591–5
   total milk production, 43
   Johne’s disease, 114, 142
   journals, packaging, 512
Kaizen, 592–5
kappa carrageenan, desserts and puddings, 408
kefir, 19–21, 250
  Codex Standard, 175
kettle process, puddings, 410–11
King’s churning theory, 275
kishk, 21
Kjeldahl method of protein determination, 177, 608
Kluyveromyces, 116
Koch Kaese, U.S. standards of identity, 160
Korea (South)
  cheese production and consumption, 48
  nonfat dry milk production and consumption, 49
  per capita consumption of various products, 51
kosher symbols, 173–4
koumiss see kumys
kumys (koumiss; kumiss), 21, 236, 250
  Codex Standard, 175
laban, 21
labeling, 166–76, 188
  ice cream/frozen desserts, 369
laboratory pasteurized count (thermoduric count; TC), 138
laboratory tests/analysis, 188–91, 600–45
  chemical tests for flavorful substances, 611
  compositional tests, 601–11
  microbes see microbiology
  milk, 611–13
α-lactalbumin, 85, 91, 358–60, 436
  analysis, 363, 364
  bioactivity, 434, 436
  structure, 358–60
β-lactam antibiotics, agar diffusion test for
  antibiotics, 612–13
lactase, 443, 449, 601
  absence/deficiency, 86, 449, 601
lactation (period), 65
  heat stability affected by stage of, 100
  milk composition affected by stage of, 88
lactic acid, cheese-making, 290, 292, 293, 294, 299, 301, 304, 306
lactic acid bacteria/LAB (and related bacteria), 119–20, 142
  cheese-making, 301, 302, 305, 306
  non-starter, 120
  probiotics see probiotics
  quality and spoilage issues, 133–4
  starter cultures see starter cultures
lactitol, 93

Lactobacillus, 112, 119–20
L. acidophilus, 112, 235, 244, 251, 253, 256, 451, 642
L. bulgaricus, 112, 644
  cultured milk products using, 235, 239, 243, 248, 249, 250, 253, 644
  enumerations in yogurt, 644
L. rhamnosus, 244, 450, 500
  probiotics, 244, 251, 253, 256, 451
  culturing, 642–3
  enumerations, 643–4
Lactococcus, 110, 118
  starter cultures, 238
lactoferrin (lactotransferrin), 91–2, 434, 436–7
  purification, 528
β-lactoglobulin, 84–5, 91, 357–8, 435, 535–6
  analysis, 363, 364
  bioactivity, 434, 435
  genetic variants affecting heat stability, 99
  high-pressure effects, 536
  structure, 357–8
lactoperoxidases, 88, 91–2, 434, 437
lactose, 30, 70–1, 84–6, 89, 216, 443–4, 610
  biosynthesis, 70–1
  crystallization, 85
  sweetened condensed milk, 329–30
  ultrasound qh and, 531
  whey, 35
  cultured products assisting digestion, 449
  heat stability and, 100
  hydrolyzed, 85, 89
  malabsorption/intolerance, 86, 443–4, 449, 600, 601
  production, 30, 216
  U.S., 56
  properties, 85–6
  see also entries under reduced-lactose
lactose content, 202, 610
  cheese, 22, 211, 297
  condensed milk products, 12, 208
  cream, 7, 202
  determination, 610
  dry milk products, 13, 209
  dry whey/whey products and other dairy products, 29, 214
  fat products, 9
  fluid/raw milk, 7, 80, 202
  mammalian species comparisons, 42, 61, 429
  puddings and desserts, 460
  dry mixes, 424
  sweetened condensed milk, 328
  ultrafiltered milk, 7
lactose-free products, 89
lactosucrose, 93
lactotransferrin see lactoferrin
lactulose, 93, 443
lambda carrageenan, desserts and puddings, 408
launch (introduction) of new product, 494, 497, 498
law see legal department; regulations and legal requirements
layered (parfait-type) pudding, 415, 416
see also regulations and legal requirements
lemon mousse, 218, 417
Leptospira, 107
let down of milk, 62
Leuconostoc, 110–11, 119
starter cultures, 238
library samples (for microbiological tests), 619
life cycle of product, 490
management, 495, 497
light cream, 8
nutrient profile, 33
U.S. product standards of identity, 155
light-fat butter, 11, 206
light ice cream, 165
light-oxidized off-flavor
cottage cheese, 480
milk, 471, 472
light whipping cream, 8
U.S. product standards of identity, 155
line extensions, 491
line samples (for microbiological tests), 617–18
linoleic acids, conjugated, 74–5, 93, 280, 442
butter, 280
cancer and, 447
diabetes type 2 and, 446
lipases (lipolytic enzymes), 441
fermentation and, 242
lipoprotein, 84, 87–8, 226
microbial, 133, 135
evaporated milk, problems caused by, 324
lipid see fat
lipolytic enzymes see lipases
lipoprotein(s), 440
lipoprotein lipase, 84, 87–8, 226
liquid sugar, desserts and puddings, 403
frozen (incl. ice cream), 372
Listeria, 112–13, 628–36
assays for/isolation of, 625, 632–6
culturing, 632, 633, 635
L. innocua, 631, 632, 635
L. ivanovii, 631, 632, 635
L. monocytogenes, 112, 129, 628–35, 636
treatment programs, 557, 641
interactions with other psychrotrophic bacteria, 137
outbreaks, 131, 629
phage spraying, 641
risk analysis of transmission dry milk, 577
organism characteristics, 631–2
taxonomy, 632
literature on packaging, 512–13
live and active cultures, 159, 159–60, 448
seals, 173
liver disease, fatty, probiotics in, 451
locust bean gum, desserts and puddings, 408
frozen (incl. ice cream), 375
log see documentation
long-chain saturated fatty acids, 441
low-carbohydrate high-protein pudding, 415, 416
low-density lipoprotein (LDL), 440
low-density polyethylene (LDPE), 508
low-fat cheeses, nutrient profile, 458–9, 461–2
low-fat ice cream, 165, 365
low-fat milk, 7–8, 33, 198
nutrient profile, 32, 452–4
sales in U.S., 54
low-fat pudding, 414–15
low-fat yoghurt, composition (incl. nutrients), 16, 34
low-sodium Cheddar cheese, U.S. standards of identity, 161
low-sodium Colby cheese, U.S. standards of identity, 161
lumen space, secretion of milk constituents see secretion
lysine in casein, 432
lysozyme, 434, 437
structure compared with α-lactalbumin, 359–60
machineability, sensory analysis of Mozzarella for prediction of, 482
macroscopic properties, high-pressure effects, 535
magnesium, 444
Maillard browning see browning
malondialdehyde, 604
maltodextrins, ice cream/frozen desserts, 373
mammals, cross-species comparisons of milk composition, 41–2, 61, 80, 429
mammary gland, 60–76
infections (incl. mastitis), 62, 75, 78, 121–2, 133
contamination from, 121–2
“cow side” tests, 612
fighting, 75
impact of mastitis bacteria on quality and spoilage, 133
research now and in future, 73–5
structure and function, 61–6, 600
see also breast milk
management (institution of/people involved in)
  hazard analysis and critical control points, commitment, 560
  in Kaizen, 595
  product development, 498–9
manganese, 444
manufacturing see plants; processing and production/manufacture
mares’ milk, composition, 41, 42, 61
margarine, 282, 283, 438, 491
market/marketplace
economy, 555
  new products, 490–1, 501
  value of desserts and puddings, 397
marketability of new product, 496
marketing, 493, 494
  skills, with new products, 496
mastitis see mammary gland
me-too products, 491
meat, cold pack cheese food with, 162
mechanical vapor recompression (MVR), 314, 317
mellorine, 32
  U.S. standards of identity, 165
melting point temperature of milk fats, 10–11, 204
  butter-making, 271–2
membrane processing/technology
dry milk products, 339
  whey products, 215, 352–3, 355
see also electrodialysis; nanofiltration; Spherosil; ultrafiltration
mesophilic starter cultures, 119, 236, 238, 247–8
  cheese-making, 290, 301
  Gouda, 306
metabolic pathways of starter cultures, 238, 239–42
  cheese-making, 301–2, 304–5
metal packaging, 508
  see also cans
metallic off-flavor
  butter, 473
  cottage cheese, 480
  milk, 471, 472
  Swiss cheese, 484
metering (volumetric measurement) of milk delivered to plant, 180, 220
methyl vanillin, desserts and puddings, 410
Mexico
  butter production and consumption, 47
  cheese production and consumption, 48
  fluid cow’s milk production and consumption, 45
  nonfat dry milk production and consumption, 49
  per capita consumption of various products, 51
  total milk production, 43
  worldwide production and consumption, 48
  yield of milk per cow, 44
Meyenberg, Jon B., 310
micelles, casein/protein, 84, 85, 95, 431–2
cheese manufacture, 298
dry milk products manufacture, 337, 338, 340, 342, 343, 344
  heat stability and size of, 100
microaerophilic Gram-negative bacteria, 107
*Microbacterium*, 113
microbes/microorganisms, 106–51
  biofilms, 141
  buildup, 614
contamination (=biological contamination) of
  milk, 80, 120–3, 613–14
  airborne, 140–1
  HACCP audit charts, 103
  by humans, 78
  nonrandom distribution and introduction of, 614
  nonrandom distribution of contaminants in a lot of production, 613–14
  puddings and desserts, 399
  random distribution of contaminants in a lot of production, 613
  die-off, nonrandom distribution and, 615–16
  ecology, 613–16
  in evaporated milk, defects relating to, 323–4
  genera/species associated with milk and milk products, 102–20
growth of
  nonrandom distribution and, 616
  water control and, 606–7
interactions in milk/milk products, 136–7
nonthermal technologies and their effects (incl. inactivation), 541–3
  high-pressure, 537
  pulsed electric fields, 529–30
  ultrasonication, 532
pathogenic see pathogens
probiotic see probiotics
quality and spoilage issues, 132–6
spoilage-causing see spoilage
microbes/microorganisms (Continued)
in sweetened condensed milk, defects relating
to, 330–1
see also specific (types of) microbes
microbiology (milk/milk products), 106–51, 613–45
cheese-making, 300–4
current and future issues, 141–3
off-flavors, 200
processing and handling interventions, 139–40
standards for raw and pasteurized milk, 137, 189–90, 565–6
puddings and desserts, 399
tests and assessment, 104, 137–9, 232, 233
puddings and desserts, 399, 411
receiving bay, 80
sampling for, 616–21
specific tests, 621–44
Micrococcus, 111
microencapsulated (ME) probiotic cultures, 256
microfluidization, 533
micronutrients, 87
recommended daily intake values, 171
see also vitamin
microscopic count, direct, 104, 180, 222, 612
microscopic examination of puddings and desserts, 422
microwave susceptors, migration, 513–14
migration of packaging material constituents, 513–14
milk (cows’), pasteurized
packaging, 521–2
standards, 137, 189–90, 565
testing, 611–12
transportation, 186–7
milk (cows’), raw milk/unpasteurized/whole fluid
biosynthesis, 60–76
for cheese-making, pretreatments, 289–90
chemistry
hazards and standards relating to, 189–90, 570
related to cheese-making, 296–300
concentrated and condensed products, see entries under concentrated; condensed
constituents/content/components/ingredients, 1, 3, 7, 33, 63–4, 80–8, 202, 232–3, 428–9
different mammals, 41–2, 61, 80
evaluation/assessment, 232–3
factors affecting, 88–9
functional ingredients, 89–94
particle size distribution, 65, 429
physical state, 65, 429
proteins, 67
quality, research on, 73–4
secretion see secretion
starter cultures and effects of, 241–2
consumption see consumption
definitions, 77, 198, 220, 428, 600
desserts and puddings, 399–400
frozen (incl. ice cream), 370, 372
dry whole milk see powders
for evaporated milk manufacture, quality, 318
harvesting see milking
inhibitory substances, 612–13
see also antimicrobial drugs
journey from farm, to plant and supermarket, 4, 178–96, 220–34
microbiology, 141–2
standards, 137
nutrition and see nutrients; nutritional value
organic, 221–2
outbreaks linked to, 125–7
physical characteristics, 94–100
pricing, 192–5
processing of/products made from see processing properties, 1–2
quality see quality
receiving see receiving
relationship of major milk products to, 199
safety, factors affecting, 88–9
sales in U.S., 53, 54
sensory evaluation and defects, 468–72
shelf-life, 8, 198–9
standards, 152–3, 189, 565–6
microbiological, 137
storage (pre-processing), 5, 179–81, 223
for sweetened condensed milk manufacture,
preparation, 327–8
testing, 611–13
value classes (Class I-IV), 193, 194
worldwide comparisons of production (and milk products), 42–6, 51
U.S., 45, 52–3, 59
yield per cow see yield
milk powders see dry milk products
milk solids-not-fat (MSNF/NFMS)
for ice cream/frozen desserts, 369, 371–2, 428
standardization, 225, 311
milking (harvesting of milk), 78–80
milk composition affected by, 88
requirements and standards, 182–3
excluding infection or contamination, 78–80
mineral(s) and salts, 1, 64, 86, 444–5
cheese, 298–9
colloidal state, 71, 72, 86
dissolved state, 71, 72, 86
heat stability, 99, 100
profiles in various products, 453–62
spray drying and, 341
trace see trace elements
UHT milk, 100
whey (sweet and acid), 350
see also reduced-minerals whey
Mineral-concentrated whey see reduced-lactose whey
mix(es), dry (puddings and desserts), 422–5
see also blends
mixed starter cultures (bacteria + yeast or mold), 236, 250–1
mixed-strain starter cultures, cheese-making, 302, 303
Modified Oxford (MOX) agar, Listeria, 630, 632, 633
moisture content
cheese, 22
determination, 605–6
pasteurized process cheese, 163
puddings and desserts, 402–3
dry mixes and problem of moisture transfer, 425
Mojonnier method of fat determination, 602
mold(s), 117, 624–5
cheese ripened by, 23, 306
defects and spoilage due to, 136
sweetened condensed milk, 330–1
in mixed starter cultures, 236, 250, 251
testing, 624–5
toxins, 136, 625
molded ice cream novelties, cream, 393–4
molecular microbiological methods, rapid, 138–9
monitoring (of critical control points), 38, 102–3, 556, 582–3
monkey fruit, puddings and desserts, 404, 405
monoglycerides, ice cream/frozen desserts, 375
monosaccharide sweeteners, ice cream/frozen desserts, 372–3
monounsaturated fatty acids, 438, 442
Monterrey (Jack) cheese
nutrient profile, 458–9
U.S. standards of identity, 163
Moraxella, 108
most probable number (MPN) counts, three-tube, 622
Motile Gram-negative bacteria, 107
mousse, 417
MOX (Modified Oxford) agar, Listeria, 630, 632, 633
Mozzarella cheese, 295, 481–2
manufacturing process, 25
nutrient profile, 35, 458–9
sensory evaluation for defects, 481–2
U.S. standards of identity, 163
MPN counts, three-tube, 622
Mucor, 117
Muenster cheese, U.S. standards of identity, 163
defects and spoilage due to, 136
tracing see tracers
Multivac-type thermoform/fill/vacuum/gas flush machine, 525
Munster cheese, U.S. standards of identity, 163
Mycobacterium, 114
M. avium subsp. paratuberculosis (MAP), 114, 142–3
Mycoplasma, 110
mycotoxins, 136, 625
nanofiltration, whey, 352
National Advisory Committee on Microbiological Criteria for Foods (NACMF), critical control point determination generic module, 578
National Collegiate Dairy Products Evaluation Contest, 468–70, 472
National Conference on Interstate Milk Shipments (NCIMS), 182, 187, 188, 191, 567, 568, 569, 580–3, 586
review plan, 586
verification and validation check list, 586, 588–91
National Yoghurt Association’s (NYA) petition, 158–9
seals, 173, 644
natural cheese, 21–3, 199, 211–12
manufacturing process, 25
nutrient profile, 458–9
sales in U.S., 54
natural circulation evaporators, 315, 316
Neosatorya, 117
neotame, puddings and desserts, 404, 405
Neufchatel cheese, U.S. standards of identity, 163
defects and spoilage due to, 136
neutralization of cream (butter-making), 270
new food products
classification, 491–2
development see development
new technology see technology
New Zealand
butter production and consumption, 47
cheese production and consumption, 48
fluid cow’s milk production and consumption, 45
New Zealand (Continued)
- microbiological standards for raw and pasteurized milk, 137
- nonfat dry milk production and consumption, 49
- per capita consumption of various products, 51
- total milk production, 43
- whole milk powder production and consumption, 50
- yield of milk per cow, 44
- niacin, 445
- nicotinic acid (niacin), 445
- nitrogen determination by Kjeldahl method, 177, 608
- no sugar added pudding, 415
- nonfat dry milk (powders/NFDM), 13–14, 209–10
- flow diagrams for production, 10, 204
- nutrient profile, 455–6
- puddings and desserts, 400
- dry mixes, 422
- *St. thermophilus* activity testing of yogurt, 644
- standards, 154, 190, 566
- worldwide production and consumption, 46, 49
- per capita consumption, 51
- U.S. production, 49, 56
- nonfat milk solids see milk solids-not-fat
- nonfat plain blended yoghurt, composition, 16
- nonfat pudding, 414–15
- nonfat white (fluid) milk
- nutrient profile, 452–4
- sales in U.S., 54
- nonnutritive (artificial) sweeteners, puddings and desserts, 404–5
- frozen (incl. ice cream), 372–3
- novelties, ice cream, 393–4
- nut(s), ice cream/frozen desserts, 385
- nutrients, 430–46
- in blood see blood
- labeling information, 171–2
- profiles, 32–6, 452–62
- see also food
- nutritional value (and role), 430–52
- facts box/panel, 170–1
- ice cream/frozen desserts, 393, 395
- nutritive carbohydrate sweeteners, 154, 156, 157, 159
- ice cream/frozen desserts, 372–4
- sweetened condensed milks, 311

O (somatic) antigens
- *Listeria*, 635, 636
- *Salmonella*, 628
- odor see flavor
- off-flavors see flavor defects

offshore sources of packaging, 515
- oil, butter, 11
- oleomargarine, 283
- olfaction see flavor
- oligosaccharides, 434, 437
- omega-3 fat in butter, 280
- onion see garlic/onion defect
- operating costs of nonthermal technologies, 537–8
- organic milk, 221–2
- organoleptic inspection/assessment of milk, 2
- receiving bay, 80
- see also flavor
- orodental health, 447
- osmolality, 97
- osmosis, reverse see reverse osmosis
- osmotic pressure, 97
- osteoporosis, 46–7
- outbreaks (caused by pathogens), 123–31
- cheese-related, 125, 571–2
- historical perspectives on responses to, 181
- impact of industry practices and regulation, 131–2
- current and future microbiological issues, 141, 142
- *Listeria*, 131, 629
- *Salmonella* see *Salmonella*
- overrun
- ice cream, 32, 386
- non-frozen puddings and desserts, 422
- oxidation
- dry dessert and pudding mixes, 425
- fat see fat
- off-flavor due to
- butter, 473–4
- cottage cheese, 480
- ice cream, 475
- milk, 471, 472
- process cheese, 483
- yogurt, 477
- sweetened condensed milk, 331–2
- oxidation–reduction (redox) potential or level
- fermented products, 95, 243–5
- milk, 95
- oxytoxin, 62

packagers, 510
- packaging and packing (incl. containers), 7, 231–2, 506–26, 541
- aseptic see aseptic procedures
- closure see closure
- definition, 506–7
desserts and puddings (non-frozen), 411–14
  dry mixes, 425
development, 510–12
distribution, 507, 512, 515–16, 521, 522, 524–6
equipment, 510
filling see filling
future trends, 526
materials, 507–9
new packaging of existing products, 492
operations, 509
primary packaging, 507
product and its interactions with, 513–15
raw material suppliers, 509
secondary packaging, 507
shelf life/stability and, 522–5
single-service containers, 185, 187–8, 195, 397
specific products
  butter, 279–80, 525
evaporated milk, 321
frozen desserts (incl. ice cream), 388–9, 393, 523
  non-frozen packaging and packing, see subheading above
pasteurized milk, 186, 521–2
sweetened condensed milk, 330
ultra-pasteurized milk, 8
standards for, 187–8
suppliers in packaging chain, 510
systems, 521–2
technology, 507, 526
see also storage
Pakistan, total milk production, 43
pantothenic acid, 445
paper/paperboard/cardboard/cartonboard packaging, 507–8
aseptic, 523
bulk butter, 279
content interactions with paperboard, 514–15
corrugated fiberboard, 508, 510, 515
extended shelf life, 525
gable top, 522, 523
ice cream/frozen desserts, 390
parasitic protozoa, 123
parathormone-P, 434, 437
paratyphoid fever, 626, 627
parenthetical listing, 170
parfait-type (layered) pudding, 415, 416
Parmesan cheese powdered, 27, 213
U.S. standards of identity, 163
partially-delactosed whey powder see reduced-lactose whey
particle size distribution in milk, 65, 429
particulates, pudding with, 418–21
pasta filata cheeses, 164, 295–6, 482
pasteurization see heat treatment; laboratory pasteurized count; ultraheat treatment and specific products
Pasteurized Milk Ordinance (PMO) regulations, 51–2, 139–40, 220, 554, 562–6
pathogens (human), 111, 123–31, 625–44
control programs, 557
exposures envisaged under various scenarios, 476
modeling examples, 576
outbreaks caused by see outbreaks
probiotic effects on, 450–1
testing, 625–41
ELISA, 644
pectin, desserts and puddings, 408
Penicillium, 117, 136
  P. camemberti, 306
  P. roquefortii, 117, 160, 306
spoilage by, 136
peptides, bioactive see bioactive peptides per capita
  consumption of dairy products worldwide, 46, 51
  U.S., 51, 56–9
nutrient contribution of dairy foods in U.S., 431
permeate (whey), 30, 215, 354–7
peroxide value, 604–5
personnel/employees/workers, 3
  cleanliness/hygiene, 186, 561
  Kaizen ideology, 593–5
  responsibility in HACCP, 584, 587
  welfare, 561
see also team
pH
  cheese-making, 290, 293, 295–7, 299, 300, 302–4, 306
determination, 611
  for fermentations and starters, 237, 243
  milk, 64
    heat stability and, 97–9
  yoghurt manufacture, 104
see also acidity
phages see bacteriophages
phase-reversal theory, churning, 275
Philippines  
per capita consumption of various products, 51  
whole milk powder production and consumption, 50  
phosphatase see alkaline phosphatase  
phospholipids, 81–3, 442–3  
phosphorus, 444  
physical factors  
contamination, 79  
as hazards and standards and causes of spoilage  
relating to, 189–90, 570  
new products, 497  
physical/physicochemical characteristics and properties  
evaporated and sweetened condensed milk, 323  
milk, 94–100  
puddings and desserts, 419–20  
whey proteins, 351  
physical standards, 189  
physiological effects of ingredients see functional ingredients  
*Pichia*, 116  
pipes and piping, 185  
plain yoghurt, manufacturing process, 17  
plants, dairy (manufacturing/processing facilities; factories), 178–96  
journey of milk from farm to to, 4, 178–96, 220–34  
as microbial contamination sources, 123  
raw milk quality at receiving bay, 80  
surfaces in see surfaces  
US, size and number, 53  
water control, 606–7  
plasmin, 87  
plastic cream, 9, 200, 203  
plastic packages, 508–9  
closures, 525  
content interactions with plastic, 514, 515  
ice cream/frozen desserts, 390  
pasteurized milk, 521, 522  
recycling, 519–20  
plating (methods), 138  
coliforms and *E. coli*, quantitative, 622  
molds and yeasts, 624, 625  
*Salmonella*, 627–8  
standard plate counts (SPC), 104, 119, 138, 233, 621  
polar bear milk composition, 61  
polarimetric methods of lactose determination, 610  
polyacrylamide get electrophoresis, whey proteins, 363, 364  
polyester, 509  
polyethylene (PET) packaging, 508–9  
asptic, 525  
extended shelf life, 525  
high-density see high-density polyethylene  
injection stretch blow molded PET bottles, 522  
pasteurized milk, 521  
poly-H method, *Salmonella*, 628  
polymerase chain reaction (PCR), 139  
polyporphates, puddings and desserts, 409  
poly saccharides, extracellular (LAB cultures), 241  
polysorbates, ice cream/frozen desserts, 375  
polystyrene, 509  
polyunsaturated fatty acids (PUFAs), 442  
polyvinylidene chloride (PVDC), 509  
krypton, 444  
pour-plate method, molds and yeasts, 624, 625  
powder(s)  
buttermilk see buttermilk product, dry cheese, 27, 213  
milk see dry milk products  
whey, 350–1  
powder horn, ice cream/frozen dessert manufacture, 380  
prebiotics, 15, 16, 93–4, 256, 452  
preheating (forewarming)  
dry milk products, 335–8  
evaporated milk, 317, 319–20, 322  
sweetened condensed milk, 317, 328, 331  
preliminary incubation count, 138  
coliforms (PI coliform count), 138  
prerequisite programs/PP (prior to HACCP plan), 36, 187, 558, 562, 564–7, 576, 587, 589–90  
preservation, 528–51  
cultured products, preservatives and standards of identity, 157  
evaporated and sweetened condensed milk, 313  
nonthermal technologies, 528–51  
pressing, Cheddar cheese, 295  
pressure processes see high-pressure processes  
pricing, 192–5  
classified, 193, 195  
probiotics, 15, 16, 251–7, 448–52, 641–4  
enumeration/testing, 641–2  
methods, 643–4  
health benefits, 448–52, 500  
lactic acid bacteria/cultures, 120, 251–2, 254, 642–3  
strains used in commercial applications, 243, 253  
n new products, 500  
selection, 252–3  
shelf stability, 641–2  
viability, 253–6  
improving, 254–6
Index 673

process cheese, 212–13
composition, 21
  nutrient, 459–61
manufacturing process, 26, 212
pasteurized, 23, 212–13, 458–9
  U.S. standards of identity, 163–4
sales in U.S., 54
sensory evaluation for defects, 482–3
process cheese food
  cold pack, 27
  nutrient profile, 459–61
pasteurized, 23–7, 213, 458–9
  U.S. standards of identity, 164
process cheese spread see spread
process control, cheese-making, 288–9
processing and production/manufacture of milk
  products (overview/general aspects), 1–40,
    220–34
  basic steps, 3–7, 220–34
  main classes of products, 7–32, 197–219, 221
  new products and manufacturing capability, 496
  technology see technology
trends, 41–59
  worldwide, 42–51
see also production department and specific (types of)
products
producer pricing, 193–4
product
design, 494, 496, 497
development see development
life cycle see life cycle
  packaging and its interactions with, 513–15
production department in product development, 494
see also processing
professional associations publishing information of
  packaging, 513
Profound Knowledge, Deming’s concept of, 591, 593
prolactin in casein, 433
proline in casein, 433
Propionibacterium, 114
  B. freudenreichii, 252, 306
  subsp. shermanii, 120
proteases (proteinases; proteolytic enzymes-and
  proteolytic activity)
  microbial, 133, 135
  evaporated milk, problems caused by, 324
  starter cultures, 240, 302
  in milk, 87
protein(s) (milk), 430–8
  biosynthesis, 66–8
concentrates see concentrated products
content, 66–7, 202
  cheese, 22, 211, 297–8
  condensed milk products, 12, 209
  cream, 7, 202
determinations, 608–9
dry milk products, 13, 209
dry whey/whey products and other dairy
  products, 29, 214
fat products, 9
fluid milk, 7, 80, 202
mammalian species comparisons, 42, 61, 429
puddings and desserts, 400
types of protein, 67
ultrafiltered milk, 7
glycosylation, heat stability and effects of, 99
heat effects, 5, 85, 99
high-pressure effects, 536
hydrolysates, 90–1
interactions in milk powder concentrates, 343
micelles see micelles
nutritional role, 430–8
processing effects, 85
quality, 431
  measures, 433
  in UHT milk, and heat stability, 100
whey see whey protein
see also high-protein low-carbohydrate pudding
proteinases see proteases
Prototheca, 117, 121
protozoa, parasitic, 123
protozoal pathogens, 123
Provolone cheese, 164, 295
  U.S. standards of identity, 164
Pseudomonas, 108, 134–5
interactions with other microbes, 136–7
psychrotrophic microorganisms/bacteria, 118–19, 123,
  128, 134, 135
  count, 138
  count (PBC), 138
  fermented milk and yoghurt, 241–2
  fermentation and starter cultures and effects of,
    242
  interactions between, 137
public health, 77–8
Public Health Grade A Milk Safety Program, 181–2
Public Health Service (USPHS-branch of FDA), 181,
  182, 220
puddings and desserts see desserts and puddings; ice
  cream and frozen desserts
pulsed electric fields, 529–31
consumer perceptions and concerns, 533
purchase see consumption and sales/purchase
purification technologies, 528
pyridoxine B₆ acid, 445

quality, 553–99
compositional (milk), research on, 73–4, 101–4
dairy products, 104
cheese see cheese
cultured see cultured products
Deming’s doctrine of, 587–93
in evaporated milk manufacture, of raw milk, 318
factors affecting, 78–80, 88–9
microorganisms, 132–6
management systems see food safety and quality
management systems
movement, 555, 591
tests/assessments, 101–4
UHT milk and effects of milk quality, 100
quality assurance (basics), 36–8, 232–3
butter and fat spreads, 283–5
department of, 494
quality control
cultured milk and yoghurt, 256–7
plating methods in, 138
puddings and desserts, 421–2

rabbit milk composition, 61
Rahn’s foam theory, churning, 275

rancidity
butter, 473
Cheddar cheese, 479
cottage cheese, 480
ice cream, 475
milk, 472
process cheese, 480
Swiss cheese, 484
yogurt, 477

rapid microbiological methods, 138–9
E. coli O157:H7, 637
fungi, 624–5
Listeria, 635, 636
Salmonella, 627, 628
raw materials
packaging, suppliers, 509
samples (for microbiological tests), 617
raw milk see milk
raw milk movement, 141
ready-to-eat (RTE) products, 556
desserts and puddings see desserts and puddings
REAL® seal, 173
receiving/receiving (at plant of raw milk/cream), 222–3
butter-making and, 268–70
cheese-making and, 287–8
tests/quality, 80, 180, 220–3
recipe development, 496
recombined
meaning of word, 188
sweetened condensed milk (RSCM), 101
recommended (reference) daily intake (RI)
values, 171, 176
reconstitution properties of dry milk products, 343–4
record-keeping see documentation
recycling of packaging, 507–8, 510, 518–20
redox potential see oxidation–reduction potential
reduced-fat butter, 11, 206
reduced-fat ice cream, 165, 365
reduced-fat milk, 221
describing (in HACCP), 568
nutrient profile, 33, 452–4
sales in U.S., 54
reduced-lactose products, 89
reduced-lactose whey (partially-delactosed whey
powder/mineral concentrated whey), 30
U.S. production, 56
reduced-minerals whey powder see demineralization
reference amount (customarily consumed)/RACC, 170, 177
fluid milk products, 170, 171, 198
yoghurt, 159
reference daily intake (recommended daily intake; RDI)
values, 171, 176
reformulation of existing products, 492
refrigerated desserts and puddings see desserts and
puddings
refrigeration, ice cream/frozen desserts, 385–6
Reggiano cheese, U.S. standards of identity, 163
regulations and legal requirements, 153–77, 187–92
butter, 267
concentrated (condensed and evaporated) milks, 311
impact of food-borne illness on, 131–2
microbiological standards (raw and pasteurized
milk), 137
new product development and, 494, 501
packaging, 517–18
pasteurization, 6, 201
sweeteners in puddings and dessert, 404
U.S., 51–2, 153–77, 554
see also legal department; safety; standards and specific laws and regulations

reindeer milk composition, 61
rennet and renneting, 291–2, 300
repositioned existing products, 491
research and development department, 494
resins
  ion-exchange
    whey demineralization, 351–2
    whey protein isolate, 355
plastic, packaging, 509
retail premises (for ice cream/frozen desserts)
  display equipment, 390–3
  graphic design and, 516
  handling practices, 391
  storage, 391
retailer needs and new products, 495
retesting (microbiological tests), 620
  test–retest statistics, 621
retorting, post-fill, 522–3
returnable packaging
  glass bottles, 521
  plastic bottles for pasteurized milk, 521
  plastic crates or cases, 516
reverse osmosis (RO), 29–30, 320, 325, 326
  dry milk products, 339
  evaporated milk, 320, 325, 326
  whey products, 215, 350
rhamnose reaction, Listeria, 635
rheological properties, 95
  butter, 280
Rhizopus, 117
Rhodococcus equi in CAMP test for Listeria, 635
riboflavin (vitamin B2), 445
  cheese, 291
rice pudding, 418–21
  aseptically processed, 420
Rickettsias, 115
Ricotta cheese, 211–12
  nutrient profile, 461–2
ripened cheese, 23, 212–13
  manufacture see ripening
ripening
  cheese, 212, 296, 304–7
    high-pressure effects, 535
    problems, 135, 289
cream in butter-making, 272
ripples in ice cream/frozen desserts, 385
risk analysis, 479, 574
  transmission of L. monocytogenes by dry milk, 577
transmission of S. aureus and/or its toxin in cheese manufacture, 577

RNA
  messenger (mRNA), synthesis (via transcription), 66
  transfer (tRNA), 66

rods
  Gram-negative (GNR)
    aerobic, 107
    anaerobic, 108–9
    quality and spoilage issues, 133–4
  Gram-positive
    endospore producing, 115
    irregular formed non-sporulated, 113–14
    regular formed non-sporulated, 112–13
roller drying of concentrated milk, 13–14, 210, 340, 343
Romano cheese, U.S. standards of identity, 164
Roquefort cheese, U.S. standards of identity, 164
Rose Bengal agar, molds and yeasts, 624
Russian Federation
  butter production and consumption, 47
  cheese production and consumption, 48
  fluid cow’s milk production and consumption, 45
  nonfat dry milk production and consumption, 49
  per capita consumption of various products, 51
  total milk production, 43
  whole milk powder production and consumption, 50
  yield of milk per cow, 33

saccharin, puddings and desserts, 404, 405
saccharolytic reactions, 132–3
Saccharomyces, 116
  S. cerevisiae boulardii, probiotic, 252
Safe Quality Food (SQF), 562
  factors affecting, 88–9
  history, 181
  inspection for/tests of see inspection and examination
management systems see food safety and quality management systems
  new products and, 497
  packaging and, 510–11
see also hazard analysis and critical control points;
  regulations; standards
sales department in product development, 494
see also consumption and sales
Salmonella, 109, 129–30, 625–8
  control and prevention, 627
  phage spraying, 641
detection methods, 627–8
Salmonella (Continued)

eggs and, critical control point determination, 578
foods implicated in illness, 627
organism characteristics, 626–7
outbreaks, 131–2, 572, 627
impact on industry practices and regulations, 131–2
S. enteritidis, 130, 131, 132, 626
S. paratyphi, 572, 625, 626
S. typhi, 625, 626, 627
S. typhimurium, 130, 571, 572
sources, 627
taxonomy, 626–7

Salt (sodium chloride), desserts and puddings, 409
salting
butter, 276, 456–7
cheese, 295

salts (minerals) see minerals

sampling for microbiological tests, 616–21

Samsoe cheese, U.S. standards of identity, 164
sandiness, 85
ice cream, 476
sweetened condensed milk, 329, 332

sanitizing/sanitation, 140–1, 184–5
cheese-making, 288–9
equipment (sanitizers), 79–80
improper, 122
3-A Sanitary Standards Symbol, 192
written procedures, 558

Sapsago cheese, U.S. standards of identity, 164
saturated fatty acids, 69, 93, 441–2
saucers, cheese, 27, 214
nutrient profile, 459–61
scalding (curd), 292
scalping, 514

Scamorza cheese, U.S. standards of identity, 163
Scandinavian fermented milks, 18–21
Scopulariopsis, 117

scraped surface heat exchanger (SSHE), puddings and
desserts, 406, 411, 412, 420–2
screening procedures for pathogens and toxins, 644
SDS-PAGE, whey proteins, 364
seals, 173
season
of milking affecting composition, 89
UHT milk and effect of, 100
secretion of milk constituents into lumen space, 71–2
rate, 73
self-degradation (packaging), 520

semisoft cheese, 23

sensory evaluation (for defects), 233, 467–87
methodology, 467–8
puddings and desserts, 422

separation
cream from milks/skim milk, 5, 223–4
butter-making, 270
centrifugal see centrifugal separation
fat, separation, evaporated milk, 320, 323, 324–5, 329
whey protein analysis, 353
serophin, 436, 437
serum proteins see whey proteins
serum solids for ice cream/frozen desserts, concentrated
sources, 371–2
serving sizes on labels, 171–3
sheep’s milk
blue mold and blue mold cheese from, U.S. standards
of identity, 164
composition, 41, 42, 61
shelf-life/stability, 8, 198–9, 522–5
butter, 283–5
extended, see also extended shelf life
nonthermal technologies and, 540–1
packaging, 522–5
probiotics, 641–2
puddings and desserts, 422
frozen (incl. ice cream), 390, 392, 396
sweetened condensed milk, 313

sherbet
composition, 32, 369
U.S.
sales, 54

standards of identity, 165
short-chain saturated fatty acids, 441
shredded Mozzarella, sensory analysis, 482
silos, 180–1
single-effect evaporators, 313, 314, 316
single-service containers, 185, 187–8, 195, 397
single-strain starter cultures, phage infection, 302–3
Siraitia grosvenorii, puddings and desserts, 404, 405

Six Sigma, 592–5

skim milk
condensed see condensed skim milk
evaporated see evaporated skim milk
high-pressure effects, 535
ice cream/frozen desserts, 372
nutrient profile, 33
separation see separation

skim milk powder (SMP), 333, 334, 336, 338, 342, 344
in evaporated milk manufacture, 322
flow diagram for manufacture, 335
heat classification, 336
skin health and probiotics, 451–2
skyr, 19, 250
sliced Mozzarella, sensory analysis, 482
smell see flavor
sodium carboxymethyl cellulose see carboxymethyl cellulose
sodium ions (Na\(^+\)) in milk, 64–5, 445
soft cheese, 23
packaging, 525
soft frozen products, 32
solid(s)
nonfat milk see milk solids-not-fat
serum, concentrated source for ice cream/frozen desserts, 371–2
total, determination, 605
solid dairy product packaging, 525–6
solution (dissolved) state, minerals in milk, 71, 72, 86
somatic antigens see O (somatic) antigens
somatic cell count (SCC), 121, 133, 180, 189, 195, 565, 612
 sorbitol, ice cream/frozen desserts, 373
sour cream (cultured cream), 17, 211, 248
in continuous butter-making machine, 277
formulation/composition, 16, 35
manufacturing process, 15, 20, 248
nutrient profile, 456–7
starter cultures, 248
U.S.
product standards of identity, 156–7
sales, 54
sour milk (flavor defect), 471–2
source reduction (packaging), 520
South Asia (Indian subcontinent)
clarified butterfat, 11, 206
fermented products, 21, 249–50
South Korea see Korea
sow milk composition, 61
Soxhlet extraction method, 603
specific gravity, 97–8
specification
definition and distinction from ‘standard’, 600
in HACCP-based food safety and quality management systems, 560
Spherosil process, 355
sphingolipids, 81–3, 443
Spirochaeta, 107
spoilage
new products, 497
organisms causing, 80
impact, 132–6
spore/endo spore-forming microorganisms
Gram-positive rods and cocci, 115
inactivation of spores by nonthermal and combined thermal–pressure processes, 541–3
thermoduric/heat-resistant, 118, 135
Sporendonema, 117
Sporobolomyces, 116
spray drying, 333–4
cheese powders, 27, 213
condensed whey, 20, 215
dry milk, 333–5, 340–2
dry milk, nonfat, 13, 210
puddings and desserts, 400
spread(s)
blended, 282–3
cheese, 27
pasteurized process, 164, 213
sales in U.S., 54
fat see fat spreads
spread-plate method, molds and yeasts, 624, 625
spreadability of butter, 280–2
stabilization (and stabilizers)
desserts and puddings, 407–8
frozen (incl. ice cream), 369, 374–5
evaporated milk, 321
ultrasound use, 532–3
see also heat stability
standard(s) (and standardization), 51–2, 152–77, 187–92, 224–5
butter-making, 270–1
cheese-making, 289–90
Codex see Codex
concentrated milks, 311
definition and distinction from ‘specification’, 600
farm, 182–3
fat content, 5
HAACP, 38
microbiological standards for raw and pasteurized milk, 137
milk powder processing, 334–5
U.S., 51–2, 137, 152–77
standards of identity, 153–66, 554
see also regulations; safety
Standard Milk Ordinance, 181
standard plate counts (SPC; aerobic plate counts), 104, 119, 138, 233, 621
Index

Staphylococcus, 111
  S. aureus, 75, 111, 121, 130, 530, 574, 625, 635, 638–41
    in CAMP test for Listeria, 635
    in cheese manufacture set up, 577
    in chicken processing, 578
    control and prevention, 639
    foods implicated, 639
    illness, 639
    organism characteristics, 639
    sources, 639
    testing methods, 639–41
starch-containing puddings and desserts, 405–7
  processing, 410–14
starter cultures (of lactic acid bacteria), 119, 237–50
  characteristics, 237–9
  cheese-making, 290, 301–4
    direct set cultures, 304
    maintenance and propagation, 303
  commercially available, 236
  probiotic, 253
health-promoting effects, 448
inoculation, 242
mesophilic, 119, 236, 238, 247–8
  mixed, 236, 250–1
phage infection see bacteriophages
probiotic see probiotics
quality and spoilage issues, 133–4
strain and species ratio changes
  consequences, 239, 240
  practices promoting, 243
  thermophilic, 119, 236, 238–9, 248–50
start-up samples (for microbiological tests), 617
statements see declarations and statements
  statistics, test–retest, 621
steel cans, 508, 522
sterilization, 231
  evaporated milk, 313, 321–2
  puddings and desserts, 411–14, 419
  sweetened condensed milk, 313
  see also aseptic procedures
steviol glycosides, puddings and desserts, 404, 405
stirring of curd
  final stirring, 293
  pre-stirring, 292
storage
  butter, 279
  in cheese-making, 306–7
    milk, 289
  in good manufacturing practice, 561
  construction of control of areas involving, 560
  in HACCP
    audit charts, 103
    logistics, 569
post-processing, 7, 8
  practices, contamination risk regarding, 122–3
pre-processing (raw milk), 5, 179–81, 223
probiotic bacteria, 255–6
puddings and desserts
  dry mixes, 424
  ice cream/frozen desserts, 389–93
  see also packaging
strawberry mousse, 218, 417
Streptococcus, 111, 120
  C. thermophilus, 120, 134, 644
    in activity testing, 644
    cheese-making, 306
    cultured milk and yoghurt, 239, 242, 243, 245, 248, 249, 253, 255, 644
stressed coliform count, 138
structural design, 507
sucralose, puddings and desserts, 404, 405
sucrose, desserts and puddings, 402
  frozen (incl. ice cream), 372
sugar(s)
  addition
    frozen deserts and ice cream, 372
    puddings and desserts, 402
    sweetened condensed milk, 328–9
  fermentation see fermentation
  in milk, 70–1
  see also no sugar added pudding; sucrose
sugar alcohols in ice cream/frozen desserts, 373
superheated condensed milk in ice cream/frozen dessert
  manufacture, 372
supermarket, journey of milk from farm and plant to, 4, 178–96, 220–34
supervisors in Kaizen, 595
supplements see additives and supplements
surface(s)
  environmental
    as microbial contamination sources, 122
    microbial sampling from, 618
    milk surface properties, 95–6
    in plants (incl. equipment)
      as contamination sources, 122
      microbial biofilms, 141
  sustainability, 518
sweet fresh cream for ice cream/frozen dessert
  manufacture, 370
sweet whey, 349, 350, 355
condensed, U.S. production, 56
dry, 28–9, 214–15, 455–6
sweetened condensed milk, 12, 208, 311–13, 326–32
defects and problems, 330–2
definition and standards, 311
heat stability, 101
history, 311
ice cream/frozen dessert manufacture, 372
manufacture, 326–32
flow diagram, 327
nutrient profile, 455–6
recombined (RSCM), 101
U.S. product standards of identity, 153
sweeteners
artificial, 491
desserts and puddings, 402–5
frozen (incl. ice cream), 369, 371–3
nonnutritive see nonnutritive sweeteners
nutritive see nutritive carbohydrate sweeteners
swingle fruit, puddings and desserts, 404, 405
Swiss cheeses, 301, 483–5
nutrient profile, 458–9
pasteurized process, 163
sensory evaluation for defects, 483–5
National Collegiate Dairy Products Evaluation
Contest of the ADSA, 469–70
thermophilic starter cultures, 301, 306
U.S. standards of identity, 164–5
synbiotics, 452

Taiwan
per capita consumption of various products, 51
whole milk powder production and consumption, 50
Talaromycetes, 117
tank(s)
bulk-cooling, 179
for storage (at plant), 180–1
tankers (for transportation from farm to plant), 179, 183–4
tapioca pudding, 418
taste see flavor
team
hazard analysis and critical control points, 567
new product development, 493–4
technical aspects
new product development, 496, 501
packaging, 511
technology, 528–52
new and potential products and changes in, 489–90
nonthermal, 528–52
packaging, 507, 526
teeth, healthy, 447
temperature
boiling point, 97
churning, 274
condensed milk
skim milk, 207
sweetened, 208
for fermentations and starters, 237, 242–3
freezing point, 97
gelatinization, puddings and desserts, 407
melting point see melting point temperature
for pasteurization, 227–30
times, 6, 186, 201
quality of milk affected by, 79
standards, 189–90, 565–6
storage
contamination risk and, 123
in silos, 181
warehouse, ice cream/frozen desserts, 390–1
see also cooling; freezing; psychrotrophic microorganisms and entries under cold; heat; therm-
testing
laboratory see laboratory tests
new product, 494, 497
see also inspection and examination and specific tests
tetrahedrons (incl. Tetra Pak), 510, 521
aseptic packaging, 523
texture
classification of cheese based on, 23
cultured dairy products, 246–7
defects and their evaluation, 470
butter, 281, 285, 474
Cheddar cheese, 479
cottage cheese, 480–1
ice cream, 476
high-pressure modification of, 536–7
yogurt, 477
thawing and freezing of ice in ice cream/frozen desserts,
thawing, 391–2
therapeutic starter cultures, 236
thermal conductivity, 96–7
thermal processing see heat treatment
thermal vapor recompression (TVR), 313, 314, 316, 317
thermoduric (heat-resistant) microorganisms
count (laboratory pasteurized count; TC), 138
bacteria, 118, 135
cyoasts, 136
thermoform/fill/seal systems, 523–4
thermoform/fill/vacuum/gas flush machine, Multivac type, 525
thermophilic starter cultures, 119, 236, 238–9, 248–50
cheese-making, 290, 301, 306
Swiss-type cheeses, 301, 306
thiamin, 445
thickening
evaporated milk with age, 325, 328, 331
puddings and desserts, 407–9
3-A Sanitary Standards Symbol, 192
three-tube MPN counts, 622
timing pump, pasteurization, 228–9
titratable acidity (TA), 177, 222–3, 610
cheese-making and, 299–300
Tooth health, 447
Torulopsis, 116
total bacterial count see bacteria
total quality control (Profound Knowledge), Deming’s concept of, 591, 593
total solids, determination, 605
toxicoinfection (enterotoxigenic and enterohemorrhagic E. coli), 128–9
toxins
E. coli, 136
ELISA testing, 644
fungal, 136, 625
pasteurization and, 186
S. aureus, 130, 625, 638, 639
in cheese manufacture, 577
trace elements/minerals, 444–5
profiles in various products, 453–62
trade, global food, Codex standards and, 595
trade associations publishing information of packaging, 513
training
good manufacturing practices, 557
HACCP, 38, 560
trans-fatty acids, 93, 442
transcription, 66
transportation and conveying
contamination risk, 123
farm to plant, 179, 183–4
good manufacturing practice and, 561
pasteurized milk/milk products, 186–7
pudding and desserts
dry mixes, 424
ice cream/frozen desserts, 391
see also distribution
triacylglycerols see triglycerides
triblender system, 381
triglycerides (triacylglycerols), 69, 70, 81, 83
fatty acids of, 441
true new products, 492
tryptic soy broth supplemented with yeast extract (TSB-YE)
Listeria, 633, 635
Salmonella, 628
TSB-YE see tryptic soy broth supplemented with yeast extract
turbidimetric methods
fat determination, 603
whey protein analysis, 363
Turkey, total milk production, 43
typhoid fever, 626–7
udder, 61–2
as contamination source exterior, 122
interior, 121–2
UHT see ultraheat treatment
UK, factors influencing success of new product development, 499
Ukraine
butter production and consumption, 47
cheese production and consumption, 48
fluid cow’s milk production and consumption, 45
nonfat dry milk production and consumption, 49
per capita consumption of various products, 51
whole milk powder production and consumption, 50
yield of milk per cow, 44
ULTICE, 396
ultrafiltration
dry milk products, 339
milk, composition of product, 7
starter cultures and effects of, 241
permeate
whey, 29–30, 214
ultraheat/ultra high-temperature treatment (UHT; ultrapasteurization), 6, 100, 199
definition, 177, 195
evaporated milk, 322, 325–6
heat stability, 100
legal time and temperature requirements, 6, 201
packaging, 8
puddings and desserts, 411–12
rice pudding, 420, 421
standards, 190
sweetened condensed milk, 12, 208, 313, 328
ultrasound treatment, 531–3
ultraviolet (UV) spectroscopy, whey proteins, 364–5
United Kingdom, factors influencing success of new product development, 499
United States (U.S.), 51–9, 152–77
butter
production, 47
sales/consumption, 47, 54, 267
cheese
consumption/sales, 48, 53, 54, 59
production, 48
dairy industry, 51–9
Department of Agriculture see Department of Agriculture
fluid cow’s milk production and consumption, 45, 52–6, 59, 267
frozen dessert sales/consumption, 53–5, 59
ice cream and frozen desserts see ice cream and frozen desserts
microbiology
outbreaks of milk-borne illness, 126–7
standards for raw and pasteurized milk, 137
milk cows and yield of milk per cow, 44, 52
new product development, factors influencing success, 499
nonfat dry milk production and consumption, 49
pasteurization minimal requirements, 140
per capita consumption of various products, 51, 56–9
Public Health (USPH) Service (branch of FDA), 181, 182, 220
regulations, 152–77
role of milk constituents in American diet, 429–30
standards see standards
total milk production, 43
whey/whey product production, 350
whole milk powder production and consumption, 50
universal product bar codes, 174
unpasteurized milk see milk
unripened natural cheese, 23, 211–12
nutrient profile, 461–2
unsalted butter, 267, 371, 456–7
unsaturated fatty acids, 69, 442
trans-fatty acids generated from, 442
urea levels, heat stability and effects of, 99
U.S. see United States
utensils see equipment and utensils
UV spectroscopy, whey proteins, 364–5
vacuum evaporation
dry milk products, 339
evaporated milk, 313–17

sweetened condensed milk, 328–9
whey powder manufacture, 351
vacuum packing of hard cheese, 525
vaginitis, probiotics, 450
validation procedures in HACCP, 38
Vancreator, 271
vanilla, desserts and puddings, 409–10, 410, 411, 416, 417, 418
dry mixes, 423
frozen (incl. ice cream), 384
vapors in vacuum evaporation, 313–17
variegate patterns in ice cream/frozen desserts, 385
vat pasteurization
as critical control point, 583, 585
minimal requirements in U.S., 140
vegetable(s), cold pack cheese food with, 162
vegetable fat pudding, 414
vegetable oil–butter blends, 206
verification procedures in HACCP, 38, 556, 560, 584, 586
verotoxigenic E. coli (incl. O157:H7), 128–9, 636–8
control and prevention, 637
foods implicated, 637
illness, 637
organism characteristics, 636
outbreaks, 125, 126, 127
sources, 637
testing methods, 637–8
very hard cheese, 23
vibrioid Gram-negative bacteria, 107
villi, 18–19, 250–1
violet Red Bile Agar (VRBA)
coliforms and E. coli testing, 622
Enterobacteriaceae, 621
viral pathogens, 124
viscosity, 95
butter, measurement, 282
evaporated milk, 320, 321, 322, 324, 325, 326
preheating affecting, 319
puddings and desserts, 422
sweetened condensed milk, 331
whey protein–water interactions affecting, 361
visual inspection of milk at receiving bay, 80
vitamin(s), 87, 445–6
fat-soluble, 87, 96, 438, 445
probiotics affecting production, 450–1
profiles in various products, 453–62
vitamin A, 87, 438, 445
addition, 7, 221, 225
butter, 283
vitamin A (Continued)

nutrient profile of products with, 33
U.S. product standards of identity, 158
vitamin B1, 445
vitamin B2 see riboflavin
vitamin B3 (niacin), 445
vitamin B5, 445
vitamin B6 acid, 445
vitamin B9 (folic acid), 445
vitamin B12, 445
vitamin C, 87, 446
vitamin D, 87, 438, 445
addition, 7, 221, 225
butter, 283
nutrient profile of products with, 33
U.S. product standards of identity, 158
vitamin E, 445
vitamin H, 445–6
vitamin K, 438, 445
volatilizer, 271
volumetric measurement (metering) of milk delivered to
plant, 180, 220
voluntary participation in HACCP, 187

warehousing
ice cream/frozen desserts, 390–1
in product development, 494
washing, butter-making, 276
water
activity, 607–8
determination, 607–8
fermentations and starters, 237
added, determination, 606
content in milk/milk products, 7, 202
cheese, 22, 211, 296–7
condensed milk products, 12, 208
cream/ultrafiltered milk, 7
dry milk products, 13, 209
dry whey/whey products and other dairy
products, 29, 214
fat products, 9
fluid/raw milk, 7, 80–1, 202, 428
control, dairy plants, 606–7
supply, 561
for cleaning and sanitizing, 122, 184
as contamination source, 122
whey protein interactions with, 361
see also moisture content
water ices, 165, 368, 369
U.S. sales, 54
standards of identity, 165
weight management, 446
probiotics, 451
“wet” ice cream, 386
wet salting of butter, 276
whey, 349–66
acid see acid whey
bioactivity, 434
biological/chemical/physical hazards, 570
cheese-making, 293–4
draining, 294
expulsion, 292, 293, 294
contents, 349–50
dry pudding and dessert mixes, 424
off-flavors relating to (whey; whey taint; free whey)
butter, 476
Cheddar cheese, 479
cottage cheese, 483
milk, 474
process cheese, 483
Swiss cheese, 484
yogurt, 477
permeate, 30, 215, 354–7
sweet see sweet whey
whey powder, 350–1
partially-delactosed see reduced-lactose whey
whey products, 27–31, 199, 214–16, 349–66
demineralized see demineralization
fractionated, 29–31, 215
sales in U.S., 55–6
standards, 190, 566
whey protein(s) (serum proteins), 84–5, 90, 354–64,
435–7
aggregation, 90
analysis/determination, 363–5
applications, 90
bioactive peptides derived from, 92, 434
cheese, 298
concentrates (WPC), 30–1, 90, 349, 354–6, 401
foaming, 361
gelation, 362
U.S. production, 56
WPC-35, 354
WPC-50, 354
WPC-60, 355
content in cow and other mammals, 42, 349–51
cultured milk and, 246
dry milk products and, 336–7
denaturation, 90
fractions, 433
heat effects, 5
individual proteins, 216
isolates, 30–1, 216, 355
nutritional role, 435–7
products, 354–64
structure, 357–60
use as ingredients, 360–2
whey protein nitrogen index, 336–7
whey solids in puddings and desserts, 401
whipped butter, 267, 281
whipped cream, U.S. product standards of identity, 155
whipping cream
  light see light whipping cream
  nutrient profile, 33
whole milk see milk
women’s milk see breast milk
workers see personnel; team
working of butter, 9, 202, 268, 273, 276–8
World Trade Organization (WTO) agreement, 191
worldwide dimensions see global dimensions
written records see documentation

xylitol, ice cream/frozen desserts, 373
xylose reaction, Listeria, 635

yak milk, composition, 42
yeasts, 116, 624–5
  in mixed starter cultures, 236, 250
  probiotic, 252
  problems (incl. spoilage) caused by, 135–6

sweetened condensed milk, 330
testing, 624–5
see also fungi; molds
yellow fats see butter; fat spreads
Yersinia, 109
  Y. enterocolitica, 128
yield per cow
  composition related to, 88
  U.S., 44, 52
  worldwide, 44
ymer, 19, 248
yog(h)urt, 15–16, 211, 235–65
  activity testing, 644
  frozen, 31, 55, 165, 170, 173, 403, 644
  health benefits, 449–51
  manufacturing process, 248–9
    flow diagram, 15, 205
    pH, 104
    starter cultures, 248–9
    ultrasonication, 532
  nutrient profile, 34, 454
  oxidation–reduction potential, 95, 243
  probiotic, commercial, 253
  quality and spoilage issues relating to starter cultures, 134
  sensory evaluation for defects, 476–8
  U.S.
    product standards of identity, 157–60
    sales, 54, 55

zinc, 444