

Index

Index note: page numbers in *italics* denote figures or illustrations.

- ABS *see* antibiotic stewardship (ABS)
- Achaogen, company 191
- Acinetobacter* 28
 - A. baumannii* 74, 126, 166, 192
- Action on Antibiotic Resistance (ReAct) 209, 210, 214, 215, 217, 230
- advertising 207, 212
- Africa CDC AMR Surveillance network (AMRSNET) 169
- Africa Centres for Disease Control and Prevention (Africa CDC) 169
- AGP (antimicrobial growth promoters) 101, 103, 106, 111, 224
- agricultural sector 37, 101, 223 *see also* animal husbandry; farming; livestock production
- Alliance for Prudent Use of Antibiotics (APUA) 208
- aminoglycosides 27
- amoxicillin 61, 190
- ampicillin 190
- animal feed 108, 116, 117, 227
- animal husbandry 102, 103, 107
 - see also* farming; livestock production
- animal products raised without routine use of antibiotics 15, 222, 225
- animal to human transmission of resistant bacteria 104, 111, 185
- Antibiotic Guardian Campaign 60
- Antibiotic Resistance Coalition (ARC) 15, 209, 228
- antibiotic stewardship (ABS) 8, 30, 31, 212, 221 *see also* interventions to tackle antimicrobial resistance
 - best practice 87
 - cost-effectiveness 89, 92
 - evidence of effectiveness 83
 - guidelines 86, 208
 - in hospitals 81
 - methodology used in studies 85, 92
- antibiotic use, in humans
 - effect of culture 62
 - nonprescription 4
 - not targeted 156
 - reduced, due to vaccination 182, 186, 195
 - economic benefits 196, 198, 200
- antibiotic use, in livestock production 101, 210, 212, 223
 - in animal feed 108, 227
 - decrease in 103, 105, 107
 - growth promoters 101, 103, 106, 111, 224
 - interventions to reduce use 114, 208, 209
 - measuring 107
 - risk assessment 110
- antibiotics
 - access to 6, 219
 - alternative therapies 129
 - broad spectrum 23
 - commercialization of new 132, 144
 - ionophore 102
 - last-line 2, 162, 168, 221
 - market approval of 131, 143
 - pipeline for new 4, 125, 126, 141, 215
 - post-antibiotic era 2, 4, 209
 - promotion and marketing of 208, 212
 - prophylaxis 25, 101, 103

- antibiotics (cont.)
 - research and development 10, 125, 214
 - delinkage 11, 132, 145, 216, 217
 - funding 129, 215
 - incentives for 11, 132, 212, 217
 - see also* market entry rewards (MERs); prizes
 - sales of 132, 144
 - second-line 33
 - sustainability and systems thinking 228
 - used in both humans and animals 111, 222
 - wastewater contamination with 228
- antibodies 129, 191
- antigens 186
- antimicrobial growth promoters (AGP) 101, 103, 106, 111, 224
- Antimicrobial Resistance Diagnostic Challenge 139
- APUA (Alliance for Prudent Use of Antibiotics) 208
- aquaculture 103, 108, 186
- ARC (Antibiotic Resistance Coalition) 15, 209, 228
- artemisinin 6
- artists 230
- ASP (antibiotic stewardship programme) *see* antibiotic stewardship (ABS)
- authorisation of new antimicrobials 140
- autoimmune diseases 191
- avilamycin 111
- avoparcin 111
- awareness campaigns 54
 - Antibiotic Guardian 60
 - public health 8, 47
- azithromycin 168

- bacteria
 - eradication of 187
 - Gram-negative 2, 126, 128, 131
- bacterial infections
 - bacteraemia 24
 - secondary 195
- bacteriophages 129
- BARDA (Biomedical Advanced Research and Development Authority) 138
- Bergström, Richard 215
- beta-lactams 27
- Bezlotoxumab 191
- Bill and Melinda Gates Foundation 139, 146, 191
- biomarkers 157, 159, 218
- Biomedical Advanced Research and Development Authority (BARDA) 138
- biosecurity measures 103, 107, 110, 114, 116
- biosurveillance *see* surveillance programmes
- bloodstream infections (BSIs) 30, 71, 73, 74, 89
- booklets, for patients 58, 59
- broad spectrum antibiotics 23
- budgets, health care 32
- Burden of Resistance and Disease in European Nations (BURDEN) 71
- bystander effects 182, 195, 196

- campaigns 54
 - Antibiotic Guardian 60
 - public health 8, 47
- Campylobacter* 28, 127
- cancer treatments 25, 191
- Candida* 28
- carbapenems 2, 27, 31, 192
 - resistance 28, 126
- CARB-X (Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator) 136
- ceftriaxone 162, 168
- cephalosporins 5, 31, 72, 72
- Chan, Margaret 209
- chemotherapy 25
- chicken farming 102, 116, 117
- children 59, 195, 222
- chloroquine 6
- cholera 190
- ciprofloxacin 162, 193, 194
- civil society 15, 207
- cleaning, in hospitals 74
- clinical trials 11, 131, 136, 142, 170
- Clostridium difficile* 191
- Clostridium perfringens* 102
- coccidiosis 102
- colistin 2, 111, 192

- colony-forming units 77
 - Combating Antibiotic Resistant
 - Bacteria Biopharmaceutical Accelerator (CARB-X) 136
 - commercialization of new antibiotics 132, 144
 - communication, with patients 53, 58, 59, 63
 - community, prescriptions for antibiotics 7
 - companion animals 113
 - cooperation, global 15, 16, 146
 - cost
 - of diagnostic research and development 171
 - of interventions 61
 - of market entry rewards 145
 - societal, of antimicrobial resistance 34
 - of vaccinations 198
 - cost-effectiveness
 - of antibiotic stewardship in hospitals 89, 92
 - of biosecurity in livestock production 115, 116
 - of infection control measures in hospitals 74
 - of preventative strategies in the community 38, 61
 - cough 58, 59 *see also* lower respiratory tract infections
 - C-reactive protein (CRP) 57, 58, 61, 157
 - cross transmission of infection 77
 - Cross-Research Council AMR Initiative 139
 - cross-species resistance 210
 - culture, and antibiotic use 62
 - deaths, due to antimicrobial resistance 24, 25, 35, 222
 - decolonization 74
 - delayed prescribing (DP) 54, 57
 - delinkage 11, 132, 145, 216, 217
 - dentists 46
 - development pipeline for new antibiotics 4, 125, 126, 141, 215 *see also* research and development into new antibiotics
 - diagnostic tests 12, 89, 218
 - for antimicrobial resistance surveillance 164
 - barriers to innovation 162
 - business case for 174
 - cost 61, 171
 - decrease cost of clinical trials 170
 - efficient implementation 173
 - funding for 171, 172
 - for malaria 6
 - pathogen detection 160
 - point-of-care 52, 57, 58, 144, 156
 - policies 172
 - to reduce misuse of antibiotics 164
 - regulatory approval 171
 - susceptibility testing 160
 - using host biomarkers 157
- diarrhoea
 - in children 193, 222
 - in piglets 102, 116
 - vaccines 196
 - Directorate-General for Research and Innovation (DG-RTD) 137
 - disability affected life years (DALYs) 25
 - disease prevention 105, 107, 110
 - role of diagnostic tests 174
 - doctors (GPs) 46, 58
 - Driving Reinvestment in Research and Development and Responsible Antibiotic Use (DRIVE-AB) 81, 219
 - Drugs for Neglected Diseases Initiative (DNDi) 218
 - ear infections 34
 - EARS-Net (European Antimicrobial Resistance Surveillance Network) 71, 78, 79, 168
 - ECDC (European Centre for Disease Prevention and Control) 71, 87, 109, 110
 - economics
 - of antibiotic research 132, 133
 - benefits of antibiotic stewardship 92
 - benefits of vaccines 196, 198, 200
 - of biosecurity 116
 - burden of antimicrobial resistance 6, 31, 35, 38
 - health 92
 - EDCTP (European and Developing Countries Clinical Trial Partnership) 136

- education
 - of clinicians 51, 58
 - of patients 53, 58, 173
 - of undergraduates 91
- Effective Practice and Organisation of Care Group (EPOC) 81
- EFPIA (European Federation of Pharmaceutical Industries and Associations) 137
- EFSA (European Food Safety Authority) 109
- EMA (European Medicines Agency) 140, 144
- empirical treatment 23
- enteritis, necrotic, in poultry 102, 117
- Enter-net 168
- Enterobacteriaceae 24, 31, 72, 74, 192
 - ESBL (extended spectrum beta-lactamase) 113
- Enterococcus faecium* 127
- environment *see also* One Health issues
 - antibiotics entering 210, 228
 - transmission of resistant bacteria 104, 111
- environmental cleaning, in hospitals 74
- EPOC (Effective Practice and Organisation of Care Group) 81
- EQUIP project 59
- eradication, of bacteria 187
- ESAC-Net (European Surveillance of Antimicrobial Consumption Network) 71
- ESBL (extended spectrum beta-lactamase) 113, 115
- Escherichia coli* 2, 31, 33, 165
 - cephalosporin resistant 5, 36, 72
 - colistin-resistant 111
 - enterotoxigenic *E. coli* (ETEC) 193
 - extended spectrum beta-lactamase (ESBL) 115
 - uropathogenic *E. coli* (UPEC) 194
 - vaccines against 186, 193
 - Verocytotoxin-producing (VTEC) 168
- Essential Medicines List 207
- essential oils 116
- ESVAC (European Surveillance of Veterinary Antimicrobial Consumption) 108, 109
- ETVAX, vaccine 193
- EU (European Union) 137
 - One Health Action Plan ix
- European and Developing Countries Clinical Trial Partnership (EDCTP) 136
- European Antimicrobial Resistance Surveillance Network (EARS-Net) 71, 78, 79, 168
- European Awareness Day 54
- European Centre for Disease Prevention and Control (ECDC) 71, 87, 109, 110
- European Federation of Pharmaceutical Industries and Associations (EFPIA) 137
- European Food Safety Authority (EFSA) 109
- European Medicines Agency (EMA) 140, 144
- European Surveillance of Antimicrobial Consumption Network (ESAC-Net) 71
- European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) 108, 109
- European Union *see* EU
- extended spectrum beta-lactamase (ESBL) 113, 115
- extrinsic resistance 27
- farmers 113, 116
- farming *see also* agricultural sector; animal husbandry; livestock production
 - chicken 102, 116, 117
 - intensive 10, 102, 112, 223
 - pig 102, 114, 116
 - salmon 186
- fatality rates 24, 25, 35, 222
- FDA (US Food and Drug Administration) 140, 144
- feed, animal 108, 116, 117, 227
- feedback 51
- financial incentives 52
- FIND (Foundation for Innovative New Diagnostics) 157, 218
- flavomycin 111
- Fleming, Sir Alexander 2
- fluoroquinolones 27, 195

- food
 - animal feed 108, 116, 117, 227
 - foodborne infections 185
 - hygiene 113
 - transmission of resistance 113, 185
- Food and Drug Administration (FDA) (US) 140, 144
- food animal production *see also*
 - livestock production
 - use of antibiotics in 9, 223
 - without routine use of antibiotics 15, 222, 225
- Foodborne Diseases Active Surveillance Network (FoodNet) 169
- Foundation for Innovative New Diagnostics (FIND) 157, 218
- funding
 - for antibiotic research and development 129, 215
 - for diagnostic tests 171, 172
- furunculosis 186

- G3REC (*E. coli* resistant to 3rd generation cephalosporins) 72
- G20 summit, Hamburg 2017 146
- GAMRIF (Global Antimicrobial Resistance Innovation Fund) 136
- GARDP (Global Antibiotic Research and Development Partnership) 135, 218
- GARP (Global Antibiotic Resistance Partnership) 6
- GASP (Global Gonococcal Antimicrobial Surveillance Programme) 168
- Gavi Vaccine Alliance 172, 194, 198
- GDP (gross domestic product) 37
- general practitioners (GPs) 46, 58
- GLASS (Global Antimicrobial Resistance Surveillance System) 165
- Global Action Plan on Antimicrobial Resistance (WHO) 3, 15, 105, 155, 164, 212, 213, 221
- Global Antibiotic Research and Development Partnership (GARDP) 135, 218
- Global Antibiotic Resistance Partnership (GARP) 6
- Global Antimicrobial Resistance Collaboration Hub 12, 16, 146
- Global Antimicrobial Resistance Innovation Fund (GAMRIF) 136
- Global Antimicrobial Resistance Surveillance System (GLASS) 165
- Global Challenge Research Fund 139
- global cooperation 15, 16, 146
- Global Gonococcal Antimicrobial Surveillance Programme (GASP) (WHO) 168
- Global Point Prevalence Survey of Antimicrobial Consumption and Resistance (GLOBAL-PPS) 169
- Global Strategy for Containment of Antimicrobial Resistance 208
- gonococcal resistance 160, 168
- gonorrhoea 160, 161, 168
- governing body, global 146.2
- GPs (general practitioners) 46, 58
- GRACE INTRO project 58
- Gram-negative bacteria 2, 126, 128, 131
- grants, research 132, 142
- gross domestic product (GDP) 37
- growth promoters, antimicrobial 101, 103, 106, 111, 224
- guidelines 51, 86, 88

- Haemophilus influenzae* 127, 187
 - vaccines 190
- hand hygiene 73, 77
- health
 - campaigns 8, 47
 - economics 92
 - One Health issues ix, 15, 111, 209, 223, 228
- Health Action International (HAI) 207, 209, 212
- health burden, of antimicrobial resistance 24, 27
- health care budgets 32
- health care-associated infections (HAIs) 8, 71, 72
 - outbreak control 79
 - surveillance programmes 71, 78, 90, 91

- health technology assessment (HTA)
13, 172
- Healthcare without Harm 222, 226,
229
- Helicobacter pylori* 127
- Heymann, Dr. David 209
- HNL (human neutrophil lipocalin) 159
- Horizon 2020 Better Use of Antibiotics
Prize 137, 159
- hospitals *see also* health care-
associated infections (HAIs)
antimicrobial resistance in 8, 113
blocked beds 76
environmental cleaning 74
overcrowding 77
vaccines and immunotherapies for
resistant bacteria 191
waste management 229
- host biomarkers 157, 159, 218
- host-microbe relationship 230
- HTA (health technology assessment)
13, 172, 172
- human neutrophil lipocalin (HNL) 159
- human to animal transmission of
resistant bacteria 104, 111, 185
- husbandry, animal 102, 103, 107
see also farming; livestock
production
- hygiene
cleaning, in hospitals 74
food 113
hand 73, 77
- IMI (Innovative Medicine's Initiative)
137
- immune stimulation 129
- immunocompromized patients 25
- immunotherapies 191 *see also*
monoclonal antibodies (mAbs);
vaccines
- incentives for antibiotic research and
development 11, 132, 212, 217
see also market entry rewards
(MERs)
- incidence of antimicrobial resistance 29
- infection prevention and control (IPC)
8, 25, 30, 72
cost-effectiveness 74
infection control measures 73
prevention of cross transmission 77
by vaccines 182
- infections
bacterial 24, 195
bloodstream (BSIs) 30, 71, 73, 74,
89
ear 34.1
health care-associated infections
(HAIs) 8, 71, 72
outbreak control 79
surveillance programmes 71, 78,
90, 91
incidence of 26
lower respiratory tract (LRTIs) 58
reduced severity of 182
respiratory tract infections (RTIs)
14, 46, 52, 59
urinary tract (UTIs) 61, 194
viral 46, 52, 54, 57, 195
- influenza 182
vaccines 195
- Innovative Medicine's Initiative (IMI)
137
- InnovFin ID (Infectious Diseases
Facility) 138
- intensive animal production 10, 102,
112, 223
- international response to antimicrobial
resistance 15, 16, 146
- international standards, for diagnostic
tests 172
- interspecific effects 184
- interventions to tackle antimicrobial
resistance *see also* antibiotic
stewardship (ABS)
clinician and patient focused 53
clinician focused 51
evidence of effectiveness 83
in hospitals 81
long-term impact 63
methodology used in studies 85, 92
projects 58, 59
public focused 54
- intrinsic resistance 27
- ionophore antibiotics 102
- IPC *see* infection prevention and
control (IPC)
- isolation 73
- Italy, University hospital Modena 87
- Japanese Pharmaceuticals and Medical
Devices Agency (PMDA) 141,
144

- Joint Programming Initiative on Antimicrobial Resistance (JPIAMR) 135
- KFC, restaurant chain 225
- Klebsiella pneumoniae* 2, 27, 31, 166, 192
 cephalosporin resistant 5, 36
 potential vaccine 199
- Korea, Republic of 227
- Krankenhaus-Infektions-Surveillance-System (KISS) 78
- last-line antibiotics 2, 162, 168, 221
- legal framework, international 16
- Limited Population Antibacterial Drug (LPAD) 140
- livestock production 9, 37 *see also*
 agricultural sector; animal husbandry; farming
 animals raised without routine use of antibiotics 15, 222, 225
 antibiotic use in 101, 210, 212, 223
 decrease 103, 105, 107
 measuring 107
 risk assessment 110
 growth promoters, antimicrobial 101, 103, 106, 111, 224
 intensive 10, 102, 112, 223
 interventions to reduce antimicrobial use 114, 208, 209
 productivity 105
 transmission of resistant bacteria to humans and the environment 104, 111, 185
- livestock-associated methicillin-resistant *Staphylococcus aureus* (LA-MRSA) 113
- Longitude Prize 159
- low and middle-income countries (LMICs) 4, 8, 9, 139
- lower respiratory tract infections (LRTIs) 58
- LPAD (Limited Population Antibacterial Drug) 140
- lysins 129
- malaria 6, 36, 182
- manufacturing plants 228
- market approval of antibiotics 131, 143
- market entry rewards (MERs) 11, 144, 217 *see also* prizes
- marketing, of antibiotics 208, 212
- McDonald's, restaurant chain 226
- meat, produced without antibiotics 15, 222, 223
- Médecins sans Frontières (MSF) 209, 217, 218
- medicines
 ban on advertising 207
 Essential Medicines List 207
- meningitis 190
- metaphylactic antimicrobial use 99, 101, 102
- methicillin-resistant *Staphylococcus aureus* (MRSA) 26, 28, 36, 72
 assays for 167
 livestock-associated (LA-MRSA) 113
- microbe-host relationship 230
- Modena, University hospital 87
- monoclonal antibodies (mAbs) 191 *see also* immunotherapies
- mortality, major causes of 192
- mortality rates 24, 25, 35, 222
- MRSA 26, 28, 36, 72
 assays for 167
 livestock-associated (LA-MRSA) 113
- MSF (Médecins sans Frontières) 209, 217, 218
- National Institute for Health Research (NIHR) 139
- National Institute of Allergy and Infectious Diseases (NIAID) 138
- ND4BB (New Drugs for Bad Bugs) 137
- necrotic enteritis, in poultry 102, 117
- Neisseria gonorrhoeae* 28, 127, 166, 168
- Neisseria meningitidis* 187, 190
- Netherlands 88
- neutrophil biomarkers 159
- New Drugs for Bad Bugs (ND4BB) 137
- Newton Fund 139
- NIAID (National Institute of Allergy and Infectious Diseases) 138

- NIHR (National Institute for Health Research) 139
- norovirus 196
- nosocomial bacterial pathogens 191
- Nunan, C  il  n 224
- nurses 46
- OIE (World Organisation for Animal Health) 99, 108, 185, 214
- One Health issues ix, 15, 111, 209, 223, 228
- online guidelines 88
- opportunity cost 38
- outbreaks of health care-associated infections 79
- overcrowding, in hospitals 77
- parents 59
- patients 47, 92, 212
 - educational materials for 53, 58, 59
- peptides 129
- pets 113
- pharmaceutical industry 207, 210
- Pharmaceuticals and Medical Devices Agency (PMDA), Japan 141, 144
- pharmacists 46
- pig farming 102, 114, 116
- pipeline for new antibiotics 4, 125, 126, 141, 215 *see also* research and development into new antibiotics
- Plasmodium falciparum* 182
- pledges, to reduce antimicrobial resistance 60
- PMDA (Pharmaceuticals and Medical Devices Agency), Japan 141, 144
- pneumonia 218, 222
 - pneumococcal conjugate vaccine 14, 218
- point prevalence studies 167, 169
- point-of-care diagnostic tests (POCTs) 52, 58, 144, 156
 - for antimicrobial resistance surveillance 164
 - barriers to innovation 162
 - business case for 174
 - cost 61, 171
 - decrease cost of clinical trials 170
 - efficient implementation 173
 - funding for 172
 - pathogen detection 160
 - policies 172
 - to reduce misuse of antibiotics 57, 164
 - regulatory approval 171
 - susceptibility testing 160
 - using host biomarkers 157
- pollution, antibiotic 228
- polymyxins 31
- post-antibiotic era 2, 4, 209
- poultry, necrotic enteritis 102, 117 *see also* chicken farming
- prebiotics 116
- preclinical trials 131, 142
- prescribing, delayed 54, 57
- prescription medicines, ban on advertising 207
- prescriptions, for antibiotics 7, 46, 61, 108
 - audit and feedback 51
 - preventative strategies 39
 - priority pathogens list (PPL) 126
 - prizes 137, 159 *see also* market entry rewards (MERs)
- probiotics 116, 129
- procalcitonin 52, 57, 157
- productivity, in livestock sector 105
- profits, from antibiotic sales 144
- projects to tackle antimicrobial resistance
 - EQUIP 59
 - GRACE INTRO 58
- prophylactic antimicrobial use 25, 100, 101, 103
- Pseudomonas aeruginosa* 28, 74, 126, 128, 192
 - monoclonal antibodies 191
 - vaccine 191
- public health campaigns 8, 47
- Qualified Infectious Diseases Products (QIDP) 140
- ReAct (Action on Antibiotic Resistance) 209, 210, 214, 215, 217, 230
- regulatory approval for diagnostic tests 171

- regulatory initiatives for new
 - antimicrobials 140, 143, 220
- reminders 51, 58
- Republic of Korea 227
- research and development into new
 - antibiotics 10, 125, 214
 - delinkage 11, 132, 145, 216, 217
 - funding 129, 215
 - incentives for 11, 132, 212, 217
 - see also market entry rewards (MERs)
 - pipeline 4, 125, 126, 141, 215
- research grants 132, 142
- resistance
 - extrinsic 27
 - genes, transfer of 185
 - intrinsic 27
- respiratory syncytial virus (RSV) 195
- respiratory tract infections (RTIs) 14, 46, 52, 59
 - lower respiratory tract (LRTIs) 58
- restaurant chains 15, 225
- rotavirus vaccines 196

- safety, patient 92, 212
- sales, of antibiotics 132, 144
- salmon farming 186
- Salmonella 116, 168
- Salmonella* spp. 127, 166
 - S. typhi*, vaccines for 194
- Schippers, Edith 227
- screening 74
- secondary bacterial infections 195
- second-line antibiotics 33
- self-care 53
- self-limiting symptoms 54
- shared decision-making (SDM) 53, 55
- Shigella* spp. 127, 166
- smallpox 187
- societal costs of antimicrobial
 - resistance 34
- society, civil 15, 207
- specificity, of vaccines 186
- standards
 - for diagnostic tests 172
 - for licensed drugs 143
- Staphylococcus aureus* 33, 127, 128, 166
 - methicillin-resistant (MRSA) 26, 28, 36, 72, 113, 167
- monoclonal antibodies 191
- vaccine 191
- stewardship see antibiotic stewardship (ABS)
- Streptococcus pneumoniae* 28, 127, 166
 - vaccine 187
- Subway, restaurant chain 225
- surgical procedures 25
- surveillance programmes
 - antibiotic consumption, in agriculture 109
 - antibiotic resistance 71, 78, 90, 91, 109, 212
 - in developing countries 167
 - diagnostic tests 164
 - Africa CDC AMR Surveillance network (AMRSNET) 169
 - Enter-net 168
 - European Antimicrobial Resistance Surveillance Network (EARS-Net) 71, 78, 79, 168
 - Foodborne Diseases Active Surveillance Network (FoodNet) 169
 - Global Gonococcal Antimicrobial Surveillance Programme (GASP) 168
 - Global Point Prevalence Survey of Antimicrobial Consumption and Resistance (GLOBAL-PPS) 169
- surveys 91
- sustainability and systems thinking 228
- symptoms, self-limiting 54

- therapeutic antimicrobial use 99, 101, 102, 106, 224
- toxicity 111, 187
- Transatlantic Task Force on Antimicrobial Resistance (TATFAR) 141, 144, 215
- transmission
 - of antimicrobial resistance by water 113, 185, 228
 - of infection in hospitals 77
 - of resistant bacteria between animals, humans and the environment 104, 111, 185

- treatment, empirical 23
- trends in antimicrobial resistance rates
31
- tuberculosis 34, 36
- Ty21a, vaccine 194
- UK Research and Innovation 139
- understaffing, of hospitals 77
- United Kingdom (UK) 139
- United Nations (UN) 3, 214
- United States (US) 138
- antibiotics in food animal
 production 224
- Food and Drug Administration
 (FDA) 140, 144
- University hospital Modena,
Italy 87
- urinary tract infections (UTIs) 61, 194
- Vaccine Alliance, GAVI 172, 194, 198
- vaccines 14, 102, 103, 116, 129, 218
- see also* immunotherapies
- advantages 186
- in animal production 185
- cost 198
- difficulties in developing 193
- economic benefits 196, 198, 200
- impact on antimicrobial
 prescriptions 199
- reducing antibiotic use 182, 186,
 195
- reducing antimicrobial resistance
 182, 199
- specificity of 186
- value of 198
- for *Clostridium difficile* 191
- for *Escherichia coli* 186, 193
- for *Haemophilus influenzae* 190
- for *Pseudomonas aeruginosa* 191
- for rotavirus 196
- for *Salmonella typhi* 194
- for *Staphylococcus aureus* 191
- for *Streptococcus pneumoniae* 187
- for urinary tract infections 194
- for *Vibrio cholerae* 190
- for viruses 195
- ETVAX 193
- pneumococcal conjugate 218
- Ty21a 194
- Vi-polysaccharide 194
- WC-rBS 193
- vancomycin resistance 111
- vancomycin-resistant Enterococci
 (VRE) 28
- Verocytotoxin-producing *E. coli*
 (VTEC) 168
- veterinary prescriptions 108
- Vibrio cholerae*, vaccines 190
- Vi-polysaccharide, vaccine 194
- viral infections 46, 54
- diagnostics 52, 57
- vaccines for 195
- waste
- in environment 113
- management practices of hospitals
 229
- wastewater contamination with
 antibiotics 228
- water, as a means of transmission of
antimicrobial resistance 113,
185, 228
- WC-rBS, vaccine 193
- websites 60
- Wellcome Trust 140, 147
- white blood cell count 157
- World Health Organization (WHO) 2,
155, 207, 208, 218, 221
- World Organisation for Animal Health
(OIE) 99, 108, 185, 214