

- A
- AaΦ23-like phage, 133, 134–135
- ABC transporters, 19, 414–415
- Abscesses, periodontal, 255, 355–356, 359–360, 395–396
- Acid tolerance, 52, 109–114, 250
- Acid-base cycling in oral cavity, and pathology, 108–109, 114, 124
- Acid-base physiology of oral bacteria, 108–115
- acid tolerance, 52, 109–114, 250
- alkali production and tolerance, 109–110, 114–115
- and cariogenesis, 108–109, 111
- Acid-fast staining, 5
- Acquired (adaptive) immunity. *See* Immune system, adaptive immunity
- Acquired immunodeficiency syndrome (AIDS), 319, 321–322, 430–431
- Actinobacillus actinomycetemcomitans*
- AaΦ23-like phage in, 133, 134–135
- aggressive periodontitis and, 193, 198–199, 255
- colony morphology variations in, 272
- epithelial internalization of, 104, 271–272
- JP2 clone, 193, 198–199
- natural transformation in, 132
- in periodontitis, 224–225, 259–260
- plasmids for research in, 157, 158
- population genetics of, 191, 193, 198–199
- strain variations in virulence, 194
- virulence traits of, 259–260, 268–273, 283
- Actinomyces naeslundii*, 224
- Actinomyces* spp.
- in cariogenesis, 233, 252
- in pulpal infections, 356
- Acute-phase proteins, 27
- Acyclovir, 329, 330
- Adaptive immunity. *See* Immune system, adaptive immunity
- Adhesins, 20, 55, 92–93, 95–96
- Adhesion
- of *Actinobacillus actinomycetemcomitans*, 270–271
- bacterial surface structure and molecular promoters of, 91–94
- of *Eikenella corrodens*, 276
- to epithelial cells, 51, 96, 104, 275, 278
- of *Fusobacterium nucleatum*, 277
- host-specific constraints on, 51–53, 90, 91, 96, 101–104
- mechanisms of, 94–96
- and metabolic processes, 96–98
- pellicle and, 51, 53–55, 68–69
- in plaque formation, 20–21
- of *Porphyromonas gingivalis*, 264–265
- of *Prevotella intermedia*, 278
- of *Streptococcus mutans*, 247–250
- of *Tannerella forsythia*, 279
- of *Treponema denticola*, 274–275
- Adhesion receptors, pellicle, 51, 55, 68–69
- Aerobic bacteria, 18
- Aerosol transmission, 426–427
- Agarose gel electrophoresis, 77
- Age of host, and oral bacterial colonization, 53, 90. *See also* Children, oral microbial colonization in
- Agglutinins, in saliva, 66–68, 210
- Aggressive periodontitis. *See* Generalized aggressive periodontitis; Localized aggressive periodontitis (LAP)
- AIDS (acquired immunodeficiency syndrome), 319, 321–322, 430–431
- Airborne routes of infection, 426–427
- Alcohol consumption, antibiotic interactions and, 404
- Alkali production, 109–110, 114–115
- Allelic exchange mutagenesis, 176, 177
- Alpha interferon, 330–331
- Alveolar abscesses, 255, 355–356, 359–360, 395–396
- Ameloblasts, 238
- Amelogenin, 238
- Amino acid metabolism by bacteria, in periodontal pockets, 109–110, 114–115
- Aminoglycoside antibiotics, 387
- Ammonia production, 109–110, 114–115, 250
- Amphotericin B, 345
- Ampicillin resistance, 408
- Amplicon, 141
- Amylase, salivary
- binding to streptococci, 70–71, 93–94
- function of, 65
- Anaerobic bacteria
- characteristics of, 18–19
- culture of, 84–86
- oxidative metabolism and, 118–119
- in plaque of periodontitis, 57–58
- Anaerobic culture chamber, 86
- Angular cheilitis, 342, 343–344
- Animal model studies
- of cariogenesis, 220–221, 239–242
- of periodontal disease, 286–289
- Antibiotic resistance, 405–421. *See also specific antibiotics and antibiotic classes*
- biofilms and, 62, 122–123, 400–401
- efflux pumps and, 414–416, 420
- integrons in, 411–412, 418–419
- measurement of, 392–393
- mechanisms of, 407–408, 419–421
- mutations and, 412–414
- in nosocomial infections, 424
- in oral bacteria, 401, 416–418
- plasmids in, 135, 136, 405–407, 409, 410–411, 418–419
- transposons in, 138, 408–410, 418–419
- Antibiotic sensitivity testing, 87–88
- Antibiotics, 379–405. *See also specific antibiotics and antibiotic classes*
- antimetabolite antibiotics, 380, 390–391
- antimicrobial resistance to. *See* Antibiotic resistance
- cell wall synthesis inhibitors, 380–385
- classification of, 379–380
- in combination treatment, 391–392
- in dental practice, 393–405
- development of, 421–422
- drug interactions and, 402–405
- in endodontic therapy, 358
- nucleic acid synthesis inhibitors, 380, 388–389
- for odontogenic infections, 358, 392–400
- abscesses and cellulitis, 395–396
- periapical infections, 394–395
- pericoronitis, 400
- selection of, 396–400
- for periodontitis, 394, 400–403
- potency of, 392–393
- prophylactic use of, 394, 402, 403
- protein synthesis inhibitors, 380, 385–388

- Antibiotics (*cont.*)
 subgingival delivery systems for, 401–402
 for tuberculosis, 391
- Antibodies, 31–37, 44. *See also* Immunoglobulins
 affinity and avidity of, 34
 B lymphocytes in production of, 29, 42–43
 classes of, 34, 35
 cross-reacting, streptococcal, 221–222, 245–246
 differential properties of, 34–35
 in gingival crevicular fluid, 218
 helper T cells in production of, 42–43
 in localized aggressive periodontitis, 255, 285
 mechanisms of protection by, 35–37
 in mucosal defenses, 35–36
 in periodontitis, 255, 282, 285, 293
 in saliva. *See* Secretory immunoglobulin A
 structure and specificity of, 31–34
- Antibody-dependent cytotoxicity, 37
- Anticoagulants, antibiotic interactions with, 404
- Antifungal therapy, 338–340, 348
- Antigen I/II (SpaP), 244–245
- Antigen-antibody complexes, 34, 287
- Antigenic determinant (epitope), 33, 34
- Antigen-presenting cells, 323–324
- Antigens
 lymphocyte recognition of, 37–39
 T lymphocyte processing of, 38–40
 in vivo induced antigen assay for, 180–182
- Antimetabolite antibiotics, 380, 390–391
- Antimicrobial agents. *See also* Antibiotics
 biofilm physicochemical gradients, and resistance to, 122–123
 in endodontic therapy, 358–359
 types of, 379
- Antiretroviral therapy, 329–330
- Antiviral compounds and therapies, 329–331, 332
- Aphthous lesion, 309
- Apoptosis, 43–44
- Arbitrary primer PCR, in bacterial strain typing, 196
- Archaea, 4, 7
- Arginine, in ammonia production, 114–115
- Arthus-type reactions, in periodontitis, 287
- Aspergillosis, 345–346
- Aspergillus fumigatus*, 337
- Atherosclerotic plaques, 266, 359, 373–375
- ATP-binding cassette (ABC) transporters, 19, 414–415
- Attenuated vaccines, 327–328
- Australia antigen, 314
- Autoimmunity, streptococcal systemic infection and, 371–372
- Autoinducers, 99–100
- B**
- B lymphocytes
 antibody production by, 29, 42–43
 antigen recognition by, 37, 38
 mucosal, 217
 in response to viruses, 323–324
 T cell interactions, 42–43
- Bacteremia
 antibiotic prophylaxis for, 394, 402, 403
 causes of, 108
Porphyromonas gingivalis and, 266, 373–375
 systemic consequences of, 359, 361, 368
- Bacteria. *See also* Oral microbiota; *names of specific organisms*
 acid tolerance in, 52, 109–114, 250
 adaptations of, to oral environment, 107–108
 adhesion of. *See* Adhesion
 agglutination of, 36, 66–68
 alkali production and tolerance of, 109–110, 114–115
 antibiotic resistance in. *See* Antibiotic resistance
 in cariogenesis. *See* Cariogenic bacteria
 classification of. *See* Classification of bacteria
 coaggregation of. *See* Coaggregation
 colonization by, 53, 90–91. *See also* Adhesion
 genetic organization of, 15–17
 genome sequences of, 15, 74–75, 81–83, 126–127
 growth phases of, 17–20
 identification of. *See* Identification of bacteria
 immobilization of, by antibodies, 36
 interactions of/communication between, 20–22, 99–101, 123
 isolation of, from clinical samples, 76–77
 metabolism of, and adhesion, 96–98
 microscopy of, 84
 mucosal interactions of. *See under* Epithelium, mucosal
 naming of, 83
 nutrition of
 coaggregation and, 96–98
 plaque nutrient levels and, 121, 123
 saliva as source of, 70–71
 transport proteins in, 19
 oral cavity clearance of, 66–68
 oral cavity organisms. *See* Oral microbiota
 oxidative damage, 18, 52, 117–121
 oxidative damage in. *See* Oxidative damage
 oxygen metabolism in, 18–19, 117–120
 in periodontal diseases, 255–258. *See also* Periodontal
 pathogens; *specific organisms*
 physiology of. *See* Microbial physiology
 in plaque formation. *See* Biofilms; Plaque
 population genetics of. *See* Population genetics
 in pulpal infections, 351, 353–356, 359–360
 saliva interactions of, 65–71
 sampling techniques for, 75–76
 staining of, 5
 structural components and products of
 capsule, 12–13
 cell wall peptidoglycan, 10
 cytoplasmic membrane, 7–9
 endospores, 14
 fibrillar layer, 13
 fimbriae/pili, 13, 92
 flagella, 13–14
 lipopolysaccharide, 9–10
 lipoteichoic acid, 10–12
 s-layer, 14
 vesicles, 14
 surface structural components of, and adhesion, 91–94
 typing of strains of, 195–197
- Bacterial clearance in oral cavity, 66–68
- Bacterial endocarditis. *See* Endocarditis, infective
- Bacteriocins, 21–22, 101
- Bacteriophages
 characteristics of, 16
 in horizontal genetic transfer, 129
 of oral bacteria, 133–135
 virulent vs. temperate, 132–133, 134

- Bacteroides forsythus*. See *Tannerella forsythia*
 Bead beating, DNA recovery technique, 76–77
 Behçet's disease, 371, 372
 β -Lactam antibiotics, 383–384, 396, 418, 419–420
 β -Lactamase, 407, 418, 419–420
 β -Lactamase inhibitor antibiotics, 385
 Biofilms. See also Plaque
 antibiotic resistance and, 62, 122, 400–401
 bacterial interactions in, and pathogenicity, 21–22
 community composition of, 20–22
 defined, 20
 in dental water lines, 433–435
 formation of, 63
 physiological gradients in, 121–123
 structure and biology of, 61–62
 Biohazardous waste disposal, 440, 443, 445
 Births, preterm, 375
 BLAST search engine, 74, 183
 Blastomycosis, 346–347
 Bone resorption/destruction
 Actinobacillus actinomycetemcomitans and, 273
 cytokine IL-1 in, 287
 immune factors in, 285–286
 mouse studies of, 288
 Porphyromonas gingivalis and, 267–268
- C**
 Calcium hydroxide, 359
 Calculus, formation of, 58–61
 Calprotectin, 206
Candida albicans, 340–341. See also Candidiasis
 overgrowth of, 208
 prevalence of, in oral cavity, 333, 336
 replication of, 335
 and stomatitis, in AIDS, 321
 virulence factors of, 337
Candida spp., drug resistance in, 340
 Candidiasis, 341–345
 clinical conditions, 341–344
 predisposing factors, 336, 341
 treatment of, 344–345
Capnocytophaga spp., 279
 Capnophilic bacteria, 19, 84
 Capsid, 297
 Capsules, 12–13, 264
 Carbapenem antibiotics, 383, 384
 Carbohydrate ingestion
 and cariogenesis, 202, 234, 235, 241
 and pH changes, 114, 235
 Cardiovascular disease, 266, 359, 372–375
 Caries, 233–252. See also Cariogenesis; Cariogenic bacteria
 bacterial etiology of, 233, 237, 252
 genomic research in, 251–252
 immunization against, 220–224, 242–243, 244–247
 incidences of in populations, 235–236
 locations of, 237–239
 models for study of, 220–221, 239–242
 molecular techniques in study of, 247–252
 and pulpal infections, 351–352
 Caries scoring, 241
 Cariogenesis
 alkali production and, 114
 carbohydrate ingestion and, 202, 234, 235, 241
 Cariogenesis (*cont.*)
 immunology of, 242–244
 oral pH and, 51–52, 108–109, 111, 235
 Cariogenic bacteria. See also *Actinomyces* spp.; *Lactobacillus* spp.;
 Streptococcus mutans; *Streptococcus sobrinus*
 acid tolerance in, 111–112
 and biofilm composition, 21
 glucan and fructan production by, 12–13, 247–250
 serotypes and subgroups of, 237
 species involved, 233, 252
 Caspofungin, 340, 345
 Catabolite repression, 132
 CD4 cells, 42, 217, 319–321, 323
 CD8 cells, 42, 217, 323
 cDNA microarrays, 251–252
 Cell wall
 of bacteria, 10
 of fungi, 334, 340
 Cell wall synthesis, as antibiotic target, 380–385
 Cell-mediated immunity
 antibody interactions and, 37
 innate, 23–24
 T lymphocytes in, 43
 Cellulitis, treatment of, 395–396
 Cementum, 50, 238
 Cephalosporin antibiotics, 383, 384, 396, 399
 CGF. See Gingival crevicular fluid
 Checkerboard analysis, 80–81
 Cheilitis, candidiasis-associated, 342, 343–344
 Chemotaxis disruption, by *Actinobacillus actinomycetemcomitans*,
 272–273
 Chemotaxis, in virulence of *Treponema denticola*, 274
 Chicken pox, 311
 Children, oral microbial colonization in, 90, 91, 193, 256, 257
 Chloramphenicol, 387
 Chlorhexidine, 223–224
 Chromogranin, 211
 Chromosomal integration of cloned DNA, 160–161
 Chromosomes, bacterial, 15–16
 Chymotrypsinlike proteinase complex. See Dentilisin
 Ciprofloxacin, 397
 Cistron, defined, 126
 Clarithromycin, 397
 Classification of bacteria. See also Molecular analysis techniques
 culture-based techniques for, 73, 87
 name assignment in, 83
 population genetics and, 187–189, 196–197
 ribosomal 16S DNA and, 74–75, 83
 schemes for, 4–6
 Clindamycin, 387–388, 396–397, 401
 Clinical samples, collection of, 75–76
 Clonal population structure, 187–188
 Cloning
 DNA, 169–172
 ribosomal 16S, 74–75, 81–83
 Clotrimazole, 345
 CMV (cytomegalovirus), 312, 325
 Coaggregation
 and adhesion, 92–94
 of *Fusobacterium nucleatum*, 277
 mutual benefits of, 96–98
 of *Porphyromonas gingivalis*, 264–265

- Coaggregation (*cont.*)
of *Prevotella intermedia*, 278
of *Tannerella forsythia*, 279
of *Treponema denticola*, 275
- Colitis, antibiotic-associated, 404–405
- Colonization/adhesion of bacteria. *See also* Adhesion
in children, 90, 91, 193, 256, 257
host factors in, 51–53, 90, 91, 96
- Colony phase variation, in *Actinobacillus actinomycetemcomitans*, 272
- Commensal oral microbiota
in host defenses, 208, 214
immune regulation of, 218–219
population genetics of, 191–192, 200
potential systemic pathogenicity of, 362–366
transmission of, 191–192
- Competence
defined, 129
in gram-negative bacteria, 132
in streptococci, 100, 130, 131, 132, 166
- Competence-stimulating peptide, 100–101
- Complement system, 24, 26–27, 37
- Complementation, 139, 145–146
- Condyloma, 313
- Conjugation, 17, 129–130, 135–138
- Contact routes of infection, 428
- Contraceptives, oral, antibiotic interactions with, 404
- Coronary artery disease, 266, 359, 373–375
- Coumarin antibiotics, 389
- Cowpox vaccine, 326–327
- C-reactive protein, 372–373
- Creutzfeldt-Jakob disease, 431–433
- Crevicular fluid. *See* Gingival crevicular fluid
- Cross-infection. *See also* Infection control
defined, 423
dental water lines and, 433–435
emerging infectious diseases and, 430–433
routes of infection spread and, 427–430
sources of, 426–427
- Cross-reacting antibodies, streptococcal, 221–222, 245–246
- Cryptococcosis, 346
- Cryptococcus neoformans*, 334, 337
- Culture mediums, 86–87, 338
- Culturing
endodontic therapy and, 356–357
of fungi, 338–339
of oral bacteria, 73, 84–88
- Cystatins, 210–211
- Cytochrome P-450 system, in drug interactions, 402–404
- Cytokines
functions of, 27
genetic variability in, 290–291
induction of acute-phase proteins by, 27
induction of, by *Eikenella corrodens*, 276
in mucosal defenses, 367
in periodontitis, 5, 225, 284–285, 287, 293
- Cytolethal distending toxin/immunosuppressive factor, 268–269, 293
- Cytomegalovirus (CMV), 312, 325
- Cytoplasmic membrane, 7–9, 19
- Cytoplasmic pH, relative to environmental pH, 111
- Cytotoxic T cells, 29, 43, 323–324
- Cytotoxicity
of *Actinobacillus actinomycetemcomitans*, 268–269, 293
antibody-dependent, 37
cell-mediated, 43–44
of *Fusobacterium nucleatum*, 277
- D
- Defensins, 205–206
- Dendritic cells, 39, 41–42, 322
- Dental calculus, formation of, 58–61
- Dental plaque. *See* Plaque
- Dental water lines, infection control in, 433–435
- Dentilisin, 273, 275
- Dentin, 49, 238
- Derjaguin-Landau-Vervey-Overbeek theory, 94
- Desquamation, as host defense, 207
- DIC (disseminated intravascular coagulation), 370
- Dimorphic fungi, 334–335
- Disinfectants, 442, 445
- Disinfection, defined, 436
- Disk diffusion test, quantitative, 392–393
- Disposal of infected wastes, 440, 443, 445
- Disseminated intravascular coagulation (DIC), 370
- DNA
bacterial, 15, 16
viral, 296
- DNA cloning, 169–172
- DNA databases, 74, 183
- DNA fingerprinting, in typing of bacterial strains, 195–196
- DNA hybridization assays, 80–81, 173, 183–185
- DNA polymerase, 170, 173
- DNA recovery from clinical samples, 76–77
- DNA replication
in bacteria, 15–16
in fungi, 335
in plasmids, 146–151
in viruses, 300–301
- DNA transfer. *See* Genetic transfer
- DNA viruses, 296, 300–301, 306
- Drug interactions, antibiotics and, 402–405
- Drug resistance. *See also* Antibiotic resistance
to antifungal agents, 340
to antiviral agents, 330
- E
- EBV (Epstein-Barr virus), 312, 322
- Ecological plaque hypothesis of periodontal disease, 257–258, 293
- Efflux pumps, and antibiotic resistance, 414–416, 420
- Eikenella corrodens*, 275–277
- Electrophoresis, 77, 185, 196
- Electroporation, 141
- Enamel
acquired pellicle of, 207–208
characteristics of, 48–49, 237–238
development of, 238
- Endocarditis, infective, 368–370, 375, 402, 403
- Endodontic therapy, 349–360
antibacterial agents in, 358–359
bacteriology of, 353–356
culturing and, 356–357
drainage and debridement in, 355, 357–358
focal infection hypothesis, 350, 359
history of, 351–353

- Endodontic therapy (*cont.*)
infection sources, 351–353
one-visit therapy, 357
- Endoflagella, 153
- Endospore production, 14
- Endothelium
Porphyromonas gingivalis invasion of, 265–266
Treponema denticola adhesion to, 275
- Endotoxin, 9–10. *See also* Lipopolysaccharide
Enterococcus faecalis, in pulpal infections, 355, 359–360
- Envelope, viral, 297
- Environment, and gene expression, 363–366
- Enzymes, fungal, 337
- Epidemic population structure, 188–189
- Epithelial antibody receptors, 207
- Epithelium, mucosal. *See also* Mucosa
antibody-mediated defenses of, 35–36
bacterial colonization of, 107
bacterial internalization by, 61–62, 101–104, 293
Actinobacillus actinomycetemcomitans, 104, 271–272
Porphyromonas gingivalis, 102–104, 265
Prevotella intermedia, 278
growth inhibition of, by *Eikenella corrodens*, 276–277
microbial adhesion to, 51, 96, 104, 275, 278
microbial communication with, 101–104
properties of, 50–51
- Epitopes, 33, 34
- Epstein-Barr virus (EBV), 312, 322
- Erythematous candidiasis, 342–343
- Erythromycin, 388, 397, 399
- Erythromycin resistance cassette, 141, 144
- Eukaryotes, 4–5
- Exopolysaccharide, of *Eikenella corrodens*, 276
- External defenses, host, 25
- Extracellular amorphous material, 270
- Extracellular matrix proteins
Actinobacillus actinomycetemcomitans adhesion to, 271
Fusobacterium nucleatum adhesion to, 277
Prevotella intermedia adhesion to, 278
and streptococcal pathogenicity, 363–364
Treponema denticola adhesion to, 274
- F**
- Facemasks, 439–440
- Facultative anaerobes, 18–19, 84–85, 118–119
- Fas-mediated apoptosis, 43–44
- F-ATPase, 111, 112–113
- Fc receptors, genetic variability in, 291–292
- Fc-binding proteins, 269
- Fenton reactions, 118
- Fibrillar layer, of gram-positive bacteria, 13
- Fibroblasts, *Treponema denticola* adhesion to, 274
- Fimbriae
of *Actinobacillus actinomycetemcomitans*, 270
and bacterial adhesion, 92
characteristics of, 13
of *Porphyromonas gingivalis*, 263–265, 267
of *Prevotella intermedia*, 277–278
- FISH (fluorescent in situ hybridization), 83–84
- Flagella, 13–14, 36, 153
flgE mutation, in *Treponema denticola*, 153–156
- Fluconazole, 340, 345
- Flucytosine, 339–340, 348
- Fluorescent in situ hybridization (FISH), 83–84
- Fluoride
biofilm physiochemical gradients of, 122–123
and enamel formation, 238
mechanisms of action of, 122–123, 124
and reduction of caries incidence, 235–236
- Fluoroquinolone antibiotics, 389, 397, 399, 404, 412–413
- Focal infection hypothesis, 350, 359
- Fructan, cariogenic bacteria production of, 12–13
- Fructosyl transferase, 234, 247–250
- ftf* gene, of *Streptococcus mutans*, 248–250
- FUN genes, 183
- Fungal infections, 341–348
aspergillosis, 345–346
blastomycosis, 346–347
candidiasis, 336, 341–345
cryptococcosis, 346
histoplasmosis, 346
mucormycosis, 347
paracoccidiomycosis, 347
treatment of, 338–340
- Fungi, 333–348. *See also* *Candida albicans*; Fungal infections
acid tolerance in, 109
biology of, 333–335
culture and identification of, 338–339
host defenses against, 337–338, 348
pathogenicity of, 5, 335–337
- Fusidic acid, 388
- Fusion PCR, 144, 162–163
- Fusobacterium nucleatum*, 277
- G**
- $\gamma\delta$ T-cell receptor, 213–214
- GB virus C (GBV-C), 300, 304–305
- Gel electrophoresis, two-dimensional, 185
- GenBank, 74, 183
- Gene chips, 251–252
- Gene expression
bacterial communicator molecules and, 99–100
regulation of, 98, 99–100, 139, 178–182
in *Streptococcus mutans*, 251
in systemic pathogenicity of commensals, 363–366
- Gene expression research
DNA cloning and, 169–172
PCR amplification and, 172–175
reporter genes in, 139, 178–179
in vivo induced antigen technology in, 180–182
- Gene function research, 138–141, 175–178
- Generalized aggressive periodontitis, 255, 293
- Genetic susceptibility, in periodontal disease, 289–292
- Genetic transfer, 126–138, 166–167. *See also* Horizontal transmission; Vertical transmission
plasmids and bacteriophage in, 16–17. *See also* Vectors
in population evolution, 189–190
in streptococci, 100, 125, 130–131
in transformable bacteria, 162–163
transposon mutagenesis in, 163–166, 176–178
vectors in. *See* Vectors
- Genetic vaccines, 329
- Genetics of bacterial populations. *See* Population genetics
- Genetics terminology, 125–126
- Genome databases, 74, 127, 183

- Genome/genome sequencing
 bacterial, 15, 74–75, 81–83, 126–127
 viral, 296–297, 304–305
- Genomics
 applications of, 126, 182–183
 in caries research, 251–252
- Genotype, defined, 125
- Gingiva, anatomy of, 50
- Gingival crevicular fluid (CGF)
 constituents of, 71, 201, 203, 217–218
 normal flow of, 71, 201
 as oxygen source, 115
 in saliva, 64
- Gingival sulcus
 anatomy of, 50
 host defenses in, 283–284
- Gingivitis
 AIDS and, 321–322
 description of, 253, 254
 necrotizing ulcerative, 58, 321–322
 pathogenesis of, 280–281
 plaque microbiota in, 55, 57
 of pregnancy, 261
- Glasses, 439–440
- Glossitis, median rhomboid, 344
- Gloves, 438–439
- Glucan
 in adhesion of bacteria, 94, 234–235
 cariogenic bacteria production of, 12–13, 234–235
 enzymatic formation of, 247–248
- Glucan-binding protein, 245
- Glucosyltransferase, 234, 245, 247–250
- Glycan hydrolase, 97
- Glycolysis, acid tolerance and, 111
- Glycopeptide antibiotics, 385
- Gram staining, of bacteria, 5
- Gramicidin antibiotics, 391
- Gram-negative bacteria, 5
 bacterial associations of, 97–98
 cell wall of, 10
 cytoplasmic membrane of, 7, 8
 endotoxins of, 9–10. *See also* Lipopolysaccharide
 natural transformation in, 132
 oral cavity inhabitants, 6
 in periodontitis, 246
 surface architecture of, 11
 vesicle production by, 14
- Gram-positive bacteria, 5
 cell wall of, 10
 cytoplasmic membrane of, 7
 lipoteichoic acids of outer envelope, 10–12
 oral cavity inhabitants, 6
 in periodontitis, 246, 261
 surface architecture of, 11
- Growth phases of bacteria, 17–19
- gtf* genes, of *Streptococcus mutans*, 248–250
- H**
- Haemophilus* spp., 132, 408
- Hairy leukoplakia, 322
- Halitosis, 117
- Hand, foot, and mouth disease, 309
- Handwashing, 437–438
- HAV (hepatitis A virus), 309
- Hazard, defined, 426
- HBV. *See* Hepatitis B virus
- HCC (hepatocellular carcinoma), 315, 316, 318
- HCV (hepatitis C virus), 300, 317–319
- HDV (hepatitis D virus), 317
- Heart cross-reacting antibodies, streptococcal, 221–222, 245–246
- Heat shock proteins, 370–371
- Helper T cells (Th cells), 29
 B-lymphocyte interactions, 42
 in cell-mediated immunity, 43
 in initiation of adaptive immune response, 39, 41–42
 in periodontitis, 285, 293
 in response to viruses, 323–324
- Hemagglutinins, 262–263, 274, 278
- Hemin-binding proteins, 274
- Hemolytic activity, in virulence, 274, 278
- Hepatitis A virus (HAV), 309
- Hepatitis B virus (HBV), 300–302, 314–317, 325–326, 444
- Hepatitis C virus (HCV), 300, 317–319
- Hepatitis D virus (HDV), 317
- Hepatocellular carcinoma (HCC), 315, 316, 318
- Herpes simplex viruses (HSV), 310–311, 329
- Herpes zoster, 311–312
- Herpesviruses. *See* Human herpesviruses
- HHV. *See* Human herpesviruses
- Histatins, salivary, 69, 210
- Histidine-rich proteins. *See* Histatins, salivary
- Histoplasmosis, 346
- HIV. *See* Human immunodeficiency virus
- Horizontal transmission, 16–17, 127–130. *See also* Conjugation; Transduction; Transformation
- Host adaptations, among bacteria, 190–191, 200
- Host defenses, 201–204. *See also* Immune response; Immune system
 adherent mucin layer as, 206–207
 commensal oral microbiota in, 208, 214
 epithelial. *See* Epithelium, mucosal
 against fungi, 337–338, 348
 in gingival sulcus, 283–284
 oxidative defense systems, 119
 pellicle as, 207–208
 systemic infection and, 366–368
- Host factors
 in colonization/adhesion of bacteria, 51–53, 90, 91, 96, 101–104
 in periodontal disease, 283–284, 289–292, 293. *See also* Periodontal disease, immunopathology
- HPV (human papillomaviruses), 313–314
- HSV (herpes simplex viruses), 310–311, 329
- Human herpesviruses (HHV), 309–313, 325, 329
- Human immunodeficiency virus (HIV), 319–322
 infection control and, 430–431
 postexposure chemoprophylaxis, 445
 saliva inactivation of, 70
 treatment of, 329–330
- Human leukocyte antigens, 38–39, 42, 322–324. *See also* Major histocompatibility complex
- Human papillomaviruses (HPV), 313–314
- Humoral immunity, 24–27, 209, 214–216, 322. *See also* Antibodies
- Hunter, William, 350
- Hydrogen peroxide production, 21

- Hydrolases, in virulence, 278, 279
Hydroxyl radical, 117–118
Hyphae, fungal, 334
- I
- Iatrogenic infection, 424
- Identification of bacteria, 73, 76–88
cultivation methods, 73, 84–88
DNA hybridization assays, 80–81
DNA recovery from samples, 76–77
microscopic methods, 83–84
PCR analysis in, 74, 77–79
ribosomal 16S cloning and sequence analysis in, 74–75, 81–83
- Identification of fungi, 338–339
- IL. *See* Interleukin
- Immune complexes, 34, 287
- Immune response
to cariogenic bacteria, 242–247. *See also* *Streptococcus mutans*, immunization against
to fungi, 337–338
in periodontitis, 281–282, 284–285. *See also* Periodontal disease, immunopathology
to viruses, 322–326, 332
- Immune system, 23–45
adaptive immunity, 28–44. *See also* Antibodies
antigen recognition, 37–39
initiation of response, 39, 41–42
lymphoid system and, 28–31
in oral cavity, 203, 214–219
T cell interactions, 38–39, 42–43
viruses and, 323–324
bacterial evasion of, 282–283
commensal microbiota regulation by, 218–219
innate immunity, 23–28, 44, 202–203
cellular immunity, 23–24
humoral immunity, 24–27
interface with adaptive system, 39, 41–42
on oral surfaces, 204–208
pathogen recognition by, 27–28
in saliva, 208–214
viruses and, 322–323
mucosal, in transport/translocation of microbes into systemic compartment, 362
viral evasion of, 325–326
- Immunization. *See also* Vaccines
in caries prevention, 220–224, 228, 242–247
passive, 223–224, 327
in periodontitis prevention, 227–228, 289
against viruses, 326–329
- Immunodeficiency. *See* Immunosuppression
- Immunoglobulins. *See also* Antibodies
IgA, 35, 214–215. *See also* Secretory immunoglobulin A
IgD, 35
IgE, 35
IgG, 29, 34–35, 42–43, 203
IgM, 34, 35, 203
for passive immunization, 223–224, 327
- Immunopathology, defined, 34
- Immunopathology of periodontal disease. *See* Periodontal disease, immunopathology
- Immunosuppression
in AIDS, and oral pathology, 321–322
and fungal infections, 336, 341
- Immunosuppression (*cont.*)
by *Treponema denticola*, 275
- Immunosuppressive factor, of *Actinobacillus actinomycetemcomitans*, 268–269, 293
- In vivo expression technology (IVET), 180
- In vivo induced antigen technology (IVIAT), 180–182
- Inactivated vaccines, 327–328
- Infection control, 423–446
biohazardous waste disposal, 440, 443, 445
checklist for, 440–441
in dental water lines, 433–435
emerging infectious diseases and, 430–433
information sources on, 429
instrument sterilization, 441–445
problems in dental practice, 435–437
risk management in, 423–426
routes of infection spread, 427–430
sources of infection, 426–427
terminology, 435
universal precautions in, 425, 437–440
- Infective endocarditis. *See* Endocarditis, infective
- Inflammatory response
as defense mechanism, 28, 202–203
mediators of, 28
Porphyromonas gingivalis and, 266–267
Prevotella intermedia and, 278–279
and systemic disease, 372–375
- Influenza A virus, 296–297
- Innate immunity. *See* Immune system, innate immunity
- Insertional mutagenesis, 163–166, 176–178
- Insertion-duplication mutagenesis, 176
- Instrument sterilization, 441–445
- Integration vectors, 159–163
- Integrons, in antibiotic resistance, 411–412, 418–419
- Interferon, 27, 42, 330–331
- Interleukin (IL)
induction of acute-phase proteins by, 27
in mucosal defenses, 367
in periodontitis, 225, 284–285, 287, 293
- Intracellular defenses against viruses, 322
- Intraoral devices, for caries research, 241
- Intravenous drug users, hepatitis B infection in, 316
- Isogenic mutants, 139, 145–146
- Iron-regulated replicons, 147
- Itraconazole, 345
- IVET (in vivo expression technology), 180
- IVIAT (in vivo induced antigen technology), 180–182
- J
- Jenner, Edward, 326
- Juvenile periodontitis. *See* Localized aggressive periodontitis
- K
- Ketoconazole, 345
- Knockout of genes, 145–146, 159–160
- L
- Lactobacillus* spp., in cariogenesis, 21, 233, 239, 252
- Lactoferrin, 70, 212–213
- Lactoferrin-binding proteins, 274
- LAP. *See* Localized aggressive periodontitis
- Latex hypersensitivity, 439
- Lead exposure, and enamel formation, 238
- Leeuwenhoek, Antony van, 3

- Legionella* spp., 434
 Leukotoxin, 198, 268, 273, 283, 293
 Lincosamide antibiotics, 387
 Linezolid, 386, 413–414
 Linnaeus, Carl, 4
 Lipopolysaccharide (LPS)
 of *Actinobacillus actinomycetemcomitans*, 269
 of *Eikenella corrodens*, 276
 pathogenetic effects of, 9–10, 293, 372
 of *Porphyromonas gingivalis*, 9, 263
 recognition of, by host cells, 367
 Lipoteichoic acids, 10–12
 Lithium, antibiotic interactions with, 404
 Localized aggressive periodontitis (LAP)
 Actinobacillus actinomycetemcomitans and, 193, 198–199, 255, 256, 260
 antibody response in, 255, 285
 neutrophil function in, 281–282
 plaque microbiota in, 58
 Localized juvenile periodontitis. *See* Localized aggressive periodontitis
 LPS. *See* Lipopolysaccharide
 Lymph nodes, 29–31
 Lymphocytes. *See also* B lymphocytes; T lymphocytes
 antigen recognition by, 37–39
 function of, 28–29, 44
 in initiation of adaptive immune response, 39, 41–42
 intraepithelial, 213–214, 217
 mucosal, 213–214, 216–217
 recirculation of, 31, 32
 types of, 29
 Lymphoid system, 28–31
 Lysis of bacteria, for DNA recovery, 76–77
 Lysozyme, salivary, 69, 211–212
M
 Macrolide antibiotics, 388, 397, 399, 404
 Macrophage chemoattractant protein, 367
 Macrophages
 in cell-mediated immunity, 43
 in initiation of adaptive immune response, 39, 42, 43
 in innate immunity, 23, 25, 322
 Mad cow disease. *See* Transmissible spongiform encephalopathies
 Major histocompatibility complex, 38, 292, 322–324. *See also* Human leukocyte antigens
 Malodor, oral, 117
 Masks, 439–440
 Mast cells, in innate immunity, 24, 25
 Materia alba, 54
 MBC (minimal bacteriocidal concentration), 392, 393
 Mechanical forces, and plaque formation, 52
 Membranes, bacterial. *See* Cytoplasmic membrane
 Metronidazole
 adverse effects of, 397, 404
 resistance to, 401, 413
 spectrum of, 390–391, 397, 399
 MIC (minimal inhibitory concentration), 392, 393
 Micafungin, 340
 Mice
 caries research in, 220, 241–242
 periodontal disease research in, 288–289
 Miconazole, 345
 Microaerophilic bacteria, 19, 84
 Microarrays, for DNA analysis, 80–81, 183–185, 251–252
 Microbial physiology, 107–124
 acid tolerance, 52, 109–114, 250
 acid-base cycling in oral cavity, 108–109, 114
 alkali production and tolerance, 109–110, 114–115
 in biofilms, 121–123
 oxygen levels and oxidation-reduction potentials in plaque, 116–117
 oxygen metabolism and oxidative damage, 117–121
 oxygen sources, 115
 Microscopy of bacteria, 83–84
 Minimal bacteriocidal concentration (MBC), 392, 393
 Minimal inhibitory concentration (MIC), 392, 393
 Molds, 334
 Molecular analysis techniques, 76–83, 138–141. *See also* Polymerase chain reaction; Recombinant DNA technology
 and bacterial classification, 74–75, 83
 DNA hybridization assays, 80–81, 173, 183–185
 DNA recovery from samples, 76–77
 ribosomal 16S cloning and sequence analysis, 74–75, 81–83
 Molecular biology, 169–186. *See also* Genetic transfer
 gene expression studies, 169–175
 gene function studies, 138–141, 175–178
 gene regulation studies, 178–182
 genomics, 126, 182–183
 proteomics, 185–186
 transcriptomics, 183–185
 Molecular techniques in cariogenesis research, 247–252
 Molecular techniques in population genetics research, 195–197
 Monobactam antibiotics, 383, 384
 Mosaic genes, 127, 129
 Motility, in virulence of *Treponema denticola*, 274
 Mucins
 and bacterial clearance, 66–67
 complexes formed by, 65
 as host defense, 206–207
 in saliva, 209–210
 Mucormycosis, 347
 Mucosa. *See also* Epithelium, mucosal
 anatomy of, 50–51
 antibody-mediated defenses of, 35–36
 breaches of, and systemic disease, 361–362
 defense mechanisms of, 35–36, 201–202, 208–209, 214–216, 367
 lymphocytes of, 29, 216–217
 microbial attachment to, 51, 61, 62
 Mucosa-associated lymphoid tissues, 29
 Mucosal immunization, against streptococci, 222–223
 Multilocus enzyme electrophoresis, 196
 Multilocus sequence typing, 196–197
 Mupirocin, 387
 Murein (peptidoglycan), 10, 380–385
 Mutacin, 21–22, 101
 Mutagenesis
 directed, 163–166, 175–178
 insertional, 163–166, 176–178
 Mutants, isogenic, 139, 145–146
 Mutation
 and antibiotic resistance, 412–414
 in genetic diversification, 187–188
 Mycobacterium tuberculosis, staining of, 5

Mycoplasma spp., staining of, 5

N

Naming of bacteria, 83

NAT2 gene, and periodontitis risk, 292

Natural killer (NK) cells, 24, 322–323

Necrotizing periodontal disease, 255

Necrotizing ulcerative gingivitis, 58, 321–322

Needles, use and disposal of, 440

Neutrophil defects, and periodontitis, 281–282

Neutrophils, and tissue damage in periodontitis, 282, 293

NK (natural killer) cells, 24, 322–323

Nonspecific plaque hypothesis of periodontal disease, 255–256

Nosocomial infection, 424

Nucleic acid synthesis, as antibiotic target, 380, 388–389

Nucleocapsid, 297

Nutrient acquisition

and bacterial growth, 19

and coaggregation, 96–98

from saliva, 70–71

Nutrient levels, in plaque, 121, 123

Nystatin, 344–345

O

Obligate anaerobes, 18, 84

Odontogenic infections, 392–400

abscesses and cellulitis, 395–396

antibiotic selection for, 396–400

bacterial composition of, 351–356

periapical infections, 394–395

pericoronitis, 400

Oligonucleotide checkerboard analysis, 80–81

Open reading frames (ORFs), 126, 182–183

Operator, defined, 126

Operon, defined, 126

Operon inducer, defined, 126

Opsonization, 37

Oral cavity

AIDS-related pathology in, 321–322

defense mechanisms in, 201–204. *See also* Host defenses; Immune system

ecology of. *See* Oral ecology

environment of. *See* Oral environment

microbacterial niches in, 75

microbiota of. *See* Oral microbiota

viruses causing pathology in, 308–314

Oral contraceptives, antibiotic interactions with, 404

Oral ecology, 3, 89–105. *See also* Biofilms; Plaque

bacterial intercommunication and, 20–22, 99–101, 123

bacterial–host cell communication and, 101–104

colonization/adhesion of bacteria in, 91–97

acquisition of bacteria, 90–91

bacterial metabolism and, 96–98

host surface-specific constraints, 96

mechanisms of, 94–96

surface structure and molecular promoters of, 91–94

fundamental concepts in, 20–22

gene regulation and, 98, 99–100

Oral environment, 47–71

dental biofilm formation, 61–63

gingival sulcus, 71

host and physical parameters in microbial colonization, 51–53

microbiota in, 53–61. *See also* Oral microbiota

Oral environment (*cont.*)

saliva in. *See* Saliva

soft tissues, 50–51

teeth, 47–50

Oral microbiota. *See also* Bacteria; Fungi; Viruses; *names of specific organisms*

acquisition of, 90–91, 256, 257, 335–336

antibiotic resistance in, 401, 416–418. *See also* Antibiotic resistance

of calculus, 58–61

commensal organisms. *See* Commensal oral microbiota

diversity of, 3, 73–74, 192–193

of mucosa, 61

normal flora, 5, 22, 333

pathogenicity of. *See* Pathogenicity; Virulence

physiology of. *See* Microbial physiology

of plaque, 53–57, 118–119

population dynamics in, 193. *See also* Population genetics

sampling of, 75–76

significant organisms, 6, 56

Oral mucosa. *See* Mucosa

Oral ulceration, 308–309, 310, 361–362

ORFs (open reading frames), 126, 182–183

Ornidazole, 399

Osteoclasts, activation of, 267

Osteoprotegrin, 286

Outer membrane, of gram-negative bacteria, 7

Outer membrane proteins, 273, 276

Outer membrane vesicles, 14, 264, 269

Oxidation-reduction potentials in plaque, 116–117

Oxidative damage, 18, 52, 117–121

Oxygen

intraoral levels of, 52, 116–117

sources of, 115

Oxygen metabolism, 18–19, 117–120

Oxygen radicals. *See* Reactive oxygen species

Oxygen requirements of bacteria, 18–19, 84–86

P

pAMβ1 plasmid, 147

PAMPs. *See* Pathogen-associated molecular patterns

Panmictic population structure, 188

Papillomaviruses. *See* Human papillomaviruses

Paracoccidiomycosis, 347

Parental streptococcal vaccines, adverse effects of, 221

Parenteral routes of infection, 428, 430

Passive immunization

against *Streptococcus mutans*, 223–224

against viruses, 327

Pathogen-associated molecular patterns (PAMPs), 202, 205, 367

Pathogenic bacteria, transmission of, 191–192, 427–430

Pathogenicity. *See also* Virulence

of commensals in systemic infection, 362–366

of fungi, 335–337

mechanisms of, 293

in oral biofilms, 21–22

Pathogenicity islands, 189

PCR. *See* Polymerase chain reaction

Pellicle

bacterial adhesion and, 51, 53–55, 68–69

as host defense, 207–208

salivary components of, 51, 68–69

and tooth demineralization/remineralization, 64

- Pellicle adhesion receptors, 51, 55, 68–69, 92–94
- Penicillin antibiotics, 383–384, 396, 398. *See also* Penicillin resistance
- Penicillin resistance, 401, 413, 419–420
- history of, 405
- in streptococci, 129, 132
- Penicillin-binding proteins, 129, 132, 382–383
- Peptidoglycan, 10, 380–385
- Perforin-mediated cell death, 43–44
- Periapical infections, treatment of, 394–395
- Pericoronitis, 400
- Periodontal abscesses, 255, 355–356, 359–360, 395–396
- Periodontal disease, 253–293. *See also* Gingivitis; Periodontitis
- animal models for, 286–289
- bacterial role in, 255–258. *See also* Periodontal pathogens and cardiovascular disease, 266, 359, 372–375
- host genetic factors and, 289–292
- hypotheses of, 255–258
- immunological control of, 224–228, 289
- immunopathology, 279–286
- bacterial virulence and, 225, 282–283
- of gingivitis, 280–281
- immune cells and bone resorption, 285–286
- model for, 283–285
- of periodontal tissue destruction, 281–283, 285–286
- and preterm low-birth-weight babies, 375
- and pulpal infections, 353
- terminology, 255
- Periodontal ligament, 50, 281
- Periodontal pathogens, 255–258
- A. actinomycetemcomitans*. *See* *Actinobacillus actinomycetemcomitans*
- Capnocytophaga* spp., 279
- Eikenella corrodens*, 275–277
- Fusobacterium nucleatum*, 277
- P. gingivalis*. *See* *Porphyromonas gingivalis*
- Prevotella intermedia*, 261, 277–279
- Tannerella forsythia*, 261, 279
- T. denticola*. *See* *Treponema denticola*
- virulence traits of, 261–279, 293
- virulence variation between bacterial strains in, 190, 194–195, 197
- Periodontal pockets
- amino acid metabolism by bacteria in, 109–110, 114–115
- pH in, 109
- sampling of, 75–76
- Periodontitis. *See also* Periodontal disease
- antibiotics for, 394, 400–403
- bacterial species involved in, 256
- chronic, 57–58, 253–254, 260, 292
- description of, 253–254
- generalized aggressive, 254–255, 292–293
- localized aggressive. *See* Localized aggressive periodontitis
- pathogenesis of, 281–282
- plaque microbiota in, 57–58
- viral associations with, 312
- Periodontium, 50
- Peroxidase, salivary, 70, 119, 212
- pH, cytoplasmic, regulation of in acid tolerance, 111
- pH, in regulation of gene expression, 363
- pH, intraoral
- and cariogenesis, 51–52, 108–109, 111, 235
- fluctuation of, 108–109, 114, 124
- Phage. *See* Bacteriophages
- Phagocytic cells, in innate immunity, 23–24, 202–203, 322. *See also* Macrophages; Polymorphonuclear cells
- Phenotype, defined, 126
- Phenotype detection, in cloned DNA studies, 171–172
- Pheromone peptides, in competence, 100–101
- Phylogenic classification of bacteria. *See* Classification of bacteria
- Picornaviridae*, 304–305
- Pili, 13, 276. *See also* Fimbriae
- Plaque, 53–58. *See also* Biofilms
- acid production in, 111–112
- acquired pellicle, in formation of, 53–54
- alkali production in, 109–110, 114–115
- bacterial adhesion, in formation of, 20–21, 54–55, 264–265
- bacterial colonization of, 108
- bacterial interactions in, 20–22
- maturation of, 55–57
- microbiologic composition of, 55–57, 118–119
- in gingivitis, 55, 57
- in necrotizing ulcerative gingivitis, 58
- in periodontitis, 57–58, 59
- oxidation-reduction potentials in, 116–117
- sampling of, 75
- Plaque fluid, 218, 219
- Plaquelike/nodular candidiasis, 342, 343
- Plasma cells, 29, 37, 38
- Plasma membrane. *See* Cytoplasmic membrane
- Plasmid vectors, 145–159
- essential features of, 146–151
- native, 151–156
- nonnative/broad-host-range, 157–159
- production of, 170–171
- Plasmids
- in antibiotic resistance, 135, 136, 405–407, 409, 410–411, 418–419
- categorization of, 146
- characteristics of, 16, 166
- in conjugation, 135
- conjugative vs. mobilizable, 137, 166
- in horizontal genetic transfer, 129
- markers for, 151
- in oral microorganisms, 135–137
- phenotypes associated with, 136–137
- replication mechanisms of, 146–151
- as vectors. *See* Plasmid vectors
- Platelet aggregation-associated protein, 364, 369, 371–372
- Polymerase chain reaction (PCR)
- applications of, 74, 77–79, 174–175, 196
- fusion PCR, 144, 162–163
- primer design for, 77
- quantitative PCR, 78–79
- technique description, 77–79, 141, 172–174
- Polymeric immunoglobulin receptor, 214
- Polymorphic fungi, 334–335
- Polymorphonuclear cells
- in innate immunity, 23, 25
- and tissue damage in periodontitis, 281–282, 293
- Polymyxin antibiotics, 391
- Polysaccharide capsule, of *Porphyromonas gingivalis*, 264

- Population genetics, 187–200
 of commensal bacteria, 191–192, 200
 dynamic change in oral species, 193
 evolution patterns within species, 187–189
 genetic diversity variation among species, 192–193
 host adaptations of clones, 190–191
 local recombination and, 189–190
 strain differentiation, 195–197
 strain variations in pathogenicity, 190
 virulence variations within species, 194–195, 197
- Pores, cytoplasmic membrane, 8, 9
- Porins, 9
- Porphyromonas endodontalis*, 355–356
- Porphyromonas gingivalis*
 in atherosclerotic plaques, 373–375
 colonization of, in children, 193, 256, 257
 epithelial internalization of, 102–104, 265
 in periodontitis, 259, 260
 plasmids for research in, 157–159
 population genetics of, 193, 194, 197–198
 strain variations in virulence, 194
 virulence traits of, 259, 260, 262–268, 282–283
- Pregnancy gingivitis, 261
- Preterm low-birth-weight babies, 375
- Prevotella intermedia*, 261, 277–279
- Primates
 caries research in, 221, 240
 periodontal disease research in, 286–287
- Primer design, for PCR, 77
- Prion-associated diseases, 431–433
- Prokaryotes, 4–5
- Promoter, defined, 126
- Prophage, 133–135
- Prophylactic use of antibiotics, 394, 402, 403
- Proteases
 in bacterial virulence, 282–283
 of *Porphyromonas gingivalis*, 262, 263, 266
 of *Treponema denticola*, 273–274
- Protective barriers, 438–440
- Protein identification technology, multidimensional, 185–186
- Protein synthesis, as antibiotic target, 380, 385–388
- Proteins
 of cytoplasmic membrane, 7–8
 viral, 296, 302
- Proteolytic activity, of *Treponema denticola*, 275
- Proteomics, 185–186
- Pseudomembranous candidiasis, 341–342
- Pulp cavity. *See also* Endodontic therapy
 anatomy of, 49–50, 349
 culturing of, 356–357
 infections of, 351–356. *See also* Odontogenic infections
- pVA380-1 plasmid, 150, 151–153
- Q**
- Quality assurance, 425
- Quantitative PCR (qPCR), 78–79
- Quinolone antibiotics, 389
- Quorum sensing, 99–100, 130
- R**
- R factor, 407
- Random amplified primer DNA fingerprinting, 196
- RANK-L proteins, and bone resorption, 286
- Rats
 caries research in, 220, 241
 periodontal disease research in, 289
- Reactive oxygen species (ROS), 18, 52, 117–121
- Real-time (quantitative) PCR, 78–79
- Recombinant DNA technology. *See also* Cloning
 in molecular analysis of organisms, 139–143
 in vaccine production, 328
- Regulons, defined, 126
- Replication. *See* DNA replication; RNA viruses, replication of;
 Theta replication
- Replicons, iteron-regulated, 147
- Reporter genes, 139, 146, 178–179
- Research models
 of cariogenesis, 220–221, 239–242
 of periodontal disease, 286–289
- Restorative procedures, and pulpal infections, 353
- Restriction endonucleases, 139–141, 170–171
- Restriction fragment length polymorphism, 194, 195
- Reverse capture checkerboard analysis, 80–81
- Reverse transcriptase, 170
- Ribavirin, 331
- Ribosomal 16S cloning and sequence analysis, 74–75, 81–83
- Ribosomal Database Project, 74
- Ribotyping, 195
- Rifamycin antibiotics, 388–389, 404
- Risk management, 423–426
- Risk perception, 424–425, 426
- RNA, double-stranded, as intracellular defense trigger, 322
- RNA viruses
 classification of, 296
 replication of, 300, 301
 taxonomy of, 307
- Rodents
 caries research in, 220, 240–242
 periodontal disease research in, 287–289
- Rolling-circle replication, of plasmids, 146, 147–150
- Root canal. *See* Pulp cavity
- Root surface caries, 238–239
- ROS. *See* Reactive oxygen species
- S**
- Saliva
 in adhesion of bacteria, 65
 agglutinins in, and bacterial clearance, 66–68
 antimicrobial components of, 69–70
 bacterial colonization of, 108
 bacterial interactions with, 65–71
 and bacterial nutrition, 70–71
 flow rates of, 53, 208
 functional complexes of molecules in, 65–66, 203–204
 functions of, 64–66
 immunologic defenses in, 69–70, 203–204, 209–214, 366–367
 pellicle adhesion receptors, 51, 68–69, 92–94
 pellicle formation and, 64–65
 production of, 63–64, 208
 properties of, 208–209
 sampling of, 75
- Salivaricin, 101
- Salivary glands, 50–51
- Sanitization, defined, 436
- SARS (severe acute respiratory syndrome), 431
- Secretory component, 207, 214

- Secretory immunoglobulin A (S-IgA), 214–216
 and acquired specific immunity, 203
 as agglutinin, 67–68
 deficiency of, 214, 220
 duration of antigen response, 242–243, 245
 functions of, 215–216
 fungal infection and, 338
 in innate immunity, 213
 polymeric structure of, 214–215
 production of, 243
- Secretory leukocyte protease inhibitor, 211
- Segmented viral genomes, 296–297
- Severe acute respiratory syndrome (SARS), 431
- Sharp instruments, use and disposal of, 440, 443
- Sharpey's fibers, 50
- Shigella* spp., antibiotic resistance in, 405–407
- Shingles, 311–312
- Shuttle vectors, 151, 156, 166–167, 171–172
- S-IgA. *See* Secretory immunoglobulin A
- Sigma factor, defined, 126
- Site-specific mutagenesis, 163–166, 175–178
- S-layer, of bacteria, 14
- Slime layer, of *Eikenella corrodens*, 276
- Smallpox, 326–327
- Southern blot hybridization, 173
- SpaP (antigen I/II), 244–245
- Specific plaque hypothesis of periodontal disease, 256–257
- Spirochetes
 flagella of, 14
 in periodontitis, 261. *See also* *Treponema denticola*
- Spleen, 31
- Spongiform encephalopathies, transmissible, 431–433
- Spore production, 14
- Staining of bacteria, 5
- Staphylococcus aureus*, antibiotic resistance in, 405, 407, 411, 424
- Sterilization
 defined, 435
 of instruments, 441–445
 methods for, 441, 444–445
- Stomatitis, 310, 321
- Streptococcal vaccines, 220–224, 242–243, 244–247
- Streptococci
 adhesins of, 92–93
 antibiotic resistance in, 413, 416–417
 bacteriocin secretion by, 21–22, 101
 competence development in, 100, 130, 131, 132, 166
 genetic transfer in, 100–101, 125, 130–131
 heart cross-reacting antibodies and, 221–222, 245–246
 and infective endocarditis, 368–369, 375
 mucosal immunization against, 222–223
 penicillin resistance in, 129, 132
 salivary amylase binding, 70–71, 93–94
- Streptococcus cristatus*, 265
- Streptococcus mitis*, 193, 195
- Streptococcus mutans*
 adaptations of, 107
 adherence and colonization by, 247–250
 antigens of, 244–245
 bacteriocin production by, 21–22, 101
 colonization of, in children, 193
 gene expression in, 251
 glucan production by, 13
- Streptococcus mutans* (cont.)
gtf and *fff* genes of, 248–250
 immunization against, 220–224, 242–243, 244–247
 natural immunity against, 219–220
 in root carogenesis, 239
 serotypes and subgroups of, 237
 strain variations in virulence, 195
 stress responses of, 250–251
 sucrose metabolism in, 234, 235
 virulence of, 233–235, 248–249
- Streptococcus sobrinus*
 in carogenesis, 233, 252
 DNA transfer via plasmids in, 150, 152–153, 154
 strain variations in virulence, 195
- Structural gene, defined, 126
- Subgingival antibiotic delivery systems, 401–402
- Subgingival caries, 238–239
- Sucrose metabolism, in *Streptococcus mutans*, 234, 235
- Sugar consumption. *See* Carbohydrate ingestion
- Sugar-phosphotransferase system, 19–20
- Suicide vectors. *See* Integration vectors
- Sulfamethoxazole, 390, 391
- Sulfonamide antibiotics, 390, 391, 405–407
- Supragingival caries, 237–238
- Systemic disease, 361–375. *See also* Atherosclerotic plaques;
 Endocarditis, infective
 autorecognition and, 371–372
 conditions associated with oral microbes, 368–370, 372–375
 heat shock proteins and, 370–371
 host defenses and, 366–368
 inflammation and, 372–375
 oral to systemic routes for microbes, 361–372
 pathogenicity of commensals in, 362–366
- T
- T lymphocytes. *See also* Cytotoxic T cells; Helper T cells
 antigen processing by, 38–40
 B cell interactions, 42
 in cell-mediated immunity, 43
 function of, 29, 44–45
 $\gamma\delta$ T cells, 213–214
 in initiation of adaptive immune response, 39, 41–42
 mucosal, 216–217
- Tannerella forsythia*, 261, 279
- TaqMan system for qPCR, 78–79
- T-cell antigen receptors, 38, 39
- Teeth. *See* Tooth
- Teichoic acid, 11
- Teichuronic acid, 12
- Teicoplanin, 385
- Temperature, intraoral, 51
- Tetracycline antibiotics, 386–387, 398, 401, 417–418, 420
- Th cells. *See* Helper T cells
- Theta replication, of plasmids, 146, 147–148, 150–151
- Thiocyanate, salivary, 70
- Thiocyanate-H₂O₂-peroxidase system, 119
- Thrombospondin, 211
- Thrush, 340–341
- Tissue necrosis factor (TNF), 27, 285–286, 367
- Tn916 transposon, 138
- Toll-like receptors, 11, 205, 267, 367–368

- Tongue
 anatomy of, 51
 in halitosis production, 117
 microbiota of, 61
- Tooth, anatomy of, 47–50
- Tooth emergence, and bacterial colonization, 90, 91
- Tooth plaque. *See* Dental plaque
- Transcription, regulation of, 98
- Transcriptional fusion, 179
- Transcriptomics, 183–185
- Transduction, 17, 129, 132–135
- Transformation, 16–17, 100, 129, 130–132
- Translation, 385–388
- Transmissible spongiform encephalopathies, 431–433
- Transmission
 horizontal vs. vertical, in bacterial genetic transfer, 126–130
 of pathogenic bacteria, 191–192, 427–430
- Transport proteins, 19
- Transporters, efflux, and antibiotic resistance, 414–416, 420
- Transposon mutagenesis, 163–166, 176–178
- Transposons
 in antibiotic resistance, 138, 408–410, 418–419
 characteristics of, 137–138, 166
 in gene regulation studies, 179–180
 in horizontal genetic transfer, 129–130
- Trauma, and pulpal infections, 353
- Trench mouth, 255
- Treponema denticola*
 adaptations of, 107–108
 DNA transfer via plasmids in, 153–156
 epithelial interactions of, 104
 in periodontitis, 261
 in pulpal infections, 354
 virulence traits of, 261, 273–275
- Treponema lecithinolyticum*, 261
- Treponema pallidum*, 156
- Trimethoprim-sulfamethoxazole, 390, 391
- Tuberculosis, treatment of, 391
- Typing of bacterial strains, 195–196
- U
- Universal precautions, 425, 437–440
- Uptake signal sequence, 132
- Urea, ammonia production from, 114–115
- Urease, in acid tolerance of bacteria, 114–115, 250, 251
- V
- Vaccines
 adverse effects of, 221, 228, 245–246
 for caries prevention, 220–224, 228, 242–247
 for periodontitis prevention, 227–228, 289
 production methods for, 328–329
 for viral diseases, 326–329
- Vancomycin, 385, 410–411, 424
- Varicella-zostervirus, 311–312
- Variola, 326–327
- Vectors
 integration vectors, 159–163
 plasmids as, 145–159
 essential features of, 146–151
 native, 151–156
 nonnative/broad-host-range, 157–159
 production of, 170–171
- Vectors (*cont.*)
 properties of, 145
 research uses of, 141, 145–146
- Vertical transmission, 126–127, 128
- Vesicles, outer membrane, 14, 264, 269
- Virion, 297
- Virulence. *See also* Pathogenicity
 attributes of *Streptococcus mutans*, 233–234
 in fungi, 336–337
 immune system evasion and, 282–283
 of periodontal pathogens, 261–279, 293. *See also names of specific organisms*
 variations of, between bacterial strains, 190, 194–195, 197
- Viruses, 295–332
 antiviral compounds and therapies, 329–331, 332
 characteristics and structure of, 295–297, 331
 chronic infection establishment by, 325–326
 genome of, 296–297, 304–305
 hepatitis viruses, 300–302, 309, 314–319, 325–326, 444
 human herpesviruses, 309–313, 325, 329
 human immunodeficiency virus, 70, 319–322, 329–330, 430–431, 445
 human papillomaviruses, 313–314
 immune responses to, 322–326, 332
 immunization against, 326–329
 life cycle of, 297–304, 331
 Picornaviridae, 304–305
 salivary antiviral factors, 70
 S-IgA neutralization of, 216
 taxonomy of, 304–308
- Von Ebner gland protein, 210
- W
- Warts, 313–314
- Western blot analysis, 172
- Whole genomic checkerboard analysis, 80
- Y
- Yeasts, 334
- Z
- Ziehl-Neelsen staining, 5