Index

A/ECC see attaching and effacing *Escherichia coli*
abattoir wastes 419–20
abortions 234
abrasions 33
*Acanthamoeba* 256, 259
ascarid nematodes 295
acceptable risks 24
  *see also* tolerable...
acid-fast staining 285
acquired immunodeficiency syndrome (AIDS)
cryptosporidiosis 142, 143
cyclosporiasis 283, 286
microsporidia 258, 326, 327
acute gastrointestinal illness of unknown origin (AGI) 125
adaptation capacities 9, 309, 310–11
adenoviruses 343, 355
aerobic digesters 414, 417
aerosols 34, 38–9, 246
AFLP *see* amplified fragment length polymorphism
AFOs *see* animal feeding operations
Africa 93–108
age factors
animals 414
control envelope 79
*Cryptosporidium* 183
dose-response studies 464
*Giardia* 182–3
tolerable microbial risk 457–8
AGI *see* acute gastrointestinal illness of unknown origin
agriculture
animal systems 409–12
biosecurity 177
campylobacteriosis risks 201
industrial systems 21–4, 411
mixed systems 411
New Zealand 194, 196–7
pastoral 194, 200
public health impact 200
Salmonella outbreaks 231–2
zoonosis distribution 52–3
AIDS see acquired immunodeficiency syndrome
air drying 413, 417
Alaria marcianae 300
alkaline treatment 414, 417
alveolar hydatid disease 301–2
ambient waters 442, 449, 450
amitochondriate parasites 479
amoebae 211, 256, 259–61
Amoy Gardens, Hong Kong 38–9
amplified fragment length polymorphism (AFLP)
352, 353
anaerobic digestion 413, 415, 417
Ancylostoma 296
Andean countries 307, 308
Andes virus 105
Angiostrongylus 296–7
animal densities 382
animal faeces/wastes
Campylobacter 176
Cyclospora cayetanensis 287
cyclosporiasis 287
dead animals 419–21
disposal 22–3
Escherichia coli O157 187–8
field application 416–17
human exposure 439–40, 443–4, 448–9
manure treatment 416
pathogen control 378–9, 409–22
pathogen sources 14
policies 418
Salmonella 237
treatment processes 412–16, 417
versus human 450
animal feeding operations (AFOs) 433–4
animal husbandry
Campylobacter 176–7
control envelope 69–71
emerging diseases 21–4
environmental impact 21–4
Escherichia coli O157 178–9
global densities 22
global increase prediction 21
‘livestock revolution’ 21
management 69–71
New Zealand 191–200
Salmonella reservoirs 232–5
Scotland 167–8
stocking levels 199
zoonosis distribution 52–3
see also domestic animals
animal products demand 6
animal reservoirs
control strategies 377–8, 380–401
pathogen evaluation 9–10
risk factors 381–4
Salmonella 232–5
Scotland 151, 167–8
viruses 246–50
animal viral transmission 246
anthropogenic factors 46–61
anthroponoses 29
antibiotic resistance analysis 352
antibiotics
animal agriculture 412
Campylobacter jejuni 71
control envelope 70, 71, 78
gene exchange 477
reistance 71, 233, 238, 389–90, 477
Salmonella 233, 238
virulence genes 78
zoonosis distribution 58
antibodies 250, 251
antigens 243
antimicrobials 389–90
Apicomplexa 265–75, 479
ARCC see average rate of correct classification
Argentina 105
*Ascaris*

Asia/Africa/South America 94
*A. lumbricoides* 122, 292, 294
*A. suum* 294
*ascaris pneumonia* 294
Asia 93–108, 295
asymptomatic infections 156, 158, 457
at-risk groups

control envelope 77
future perspective 6
microsporidia 326–8
zoonosis distribution 55–6
see also immunocompromised groups
attaching and effacing *Escherichia coli* (A/EEC) 214–15
Australia 104, 231
Australian bat lyssavirus 104
*Austrobilharzia variglandis* 122, 299
average rate of correct classification (ARCC) 351
average surface temperature 61
avian influenza 104
avian schistosomes 299
avian viruses 248, 249

*Bacillus anthracis* 479
*Bacillus coli* see *Escherichia coli*
backflow, distribution systems 434
backwashing, filtration 427–8
bacteria 210
Asia/Africa/South America 101–3, 106
control in animal wastes 411–12
emergence/re-emergence 478–9
expert consensus 12
genetic exchange 477
gorillas 101–2
Mexico 115

USA 123–4, 126, 132
bacterial source tracking see faecal source identification; microbiological source tracking
bacteriocins 392
bacteriophages 343, 354, 392, 477
*Bacteroides* 355–6
*Bacteroidetes* faecal markers 355–6, 359
*Balantidium coli* 121–2, 256
bank filtration 433
bats 103, 104–5
*Baylisascaris procyonis* 295
beaches 339, 462
behaviour, human 10, 53–4, 79–80
Belgium 177
benchmark organisms 8–9
beta-Poisson models 464–5
beverages 315–16
*Bifidobacterium* 357
binning procedures 467
biochips 374
biofilms 55
biosecurity 177, 388–9, 399–400
biosensors 373–4
birds 151, 167–8, 273
black rat 310–11
*Blastocystis* 100, 121
*Blastomyces hominis* 116
‘boil water’ requirements 185, 187
Bolivia 307, 308, 310
bone meal 395, 398, 481
bottled water 188
bovine reservoirs 246–7
bovine spongiform encephalopathy (BSE) 41–2, 394–9, 400
bovine reservoirs 247
dead animal wastes 419–20, 421
emergence/re-emergence 481
Bradley’s classification 31–4
broilers 22–3

*Brucella* 103
BSE see bovine spongiform encephalopathy
Bunyaviridae 105
*Buchnera* pseudomallei 479
*Buxtonella* 256

caffeine 350
calciviruses 244, 248, 249
calves and calving 171–2, 381, 390–1

**Campylobacter**
Asia/Africa/South America 102
farming transmission 222, 223
gastrointestinal illnesses 231
New Zealand 191–202
outbreak investigation 183–4
QRA application 461–3
risk models 158, 160
Scotland 169–70, 172, 176–7
seasonal patterns 171, 173
surveillance systems 163
survival rates 198
USA 123, 128–9, 132
*C. coli* 102, 176–7, 371
*C. jejuni* 137–8
symptoms 137–8
treatment 138
Canada 221, 222, 268
Canary Islands 220
candidate agents 246–50
cantaloupes 231
*Capillaria hepatica* (syn. *Calodium hepaticum*) 297
carbon-source utilization (CUP) 352
Caribbean 113–18
case definitions 159
case-studies 151–207
catchment basins 9–10
cats 77, 267–9, 294

cattle

BSE 394–9, 481
*Campylobacter* 176
*Cryptosporidium* 274
*Escherichia coli* 51–2, 178–9, 210, 222, 223
industrialization 21–3
manure disposal 23
*Mycobacterium avium* ssp. *paratuberculosis* 325
New Zealand 191–202
risk factors 381
*Salmonella* reservoirs 233–4, 237
*Salmonella* Typhimurium 172–3
Scotland 168, 171–3, 175
trade effects 51
viruses 246–7
VTEC reservoirs 217–18
CDSC see Communicable Disease Surveillance Centre
cell receptors 243, 245
Central America 113–18
cercarial dermatitis 299, 300
cestodes see tapeworms
chemical indicators 350, 447
chickens see poultry
children

congenital toxoplasmosis 145–8
diarrhoea in Latin America 114
Mexico 115
New Zealand 192, 194, 195
symptoms 142
treatments 142–3
Cryptosporidium 269–75
age factors 183
Asia/Africa/South America 95–9
chlorine resistance 74
contamination reduction 274–5
control envelope breach 75
Cuba 116
disease models 159
HACCP-like processes 81
HIV 67–8
oocysts detection tests 96–8
outbreak investigation 183–4
regulation 441, 442
Scotland 169–70, 171–2, 180–1, 186–7
seasonal patterns 173
surface waters 97
surveillance 92, 163–4
treated waters 98
USA 121, 128–30, 131–2
UV light treatment 432–3
C. hominis 180
C. parvum
automated PCR detection 371
couagulation 427
control envelope 68
disease risk 339, 340
dose-response studies 464, 465
immunocompromised groups 384
immunoprophylaxis 390–1
prevalence in animals 381
resistance 390
surveillance 473–4
types 180
waste treatment systems 414
Cuba 116
culling 419, 420–1
culture
bias 343–4, 354
Escherichia coli O157:H7 218
culture-dependent faecal source identification 351–5
culture-independent faecal source identification 358
CUP see carbon-source utilization
CWD see chronic wasting disease
cyanobacteria-like bodies (CLB) 283
cyclophyllid cestodes 300–2
Cyclops 297–8
Cyclospora cayetanensis 116, 122, 211, 256, 283–8
cyclosporiasis 143, 283–8
cystic hydatid disease 301, 302
cysts 260, 262, 263–4, 266
DAEC see diffuse adherent Escherichia coli
dairy cattle
management responses 201
New Zealand 191–2, 194, 197, 198, 200, 201
public health impact 200
Scotland 168, 171
DALYs see disability-adjusted life years
darms 53
DBPs see disinfection by-products
dead-end hosts 28–9
DEC see diarrhoeagenic Escherichia coli
definition, zoonoses 5, 28
deforestation 54
demographic changes 55–7
density of animals 382
deposition/yield studies 199
desiccation 413, 417
design of distribution systems 434
detection methods
Cryptosporidium 96–8, 274
epidemiological surveillance 159
Giardia cysts 96–8
microsporidia 258
outbreaks 161
rapid 367–74
Index 491

Salmonella 237
Toxoplasma oocysts 268
diarrhoea
age/income factors 458
cases per year 4
cryptosporidiosis 271
cyclosporiasis 284–5
giardiasis 263
Latin America 114
diarrhoeagenic Escherichia coli (DEC) 213–24
die-offs 420–1
diffuse adherent Escherichia coli (DAEC) 214–15
digenetic trematodes 292
Diphyllobothrium 303
 Diplogonoporus grandis 303
 Diplostomum spathaceum 300
direct epifluorescent filter technique 370
direct life cycles 292
direct transmission 28–9
direct zoonoses 28–9
disability-adjusted life years (DALYs) 11, 454, 455–6, 457, 458
discharge permits 449, 450
disease emergence 19–25, 36–42, 339–40, 471–84
disease models 157–8, 159
disease specificity 230–1
disease-based surveillance systems 159
disinfectants 429–33
disinfection by-products (DBPs) 428
distribution systems 75, 434–5
distribution of zoonoses
anthropogenic factors 46–61
calculation methods 467–8
Cryptosporidium 271
Entamoeba histolytica 260–1
environmental factors 46–61
 Giardia 262–3
human fascioliasis 307
microsporidia 257
Toxoplasma 266
DNA replication 476
dogs 294
domestic animals 217–18, 259, 267–9
see also animal husbandry; pets
domestic hygiene 32, 76, 77
Dominican Republic 116–17
dormancy 31
dose-response studies
 Campylobacter jejuni 466
campylobactemia 462
regulation and control 448
uncertainties 464–5, 467
Dracunculus medinensis 32–3, 297–8
drinking-water
 Cyclospora cayetanensis 287
diseases control 379, 426–35
emerging infection patterns 474
Entamoeba histolytica 260
epidemiological concerns 155
Escherichia coli O157:H7 222
faecal contamination 340–1, 342
indicators 342
regulation and control 275, 441–2, 449
risk factors 383
Stockholm framework 452–8
toxoplasmosis 268
USA outbreaks 128–9
driving forces 5–6
drought 59
drug resistance 58, 107, 309
drying animal waste 413, 417
dynamic risk assessment 468
EAggEC see enteroaggregative Escherichia coli
Echinococcosis 301–2
education 77, 107–8
effluents
 Cryptosporidium dispersal 272
health risks 200, 201
New Zealand 193, 194–5, 200, 201
see also animal faeces/wastes; human effluent/faeces

EHEC see enterohaemorrhagic Escherichia coli
EIEC see enteroinvasive Escherichia coli
El Niño Southern Oscillation 59–60
El Salvador 117
emerging diseases 4, 19–25, 36–42, 339–40, 471–84
empowerment 108
Encephalitozoon 57, 257–9, 326
encephalomyocarditis virus 328, 329
endemic diseases 161–2
endogenous infections 213
Enhanced Surface Water Treatment Rule (ESWTR) 275
Entamoeba coli 116

Entamoeba histolytica 260–1
enteric organisms 228–39
enteroaggregative Escherichia coli (EAggEC) 214–15
enterococci 342–3, 360
Enterocytozoon bieneusi 257–9, 326–8
enterohaemorrhagic Escherichia coli (EHEC) 52–3, 210, 215, 339–40
enteroinvasive Escherichia coli (EIEC) 214, 215
enteropathogenic Escherichia coli (EPEC) 214, 215
enterotoxigenic Escherichia coli (ETEC) 214, 215
enterotoxins 356
enteroviruses 243, 246–7, 343, 355
event enumeration methods 367–74
environment introduction 9
environmental changes 477–8
environmental distribution factors 46–61
environmental impact of animal agriculture 21–4
environmental persistence 10, 30–1, 74
Environmental Protection Agency (EPA) 441–4, 449–50, 457
environmental resistance 10, 31, 74
environmental transmission 30–1
EPEC see enteropathogenic Escherichia coli
epidemics, worldwide increase 46–7
epidemiology

case-studies 151–207
concerns 155–9
Cryptosporidium 273–4
cyclosporiasis 286–7
data 151–207
dynamic risk assessment 468
emerging disease patterns 20–1
human fascioliasis 308–9
limitations 154–5
New Zealand 194–6
outbreaks 151–207
protozoa 212
QRA relationship 460–1
regulatory approaches 443–4
risk management 81–2
Salmonella 231–2
studies 154–65
surveillance 159–64, 170–1
VTEC 215–17
Escherichia coli 210
Asia/Africa/South America 102–3
Campylobacter comparison 463
chlorine inactivation 429–30
concentrations 200
control envelope 74
deposition/yield studies 199
diarrhoeagenic 213–24
dose-response studies 464
faecal contamination indicator 336, 341, 342–3, 360

generic diversification 57–8
health consequences 140
infectious dose 77
regulation 441–2
symptoms 139

Escherichia coli O6:H16 123, 128
Escherichia coli O121:H19 123, 130, 132
Escherichia coli O157
Asia/Africa/South America 102–3
Index 493

Scotland 167, 169–72, 177–9, 183–5, 187–8
seasonal patterns 173
*Escherichia coli* O157:H7
agricultural practices 52–3
control envelope 68, 71–2, 73, 75
distribution system failures 434, 435
PCR detection 371
pH and survival 78
Swaziland outbreak 410
transmission 218–23
USA 123, 128, 130, 132
waste treatment systems 414, 415
*Escherichia coli* O157:[H7] 215–18
estuarine areas 236
ESWTR see Enhanced Surface Water Treatment Rule
ETEC see enterotoxigenic *Escherichia coli*
European surveillance systems 159
excision 477
exotic pets 85
expert consensus 3–16
exposure
calculation methods 467
control envelope 79
environmental transmission 31
epidemiological patterns 20–1
key concentrated sources 14
QRA 460–1
eyes 295
facultative lagoons/storage 413
faecal coliforms 431
faecal contamination
Bradley’s classification 32
*Escherichia coli* indicator 336, 341, 342–3
regulation 448–9
faecal environmental loading 23–4
faecal indicators 442–3, 446–7
faecal source identification 349–61
see also microbiological source tracking
faecal wastes see animal faeces/wastes; human effluent/faeces
farming see agriculture; animal husbandry
*Fasciola buski* 300
*Fasciola gigantica* 300, 305, 310, 312, 313
*Fasciola hepatica* 69, 299–300, 305, 310–13
fascioliasis, human see human fascioliasis
fasciolids
adaptation capacities 309, 310–11
colonization power 309
drug resistance 309
fatty stools 263
feedlots 389
feral cats 269
fields 416–17
filtration
detection/enumeration methods 367–8
drinking-water 427–9
groundwater 433
parasites 479
fingerprinting techniques 352–3, 357
Finland 220
fish kills 39, 40
fish transmission 35
flagellates 261–5
flocculation 427
flooding 59, 60, 324
flukes 212
flying fox 103
Fonterra 201
food
consumption habits 53–4, 80
epidemiological concerns 155
on-farm safety programmes 386–7
food poisoning notification 170–1
food processing effluent 237
food sources
cyclosporiasis 286–8
hepatitis E 249
*Listeria* 456
494 Waterborne Zoonoses

Salmonella 228–9, 231–2, 234–5
Food Standards Agency 177
forecasts 317–18
Fossar 311, 312
fowl plague 104
fragrances 350
France 327, 328
Francisella tularensis 124, 479
freshwater plants 314–15
freshwater quality criteria 442
freshwater snail vectors 311–13
freshwater studies
  campylobacteriosis 462
  Connecticut 195–6
  Gaerda survival 264
  New Zealand 196–8
fungi 13
Fung’s Double Tube Method 369
future trends 5–7, 471–84

Galba truncatula 311, 312–13
gastrointestinal illnesses
  Campylobacter 195, 196, 197
  child morbidity/mortality 56–7
  Cryptosporidium 273
  Escherichia coli 214
  Gaerda 262
  Salmonella 231
  surveillance systems 159–60
tolerable microbial risk 457–8
 genetic characterization 99
 genetic exchange 476–7
 genetic mutations 9, 57–8, 211, 475–6
 genetic variations 245
 genotypic methods 352–3
 genotyping 313, 326–7
 Gaerda 261–5
  Asia/Africa/South America 95–9
  chlorine resistance 74, 430–1
cyst detection tests 96–8
drinking-water regulations 275
filtration 428
regulation 441
Scotland 169–70, 171–2, 181–3
seasonal patterns 173
 surface waters 97
treated waters 98
USA 121, 128–30, 131–2
UV treatment 432–3
G. duodenalis 95, 99, 381
G. intestinalis 457
G. lamblia 116, 144, 339, 340, 464
Giardiasis 144, 192, 193, 263
Gigantobilharzia sturniae 299
global temperature rise 61
globalization 51
Gnathostoma spinigerum, USA 123
Gorilla gorilla 101–2
governments 440
grazing systems 194, 196–200, 410–11
‘great plate count anomaly’ 343–4
greenhouse gases 418
groundwater 133, 236, 383, 433
group benchmark pathogens 8–9
Guangdong 37, 38
Guatemala 118
guidelines 452–8
Guillian-Barré syndrome 138
guinea worm 32–3, 297–8
habitat creation 54
HACCP see hazard analysis and critical control points
haemolytic uraemic syndrome (HUS) 177, 178, 215–16, 223
haemorrhagic fevers 105
Haiti 286, 287
hantavirus pulmonary syndrome (HPS) 105
hantaviruses 105
HAV see hepatitis A virus
Hawaii 369
hazard analysis and critical control points
disease surveillance 84
microsporidia 326, 327
pathogen evaluation 11
zoonose distribution 56
see also at-risk groups
immunoprophylaxis 390–1
imported infections 182
in vitro infectivity 243–4
income factors 6, 458
index pathogens 454
indicator methods
criteria requirements 446–7
EPA 450
limitations 444–5
viral indicators 343
water quality criteria 442–3
indirect life cycles 292
indirect transmission 21, 28, 29
industrial farming systems 21–4, 411
infants see children
infection patterns, emerging 472–82
infections with water-related insect vectors 34
infectious agents environmental transmission 30–1
infectious dose (ID) 31, 77
infectious intestinal disease (IID) 183–4
influenza viruses 248–9, 329
infrastructure changes 54–5
ingestion diseases 32–3
inhalation 14, 34
insect vectors 34
Institute of Medicine of the National Academies (USA) 472–3
interdisciplinary collaboration 16
international issues
conflicts 50
control programmes 385–6
networks 85–6
surveillance 160–1, 164, 165
trade 85
travel 50–1
invasive infections 213–14
irrigation systems 53, 315
Japan 219, 221, 295
Johne’s disease 72, 189, 324–5
Juquitiba virus 105
kidneys 243
lagoons 413, 415
lambing 172
larva migrans 295
latency 30
laundry brighteners 350
Lee see locus of enterocyte effacement
Legionella 34
Legionnaires’ disease 34, 54, 91
length heterogeneity polymerase chain reaction
(LH-PCR) 356, 357
Leptospira 124, 129–30, 132
L. canicola 141
L. hebdomadis 141
L. icterohaemorrhagiae 141
L. interrogans, USA 124
leptospirosis 324
causative agents 141
climatic factors 478
Costa Rica 115
Honduras 117–18
Mexico 115
Scotland 169–70, 171
symptoms 141
transmission 33–4
treatments 142
vaccination 391
LH-PCR see length heterogeneity polymerase chain reaction
library-based faecal source identification 351–3
life cycles
cestodes 292
Cryptosporidium 270
Cyclospora cayetanensis 284
Entamoeba histolytica 260
foodborne listeriosis 456
helminth infections 291–2
most probable number (MPN) methods 370
mountain gorillas 101–2
mouse studies 272
movement
hosts 157, 164, 437, 478
pathogen reservoirs 47–51
pathogens 412
MPN see most probable number methods
MST see microbiological source tracking
multibarrier protection 426–7
multiple antibiotic resistance (MAR) method 352
multiple array probe technologies 446
multiple host susceptibility 292
multiple resistant strains 234, 238
municipal water supplies 49
mutation 9, 57–8, 211, 475–6
mycobacterial aerosol transmission 34
*Mycobacterium avium* complex (MAC) 74, 479
*Mycobacterium avium* ssp. *paratuberculosis* (MAP) 68, 71, 72
*Myocastor coypus* 311
*Nasuglia* 132, 256, 259
nanofiltration membranes 428
NASBA see nucleic acid sequence-based amplification technique
national conflicts 50
National Pollutant Discharge Elimination System (NPDES) 443, 450
national surveillance 160–1, 164, 165
*Necator americanus* 296
nematodes 212, 292, 293–8
neonatal sepsis 146
Nepal 286, 287
Netherlands 23, 220
New Zealand
beaches 339
campylobacteriosis 461–3
Ministry of Health pamphlet 206–7
risk models 158, 160
surveillance 152
zoonotic infections 191–202
Nicaragua 117
niche widening 312–13
Nipah virus 104–5, 328, 329
nitrate leaching 22
non-O157 VTEC 216–17, 218
non-VTEC DEC 224
non-zoonotic agents 195
noroviruses 184, 243, 480
notifications 170–1
NPDES see National Pollutant Discharge Elimination System
nutria see *Myocastor coypus*
nutrient pollution 418
O157 VTEC 215–16
occupational exposure 33, 170, 474
ocular toxoplasmosis 145
Office International des Epizooties (OIE) 385–7
on-farm control 386–93
Ontario 221, 222
oocysts
*Cryptosporidium* 181, 270, 272–3, 274
*Cryptosporidium parvum* 473
*Cyclospora cayetanensis* 284, 285
*Toxoplasma* 265–8
oral doses 233
otters 268–9
outbreaks
*Campylobacter* 176
epidemiology 151–207
Scotland 183–7
surveillance systems 160, 162–3
outcome factors 10–11
oxidants 429–33
ozonation 433
Index

pamphlets 202, 206–7
pandemic influenza 328
pandemic Salmonella 238
paragonimiasis 35
Paramyxoviridae 103, 104
parasites
Asia/Africa/South America 94–100, 106
Cyclospora cayetanensis 284, 287
emergence/re-emergence 479
see also helminths
passive infected carriers 461–2
pastoral farming 194, 196–200
see also animal husbandry
pathogen-free animals 387
pathogenicity islands 477
pathogens
changes in 475–6
characteristics 57–8
control envelope 67, 68, 77–8
detection 341–2
emerging 4, 19–25, 36–42, 339–40, 471–84
main groups 12–13
reservoir mobility 47–51
pathogen–human factors, control envelope
livestock/animal management 70–1
point of use/household 76
source water protection 71–2, 73
water supply 74
patterns of infection 472–82
PCR see polymerase chain reaction
PEAS see possible estuary-associated syndrome
pectin gel tubes 369
persistence in environment 10, 30–1, 74
person-to-person transmission
Escherichia coli 210
Giardia 183, 262
infectious intestinal disease 184
VTec 223
personal hygiene 32, 76, 77
Peru 286, 287
pets 76, 85, 235
PFGE see pulsed-field gel electrophoresis
Pfiesteria 39–41
pH 78
phenotypes, new 475–6
phenotypic methods 352
picornaviruses 244, 245
pigeons 235
pigs
Campylobacter 176
Fasciola hepatica 311
manure disposal 22
production effects 52
Salmonella reservoirs 234–5
Scotland 168
vesicular disease 246, 247
viruses 247–6, 328–9
waste lagoons 415
Yersinia enterocolitica 210, 238–9
pinniped caliciviruses 249
plant ingestion 314–16
plasmids 476–7
Pocomoke River, Maryland 40
point source exposure 20
point of use 76–7
policies
animal wastes 418
Listeria control 456
risk profile usage 468
US public health 444
polio 85–6, 430
‘pollution trading’ 449, 451
polycystic echinococcosis 302
polycystic hydatid disease 301
polymerase chain reaction (PCR) 371–2
cyclosporinias diagnosis 285
enterovirus quantification 355
methods 450
water quality surveillance 342, 344
Pontiac fever 34
population growth 6, 21, 49–50, 157
possible estuary-associated syndrome (PEAS) 41
potable water
  acceptable risks 24
  Asia/Africa/South America 106
  Nicaragua 117
poultry
  biosecurity 388
  Campylobacter 71, 177
  competitive exclusion 391–2
  control programmes 386–7
  industrialization 22
  manure disposal 22–3
  risk factors 381
  Salmonella 232–3
  Scotland 168
  undercooking 195, 196, 461
viruses 249
precipitation
  control envelope breach 73
  global change 58–9
  heavy rainfall 60, 73, 382
pregnancy 77, 145–6, 266
presence/absence data 468
pressure, water systems 434, 435
prevalence
  Cryptosporidium 271
  Entamoeba histolytica 260–1
  geographical factors 157
  Giardia 262–3
  microsporidia 257
  socioeconomic factors 157
  Toxoplasma 266, 267
preventative quality assurance framework 83
primers 356, 358
prions 12, 394–9, 421, 481
private water supplies 168–9, 185, 474
probability of illness 465
probiotics 392
processing methods 85
protein coating 242–3, 244, 245
protozoa 211–12, 255–76
  expert consensus 13
  transmission routes 95
  USA 121–3, 126, 131–2
  pseudophyllid cestodes 300, 303
  Pteropus 103, 104
public health
  agriculture impact 200
  driving forces 5–6
  pathogen evaluation 11–12
  Stockholm framework 452–8
  pulsed-field gel electrophoresis (PFGE) 352, 353
QRA see quantitative risk assessment
quality assurance 83
quality criteria
  ambient waters 449, 450
  Clean Water Act US EPA 442–3
  water distribution systems 435
quantitative microbial risk assessment (QMRA) 81–2
quantitative risk assessment (QRA) 460–8
quarantine procedures 70, 71
racehorses 103
raccoons 295
Radix 312
rainfall see precipitation
rapid detection/enumeration methods 367–74
rats 250, 310–11
raw liver 316
re-emergence 4, 478–81
reassortant virus strains 29
recombination of genetic elements 477
recontamination 55
recreational waters 33
campylobacteriosis 461–2
Cryptosporidium 181
emerging patterns 474
epidemiological concerns 155
Escherichia coli O157:H7 218, 222
faecal contamination 340–1
<table>
<thead>
<tr>
<th>Index</th>
<th>501</th>
</tr>
</thead>
<tbody>
<tr>
<td>faecal indicators 342</td>
<td>water usage 441</td>
</tr>
<tr>
<td>New Zealand 193–6, 197–9</td>
<td>risk communication 77</td>
</tr>
<tr>
<td>quality criteria 442, 443</td>
<td>risk factors</td>
</tr>
<tr>
<td>regulatory approaches 441</td>
<td>animal reservoirs 381–4</td>
</tr>
<tr>
<td>risk factors 383</td>
<td>diseases occurrence/spread 47</td>
</tr>
<tr>
<td>swimming-associated illness 339, 341</td>
<td>risk management 66, 80–6</td>
</tr>
<tr>
<td>USA 127, 129–30, 133</td>
<td>disease surveillance 84–5</td>
</tr>
<tr>
<td>regional effects 59</td>
<td>epidemiological studies 81–2</td>
</tr>
<tr>
<td>regulations</td>
<td>HACCP system 80–1</td>
</tr>
<tr>
<td><em>Cryptosporidium</em> contamination 275</td>
<td>international networks 85–6</td>
</tr>
<tr>
<td><em>Toxoplasma</em> contamination 269</td>
<td>QMRA 81–2</td>
</tr>
<tr>
<td>regulatory perspective 437–51</td>
<td>quality surveillance 338–44</td>
</tr>
<tr>
<td>Reiter’s syndrome 138</td>
<td>targeted studies 84–5</td>
</tr>
<tr>
<td>remote sensing 318</td>
<td>water safety plans 82–4</td>
</tr>
<tr>
<td>repetitive extragenic palindromic polymerase chain reaction (REP-PCR) 352, 353</td>
<td>risk profiles 461, 462–3, 467–8</td>
</tr>
<tr>
<td>replication 31, 244, 476</td>
<td>rivers see streams and rivers</td>
</tr>
<tr>
<td>reservoirs</td>
<td>RNA see ribonucleic acid</td>
</tr>
<tr>
<td>animal 377–8, 380–401</td>
<td>ruminants</td>
</tr>
<tr>
<td>human fascioliasis 310–11</td>
<td>biosecurity 388–9</td>
</tr>
<tr>
<td><em>Salmonella</em> 232–5, 237</td>
<td><em>Cryptosporidium</em> infections 270</td>
</tr>
<tr>
<td>Scotland 167</td>
<td>risk factors 381</td>
</tr>
<tr>
<td>viruses 246–50</td>
<td>see also cattle, sheep</td>
</tr>
<tr>
<td>VTEC 217–18</td>
<td>runoff 22, 73</td>
</tr>
<tr>
<td>resistance</td>
<td>rural health regions 194–5, 197, 200</td>
</tr>
<tr>
<td>antibiotics 58, 389–90</td>
<td>Safe Drinking Water Act (US) 441–2</td>
</tr>
<tr>
<td>chlorination 384</td>
<td>SALINPORK programme 387</td>
</tr>
<tr>
<td>drugs 58, 107, 309, 389–90</td>
<td><em>Salmonella</em> 210, 228–39</td>
</tr>
<tr>
<td>environmental 10, 31, 74</td>
<td>Asia/Africa/South America 101–2</td>
</tr>
<tr>
<td>environmental stressors 9</td>
<td>competitive exclusion 391, 392</td>
</tr>
<tr>
<td>respiratory illnesses 196</td>
<td>definition 229</td>
</tr>
<tr>
<td>reverse osmosis membranes 428</td>
<td>dose-response studies 464, 465</td>
</tr>
<tr>
<td>ribonucleic acid (RNA) 57, 244, 480</td>
<td>emerging problems 238</td>
</tr>
<tr>
<td>ribotyping 352, 353</td>
<td>Mexico 115</td>
</tr>
<tr>
<td>risk assessment 437–69</td>
<td>outbreak investigation 183, 184</td>
</tr>
<tr>
<td>emerging zoonotic diseases 24–5</td>
<td>pathogen-free animals 387</td>
</tr>
<tr>
<td>modelling 153, 156, 161</td>
<td>PCR detection 371, 372</td>
</tr>
<tr>
<td>quantitative 460–8</td>
<td>Scotland 169–70, 172–5</td>
</tr>
<tr>
<td>Stockholm framework 452–8</td>
<td>uses 437–8</td>
</tr>
</tbody>
</table>
seasonal patterns 171, 173
USA 123, 128–9, 132
S. Abortusovis 234
S. bongori 230
S. Choleraesuis 234–5
S. enterica 229, 230, 238, 381
S. Enteritidis 172, 174, 232–3, 238
S. Kottbus 231
S. Poona 231
S. Typhimurium 172–4, 232, 233–4, 238
salmonellosis 140–1, 192
sanitary surveys 435
sanitation, control envelope 76, 77
sapoviruses 243
sarafloxacin-susceptible/resistant strains 78
SARS see severe acute respiratory syndrome
SCCWRP see Southern California Coastal Water Research Project
Schistosoma 33, 298–9
Schistosomatidae 129–30
schistosome cercarial dermatitis, USA 122
Scotland 151, 167–89, 219–21
scrapie 395, 397, 398–9, 481
sea level rise 59
sea lions 249
sea mammals 264, 268–9
seafood see shellfish
seals 264
seasonality 59–60
Campylobacter 197, 198–9
Cryptosporidium 164
human fascioliasis 317
Scotland 171–2, 173
seawater
Cryptosporidium 272
Entamoeba histolytica 260, 261
Giardia 264
microsporidia 259
secondary transmission 155, 156
sedimentation, drinking-water 427
sediments 60, 199
self-contained film system 369
sensitivity, surveillance systems 159, 161, 162
Seoul virus 105
severe acute respiratory syndrome (SARS) 37–9, 105–6, 246
control envelope 77
emergence/re-emergence 480
host change capacity 57
sewage see animal faeces/wastes; effluents; human effluent/faeces
shedding 246, 262
sheep
Campylobacter 176
Cryptosporidium 186–7, 274
MAP-infected 72
New Zealand 191
Salmonella 234
Scotland 168, 172
scrapie 395, 398–9, 481
shellfish
Campylobacter 198, 462
growing and harvesting 443
transmission 35
transportation 51, 54
water quality criteria 443
shellfish waters
animal/human faeces 340–1
faecal indicators 342
Shiga toxin-producing Escherichia coli (STEC)
192, 194, 210, 214, 219–21
Shigella 101–2, 215
skin injuries 33
snails
cercarial dermatitis 299
Fasciola hepatica 299
Galba truncatula 311, 312–13
human fascioliasis 311–13
lymnaeids 299, 311–13
Schistosoma 298
socioeconomic factors 157
sodium chlorate 393
soils, animal wastes application 416
sorbitol 216
source tracking 349–61, 447, 450, 451
source water protection 71–3
South Africa 219
South America 93–108
Southern California Coastal Water Research Project (SCCWRP) 358–60
specific pathogen-free animals 387
spill over exposure 21
spiral plating method 368
Spirochetes emergence/re-emergence 479
Spirometra 122–3, 303
sporadic diseases 161–2
spores 257, 258–9
sporulation 265–6, 267–8, 270
sprouts 231–2
square bacteriological filter 368–9
stability, viruses 246
standards, US 448–50
statutory reporting 170–1
steatorrhoea (fatty stools) 263
STEC see Shiga toxin-producing Escherichia coli
Stockholm framework 452–8
stocking levels 199
stomach acidity 210
stool samples 163, 175
storage, animal wastes treatment 413
storm events 73, 74
strains
differentiation 15
dose-response uncertainties 465
infectious dose variation 77
streams and rivers
Campylobacter 198–9
Escherichia coli 200
management 201
sampling 197
sediments 199
streptococci 360
Strongyloides 100, 296
surface temperature 61
surface waters
Entamoeba histolytica 260
grazing systems 410
microsporidia 258–9
Salmonella transmission 236
surveillance
diseases outbreaks 162–3
Dominican Republic 116–17
emerging pathogens 473–4
epidemiological 159–64
importance 91–2, 152–3
limitations 153, 154–5
primary purposes 160–1
QRA relationship 460–1
risk management 84–5, 338–44
Scotland 170–88
studies 154–65
US 120–1
veterinary 163–4
water quality 338–44
survival rates 31
Campylobacter 198
Cryptosporidium 272
Giardia cysts 263–4
microsporidia 258–9
Toxoplasma 267–8
susceptibility
changes 155, 156–7, 158, 478
pathogen evaluation 10–11
Swaziland 410
Sweden 163
swimmer’s itch see schistosome cercarial dermatitis
swimming pools see recreational waters
swine see pigs
symptom-based surveillance systems 159–60
system failures 82
systematic errors 156
T-RFLP see terminal restriction fragment length polymorphisms

*Taenia* 122, 301

tapeworms 122, 212, 292, 300–3

targeted studies 84–5

technological interventions, control envelope

human characteristics 79–80

livestock/animal management 70, 71

point of use/household 76, 77

source water protection 72–3

water supply 74–5

temperature rise 61

terminal restriction fragment length polymorphisms (T-RFLP) 356, 357

thermophilic *Campylobacter* 198

thermotolerance 229

tiered monitoring 447, 449

Tioman virus 103

TMDLs see total maximum daily loads

tolerable disease burden 83–4

tolerable risks 454, 456–8

total maximum daily loads (TMDLs) 449, 450, 451

total viable cell count method 368–9

tourism 50–1

toxin genes 356, 359

*Toxocara* 294–5

*Toxoplasma* 99–100, 265–9

*Toxoplasma gondii* 68, 77, 122, 144–5

toxoplasmosis 266, 268

congenital 145–8

health consequences 148

ocular 145

Scotland 171

symptoms 144–5

treatments 146–8

trade issues 51, 85

traditional livestock systems 21

training 107–8

transboundary movements 437

transformation process 476

transmissible spongiform encephalopathy (TSE) 394–9, 421, 481

transmission

Bradley’s classification 31–4

criteria 36

*Cryptosporidium* 270

cyclosporiasis 286–7

everginging diseases 21

Emerging patterns 474

*Entamoeba histolytica* 260

environmental 30–1

fish 35

foci 314

*Giardia* 262

helminths 292–3

human fascioliasis 306–7, 314

microsporidia 257

modes 5, 155–6, 158

multiple modes 5

principle vehicles 14

protozoan parasites 95

shellfish 35

*Toxoplasma* 266–7

TSE 481

water aerosols 34

transport

animal wastes 412, 416, 420

shellfish 51, 54

travel issues 50–1, 85

treatment

amoebiasis 261

animal wastes 412–16, 417

cryptosporidiosis 271

cyclosporiasis 285

drinking-water 426–34

*Giardia* 263

microsporidiosis 257–8

trematodes 292, 298–30

*Trichobilharzia* 299

*Trichuris* 122, 123, 292, 295
<table>
<thead>
<tr>
<th>Index</th>
<th>505</th>
</tr>
</thead>
<tbody>
<tr>
<td>triclabendazole 309</td>
<td>surveillance systems 163</td>
</tr>
<tr>
<td>tropical forest invasion 54</td>
<td>tolerable microbial risks 457</td>
</tr>
<tr>
<td>tropical organisms 93–108</td>
<td>Toxoplasma 267, 268</td>
</tr>
<tr>
<td>tropism 243</td>
<td>VTEC outbreaks 219–21, 222</td>
</tr>
<tr>
<td>TSE see transmissible spongiform encephalopathy</td>
<td>uracil-D-glycosylase (UDG) 372</td>
</tr>
<tr>
<td>tularemia 124</td>
<td>urban agriculture 6</td>
</tr>
<tr>
<td>typhoid 192</td>
<td>urban wildlife 6</td>
</tr>
<tr>
<td>typing schemes 176, 177, 180</td>
<td>urbanization 6, 49–50</td>
</tr>
<tr>
<td>uracil-D-glycosylase (UDG) see uracil-D-glycosylase</td>
<td>urination 23</td>
</tr>
<tr>
<td>Uganda 101–2</td>
<td>uropathogenic Escherichia coli 213, 214</td>
</tr>
<tr>
<td>ultrafiltration membranes 429</td>
<td>UV light see ultraviolet light</td>
</tr>
<tr>
<td>ultraviolet (UV) light treatment 432–3</td>
<td>vaccination</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>control envelope 76</td>
</tr>
<tr>
<td>Escherichia coli O157 isolates 178, 179</td>
<td>immunoprophylaxis 390–1</td>
</tr>
<tr>
<td>Salmonella 233</td>
<td>wildlife 393–4</td>
</tr>
<tr>
<td>Scotland 151, 167–89, 219–21</td>
<td>worm infection effects 94</td>
</tr>
<tr>
<td>surveillance systems 163</td>
<td>variant Creutzfeldt-Jakob disease (vCJD) 42, 247</td>
</tr>
<tr>
<td>VTEC 218, 219–21, 222</td>
<td>potential waterborne pathogens 396, 397, 398, 400</td>
</tr>
<tr>
<td>United States of America 120–34</td>
<td>vegetables 286, 287–8</td>
</tr>
<tr>
<td>beaches 339</td>
<td>verocytotoxin-producing Escherichia coli</td>
</tr>
<tr>
<td>control programmes 152</td>
<td>(VTEC) 192, 194, 210, 213–24</td>
</tr>
<tr>
<td>Cryptosporidiosis 440–1</td>
<td>vertical transmission 232–3</td>
</tr>
<tr>
<td>Cyclospora cayetanensis 286, 287</td>
<td>vesicular diseases 246, 247, 249</td>
</tr>
<tr>
<td>distribution systems 434</td>
<td>veterinary surveillance 163–4</td>
</tr>
<tr>
<td>drinking-water regulations 275</td>
<td>viable but non-culturable (VBNC) state 31, 198, 237</td>
</tr>
<tr>
<td>Giardia 262–3</td>
<td>Vibrio 479</td>
</tr>
<tr>
<td>health criteria 448–50</td>
<td>Vietnam 286, 287</td>
</tr>
<tr>
<td>hepatitis E virus 329</td>
<td>virulence</td>
</tr>
<tr>
<td>Institute of Medicine of the National</td>
<td>control envelope 77–8</td>
</tr>
<tr>
<td>Academies 472–3</td>
<td>Escherichia coli 215</td>
</tr>
<tr>
<td>Listeria control 456</td>
<td>Salmonella 230–1</td>
</tr>
<tr>
<td>microsporidia 327–8</td>
<td>viruses 211, 242–52</td>
</tr>
<tr>
<td>principal pathogens 121–5</td>
<td>Asia/Africa/South America 103–6</td>
</tr>
<tr>
<td>regulatory approaches 441–5</td>
<td>control in animal wastes 411–12</td>
</tr>
<tr>
<td>reported outbreaks 125–30</td>
<td>drinking-water regulations 275</td>
</tr>
<tr>
<td>Salmonella 231</td>
<td>emergence/re-emergence 480</td>
</tr>
<tr>
<td>standards 448–50</td>
<td></td>
</tr>
</tbody>
</table>
Waterborne Zoonoses

expert consensus 12
faecal source identification 354, 355
faecal virus indication 343
host specificity 243–4
Mexico 115
pigs 328–9
replication 244
USA 124–5, 126
vital dyes 370
VTEC see verocytotoxin-producing Escherichia coli

Walkerton, Ontario 222
washing 316
Washington County Fair 222
wastes see animal faeces/wastes; effluents; human effluent/faeces
water distribution, control envelope 73–5
water quality assurance framework 81
criteria 435, 442–3, 449, 450
management 82–3
targets 83
water safety plans (WSP) 82–4
water shortages 93, 106
water storage, control envelope 73–5
water systems infrastructure changes 54–5
water treatment control envelope 73–5
emerging patterns of infection 474
parasites 479
viruses 480
water-based infection classification 32–3
water-borne infection classification 32
water-related disease classification 36, 37
criteria 30–5
water-washed infections 32
waterborne outbreaks definition 120
watercress 314–15
weather patterns 59–60

whipworms see Trichuris
WHO see World Health Organization
wildlife
microsporidia 259
reservoirs 389, 393–4, 400
SARS virus 38
Toxoplasma prevalence 267
viruses 249–50
VTEC reservoirs 217–18
Wisconsin, USA 440–1
World Health Organization (WHO) 452–8
worm infections 32–3, 94
wounds 33
WSP see water safety plans

years of life lost to premature death (YLL) 455
years lived with a disability (YLD) 455
Yersinia 123–4, 128–9
Yersinia enterocolitica 123–4, 210, 238–9, 339
yield studies see deposition/yield studies
young animals 381

zoonoses
definition 5, 28
determining criteria 28–9