Index

ABC (ATP-binding cassette) transporters, 1, 57, 64–7, 71, 72
probiotics and, 165
abiotic factors in flavor of fermented foods, 331–3
abortive infection mechanisms, 105
ACE inhibitory peptides, 302
acetaldehyde and flavor in fermented food, 318, 326
acetate, 300
acetic acid (ethanoic acid), dairy products, 317, 326
acetate, 300
acetate, 300
acetoin (3-hydroxy-2-butanone), 321
acetone (2-propanone), 320
acetophenone, 321
N-acetyl neuraminic acid utilization by Lact. sakei, 212
acid exposure (incl. stomach), 161, 162
acidosis, ruminants, 148–9
acne vulgaris, 90
actinobacteria, 56, 60, 64, 67, 68, 70, 71
high G+C Gram (+), 56
additives see supplements and additives
adhesins, 350
adhesion to host mucosa, mechanisms, 162–4
adjunct cultures in dairy fermentations, 191–9
Swiss cheese isolate, 33
adsorption, phage, prevention, 104
Aerococcaceae, 25, 26, 27
agmatine, 11
meat fermentation and Lact. sakei, 213
wine, 240
AI-2 (autoinducer-2), 40, 346–7
airways diseases, allergic, 179–80
D-alanylation of teichoic acids, 348, 350
alcohol (ethanol)
biomasses in fuel ethanol plants, 345
biotechnological production, 308
in cocoa bean, 251, 253, 257, 258, 259, 260, 263, 264, 265, 265–6, 272
in fermented food, flavor and, 317, 326, 328, 333
in wine
from grape fermentation (alcoholic fermentation; AF), 232, 234–5, 237, 239, 240, 241–2
strength affecting LAB growth, 236
alkaloids, cocoa bean, 251, 252
allergy, 178–80
allochthonous species, 121
Lact. rhamnosus as, 127–9, 130
amines, biogenic (BA), 11–12
wine, 239–40, 242
amine acids
assimilation, 15
catabolism, 10–11
flavor and, 326–7, 328, 332
decarboxylases, 40
free (FAA), and cheese ripening, 192
milk, 301–2
sulfur-containing see sulfur-containing amino acids;
thioether-containing amino acids;
synthesis, regulation, 15
winemaking and, 239–40
anemia, pernicious, 284, 288
angiotensin-converting enzyme (ACE) inhibitory peptides, 302
animal production and health, 144–58
antigen(s), mucosal delivery, 181–2
antigen-presenting cells in malnutrition and effects of fermented milk, 135
antihypertensive peptides, 302
antimicrobial (incl. antibacterial/bactericidal) activity
bacteriocins, 80, 81, 83, 84, 85–6, 88–90, 92, 93, 194
biofilms with, 342, 352
peptides, 302–3
phages, 113
phenolics, 225–6
protective cultures, 193–4
antioxidant enzyme-producing bacteria, 177

© 2016 John Wiley & Sons, Ltd. Published 2016 by John Wiley & Sons, Ltd.
362
antiproteases (protease inhibitors), 176
celiac disease, 180
antisense RNA in antiphage strategies, 106
arginine metabolism (and arginine deiminase), 39, 161
Lact. sakei and, 213
in wine, 239
arboviral flavinoid, 281
aromatic amino acid degradation, 10
ascorbate (Asc) group translocators, 69
asthma, 179–80
ATP-binding cassette transporters see ABC transporters
ATPases
Ca\(^{2+}\), 67, 68
P-type, 67, 68
attachment sites (att) and phage integration, 106–8
Australia, cocoa bean fermentation, 262
autochthonous species, 36
Lact. rhamnosus as, 127–9, 129–30
vegetable and fruit fermentations, 216, 218–20, 223, 228, 229
autoimmune diseases, 180
autoinducer (AI) molecules, 40, 346
AI-2, 40, 346–7
auto-inducing peptides (AIP), 346
autolysins, 332, 348
autolysis
and aroma compounds in fermented food, 329, 332
and biofilms, 351
Average Nucleotide Identity (ANI), 44
avian influenza virus, 183
bacilli, wine environment, 232
see also Lactobacillus
bacteria (in general)
agents acting against see antimicrobial activity
antigens, mucosal delivery, 181
flavor in fermented food and, 322
pathogenic see pathogenic microbes
bactericidal activity see antimicrobial activity
bacteriocins, 34–5, 57–9, 80–99, 194–5
applications, 88–93
dairy products, 194–5
characteristics and classification, 80–3
mode of action, 84–6
resistance, 66–8
bacteriolysins, 80–1
bacteriophage(s), 100–19
as biocontrol tools, 113
control strategies, 100, 101, 103–6
as molecular tools, 106–13
natural resistance mechanisms, 103–5
starter strains resistant to, 101, 199–201
bacteriophage-insensitive mutants (BIM), 105, 200–1
Baechu kimchi, 222
Belize, cocoa bean fermentation, 262, 265
benzaldehyde, 319
Bifidobacterium, 56
intestine, 123
for mucosal delivery of health molecules, 170–90
piglets, administration, 151
proteomics, 159, 161, 162, 165
bile exposure, 161
bioactive peptides, 301–3
biocontrol tools, phages as, 113
bioenergetics of citrate metabolism, 6
biofilms, 341–61
biotechnology, 354
in environmental and domesticated settings, 341–6
health potential, 352–4
lifestyle, life cycle and bacterial factors involved in, 346–52
biofuels, 3, 308
biogenic amines see amines
biosurfactants, 348, 351–2
biotic factors in flavor of fermented foods, 331–3
birds
avian influenza virus, 183
poultry farming, 152–4
bitterness disease, wine, 241
blood pressure, high (hypertension), peptides in treatment of, 124, 125
bovine β-lactoglobulin, 170
Brassica oleracea, fermented (sausage), 221–2
Brazil, cocoa bean fermentation, 255, 261–2, 265, 271
butanal, 318
2,3-butandiol, 307, 318
2,3-butandione (diacetyl), 194, 238, 320, 326
butanoic acid, 317
1-butanol, 308, 317
2-butanol, 318
2-butanoic acid, 320
butyric acid, 317
butyrate, 300
butyric acid, 317
bxbl1 (mycobacteriophage), 108
C31 phage (of Streptomyces), 108
cabbage, white, fermented (sauerkrauts), 221–2
CaCA (Ca\(^{2+}\):cation antiporter) family, 65, 67, 68
CadD (cadmium resistance) family, 61, 65, 66, 67
cadmium resistance (CadD) family, 61, 65, 66, 67
calcium (ion) ATPases, 67, 68
cancer
cervical, vaccine, 182
folate and, 284
caprylic acid, 317
caproic acid, 317
capsular polysaccharides (CPS), 196, 306, 348, 350

carbohydrate see sugar

carbon substrates for fermentation, flavor and, 326

carbon sulfide, 321

carboxylic acids, 10

taste and quality, 238–9

caries, dental, 91, 181, 352

Carnobacteriaceae, 25, 26, 27

Cas (CRISPR-associated genes), 46, 105, 108, 109, 110, 126, 200, 201

casein, degradation/hydrolysis, 7, 8, 302–3

casein phosphopeptides (CPP), 303

catabolism

amino acid see amino acids

sugar, 3–4

catabolite control protein A (CcpA), 15

Catalase-producing bacteria, 177

cattle and cows, 147–50

dairy, 89, 147, 148, 149

Caudovirales, 101

cbi, 37, 39, 289, 290

CcpA (catabolite control protein A), 15

CD4+ cells

hyperactivation in inflammatory bowel disease, 178

in malnutrition and effects of fermented milk, 135, 136, 137

in stress and effects of probiotic administration, 139, 140

CD8+ cells

in malnutrition and effects of fermented milk, 135, 136, 137

in stress and effects of probiotic administration, 140

CDF family, 65, 66, 67, 72

cicum, poultry, 152

celiac disease, 180

cell envelope

bacteriocin resistance and, 87

Lact. rhamnosus GG, 127, 128

phage resistance and, 105

cell-envelope proteinase (CEP), 7–8, 192, 302

cell wall anchoring (CWA), 175

cervical cancer vaccine, 182

channel-forming proteins, 56–9

Che9c (mycobacteriophage), 111, 112

Cheddar cheese, biofilms, 343

cheese, 33, 192–6, 198, 201, 202, 314, 315, 316–22, 326, 327, 328, 332–5

biofilms, 342, 343, 345, 353

low-fat, 198

probiotics and, 195–6

ripening, 16, 56, 192–3, 195, 202, 326, 327, 332, 333, 342, 353

Swiss, 16, 33, 332

chemicals, commodity, 307–8

cherry, sweet, fermentation, 219

chickens, 152–4

chocolate, 248–9, 251, 252, 253, 255, 257, 264, 267, 268, 269, 270, 271, 272, 273

circular (cyclic) bacteriocins, 58, 81, 83, 85–6, 87

citrate and citric acid, 4–6, 260, 263, 264

cocoa bean fermentation, 263, 264

fermented food flavor and, 326, 327

wine quality and, 238

classification see taxonomy

cloning vectors, 172

Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR), 46, 105, 109–10, 126, 200–1

clusters of orthologous groups, 37, 38, 43

cob, 37, 39, 289–90

cobalamin (vitamin B12), 37, 288–91, 306

cocci, wine environment, 232

cocoa tree (Theobroma cacao), 248–78

cocoa butter, 248, 251–2

crop cultivation and harvest, 249–50

drying of fermented bean, 252, 253, 255, 266–8, 269–70

fermentation of bean, 248–78

biochemical changes during, 266–8

farming practices, 253–6

flavor and, 258, 264, 267, 268, 269–70, 323

optical course and end, 268–9

pulp or substrate, 250–1

rationale, 252–3

starter cultures, 271–3

tree phases, 256–7

fresh unfermented bean, 251–2

roasting of fermented beans, 253, 258, 270

CodY, 15

COG (clusters of orthologous groups), 37, 38, 43

colitis

experimental/model of, 46, 176, 177, 178

ulcerative (UC), 176, 178

commodity chemicals, 307–8

comparative genomics, 42–7, 55–79

dairy fermentation microbes, 34

metabolism and, 12

pan-genome level, 32–3

transport systems, 55–79

conjugated linoleic acid, 301

cosmetics, bacteriocins, 90

cows and cattle, 147–50

cow’s milk

folate, 281, 285

natural milk cultures, 201

protein allergy, 178–9

see also milk

Criollo (cocoa variety), 249, 251, 252, 255

CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats), 46, 105, 109–10, 126

dairy fermentations and, 200–1

Crohn’s disease (CD), 176, 178

cryptosporidiosis, 184
cucumbers, pickled, 223
cyclic (circular) bacteriocins, 58, 81, 83, 85–6, 87
cyclohexanone, 321
cytokines
  - anti-inflammatory, 178
  - delivery vector, 178
  - pro-inflammatory, 178
  - in malnutrition and effects of fermented milk, 137
  - in stress and effects of probiotic administration, 139–40
dairy, 191–209
  - bioactive peptides, 301–2
  - fermentations, 34, 191–201
  - antiphage strategies, 103, 191–201
  - folate, 285
  - starter cultures, 191–209
  - flavor compounds, 317–21
  - genomic adaptations to dairy environment, 33–4
  - riboflavin, 281
  - see also milk
dairy cows, 89, 147, 148, 149
death (bacterial), triggering, as antiphage strategies, 106
  - see also autolysis
decanal, 319
delivery vehicles and systems (incl. vectors)
  - engineered for mucosal for delivery of health molecules, 170–90
  - LAB genetic manipulation using, 46
  - LAB use as, 46–7
  - fermented vegetable and fruit juices, 228
  - dendritic cells (DC)
    - in malnutrition and effects of fermented milk, 135, 136
    - in stress and effects of probiotic administration, 139–40
  - density-dependent recognition of autoinducer molecules, 40
dental health see orodental health
DHA (dihydroxyacetone) phosphotransferase systems, 70
  - DHA1 family of drug:H⁺ antiporters, 59
  - DHA2 family of drug exporters, 59
  - diabetes mellitus type 1, 180
  - diacetyl, 194, 238, 320, 326
  - diarrhea (infectious), 182–3
    - mucosal delivery of health molecules, 182–3
    - ruminants, 148
  - α-dicarbonyl compounds and aroma, 326
dietary supplement see supplement
dihydroxyacetone (DHA) phosphotransferase systems, 70
dimethyl disulfide, 321
dimethyl sulfide, 321
dimethyl sulfone, 321
dimethyl trisulfide, 321
dipeptides, 8, 9, 34
  - disaccharide hydrolysis, 1–3
diseases see infections; medical disorders/diseases
DNA
  - electroporated, bacteriophage recombineering of, 112–13
  - engineering genetic tools for delivery of, 172
  - extracellular, biofilms and, 351
    - single-stranded, recombineering, 111–12
  - domesticated settings, biofilms, 341–6
  - Dominican Republic, cocoa bean fermentation, 249, 259, 262, 265
drug exporters, DHA2 family, 59
  - drug:H⁺ antiporters, DHA1 family, 59
drug/metabolite transporters (DMT), 60, 63, 71
  - drying of fermented cocoa bean, 252, 253, 255, 266–8, 269–70
  - E7 antigen of HPV type-16, 181–2
  - Ecuador, cocoa bean fermentation, 262, 267
eggs and probiotics, 152–3
  - Elafin, 176
  - celiac disease, 180
  - electroporated DNA, bacteriophage recombineering of, 112–13
  - Embden–Meyerhof–Parnas pathway see glycolysis
  - endometritis, ruminant, 149
  - endopeptidases, 8–9
  - energy sources, Lact. sakei and meat fermentation, 212–13
  - Enterococciaceae, 25, 26, 27
  - enterococcal polysaccharide antigen, 348
  - Enterococcus (incl. Ent. faecium)
    - biofilms, 347, 348, 349, 350, 351
    - as pig probiotic, 151, 151–2
    - environment (incl. habitats)
      - biofilms, 341–6
      - diversity, 56
      - genomic adaptations to, 33–6
      - self-regulated promoters driven by environmental conditions in, 174–5
      - factors affecting growth, 236
    - see also microbiome
    - erythritol, 298, 299, 300
    - ester(s), 328
      - wine, 241
    - esterases, 327–8
      - wine, 271
    - ethanoic acid see acetic acid; acetic acid bacteria
    - ethanol see alcohol
    - ethyl acetate, 319
    - ethyl butanoate (ethyl butyrate), 319
    - ethyl hexanoate, 319
    - 2-ethyl1-hexanol, 318
    - ethyl 2-methylbutanoate, 320
ethyl 3-methylbutanoate, 320
ethyl octanoate, 319
evolution (genome), 32–54
  in dairy environment, 33–4, 317
  in GI tract, 35–6
  in vegetable and meat fermentations, 34–5
  in winemaking environment, 234–5
ewe’s milk, natural/raw, 201, 202
exopeptidases, 8, 9
exopolysaccharides (EPS; extracellular polysaccharides), 3–4, 196–9, 306–7
biofilms and, 350, 351, 354–5
gastrointestinal tract and, 161
slime, 197, 306
starter cultures in fermentations producing
dairy, 196–9
vegetable and fruit, 220
extracellular polymers (incl. proteins), 164
adhesion and, 162–3
biofilms and, 350, 351
see also exopolysaccharides
facilitated diffusion, 59
families of LABs, 25–7
fat of cocoa beans (cocoa butter), 248, 251–2
fatty acids, short-chain, 300
fermentations
food
biofilms in fermented foods, 350
dairy see dairy; milk
fruits and vegetables see cocoa; fruits and vegetables; wine
meat see meat
vitamin B group and their enrichment in, 279
heterofermentation, 2, 3, 6, 28, 232, 237, 260, 299–300, 326, 333
homfermentation, 2, 3, 6, 28, 326
starter cultures see starter cultures
sugar, 3
firmicutes, 55–6, 60, 63, 68, 70
non-LAB/other, 60, 63, 65, 66
fish sauce, 322, 324, 332
flavor (taste and smell/odour) of fermented foods, 4–6, 314–40
biochemical processes in flavor compound formation, 324–8
biotic and abiotic factors, 331–3
cheese ripening and, 192–3
citrate metabolism and formation of, 4–6
cocoa bean fermentation and production (of precursors) of, 258, 264, 267, 268, 269–70, 323
description of odor, 317–21
LAB role, 316–30
  interspecies and intraspecies role in aroma production, 328
origin of aroma compounds, 316
wine, 240, 241
see also volatile compounds
folate (vitamin B9), 280, 284–8, 306
probiotics and production of, 286–8
food(s)
bacteriocins in, 88
biofilms, 341–6, 350, 353, 354, 355
in food processing plants/facilities, 342, 343, 353
fermented see fermentations
flavor see flavor
fortification see fortification
functional see functional foods
phages as biocontrol agents, 113
plant see fruits and vegetables
supplement see supplement
viable but non-culturables (VBNC) LAB in, 332
food allergy, 178–9
Forastero (cocoa variety), 249, 252, 255, 268
fortification, 281
folate, 284, 285
free amino acids (FAA) and cheese ripening, 192
fructose-1,6-bisphosphatase gene, 283
fructooligosaccharides (FOS), 3, 151, 165, 228
fructophilic LAB, 217–18
fruits and vegetables (plant foods), 216–30
fermentation, 34–5, 216–30
  main products, 221–3
  physiology and biochemistry, 223–4
  vehicles for delivery of probiotics, 228
see also cocoa; wine
raw, microbiota see microbiome and microbiota
FSW (phage of Lactobacillus casei casei strain Shirota), 102
functional foods, 195, 197, 199
definition, 195, 298
GABA-containing, 305
immunosuppressed hosts, 134–42
vegetables and fruits, 221, 228–9
vitamins in, 280, 283, 291, 306
see also nutraceuticals
functional genomics, 16–17
metabolism and, 16–17
novel LAB utilities, 45–7
fungi and flavor in fermented, 322
GABA (gamma-aminobutyric Acid), 303–5
galactitol, 298, 299
galactitol-specific phosphotransferase system, 69
galacto-oligosaccharides (GOS), 3, 165
galactose, 1–3
gamma-aminobutyric Acid (GABA), 303–5
gapB, 283
garvicin A, 86
garvicin ML, 58, 85
gas chromatography-mass spectrometry (GC-MS), flavor and aroma compounds, 315
gastrointestinal tract (gut incl. intestine in humans), 35–6, 120–33
adaptations to environment in, 161–2
*Lactobacillus rhamnosus*, 126–7, 162
bacteriocinogenic bacteria, 91
biofilms, 344
diseases/disorders, 164, 176–8, 180, 182–3, 352
biofilms and, 352–3
ecology, 121–4, 124
microbiome and microbiota see microbiome mucosa see mucosa
probiotics see probiotics
GEBA (Genomic Encyclopedia of Bacteria and Archaea), 29
gel-free proteomics, 160–1
gene(s)
aroma compounds in fermented food, 329–30
expression systems, 173–5
*Lact. sakei* and sausage fermentation, 210
horizontal transfer, 9, 28, 33, 37, 71, 73, 234, 291
regulation of metabolism, 12–15
genera of LABs, 25–7, 32, 341
Generally Recognized As Safe (GRAS) species, 27, 33, 46, 92, 107, 152, 154, 170, 197, 279, 298, 342
genetic engineering (and recombinant strains)
antiphage systems, 105–6
dairy fermentations, 199
folate production and, 287–8
by homologous recombination using phages, 110–13
for mucosal delivery of health molecules, 170–90
riboflavin production and, 282
genital tract, biofilms, 343–4
see also vagina
genome
evolution see evolution
*Lact. rhamnosus*, diversity, 124–6
*Lact. sakei*, diversity, 210
*Oenococcus oeni*, 233–4
sequencing, 12, 29
bacteriophages, 102
characterization/taxonomy/pan-genome
development and impact of, 40–5
Lactobacillaceae, 28
*Lactobacillus reuteri*, 37
*Lactobacillus sakei*, 210, 212
studies of entire set of proteins coded by see proteomics
genomics
comparative see comparative genomics
functional see functional genomics
metabolism and, 12
revolution in, 32–3
taxonomy in era of, 29–30, 40–5
genotype and phenotype, relationships between, 28–9
Ghana, cocoa bean fermentation, 253, 261, 265, 272
giardiasis, 184
GliLaLac, *Lactococcus lactis*, 56, 57
gliadin, 180
global phenotypic characterization of microbial cells, 17
*Glucanobacter*, 265–6
glucose metabolism, 1, 2
*Lact. sakei*, 212
see also glycolysis
glucosyltransferase, 348, 351
glutamate dehydrogenase (Gdh) and flavor, 333
cheese ripening, 192, 327
gluten sensitivity, 180
glyceraldehyde-3-phosphate dehydrogenase, NADPH-dependent (gapB), 283
glycolysis (Embden–Meyerhof–Parnas pathway; EMPP), 1–3, 297
Gram (+) bacteria
bacteriocins of, 83, 84, 88, 89
high G+C, 56, 146
low G+C see firmicutes
Gram (-) bacteria as probiotics in animal production, 156
grape
juice fermentation to wine see wine
surface microbes, 231–3
GRAS species (Generally Recognized As Safe), 27, 33, 46, 92, 107, 152, 154, 170, 197, 279, 298, 342
growth of LAB
phenolics affecting, 224–5
in winemaking environment, factors affecting, 236–7
GSC (Genomic Standards Consortium), 29
Nut see gastrointestinal tract
H5N1 influenza virus, 183
habitats see environment
HAE1/HAE2/HAE3 family, 60, 62
health
animal, 144–58
biofilms and their potential, 252–4
fermented vegetable and fruit health-promoting properties, 226
mucosal delivery of health molecules, 170–90
orodental see orodental health
see also medical disorders/diseases
heavy metal transporters, 65–7
hem, 37, 39, 290
heptanoic acid, 317
heptanal, 318
1-heptanol, 317
2-heptanol, 318
2-heptanone, 320
heterofermentation, 2, 3, 6, 28, 232, 237, 260, 299–300, 326, 333
hexanoic acid, 317
hexanal, 318
2-hexanal, 319
1-hexanol, 317
2-hexanone, 320
high-value metabolites, 297–313
histamine metabolism, 11
wine, 239–40
histidine, 11
wine, 240
HME (heavy metal exporters), 60, 62, 65, 66, 67
homofermentation, 2, 3, 6, 28, 326
homologous recombination, engineering of recombinant DNA by, 110–13
honeybees, 342, 344
horizontal gene transfer, 9, 28, 33, 37, 71, 73, 234, 291
hosts
immunosuppressed, probiotics and functional foods in, 134–42
interaction factors with Lactobacillus rhamnosus, 127
HPV type-16 E7 antigen, 181–2
hrrRBA operon, 16
Human Microbiome Project (HMP), 35, 37
human papillomavirus type-16 E7 antigen, 181–2
hydrogen peroxide, vegetable and fruit fermentations, 219–20
hydrostatic pressure and Lact. sakei during meat processing, 213
2-hydroxybenzaldehyde, 319
3-hydroxy-2-butanoate, 321
hydroxyacid transporter, 4
4-hydroxy-2,5-dimethyl-3(2H)-furanone, 321
hydroxyl radical, 39
4-hydroxy-5-methyl-3(2H)-furanone, 321
3-hydroxypropionaldehyde (reuterin), 37, 112, 194, 291
hygiene, oral cavity, 88
hypertension, peptides in treatment of, 124, 125
hypervariable regions (lifestyle islands), Lactobacillus rhamnosus, 124, 125
ice cream plants, biofilms, 343
idli, 280, 282, 323
immunity
mucosal see mucosa
peptides enhancing, 303
probiotic immunomodulatory effects, 164, 352
see also autoimmune diseases
immunoglobulin A
in malnutrition and effects of fermented milk, 135, 136
in stress and effects of probiotic administration, 139, 140
immunosuppressed hosts, probiotics and functional foods in, 134–42
in vivo expression technology, Lact. sakei and sausage fermentation, 210
Indonesia, cocoa bean fermentation, 248, 260, 262
inducible promoters, 172, 173, 174–5
infections
of bacteria by phages, abortive mechanisms, 105
of humans
antimicrobial agents see antimicrobial activity
mucosal delivery of health molecules, 181–4
of pigs, 151–2
of ruminants, postpartum, 149–50
inflammatory bowel disease (IBD), 39, 176, 177, 178, 352
influenza viruses
avian, 183
swine, 151
intergrase and integration vectors, phage, 106–8
interferon-gamma (IFNγ)
in malnutrition and effects of fermented milk, 137
in stress and effects of probiotic administration, 139
interleukin-6 in malnutrition and effects of fermented milk, 137
interleukin-10
L. lactis expressing, 178
in malnutrition and effects of fermented milk, 137
interleukin-12-expressing L. lactis, 182
interleukin-27-expressing L. lactis, 178
interleukin-12-expressing
interleukin-12-expressing
interleukin-27-expressing
interleukin-12-expressing
interleukin-27-expressing
intestine see gastrointestinal tract
inulin, 165, 196
inulosucrase, 348, 351
isomalyl acetate (3-methylbutyl acetate), 320
isoleucine catabolism, 10
isopropyl alcohol, 318
Ivory Coast, cocoa bean fermentation, 262, 273
Jameson effect, 353
juices (fruit and vegetable), 228
grape see wine
α-keto acids, 327
kimchi, 222–3
Kluyveromyces marxianus, 258, 271–2
labionins, 81
labyrinthopeptins, 81
lactic acid (in food industry), 307
lacticin, 58, 87, 89
lactitol, 165, 298, 299
Lactobacillaceae, 25, 26, 27, 27–9
Lactobacillales, 28, 29, 35, 43
Lactobacillus, 121–30
aroma compounds in fermented food, 329–30
cocoa bean fermentation, 260–4
comparative genomics, 43
gut, 121–30
mucosal delivery of health molecules, 171, 173, 174, 176, 177, 182, 183
piglet health and, 151
proteomics, 161, 162, 165
vitamin B group and, 280–91
wine environment, 35, 232
**Index**

**Lactobacillus acidophilus**, immunomodulatory effects, 164

**Lactobacillus casei**
- in fermented milk in malnutrition model, 135, 137, 138 strain Shirota (S-1), phage FSW, 102
- in stress model, 139–40

**Lactobacillus fermentum**
- cocoa bean fermentation, 260, 261, 262, 263, 272–3
- riboflavin production, 283

**Lactobacillus helveticus**
- 8, 9, 10, 12, 15, 33, 34, 196, 287, 302, 303, 329

**Lactobacillus plantarum**
- biofilms and, 347, 348, 349, 350, 354
- cocoa bean fermentation, 260, 261, 262, 263
- dairy fermentation, 192, 194, 195, 202
- LpGlpF1-LpGlpF6, 57
- vitamin B group and, 280, 282, 283, 286, 287, 291

**Lactobacillus reuteri**
- 37, 42, 112, 194

**Lactobacillus rhamnosus**
- 37, 122, 123, 124–30, 131, 137, 151, 162, 163
- biofilms and, 347, 349, 350
- LsbB, 85
- cobalamin biosynthesis, 289–91
- nutraceutics, 300, 306

**Lactobacillus sakei**
- 42, 209–15, 333
- meat fermentation, 209–15
- lacticins, 7–8
- lactococcin, 85
- lactose, 85
- lactulos, 165
- Lam, 346–7
- lanthionine, 57, 59, 81
- lantibiotics (class I bacteriocins), 57, 58, 80, 81, 87, 89, 93
- leader sequences of class II bacteriocins, 83
- leucine catabolism, 10

**Leuconostoc**
- aroma compounds in fermented food, 329
- wine environment, 35

**Leuconostocaceae**, 25, 26, 27

**Listeria monocytogenes**, 181, 290

**Listeria innocua**, 181

**LpGlpF1-LpGlpF6 Lactobacillus plantarum**, 57

**LsbB**, 85

**luxS**, 40, 346, 347

**MabA (modulator of adhesion and biofilm)**, 349

**major facilitator superfamily (MFS)**, 59–63

**major intrinsic protein (MIP)**, 56–7

**malaria**, 183

**Malaysia, cocoa bean fermentation**, 255, 261, 265

**malic acid**, 6, 224, 235, 238


**maltitol**, 298, 299

**mammary gland, ruminant microbiota**, 148

**see also** mastitis

**mannitol**, 223

**cocoa bean fermentation**, 263, 264, 266

**low-calorie sugars**, 298–300

**mannose phosphotransferase system (Man-PTS)**, 69, 85, 87

**mannose-specific adhesion (Msa)**, 348

**mass spectrometry (MS)**, 160–1

**flavor and aroma compounds**, 315

**mastitis (ruminants incl. cattle)**, 89, 149–50

**Maximal Unique and Exact Matches (MUMs)**, 44

**meat**, 209–15

**fermentations**, 34–5, 209–15

**and flavor**, 322

**fitness traits of Lact. sakei**, 212–13

**medical disorders/diseases**
- animals, 144–58
- pigs, 151–2
- poultry, 153–4
- ruminants, 148–9

**humans**
- bacteriocins, 88–90
- gastrointestinal see gastrointestinal tract
- mucosal delivery of health molecules using engineered bacteria, 170–90
- probiotics in prevention and treatment, molecular mechanism, 164

**see also** infection

**membrane, transport across** see transmembrane transport

**metabolism**, 1–24

**flavor compound formation in fermented foods**, 324–8

**high-value metabolites**, 297–313

**Lactobacillaceae**, 28

**Lact. rhamnosus**, 126–7

**Lact. sakei** and meat fermentation, 212–13, 214

**novel aspects of regulation in post-genomic age**, 12–15

**proteomic studies**, 16, 159, 161–2, 165

**vegetable and fruit fermentations**, 217, 219, 221, 224

**phenolics**, 226, 227

**wine quality affected by**, 237–41
metabolomics and metabolism, 16
metagenomics, 12
intestine, 123–4
methanethiol, 321
methionol, 319
methionine metabolism in winemaking, 240
methyl acetate, 319
methyl-directed mismatch repair systems, 112
2-methylbutanal, 319
2-methylbutanoic acid, 317
3-methylbutanoic acid, 317
2-methylbutanol, 318
3-methylbutanol, 318
3-methylbutyl acetate, 320
methyglyoxal, 326
methylthioninone, 81
2-methylpropanal, 319
methylpropanoate, 319
2-methylpropanol, 318
metritis, ruminant, 149
microbiome and microbiota, 120–43
cocoa bean fermentations, 256–7
human gut, 120–43
vitamin B group and, 283–4
non-human animals (incl. intestine), 120–43
pigs, 150
poultry, 152
ruminants, 147–8
raw fruits and vegetables, 216–18
grapes, 247
raw milk/cheeses, 201–2
micro-particulated whey protein concentrate
(MWPC), 198
milk
bioactive peptides, 301–3
cow’s see cow’s milk
flavor and fermented milk, 322
probiotic fermented milk, 195, 196, 306, 317–21
antihypertensive activities, 303
B group vitamins, 281, 285, 287
in malnutrition model, 135–8
raw see natural milk
MIP (major intrinsic protein), 56–7
mismatch repair systems, methyl-directed, 112
mleA, 238
molecular mechanisms of probiotic action, proteomic studies, 161–5
molecular typing
Oenococcus oeni, 233
vegetable and fruit LAB isolates, 217–18
monosaccharides
in exopolysaccharides, 306
metabolism, 1–3
MSA (mannose-specific adhesion), 348
mucosa, host (predominantly GI tract)
adhesion mechanisms, 162–4 engineering for delivery of health molecules to, 170–90
immunity
health molecule effects on, 182
in malnutrition, fermented milk and effects on, 136, 137
in stress, probiotic effects on, 139
multidrug resistance (MDR) pumps, 60, 63, 65, 71
multidrug/oligosaccharide/polysaccharide (MOP) porters, 60, 63, 71
multi-locus sequence typing (MLST), Oenococcus oeni, 233
mycobacteriophages, 108, 111, 112
myovirus, 102
NADPH-dependent glyceraldehyde-3-phosphate dehydrogenase gene (gapB), 283
natural (raw) milk
cheese from, 192, 193, 201–2, 353
cultures
cow’s milk, 201
ewe’s milk, 201, 202
NICE (nisin-controlled gene expression), 173–4, 179, 182, 184
NiCoT family, 65, 66, 67
Nigeria, cocoa bean fermentation, 260, 262
nisin, 58, 81, 181, 183, 194, 195
applications, 88, 89, 90, 92, 93
biofilms and, 353, 354
mode of action, 84
nisin-controlled gene expression (NICE), 173–4, 179, 182, 184
resistance, 87–8
nonanal, 318
2-nonanone, 320
non-starter LAB, 10, 192, 202, 326, 332, 345
donor-structural protein-4, rotaviral, 182
Nrap family, 65–6, 67, 72
NSP4 (non-structural protein-4), rotaviral, 182
nukazuke, 286
nutraceuticals, 298–306
definition, 279, 298
nutrient transport and utilization, 71
GI tract, 126
nutritional supplement see supplement
octanal, 318
octanoic acid, 317
2-octanone, 320
odor
body, treating, 90
food see flavor
Oenococcus (incl. Oenococcus oeni), 9, 225, 231, 232, 233–4
strain level typing, 233
wine environment, 35, 233–4
oligopeptides, 8, 34, 89
oligosaccharide metabolism, 3
prebiotic, 165
see also multidrug/oligosaccharide/polysaccharide porters
olives, biofilms, 343
ORFans, 45
organocation transporter (OCT) family, 59
organophosphate:phosphate antiporter family, 59
origin of replication (ori), vectors and, 107, 172
ornithine, 11
wine, 239, 240
orodental health, 88
caries, 91, 181, 352
oxidative stress and reactive species of oxygen, 39, 177
inflammatory bowel disease and, 177
*Lact. sakei* and resistance to, 213

P-type ATPases, 67, 68
P170 system, 173, 175
pan-genome, 32–3, 40–5
parasitic diseases, 183–4
pathogenic microbes incl. bacteria
attenuated forms as vectors or in vaccine delivery, 170
bacteriocins and, 88
*Lact. sakei* meat fermentations and, 212
probiotic islands (in GI tract) and, 36
sharing same intestinal environment, 37
pCWA, 173, 175
pCYT, 173, 175
*pdu*, 37, 39, 112, 291
pediocin(s), 45, 59, 86, 88, 93
pediocin-like bacteriocins, 81–3
*Pediococcus*, wine environment, 35
2,3-pentanedione, 321, 326
1-pentanol, 317
2-pentanol, 318
3-pentanone, 320
pentose phosphate (PP) pathway, 28, 212, 237, 283
peptidases, 8–9
peptides
bioactive, 301–3
signal, 175
uptake, 71
permeases, 1, 4, 61, 65, 69, 70
pernicious anemia, 284, 288
personal hygiene, oral cavity, 88
phages see bacteriophages
phenol, 318
phenolic compounds (incl. polyphenols), 224–6
cocoa bean, 251, 252, 267, 268
wine, 239
phenotype
genotype and, relationships between, 28–9
*Lact. sakei*, diversity, 210, 214

Phenotype MicroArray™ technology (and global phenotypic characterization of microbial cells), 17
phenylacetaldehyde, 319
phenylethanol, 318
phosphorylation, protein, 163
phosphotransferase systems (PTS), 1, 68–71
mannose, 69, 85, 87
phylogenetic tree, Lactobacillaceae, 26
pickled cucumbers and other vegetables, 223
see also nukazuke
pigs and piglets, 150–2
pili, 348
biofilms and, 348, 349
spcCBA, 37, 124, 127, 128
plant foods see fruits and vegetables
plasmids, 172
for DNA delivery/protein production, 172, 175
therapeutic applications, 178, 179
integrative, 107
*Oenococcus oeni*, 234
*Plasmodium*, 183
podovirus, 102, 103
polyphenols see phenolic compounds
polysaccharides
capsular (CPS), 196, 306, 348, 350
extracellular see extracellular polymers
dorm-forming toxins
LABs, 57, 58
*Listeria monocytogenes*, 181
postbiotics, 164, 166
postpartum infection of ruminants, 149–50
prebiotics, 164–5
pregnancy and folate, 284
probiotics, 36–9, 90–2, 134–69
acid resistance, 39–40
animals, 144–58
classification and regulatory criteria, 146
specific livestock types, 147–54
bacteriocin-producing, 90–2
biofilms and, 352–3
dairy fermentations, 195–6
definition, 36, 145, 279
folate production, 286–8
immunosuppressed hosts, in, 134–42
probiotic islands, 36–9
proteomic studies, 159–68
vegetable and fruit fermentations, 221, 226–8
vehicles for delivery, 228
proline-specific peptidases, 9
promoters, inducible, 172, 173, 174–5
propanal, 318
2,3-propanediol, 307
1-propanol, 317
2-propanol, 318
2-propanone, 320
prophages, 101, 102, 111, 112
propionate, 300
propionic acid bacteria (PAB) in animals, 149
poultry, 153
protective cultures, 193–5
protein(s)
  degradation, 7–8
  see also proteolysis
  engineering genetic tools for delivery of, 172
  extracellular see extracellular polymers
  see also amino acids
proteolysis (and proteases), 6–11
  cell-envelope proteinase (CEP), 7–8, 192, 302
  dairy environment, 34
  flavor and, 326, 327, 328
  regulation, 15
  technological applications, 10
  see also antiproteases
proteomics
  metabolism and, 16, 159, 161–2, 165
  probiotic studies using, 159–68
protozoan infections, 183–4
  prtB/prtH/prtP/prtS, 7–8
Primus avium fermentation, 219
pSEC, 173, 175
pSIP system, 174
putrescine, 11
  wine, 240
pyruvate, 6, 238, 265, 326
  vegetable and fruit fermentations, 224
  pZn system, 173, 174
Qualified Presumption of Safety (QPS), 92, 197, 324
quorum sensing, 40, 346, 347
R4 phage (of Streptomyces), 108
raw fruits and vegetables, microbiota see microbiome and microbiota
raw milk see natural milk
reactive oxygen species see oxidative stress
receptors, phage, 104
recombinant strains see genetic engineering
recombination
  homologous, engineering of recombinant DNA by, 110–13
  phage integration via, 106
  recombineering, 110–13
regulatory T cells, 178
resistance/modulation/division (RND) exporters, 60–3, 66, 71
respiratory diseases, allergic, 179–80
restriction/modification systems and phages, 105
reuterin, 37, 112, 194, 291
ribitol, 298, 299
riboflavin (vitamin B2), 280, 281–4, 306
ribose, Lact. sakei grown on, 212
ripening, cheese, 16, 56, 192–3, 195, 202, 326, 327, 332, 333, 342, 353
RNA
  antisense, in antiphage strategies, 106
  CRISPR (crRNA - interfering RNA), 108, 109
roasting of fermented dry cocoa beans, 253, 258, 270
ropiness disease, wine, 241
roseoflavin-resistant strains., 280, 282, 283
rotavirus, 192–3
  animals, 90, 151
ruminants, 147–50
S-layer protein (slpA), 164
saccharides see sugars
Saccharomyces cerevisiae, cocoa bean fermentations, 258, 259, 269, 272, 273
sactibiotics, 81
sakacins, 59, 86–7, 88, 353
Salmonella
  pigs, 152
  poultry, 153, 154
sauerkrauts, 221–2
sausages
  biofilms, 343
  fermented, 209, 210, 213
SDP (sortase-dependent protein), 347–9, 350
SecDF, 62, 63, 72
secondary carriers, 59–63, 67, 69, 71, 72
sensory properties, vegetable and fruit fermentations, 219, 221, 222
  wine, 240–1
  see also flavor
serine recombinases, 106
short-chain fatty acids, 300
shotgun (gel-free) proteomics, 160–1
signal peptide, 175
single-stranded DNA recombineering, 111–12
siphovirus, 102
site-specific recombinases, 106
slime exopolysaccharides, 197, 306
slpA, 164
Smn lantibiotics, 84
smell see flavor; odor
sorbitol, 298, 299, 300
sortase A (srtA), 7
  biofilms and, 347, 348, 349
  sortase-dependent protein (SDP), 347–9, 350
soymilk, B group vitamins, 280, 282, 283, 290–1
spaCBA, 37, 124, 127, 128
srtA see sortase A
starter cultures, 33
  adjuncts see adjunct cultures
cocoa bean fermentation, 271–3
dairy fermentations, 191–209
phages in, 103
  phage-resistant strains, 101, 199–201
vegetable and fruit fermentations, 216, 218–20, 221, 223, 229
wine and malolactic fermentations, 233, 236, 241–2
stomach, acid exposure see acid exposure
Streptococcaceae, 25, 26, 27
Streptococcus mutans surface protein antigen, mucosal delivery, 181
Streptococcus thermophilus, 34, 45
dairy fermentations, 197, 198, 199, 200, 201, 202
protein degradation, 8
Streptomyces phages, 108
stress, 39–40, 138–40
gene expression system activated under (SICE system), 173, 175
Lact. sakei and meat processing and, 213–14
oxidative see oxidative stress
probiotics and, 138–40, 161
resistance, 39–40
subacute ruminal acidosis, 148–9
subtilosin A, 81, 86
succinate, citrate conversion to, 6
sugar(s) (carbohydrates; saccharides), 1–4
low-calorie, 298–300
metabolism, 1–4
flavor compound in fermented foods, 324–6
Lact. sakei, 212–13
wine quality and, 237
prebiotic, 164–5
transport incl. uptake, 1, 3, 71
see also capsular polysaccharides; disaccharide; exopolysaccharides; fermentation; fructooligosaccharides; multidrug/oligosaccharide/polysaccharide porters; oligosaccharide
sugar porter (SP), 59
sugar refineries, biofilms, 343
sulfur compounds, volatile
and cheese flavor, 193
and wine aroma, 240
sulfur-containing amino acids, 10
wine aroma and, 240
sulfur dioxide and LAB growth in winemaking, 237
supersinfection exclusion (Sie) proteins, 104
superoxide dismutase (SOD), 39
bacteria producing, 177
superoxide radical, 39
superoxide radical, 39
supplements and additives (nutritional/food/diet)
animal feed, 145, 146, 148, 151, 152, 153, 154
B group vitamins, 282, 284, 290
fermented milk as, 135
see also fortification
supra-genome (pan-genome), 32–3, 40–5
surface protein antigen of Streptococcus mutans, mucosal delivery, 181
surfactants, biological, 348, 351–2
sweet cherry fermentation, 219
sweeteners, low-calorie, 298–300
swine influenza virus, 151
Swiss cheese, 16, 33, 332
synbiotics, 165
systematics, 26–31
see also taxonomy
systems biology, 15, 17–18
T cells in gut homeostasis, 178
see also CD4+ cells; CD8+ cells
tartaric acid, wine, 238–9
taste see flavor
taxonomy, 26–31, 40–5, 55
genomics and, 26–31, 40–5
see also families; genera
telio acids, D-alanylation, 348, 350
tempe, 291
temperature, winemaking, 236
tetanus toxin, 181
Tetragenococcus halophilus, 11, 322, 324, 332
Theobroma cacao see cocoa tree
thioether-containing amino acids, 81
thuricin CD, 81, 89
thymus in malnutrition, fermented milk and its effects on, 137
toxins
pore-forming see pore-forming toxins
tetanus, immunization, 181
TP901-1 phage, 104, 106, 107, 108, 113
transamination and cheese ripening, 327
transcription (and transcription factors and transcriptomics), in metabolic regulation, 12–15, 16
transmembrane spanners (TMS), 57, 60
ABC transporters, 64, 65
transmembrane transport, 56
gastrointestinal tract, 161
transport systems (incl. transporters)
bacteriocin producer self-immunity and, 87–8
comparative genomics, 55–79
Tree of Life, 29
tricarboxylic acids (TCA) pathway, 6, 265
Trinidad, cocoa bean fermentation, 261, 275
Trinitario (cocoa variety), 249, 255
tri peptides, 8, 9, 34
tumor necrosis factor-α (TNFα) in malnutrition and effects of fermented milk, 137
two-dimensional electrophoretic (2-DE), 159, 160
tyrosine, wine, 240
tyrosine recombinases, 106
ulcerative colitis (UC), 176, 178
U-MOP family, 64
urease and acid resistance, 39–40
uterine, ruminant
infection (=metritis), 149
microbiota, 147–8
vaccines (LAB delivery of), 46, 181–4
vagina
biofilms, 343–4, 352
probiotics in prevention of infections, 91
ruminant microbiota, 147–8, 149
valine catabolism, 10
variable number tandem repeat, Oenococcus oeni, 233
vectors
for delivery see delivery vehicles
origin of replication, 107, 172
phage integration, 106–8
vegetables see fruits and vegetables
viability of LAB, phenolics affecting, 224–5
viable but non-culturable (VBNC) LAB in foods, 332
viruses
antigens, mucosal delivery, 181–3
bacterial see bacteriophages
VIT family, 65–7, 72
vitamin(s), 279–96, 305–6
B-group, 279–96
in functional foods, 280, 283, 291, 306
vitamin B6 (riboflavin), 280, 281–4
vitamin B9, see folate
vitamin B12 (cobalamin), 37, 288–91, 306
volatile compounds, 315–16
amino acid degradation leading to synthesis of, 10
in fermented foods, 315–16
diversity and analytical methods, 317
flavor contribution, 316
sulfur-based see sulfur compounds
see also flavor
whey protein concentrate, micro-particulated (MWPC), 198
white cabbage, fermented (sauerkrauts), 221–2
wine, 35, 231–47
aroma, 239, 240
biofilms, 345
fermentation (grape juice), 231–47
primary (alcoholic), 232, 234–5, 237, 239, 240, 241–2
metabolism of LAB affecting quality of, 237–41
xylitol, 298, 299, 300
xylose-inducible expression system (XIES), 173, 174
yeast
biofilms and LAB and, 350
cocoa bean fermentations, 257–60
fermented food flavor and, 322
grapes and subsequent fermentation, 231, 232, 234, 235–6, 237, 238, 239, 240, 242
ruminant feed supplementation, 148
ygfCBA operon, 16
yoghurt, 16, 196, 197, 326
folate, 285
riboflavin, 281
yvJB, 85
zinc-inducible expression systems, 174
Zirex, 173, 174
ZIP family, 65–6, 67
zootechnical issues, 144
additives, 146
pigs, 150, 151
poultry, 152–3
ruminants, 148