

## Index

### a

- abamectin 223  
 Abbott formula 468  
 ABBV-4083 593  
 ABCB1 gene mutations 196  
 abundant larval transcript (ALT) 538  
*Acanthocheilonema dracunculoides* 129, 131, 139, 205, 220, 566  
*Acanthocheilonema ohendhali* 134  
*Acanthocheilonema reconditum* 129, 131  
*Acanthocheilonema (Dipetalonema) reconditum* 138–139  
   microscopy-based tests 139  
   serological and molecular tests 139–140  
*Acanthocheilonema viteae* 20, 30, 393, 396–398, 400–403, 405, 406, 410, 411, 413, 414, 416, 417, 419–423, 425–437, 442–444, 450, 451, 496, 498, 518, 590, 591  
   life cycles 443  
 active pharmaceutical ingredients (APIs) 221  
 acute death syndrome 77  
 acute dermatolymphangioadenitis (ADLA) 51  
 acute filarial attacks 51  
 acute filarial lymphangitis (AFL) 164  
 acute papular onchodermatitis (APOD) 165  
 adult worm, transplantation of 469–470  
 Advantage® Duo 81, 83  
 Advantage Multi® 80, 83, 86, 88  
*Aedes aegypti* 90, 287, 463, 554, 567, 574, 577–579  
*Aedes Densonucleosisvirus (AeDNV)* 577  
*Aedes polynesiensis* 554  
*Aedes* spp. 21, 27, 551, 552  
 aerial larvaciding 56  
 African Programme for Onchocerciasis Control (APOC) 56, 309, 532  
 African sleeping sickness 346  
 albendazole (ABZ) 36, 162, 171–172, 286, 483  
   anti-wolbachials plus 602  
   intensive regimens of 260  
   larvicidal activity of 446  
   mechanism of action 261  
   pharmacodynamics 261–262  
   structure 256  
 AN8799 488  
 AN11251 604–605  
 AN15470 488  
*Ancylostoma caninum* 7, 81, 83, 195, 355  
*Angiostrongylus vasorum* 134  
 Animal Health R&D programs 346  
 animal phylum 18  
*Anopheles algeriensis* 220  
*Anopheles gambiae* 550, 551–554, 577  
*Anopheles maculipennis* 220  
*Anopheles* mosquito spp. 21

- Anopheles* spp. 39, 219, 551, 578  
 anthelmintic resistance (AR) 372, 462  
 antibody capture ELISA tests 128  
 antibody-dependent cellular  
   cytotoxicity (ADCC) assays  
     536  
 antibody detection tests 128  
 antifilarial activity 261  
 antifilarial drugs  
   efficacy and potency 258  
   human and animal filariases 6  
   *in vitro* tests in general 368–372  
   mechanisms of action  
     albendazole 261  
     antibiotics 265  
     diethylcarbamazine 253  
     macrocyclic lactones 262  
     melarsomine 266–267  
     triple drug combination 267–268  
   screening assays for heartworms  
     372–373  
 antigen tests 127, 133, 466–467  
 antihistamine 55, 61  
 anti-*Wolbachia* drug 221  
   clinical trials 600–604  
   combinations of 601  
   compounds and candidates  
     592–593  
   identification of 600  
   plus albendazole 602  
 arachidonic acid pathway 43  
 arsenamide sodium 225  
 arsenic-based compounds 266  
 arthralgia 43  
*Ascaris* sp. 34  
 atrophy 165  
 auranofin 270, 271, 371, 488  
 automated larval migration assay  
   (ALMA) 369  
 AWZ1066S 604
- b**
- Bacillus sphaericus* 551  
*Bacillus thuringiensis* 556, 578  
 bancroftian filariasis 37, 39, 51, 52,  
   165, 287, 594, 596, 603  
 Barbervax® 361  
 benzimidazole (BZD) 7, 171–172, 253,  
   260–262, 271, 351, 358, 376, 377,  
   392, 444, 447, 450, 483, 484, 488,  
   602  
 biological control agents 550, 577–578  
 biting black flies 21  
*Brugia ceylonensis* 140  
*Brugia malayi* 5, 6, 17, 19, 21–23, 29,  
   30, 37, 39, 102, 125–127, 129,  
   140–143, 161, 162, 165, 191, 205,  
   216, 217, 250, 251, 258, 260, 264,  
   265, 271, 284, 287, 288, 307, 308,  
   371, 394, 396, 398–407, 410, 411,  
   413, 414, 416, 418, 420–423,  
   426–430, 434, 435, 438, 445–446,  
   488, 489, 496–498, 500, 501, 503,  
   504, 518–520, 522–525, 533,  
   535–536, 565, 566, 590, 591, 596,  
   601, 602, 604  
   microscopy-based tests 140–141  
   serological and molecular tests 141  
*Brugia malayi*-gerbil infection model  
   535–536  
 Brugian filariasis 39  
*Brugia pahangi* 5, 6, 19, 39, 140–143,  
   191, 205, 258, 394, 396, 398, 400,  
   402, 403, 405, 407, 408, 410–413,  
   416, 418–433, 436, 437, 440,  
   444–446, 486, 488, 489, 501, 502,  
   520, 565, 566, 590  
   microscopy-based tests 140–141  
   serological and molecular tests 141  
*Brugia* spp. 128  
*Brugia timori* 19, 37, 39, 52, 102, 161,  
   162, 250, 251, 284, 307, 308, 589,  
   590
- c**
- Caenorhabditis elegans* 23, 24, 258,  
   260, 263, 264, 270, 288, 367,  
   368–371, 374–378, 381, 382, 498,  
   501, 502, 517, 518, 520–525

- Caenorhabditis elegans* Genetics Center (CGC) 523
- Calabar swelling 40, 109, 164
- canine heartworm disease 7, 19, 28, 125, 126, 130, 134, 162, 236, 363, 368, 471, 533, 573, 589
- Canis aureus* 220
- cardiac ultrasound 136
- caval syndrome 77
- central nervous system (CNS) syndromes 49
- Cercopithifilaria grassi* 131
- Chagas' disease 346
- chemotherapy  
of *Dirofilaria repens* 5, 6, 19, 129–132, 134, 136–139, 191, 192, 204–206, 218, 220, 258, 352, 353, 355, 461, 463, 474, 565, 566, 569, 589, 590  
of other filarioids 205
- chronic onchodermatitis 45
- chronic papular onchodermatitis (CPOD) 165
- Chrysops* sp. 40
- CNS tissue leiomodin-1 49
- coin lesion 54
- Community Directed Treatment with Ivermectin (CDTI) 312
- community drug distributors (CDD) 321
- Companion Animal Parasite Council (CAPC) 79, 192
- Corallopyronin A 605
- COVID-19 virus 63
- CRISPR/Cas 521–522
- Ctenocephalides* 139
- Culex* control 551–552
- Culex pipiens* 23, 567, 571
- Culex quinquefasciatus* 549–551
- Culex* spp. 20, 550
- Culicoides* sp. flies 40
- curative macrofilaricide 348
- cysteine proteinase inhibitor (CPI) 538
- d**
- dermal edema 43
- dermal exfoliation 59
- dermal onchocerciasis 44
- Diagnostics Technical Advisory Group (DTAG) 114
- Dictol® 361
- diethylcarbamazine (DEC) 7, 8, 10, 11, 33, 36, 75, 91, 92, 162, 169–170, 192, 196–197, 224–225, 250, 256, 283, 284, 307, 309, 445, 475, 481, 483, 526, 550, 552, 556, 589
- larvicidal activity of 446
- in lymphatic filariasis treatment 250–251
- mechanism of action 259–260
- pharmacodynamics 260
- side effects 259
- diethylcarbamazine citrate 224–225
- diethylcarbamazine (DEC)-fortified salt 251
- direct-acting drugs 448
- Dirofilaria immitis* 6–11, 17, 21–29, 76–78, 81, 84, 85, 89, 90, 92, 102, 110, 126, 128, 130–140, 162, 169, 178, 191–206, 215–221, 223, 225, 226, 232, 237, 251, 253–255, 257–260, 264–268, 270, 272, 283–285, 287, 289–295, 297, 298, 331, 332, 338, 341, 346, 352–356, 360, 361, 363, 367, 368, 370, 372–377, 382, 396, 400, 415, 437, 444, 447, 449, 450, 459–463, 465–469, 473–475, 498, 501, 519, 520, 525, 532, 533, 566–574, 590, 598–600
- adult infections, chemotherapy of 192
- antibody testing 134
- antigen tests 133
- authorities requirements of 474, 475
- diethylcarbamazine for L3 stage larvae prevention 196–197
- DNA-based tests 135

- Dirofilaria immitis* (contd.)
- geographic distribution 126, 129, 136, 191, 192, 194, 203, 204, 216
  - imaging 136
  - infection 79, 218
    - macrocyclic lactones 5–7, 84–86, 88–90, 192–196, 200, 216, 217, 221, 237, 251, 257, 264, 272, 285, 288, 353, 354, 360, 361, 373, 377, 449
    - prevention guidelines 193
    - treatment guidelines 193
  - inoculation 465
  - isolation of 462
  - life-cycle stages of 24–26, 216, 217, 264, 290, 368, 374, 449, 460, 461, 468, 520, 525
  - macrocyclic lactones, for L3/L4 stage larvae prevention 194–196
  - ML-resistance in 206, 289–297, 353
  - patency in hydrocortisone-fed rats 447
  - reducing exposure to infection 202–203
  - treatment and prevention guidelines 193
  - treatment protocols, for immature (L5) and mature
    - in cats 201–202
    - in dogs 197–201
- Dirofilaria (Nochtiella) repens* 5, 6, 19, 129–132, 134, 136–139, 192, 204–206, 218, 220, 258, 352, 461, 463, 565, 566, 569, 590
- cytology 137–138
  - DNA-based tests 138
  - drugs used in 258
  - imaging 138
  - microscopy-based tests 137
  - recovery of adults 137
  - treatment 204
- dirofilariasis 54, 76, 78, 130, 216, 360, 361, 460, 461, 469, 471, 475, 573, 600, 605
- Dirofilaria* sp. 40, 54
- Dirofilaria striata* 131
- disability-adjusted life year (DALY) 359
- discrete papular lesions 46
- disseminated intravascular coagulation (DIC) 79
- DNA-based tests 135–136
- DNA vaccines 503–505
- Dog Breeds Worldwide 227
- doxycycline (DOX) 59, 178, 225, 251, 252, 265, 266, 287, 591, 594
  - antifilarial effects 266
  - limitations 598
  - for lymphatic filariasis 598
  - lymphedema treatment with 597–598
  - and onchocerciasis 598
- doxycycline administration 198, 200
- DrugBank target database 498
- drug metabolism and pharmacokinetics (DMPK) 369
- drug resistance, human and animal
  - filariases 6–8, 90, 182, 267, 283–298, 363, 377
- Drugs for Neglected Diseases initiative (DNDi) 349
- e**
- Echinophaga* spp. 139
- egg hatch assay (EHA) 368
- elephantiasis 18, 28, 51
- elimination as a public health problem (EPHP) 309–310
- elimination of transmission (EoT) 56, 310
- embryo-gram 45
- emodepside 269–270, 286–287, 487
- endecto-parasitocides 352
- enterotoxigenic *Escherichia coli* (ETEC) 88
- enzyme-linked immunosorbent assay (ELISA) 127, 168
- eosinophil infiltration 42

- 4''-epi-acetylamino-4''-deoxyivermectin  
B1 223
- epidemiological mapping 62
- epidemiological testing 114
- eprinomectin 195, 221–223, 230, 233,  
234
- erythromycin 88–89
- essential package of care (EPC) 58
- European Scientific Counsel for  
Companion Animal Parasites  
(ESCCAP) 192
- exclusion mapping 62
- excretory-secretory (ES) products 497,  
521
- experimental infection 464–465  
of cats 468–469  
characteristics of 474  
third-stage-larvae for 460
- expressed sequence tags (EST) 497
- extracellular vesicles (EVs) 499–501
- eye worm 54, 109
- f**
- feline infections 134
- fenbendazole 271
- filariae 17–18  
gene editing in 521–526  
gene silencing in 521–526  
genomic insights 23  
life cycle of 24–25  
macrofilariae 18, 20  
microfilariae 18, 20–21  
mutualism with endosymbiont  
bacteria 23–24  
pathologies in human health 29  
pathology of 28  
species of 19–20  
tropical medicine 21–23
- Filaria immitis* 21
- filarial  
cryopreservation of 525–526  
diseases  
combination therapies 483  
current therapies 481–483  
drug discovery approaches  
484  
experimental therapies 484  
immunological spectrum 41  
*in vitro* culture of 525–526  
models 373–374  
nematodes 34, 102, 125, 284, 497,  
498  
secretome 521  
transcriptome 519
- Filaria malayi* 22
- Filaria sanguinis hominis* 21
- Filaria sanguinis hominis minor* 22
- filariasis 4, 9, 18, 19, 20, 22–30, 33–37,  
39–42, 47, 49–54, 56–65, 75–92,  
97–100, 102–103, 108, 110–111,  
113–116, 128, 140, 141, 161,  
164–165, 172–178, 181, 205, 250,  
260, 265, 266, 268, 271, 284,  
286–287, 289, 295, 308, 309,  
319–320, 322–324, 345–363, 392,  
445, 481, 484, 496, 503, 505, 533,  
537, 546–548, 550–551, 565–579,  
589–606
- Filaribits 91
- filaricele 52
- filaricidal arsenicals 267
- filaricide compounds 83, 271, 363,  
373, 375–377, 380–381, 444, 445,  
444
- flubendazole (FBZ) 271, 484, 486
- fluoroquinolones 88
- free-living L3-larvae of  
trichostrongyloid species 381
- free-living nematode *Caenorhabditis  
elegans* 368
- g**
- gastrointestinal nematode (GIN)  
parasites 260, 270, 271, 288,  
372, 375, 484, 487, 521
- genital filariasis 59
- genital manifestations 165
- glass feeding system 464

- Global Alliance to Eliminate Lymphatic Filariasis (GAELF) 547
- global economic cost, of heartworm disease 333
- Global Funding of Innovation for Neglected Diseases (G-FINDER) surveys 358
- global health policies, LF 547
- Global Programme to Eliminate Lymphatic Filariasis (GPELF) 116, 547–548
- glucocorticoids 447
- glutamate-gated chloride channel (GluCl) 194, 254, 263–265, 288, 360, 484, 520
- glycoproteins 498
- h**
- Haemonchus contortus* 89, 288, 361, 368, 370, 375–382, 392, 450, 502, 524
- haemorrhages 52
- haemosiderin 44
- HeartGard® 83
- HeartGard®Plus 79, 81, 87
- HeartGard-30®-Plus 81, 91
- heartworm
- aberrant migration 76
  - caval syndrome 77
  - current gaps 79–92
  - disseminated intravascular coagulation 79
  - dogs and cats 11, 76, 134, 192, 192, 194, 215, 217, 223, 229, 237, 285, 290, 331, 346, 355, 449, 465, 475, 573
  - effects of MLs 293–294
  - HARD 76
  - histologic changes 77
  - inbreeding 292
  - pathogenesis of 76–79
  - pulmonary arteries 77
  - pulmonary intravascular macrophages 76
  - refugia 292
  - selection for ML resistance in 290, 291
  - transmission and survival 576
  - vascular permeability 77
- heartworm associated respiratory disease (HARD) 77
- heartworm disease. *see also*
- dirofilariasis
  - arsenamide sodium and melarsomine dihydrochloride 225
  - biology 216–217
  - control 5, 79, 81, 83–87, 91, 92, 216, 221–236, 250, 252, 290, 294, 352, 353, 355, 450, 460, 465, 471, 505
  - abamectin 223
  - doxycycline 225
  - drugs used in 257
  - eprinomectin 223
  - ivermectin 6, 8, 9, 80–84, 170–171, 221–222, 226, 230, 233–235, 372, 475, 576, 599, 600
  - macrocyclic lactones 6–7, 9, 79, 80, 85, 86, 88–91, 133, 194, 216, 221–224, 256, 257, 262, 285, 352, 392, 463, 471, 475, 476
  - milbemycin oxime 80, 84–86, 88, 91, 216, 221, 223, 230, 233–235, 256, 257, 262, 285, 290, 291, 293, 352, 449, 576
  - moxidectin 5, 79–83, 86–88, 221, 223–224, 226, 233, 234, 236, 256, 257, 262, 285, 352, 360, 372, 449, 576
  - selamectin 223
- economic cost of
- in key countries 340
  - in rest of world 341
- market products
- Australia 232
  - EU 229, 232
  - Japan 232
  - USA 228–229
- Mdr1 mutations 226

- non-macrocyclic lactone treatments,
  - diethylcarbamazine citrate 224–225
- in pets 333
  - global economic costs of 333–334, 336
  - opportunity cost of pet owner 338–339
  - prevention 336–338
- prevalence 128, 216–220, 332, 335, 338, 340, 341, 472, 568
- treatment 9, 12, 28, 30, 79–81, 83–89, 91, 92, 127, 134–135, 193, 197–201, 216, 217, 220, 225, 227, 230, 233–235, 237, 250, 251, 256, 262, 266, 267, 284–286, 291, 293–294, 298, 332–335, 337–341, 372, 373, 449, 460, 461, 463, 466, 469, 471–473, 475, 476, 577, 598, 599
- heartworm models 449–450
- Helminth-host interactions 495–497
  - Heterodoxus* 139
- HH 8
- “high/low” antigen scoring 133
- holiday travel guidelines with animals 193
- “hostile” host tissues 41
- host-parasite combination 392
- human and animal filariases
  - antifilarial drugs 6, 8–10, 28, 173, 181, 249–272, 286, 347, 352, 360, 367–382, 391–451, 459–476, 481–489
  - drug resistance 6–8
  - potential synergies 5, 9
  - zoonotic characteristics of 5, 6
- human bancroftian filariasis 51
- human filarial infections 37
  - assessment procedures 99
  - clinical signs and symptoms 100
  - dermal onchocerciasis 102
  - diagnosis of 115
  - diagnosis vs. assessment 98
  - historical aspects 35–37
  - homeostatic phenomena 63
  - immune-avoidance mechanisms 63
  - immunosuppression 63
  - incidental filarial conditions 40
  - life cycles 113
  - loiasis 39, 109
  - long-term surveillance 64
  - lymphatic filariasis 39, 107–108
  - mansonellosis 40, 109–110
  - onchocerciasis 38, 43–49, 99, 102
  - pathogenesis and presentation of 41–55
  - research 6, 8, 9, 12, 22, 30, 34, 41, 48, 63, 64, 103, 109, 111, 113–115, 126, 127, 144, 260, 268, 272, 347, 361, 391, 392, 446, 450, 460, 497, 556
  - treatment and control of 36, 55–63, 162, 163, 169–178, 181, 315, 349, 352, 360–361
  - zoonotic filariasis diagnosis 110
- human filarial parasites
  - arsenal of mosquito control tools 549–550
  - diagnosis and assessment 100
  - lymphatic filariasis
    - genetic/genomic interventions 553–554
    - global health policies 547–548
    - vector control innovations 548–549
  - mosquitoes 545–546, 549–554, 557, 565–579
    - insecticide resistance 552–553
    - prevention measures and 551
    - vector control 553–554
  - vector control
    - loiasis 556–557
    - lymphatic filariasis 549–550
    - onchocerciasis 554–556
- human-pathogenic Filarioidea 17–18, 19
- hydrocoele 52
- hydrocoelectomy 59

**i**

imidacloprid 88  
 immuno-chromatographic test (ICT)  
 108  
 immuno-compromised models  
 446–447  
 immunodiagnostic methods 127–130  
 immunomodulation 521  
 immunomodulators 501–503  
 immunomodulatory molecules 538  
 inbreeding 292  
 incidental filarial conditions 40–41  
 individual case management 348  
 initial larval migration 76  
 Integrated Mosquito Management  
 (IMM) 573–577  
 integrated parasite control concept  
 193  
 Integrated Vector Management (IVM)  
 547  
 Interceptor® 80–81, 83  
 Interceptor® Flavor Tabs 87  
 Interceptor™ Spectrum 84  
 intolerable pruritus 47  
 intracellular bacteria 590  
*in vivo* models  
 for heartworm 449–450  
 for human filariae 448–449  
 isoxazolines 89  
 Iverhart Max® 81  
 ivermectin 23, 35, 43, 55, 62, 80, 81,  
 162, 170–171, 221, 285, 309, 358,  
 372, 445, 448, 483  
 arsenal of mosquito control tools  
 549–550  
 concentration-response curve  
 380–381  
 in heartworm disease prevention  
 257  
 mass drug administration of 532  
 persistent microfilaricidal activity  
 251  
 ivermectin-diethylcarbamazine-  
 albendazole 347

**j**

Jaboulay's technique 59  
 Jur River Blindness 35, 102  
 juvenile oncho-dermatitis 45  
 JYD-34 ML-resistant strain 80

**k**

Knott's concentration technique 126

**l**

larval development assay (LDA) 369  
 larval exsheathment inhibition assay  
 (LEIA) 369  
 larval feeding inhibition assay (LFIA)  
 369  
 larval migration inhibition assay  
 (LMIA) 369  
 larval motility assay (LMA) 369  
 lateral flow immunochromatographic  
 assay 133  
 leaf monkeys 445  
 leishmaniasis 346  
*Linognathus* spp. 139  
*Litomosoides sigmodontis* 30, 442, 48,  
 450  
 life cycles 441–442  
*Loa loa* 40, 109, 556  
 circulating microfilariae 36  
 co-endemicity 315  
 drugs used in 258  
 infections 532  
 LoaScope 109, 349  
*Loa* sp. 36  
 localized onchodermatitis 165–166  
 loiasis 34, 40, 52–54, 166–167  
 control of 61  
 diagnosis 109  
 individual treatment 61  
 vector control 556–557  
 long-lasting insecticidal bed nets  
 (LLLIN) 321  
 loop-mediated isothermal amplification  
 (LAMP) 135  
 Lord's technique 59

- lufenuron 84  
 lymphadenopathy 59  
 lymphangitis 59  
 lymphatic filariasis (LF) 35, 38, 47,  
     50–52, 54, 98, 164–165  
     arsenal of mosquito control tools  
         549–550  
     combination treatments used for  
         286  
     control of 172–178  
     current status and progress 316–319  
     DEC treatment for 251  
     diagnosis 107–108  
     drugs used in 256–257  
     elimination of 318–320  
     framework/steps 320–321  
     genetic/genomic interventions  
         553–554  
     global health policies 547–548  
     implementation of 321–322  
     individual treatment 58–60  
     mass treatment 60–61  
     MDA for 321  
     Morbidity Management and  
         Disability Prevention 322  
     onchocerciasis and 308  
     pathogenesis of 53  
     program 162  
     in SEAR countries 323  
     vector control in 321, 548–549, 553  
 lymphatic filariasis-induced  
     lymphoedema 63  
 lymphatic valve dysfunction 50  
 lymphatic vessel immuno-profiles 44  
 lymphedema 165  
 lymphedematous limb 51  
 Lymphotech® 108  
 lymph scrotum 52
- m**
- macrocyclic lactone (ML) 216, 220,  
     221, 284–285, 352, 448, 484  
     action and resistance 288–289  
     detection for 294–295  
     diagnosis for 294–295  
     for *D. immitis* 84, 85, 90, 92, 195,  
         216, 251, 257, 258, 268  
     for heartworm treatment 84, 215,  
         226–228, 237, 251, 257, 262, 264,  
         266  
     lack of efficacy and resistance 203  
     monitoring for 294–295  
     resistance in heartworm 289–294  
     resistance in human filariae  
         295–297  
 macrofilaricidal drug 163, 164, 484  
*Mansonella* sp. 36, 40  
     *M. ozzardi* 40  
     *M. perstans* 22, 40  
     *M. streptocerca* 40  
*Mansonella* spp. 21  
 mansonellosis 34, 40, 54, 61, 109–110,  
     167  
 mass drug administration (MDA) 60,  
     99, 162, 252, 308, 348–349  
     campaign 35–36  
     of ivermectin 532  
     for LF 321  
     programs 483  
 Mazzotti reaction 36, 42, 252, 284  
 MDR1 226  
 Mdr1 mutations, collies 226–228  
 mecillinam 88  
 Mectizan Donation Program (MDP)  
     23  
 melarsomine 79, 192, 257, 258  
     administration 199  
     injections 197  
     mechanism of action 266–267  
     pharmacodynamics 267  
 melarsomine dihydrochloride 225  
 Mel T 267  
 membrane-bound ELISA 133  
*meso*-diaminopimelate 591  
 metaphylaxis 194  
 microfilaremia 127  
     antigen tests and 466–467  
 microfilariae (mf) 18–21, 131, 519  
 microfilarial-related antigens 42  
 Microfilaria Suppression Test 127

- microfilaricides 192
    - activity 392
    - approach 289
    - chemotherapy 40
  - microfluidic devices 371
  - microRNA (miRNAs) 11, 500,
    - 501–503
    - profiling 520–521
  - milbemycin moxidectin 262
  - milbemycin oxime 80, 83, 88, 216,
    - 221–223, 230, 233–236, 255, 257, 262
  - Millennium Development Goals (MDGs) 347
  - Minimum Product Profiles in Animal Health 346
  - minocycline 601
    - for filaricidal usage 268
  - ML-Dirofilaria immitis-host immune reaction interaction 196
  - modified Knott's tests 127, 131, 466, 472, 473
  - monopantel 90
  - morbidity management and disability prevention (MMDP) 58, 322, 547, 548
  - mosquitoes
    - breeding 461–462
    - isolation 462–463
    - and production of L3 463–464
    - cage 464
    - Dirofilaria immitis* in 567–573
    - feeding
      - with blood 464
      - on microfilaremic blood 462
    - habitats 566–567
    - insecticide resistance 552–553
    - life cycle 566–567
    - malpighian tubules of 573
    - prevention measures 550
      - Aedes* spp. 551
      - Anopheles* spp. 551
      - Culex* spp. 551–552
    - vector control 553
  - mosquito-proof housing, of dogs 461
  - motility trap assay (MTA) with
    - Haemonchus contortus* 378–381
  - moxidectin (MOX) 79, 86, 87, 178,
    - 179, 180, 202, 203, 223–224, 285, 315, 358, 372, 448, 483–484
    - Dirofilaria repens* treatment 204
    - for *Onchocerca lupi* 205
  - multi-drug resistance gene (MDR) 90, 226–228
  - multiple-antigen vaccines 535
  - mutualism with endosymbiont bacteria 23
- n**
- NAAT. *see* Nucleic Acid Amplification Techniques (NAAT)
  - N*-acetyltyramine-*O*-glucuronide (NATOG) 111
  - nAChR antagonist derquantel 368
  - Nakalanga syndrome 49
  - necropsy counts 467
  - neglected tropical diseases (NTDs)
    - 102, 103, 163, 308, 345
  - Neglected Zoonotic Diseases 6
  - NexGard SPECTRA® 84, 92
  - nicotinic acetylcholine receptor (nAChR) 368, 522
  - night-feeding *Culex* 21
  - Nodding disease 49
  - nodulectomy 44, 55
  - nonantibiotics, for filaricidal usage 269
  - non-macrocyclic lactone,
    - diethylcarbamazine citrate 224–225, 250
  - non-melarsomine treatment 197
  - Nucleic Acid Amplification Techniques (NAAT) 105, 110
- o**
- ocular disease 166
  - ocular onchocerciasis 45, 48
  - Onchocerca lupi* 143, 565
    - microscopy-based tests 143–144

- molecular tests 144
  - recovery and imaging of adults 144
  - Onchocerca ochengi* 444–445
  - Onchocerca volvulus* 7, 22–25, 46, 48, 102, 103, 216, 371, 554, 555
    - vaccine development against 534
  - onchocerciasis 35, 36, 38–39, 43–49, 54, 104, 163–164
    - control of 162, 178, 531–533
    - discontinued drugs for 251
    - elimination of 310
    - individual treatment 55–56 and LF 308
    - mass treatment 56
    - medical imaging techniques 105
    - pathogenesis of 53
    - skin snip technique 105
    - sub-dermal nodules 103
    - transmission, elimination of
      - challenges and alternative approaches 316
      - conceptual framework 311–312
      - coverage 313–314
      - current status and progress 316–319
      - diagnostics 314
      - implementation of 312–313
      - Loa loa* co-endemicity 315
      - mapping 315
      - modelling 315
      - monitoring and evaluation 314–315
      - research 39
      - vector control 250, 554–556
  - onchocerciasis control project (OCP) 35, 311
  - onchocerciasis elimination mapping (OEM) 62, 100, 314
  - Onchocerciasis Elimination Program for the Americas (OEPA) 56
  - Onchocerciasis Technical Sub-Committee (OTS) 114
  - Onchocerciasis Vaccine for Africa (TOVA) initiative 361
  - Onchocercidae 18
  - onchocercid parasite 25
  - onchocercomas 44
  - onchocercomata implantation 447
  - Oncho Exclusion Mapping (OEM) 313
  - oncho shins 48
  - ONCHO vaccine
    - in *Brugia malayi*-gerbil infection model 535–536
    - immune responses in 538–539
    - proof of principle 536–538
  - One Health 4, 6, 136
    - health benefits 12
    - host-parasite interactions 11
    - human and animal filariases
      - AH and HH 8
      - antifilarial drugs 6, 8
      - drug resistance 7–8
      - drug targets 10
      - zoonotic characteristics of 4
    - indicators for 4
  - opportunity cost, of pet owner 338–340
  - optical coherence tomography (OCT) 105
  - Ornithodoros moubata 443
  - Ov16 antibodies 106
  - oxfendazole (OXF) 271, 481, 486
- p**
- papular eruptions 43
  - parasite-derived biomarkers 447
  - parasite-related inflammatory responses 51
  - parasite-specific nAChR genes ACR-26 and ACR-27 368
  - peritoneal exudate cells (PECs) 536
  - pet populations, in heartworm endemic regions 336
  - P-glycoprotein 226, 262
  - phylogenetic analysis 590
  - pigmentation changes 165–166
  - PK/PD modelling 448
  - Plasmodium* parasites 545
  - point-of-care (POC) 99, 114

- porphyrins 24  
 post-treatment surveillance (PTS) 310  
 praziquantel 81, 358  
*Presbytis* spp. 445  
 primate *Loa* sp. 41  
 Profender® 90  
 ProHeart® 80  
 ProHeart®6 81, 86  
 ProHeart®12 80, 86  
 Prophylaxis, preventive, fundamental  
   principle of 546  
 public health problem 56  
 Pulex 139  
 punctate keratitis 48  
 pyrantel 81, 86
- r**
- radiography 136  
 rapid diagnostic test (RDT) 168, 314  
 rapid epidemiological mapping for  
   onchocerciasis (REMO) 103  
 rapid epidemiologic assessment (REA)  
   103  
 RAPLOA 109  
 reactive oncho-dermatitis 41, 46, 47,  
   56  
 refugia 292  
 repurposing 358  
 Revolution® 81, 85, 88  
 Rifampicin 600–601  
   for filaricidal usage 268  
 Rifampicin plus doxycycline 603  
 Rifapentine plus moxifloxacin 602  
 river blindness 28, 35, 102  
 RNA interference (RNAi) 498,  
   521–522  
 RNA sequencing (RNA-Seq) 519  
 rodent models, drugs activity in 393  
 routine hematocrit test 132
- s**
- sarolaner 86  
 SARS-CoV-2 4  
 schistosomiasis 346  
 sclerotic keratitis 48  
 selamectin 80, 85, 88, 223, 285  
 semi-synthetic antibiotic (TylaMac)  
   269  
 Sentinel® 81, 83  
 Sentinel®Spectrum® 84, 85  
 severe acute respiratory disease (SARS)  
   4  
 severe combined immunodeficiency  
   disorder (SCID) 446  
 severe filarial dermatitis 51  
 short stroke massage 59  
 Simparica Trio™ 79, 86  
*Simulium amazonicum* 40  
*Simulium exiguum* 39  
*Simulium rasyani* 38  
*Simulium* spp. 21, 546  
 single nucleotide polymorphisms  
   (SNPs) 8, 286, 295  
 single subcutaneous (SC) injections  
   486  
 skin snip method 314  
 “slow-kill” treatment method 198, 293  
 spatial repellents 576  
*Spirocerca lupi* 134  
*Streptomyces avermitilis* 22, 221  
*Streptomyces cyaneogriseus* 223  
*Strongyloides* 23  
 subconjunctival migration 166  
 subcutaneous fibro-inflammatory  
   masses 38  
 Sudan regime 36  
 superficial scrotal lymphangiomatosis  
   52  
 suramin 36  
 Sustainable Development Goals (SDGs)  
   347, 359  
 swollen and tender lymph nodes 43
- t**
- target product profile (TPP) 339  
   for an endoparasiticide for dogs and  
   cats 355  
   for a heartworm chemotherapeutic  
   preventative for animal health  
   353–354

for human filariasis 347–348  
 onchocerciasis 349–351  
 Test-and-not-Treat (TaNT) campaigns  
 348, 349  
 Test-and-Treat strategies (TNT) 348,  
 349  
 tetracycline-resistant ETEC 89  
 tetracyclines 265–266  
 1,2,4-Thiadiazol-5-amines 488–489  
 Th1 immune responses 41  
 tissue-specific gene/protein expression  
 519–520  
*Toxascaris leonina* 81  
*Toxocara canis* 81  
 transgenesis, *Caenorhabditis elegans*  
 522–525  
 transgenic models in rodents 446  
 transgenic rodent hosts 392  
 transmission electron microscopy  
 (TEM) 488  
*Trichostrongylus colubriformis* 392  
 triclabendazole 358  
 Trifexis® 84, 85, 88  
 Tri-Heart® Plus 81  
 trimethoprim/sulfamethoxazole  
 88  
 triple drug therapy 321  
 for lymphatic filariasis 257  
 Tropical Council for Companion  
 Animal Parasites (TroCCAP)  
 192  
 tropical pulmonary eosinophilia (TPE)  
 60, 165  
 TrxR 488  
 tunica albuginea 52  
 tunica vaginalis 50, 52  
 TylaMac (semi-synthetic antibiotic)  
 269  
 tylosin A 269  
 tylosin derivative 269

## U

*Uncinaria stenocephala* 81, 83  
 uterus-derived components 42

## V

vaccines 361, 531–539  
 vector-borne diseases (VBDs) 346,  
 546, 548  
 vector control  
 loiasis 556–557  
 mosquito 553–554  
 onchocerciasis 554–556  
 veterinary diagnosis of filarial infection  
*Acanthocheilonema (Dipetalonema)*  
*reconditum* 138–140  
*Brugia malayi* 140  
*Brugia pahangi* 140–141  
*Dirofilaria immitis* 130–136  
*Dirofilaria (Nochtiella) repens*  
 136–138  
 immunodiagnostic methods  
 127–130  
 microscopy-based methods 126–127  
*Onchocerca lupi* 143  
 veterinary spending, in USA 334

## W

*Wolbachia*-derived heme 265  
*Wolbachia endosymbionts* (wBm)  
 590–591  
*Wolbachia pipientis* 23  
*Wolbachia* reduction treatment  
 with doxycycline 198–199  
 with melarsomine 199–201  
 with minocycline 198  
*Wolbachia* sp. 23, 43, 225  
 measurement 448  
 as targets for *D. immitis* infections of  
 dogs 598–600  
 as targets for human filarial diseases  
 591–598  
 World Association for the Advancement  
 of Veterinary Parasitology  
 (WAAVP) 232  
 World Health Organization (WHO)  
 347  
 worldwide pet spending 333  
 WormAssay 371  
 Worminator 371

*Wuchereria bancrofti* 21–24, 26, 27, 39, 216

*Wuchereria bancrofti*-infected male patients 52

## **X**

xL3 approach 537

XX/XY-based genetic sex determination system 23

## **Z**

Zolvix™ 90

Zolvix™ Plus 90

*zooepidemicus* 89

zoonotic filarial infections 40

zoonotic filariasis 4, 6, 40, 110

zoonotic subcutaneous/ocular  
dirofilariasis 130















