

# Index

- adenine 343, 345–46
- advanced therapies medicinal products (ATMPs) 6
- aerosols 156, 162, 168–70, 172–74, 188, 190–91, 196
- allergen-loaded nanoparticles 276
- alternative pathway (AP) 276–77, 291, 300, 302, 304–5, 343, 429–30
- Ames test 358, 367–68
- anaphylatoxins 271, 306–7
- anaphylaxis 16, 18, 271, 273, 276, 308
- antibodies 5, 13, 18, 245, 269, 272–73, 275, 298–99, 530
- antibody generation 273
- antioxidants 56, 180, 227, 230–31, 366, 398, 427
- AP, *see* alternative pathway
- AP activation 299, 302
- apolipoproteins 96, 99, 299, 307
- apoptosis 50, 92, 180, 231, 348, 352, 367, 369–70, 475–76
- aquatic toxicity 132
  - acute 121, 133
- arterioles 394, 397
- aspiration 161–62, 168, 331, 398
- atherosclerosis 117, 345, 526, 528–29
- ATMPs, *see* advanced therapies medicinal products
- base excision repair (BER) 343, 346
- BBB, *see* blood–brain barrier
- BBB breakdown 414–16, 418–19, 421–23
- BBB disruption 418, 420
- BBB dysfunction 416, 423–24
- BBB function 415–16, 419
- BBB permeability to EBA 423, 425–26
- BCNSB, *see* blood–CNS barrier
- BDNF, *see* brain-derived neurotrophic factor
- BER, *see* base excision repair
- biocompatibility 9–10, 45, 49, 51–52, 164, 319, 321, 334
- biocorona 90, 93–95, 97–98, 100–2, 245, 247, 256, 258–59
- biodegradation 23, 234–35, 245, 320, 322, 327, 329, 332–34, 425
- biodistribution 56, 60, 243, 245–46, 250–52, 255–56, 260, 472, 477, 482, 500
- biological activities 140, 179, 222, 227, 258, 334
- biological barriers 10, 26–27, 234, 245
- biological characterization indices 255, 257, 259
- biological identity 86, 93–95, 100–2
- biological media 54, 59
- biological surface adsorption index (BSAI) 228, 258–59, 454
- biological systems 59, 82, 85, 93–94, 221, 226, 228, 236, 239, 259, 359–60, 371, 454, 480, 500–2
- biomembranes 227–28, 292

- biomolecules 71, 85, 93, 101, 179, 195, 200, 202, 245, 257, 259, 361–62
- blood–brain barrier (BBB) 10, 27, 409–16, 418
- blood cells 195, 294, 307, 355
  - peripheral 355, 357
- blood–CNS barrier (BCSNB) 411–14
- BMPs, *see* bone morphogenetic proteins
- bone morphogenetic proteins (BMPs) 18
- brain 56, 156, 193–97, 269, 353, 408, 410–14, 416, 418, 420–21, 427, 480–81
- brain damage 410, 415, 421, 425, 427
- brain-derived neurotrophic factor (BDNF) 415
- brain edema 413–14, 417, 423, 426–27
- brain function 409, 422, 425–26
- brain pathology 409, 414–15, 417, 423–25, 427–28, 430
- brain stem 418, 420, 422
- BSAI, *see* biological surface adsorption index
- C activation-related pseudoallergy (CARPA) 290, 294, 305–7
- C-reactive protein 397
- cancer 13, 18–19, 21, 47, 50, 78, 116, 119–20, 268, 276, 278, 348, 523, 526, 529
- cancer bioassays 116, 131
- cancer cells 99, 293, 342
  - ovarian 98
- cancer therapy 344–45, 424
- carbon-based nanomaterials (CNMs) 319–24, 326, 328–34, 350–51, 353
- carbon-based nanomaterials, biodegradation of 319–20, 322, 324, 326, 328, 330, 332, 334
- carbon nanofibers (CNFs) 165–66, 174
- carbon nanotubes (CNTs) 49, 164–65, 177–78, 199–200, 234–35, 274, 277, 319–24, 326, 329–34, 390–93, 397–99, 424–25, 462–63, 473
- carboxylic acid 181–82, 451, 454
- carcinogenicity 7, 24, 341–42, 344, 346, 348, 350, 352–54, 356, 358, 360, 362, 364, 366–68, 370
- cardiovascular dysfunction 390–91, 396, 398
- cardiovascular effects 165, 175–76, 200, 394, 397–98, 400
- cardiovascular toxicity 389–90, 392, 394, 396, 398, 400
- CARPA
  - see* C activation-related pseudoallergy
  - symptoms of 306, 308
- cell lines 48, 227, 350, 355, 369, 470–71, 476
- cell–nanoparticle interactions 48
- cell proliferation 157, 168, 175, 179, 476
- cells
  - daughter 364
  - diffusion 448–51, 454
  - glial 411, 414–15, 420, 422
  - human 117, 476
  - human epidermal 356
  - natural killer 265–66, 271
  - non-hematopoietic 294–95
  - tumor 47–48, 352

- cellular uptake 28, 87–88, 92, 96,  
101, 117, 120, 125, 195,  
202, 227–29, 247, 360,  
445, 448
- central nervous system (CNS)  
390, 409–10, 412–15,  
418–19, 428, 430
- cerebellum 418, 420, 422–23
- cerebrolysin 415, 427
- chemical toxicity modeling 222
- chemicals, industrial 116, 119,  
139
- chemokines 397
- chemotherapy 344, 347, 514
- classical pathway (CP) 291, 298,  
300, 302, 304–5, 355
- CNFs, *see* carbon nanofibers
- CNMs  
*see* carbon-based  
nanomaterials  
biodegradation 329–31,  
333–34
- CNS, *see* central nervous system
- CNS injuries 408, 415, 422, 425,  
428–29
- CNT toxicity 50, 393
- CNTs  
*see* carbon nanotubes  
degradation of 324–25  
degraded 333
- colloidal stability 17, 49, 52, 54,  
86, 89, 101
- complement regulatory protein  
(CRP) 292, 298–99
- copper nanoparticles 418–19,  
421, 426–27
- CP, *see* classical pathway
- CRP, *see* complement regulatory  
protein
- curative medicine 523, 526, 528,  
530, 532
- cytokine release 134, 272, 442–45
- cytosine 343, 345–46
- cytotoxic drugs 15, 17, 273, 276
- cytotoxic T-cells 266
- cytotoxicity 52, 87, 89–92, 101,  
126, 156, 167, 186, 192,  
225, 230–31, 351, 356–57,  
470
- cytotoxicity assays 89, 128
- DAF, *see* decay accelerating factor
- DDS, *see* drug delivery system
- decay accelerating factor (DAF)  
293–94, 296
- dendrimers 11, 20, 27, 99–100,  
297, 303–4, 462, 472
- dendritic cells 265, 269–71, 273,  
278–79, 448  
maturation 273–74, 278
- density functional theory (DFT)  
224, 230–31, 233
- deoxyguanosine 343–44, 346
- dermatotoxicity 444, 453  
nanomaterial-induced 443
- developmental toxicity 179, 468
- DFT, *see* density functional theory
- diabetes 13, 117, 408, 414,  
425–26, 524, 527
- DNA damage 50, 87, 174, 195,  
342–43, 345, 347–48,  
352–58, 363, 366–68, 393,  
476
- DNA damage and repair 341, 345,  
347, 349
- DNA glycosylases 346
- DNA lesions 342
- DNA ligase 342, 346–48
- DNA replication 341–45, 347
- double-strand breaks (DSBs)  
343–44, 348–49
- drug delivery system (DDS) 4–5,  
10, 20, 30, 44, 234, 505
- DSBs, *see* double-strand breaks
- EA, *see* electron affinity
- EBA, *see* Evans blue albumin
- EBA leakage 418–19

- edema formation 415–16, 420, 423
- electron affinity (EA) 224, 231, 233
- electron microscopy 71, 177, 445
- electrostatic interactions 55, 228, 235
- embryotoxicity 121, 473
- endocytosis 26, 28–29, 31, 77, 86, 236–37, 360–61
- endometrium 464–65, 472, 475
- endothelial cells 271, 306, 398–99, 410–15, 419–21
  - cerebral 411–12
  - specialized 410–11
  - vascular 271
- engineered metal nanoparticles, neurotoxicity of 415, 417, 419, 421
- enzymes 126, 195, 202, 234–35, 298, 322–23, 325, 327, 329, 332, 334, 347
- epidermal keratinocytes, human 356, 445–46, 449
- epidermis 192, 198, 443, 451–52, 455
- epithelial cells
  - human bronchial 352
  - human lung 360
- ethical issues 506–7, 510, 512–13, 515–16
- eukaryotic cells 294, 296
- Evans blue albumin (EBA) 416, 418, 423–25
- fibrinogen 96–97
- fullerenes 19, 179–84, 200, 222–23, 227, 234, 252, 258, 273, 320, 350, 353, 473–74
  - toxicology of 179
- fullerenol 180
- genotoxic effects 183, 357, 369, 371
- genotoxic influence 351, 357, 362
- genotoxic nanomaterials 371
- genotoxicity 7, 24, 57, 118, 122, 128, 198, 345, 350–51, 353–55, 357–60, 362, 366–71
  - nanomaterial-induced indirect 365
    - primary 362–65
  - genotoxicity effects 357, 359
- germ cells 466–67, 475
- GFAP, *see* glial fibrillary acidic protein
- glial fibrillary acidic protein (GFAP) 420
- GLP, *see* good laboratory practice
- glycoproteins 290, 296, 299
- gold nanoparticles 88
  - charged 97
  - colloidal 96
  - conjugated 97
  - hematocompatibility of colloidal 96
  - hollow 14
  - radio-labeled 87
  - surface-modified 93
- good laboratory practice (GLP) 7, 24, 27, 139
- graphene 5, 166, 319–23, 326, 329–30, 334, 350
- HARNs, *see* high-aspect-ratio nanomaterials
- heat shock proteins (HSPs) 421–22
- HEK, *see* human epidermal keratinocyte
- HEK cells 445, 447–48
- hematotoxicity 7, 24
- hemolysis, nanoparticle-mediated 96
- hepatotoxicity 174
- high-aspect-ratio nanomaterials (HARNs) 49–50

- high-throughput screening (HTS) 91–92, 204, 232
- hippocampus 194, 398, 420, 422–23
- HIV, *see* human immunodeficiency virus
- homologous recombination (HR) 331, 342, 347–49
- HR, *see* homologous recombination
- HSPs, *see* heat shock proteins
- HTS, *see* high-throughput screening
- human epidermal keratinocyte (HEK) 247, 356, 445–46, 449
- human immunodeficiency virus (HIV) 227, 292, 295, 523
- human placenta 471–72, 481
- human skin 119, 192–93, 201, 449, 451–52
- hydrogen peroxide 230, 322–23, 326–27, 343
- hypersensitivity 266, 274
- hyperthermia 425–26, 430
- hypochlorite 234, 323, 326–27, 332
- hypothalamus 418, 420, 422–23, 425, 462, 467
- immune cells 268–69, 271–72, 274, 276–78, 306, 323, 346, 362
- immune responses 177, 266, 271–73, 275, 277–78, 297, 321, 443, 471  
 adaptive 266–67, 278
- immune system 177, 180, 228, 265–68, 275, 277, 290–92, 440, 467
- immunogenicity 101, 273, 275, 277, 294
- immunostimulation 266, 272
- immunosuppression 266, 268, 272, 275
- immunotoxicity 26, 116, 133, 200, 530
- inhalation, intratracheal 158, 162–63
- inhalation exposure 155, 157, 159–62, 169–70, 172, 200  
 short-term 160, 162, 170, 180
- interactions, nanoparticle–protein 245, 248
- intracellular trafficking 28–29, 125
- intratracheal instillation 48, 158–61, 163, 166–70, 180, 186, 190, 196, 332, 391–92, 394, 397
- ionization potential 224–25, 231, 233, 516
- IPPSF, *see* isolated perfused porcine skin flap
- iron oxide 5, 48, 53, 114, 253, 255, 357
- iron oxide nanoparticles 14, 19, 47, 96, 249
- Ishikawa cells 470
- isolated perfused porcine skin flap (IPPSF) 251, 253
- keratinocytes 443, 445
- kidney 56, 182, 193–97, 247–49, 252–53, 257, 358, 396, 481
- Kupffer cells 247, 268, 276
- lactoperoxidase (LPO) 323–25, 327
- Langerhans cells (LCs) 269, 441, 443
- LCs, *see* Langerhans cells
- lectin pathway (LP) 291, 299, 302, 305
- lipid peroxidation 343–46
- lipids 59, 86, 93, 97, 101, 298, 300
- lipoproteins 300

- liposomes 11–13, 19, 99, 234, 244, 246, 266, 269–70, 272–75, 292, 297–99, 303, 305, 462
- liver 48, 52–53, 56, 60–61, 174, 178, 181–84, 193–97, 245–47, 249, 254, 257, 355, 358, 396
- liver cells 60, 357
- LP, *see* lectin pathway
- LP activation 304–5
- LPO, *see* lactoperoxidase
- lungs 59–61, 155–62, 168, 170, 173, 175–76, 180, 183–86, 189–90, 193–97, 331–32, 351, 358–60, 393–94, 396–98
  - toxicity 119, 179, 185, 187
- lymph nodes 195, 248, 266, 268–69, 278–79
- macrophages 17, 48, 52, 57, 88, 96, 189, 196, 230, 268–70, 273, 306, 323–24, 329, 331
- magnetic resonance imaging (MRI) 20, 48, 470
- magnetic sperm cells 477
- malondialdehyde 343, 345
- MAP, *see* mitogen-activated protein
- mast cells 271, 306–7
- MBP, *see* myelin basic protein
- MCP, *see* membrane cofactor protein
- mean residence times (MRTs) 250
- medicinal products 2, 6–7, 22–23
- membrane cofactor protein (MCP) 293–94, 296
- mesothelial cells, human 352
- mesotheliomas 164, 171, 351
- metal nanoparticles
  - engineered 415, 417, 419, 421
  - pristine 350
- metal oxide nanoparticles 89, 91–92, 223, 225–26, 230, 233, 274
- micelles 44, 297, 299–301, 304
  - block copolymer 14, 19–20
- micronuclei formation 356, 363
- mitogen-activated protein (MAP) 231, 394
- Mn nanoparticles 423
  - neurotoxicity of 423
- MnO<sub>2</sub> exposure 423
- MRI, *see* magnetic resonance imaging
- MRTs, *see* mean residence times
- multiscale modelling 237
- multiwalled carbon nanotubes (MWCNTs) 88, 160–61, 165, 169–74, 176–78, 200, 304, 320–21, 324–25, 328–29, 332, 350–53, 393, 395–98, 473
- muscle, shoulder 394, 397–98
- mutagenicity 118, 120, 351, 355, 357–59
- MWCNTs
  - see* multiwalled carbon nanotubes
  - dispersed 169–70
- myelin basic protein (MBP) 421
- nano-Ag 196–98, 202
  - toxicity 196, 202
- nano-TiO<sub>2</sub> 184–86, 188–94, 200–1, 203, 390–92, 394, 396–400
  - inhalation of 395, 397–98
  - toxicity of 185, 188, 194, 200
- nano-TiO<sub>2</sub> exposure 191
- nano-TiO<sub>2</sub> particles 185, 188–90, 194
- nanocarriers 17–18, 27
- nanodrug delivery 410, 428, 430
- nanoethics 509
- nanoinformatics 501, 503

- nanomaterial absorption 449–50
- nanomaterial biocorona 93, 95, 97, 99
- nanomaterial biodistribution 227, 260
- nanomaterial dermatotoxicity, assessment of 444–45, 447, 449, 451, 453
- nanomaterial dermatotoxicology 444
- nanomaterial exposure 93
- nanomaterial hazards 92
- nanomaterial-induced genotoxicity 350–51, 353, 355, 357, 359, 361–63, 365
- nanomaterial interaction 97, 454, 456, 529
- nanomaterial risk assessment 154, 204
- nanomaterial toxicity 2, 25, 55, 57, 90–91, 355, 361
  - assessment of 55, 57
- nanomaterial toxicology 2, 27
- nanomaterials
  - carbonaceous 233–34
  - chemical properties of 359–60
  - genotoxicity of 360, 369
  - immunotoxicity of 265–66, 268, 270, 272, 274, 276, 278
  - metal-based 354–55
  - neurotoxicity of 407–8, 410, 412, 414, 416–18, 420, 422, 424, 426, 428, 430
  - reproductive toxicity of 461–62, 464, 466, 468, 470, 472, 474, 476, 478, 480, 482
  - toxicity testing of 202–3
- nanomedicinal products 12, 15–16, 19, 23–24
- nanomedicine applications 358–59, 371, 501
- nanomedicine development 1, 22, 244
- nanomedicine-induced
  - C-activation 297
- nanomedicines 1–6, 8–20, 22, 24–31, 43–52, 56, 58–62, 77–78, 97–99, 289–91, 461–62, 499–502, 506–10, 512–16, 528–31
  - administered 29, 268
  - novel 86, 94
  - safety 2, 26, 30
  - second-generation 23, 30
  - stability 15
  - toxicity 9
- nanoparticle-based delivery
  - systems 279
- nanoparticle–cell interactions 93
- nanoparticle drug delivery 243
- nanoparticle-mediated immune responses 271
- nanoparticle modulation of
  - immune responses 271, 273, 275
- nanoparticle surface decoration 273
- nanoparticles
  - accumulation 248
  - acid-functionalized 98
  - administered 194, 247
  - aerosolized 390
  - agglomerated 89
  - airborne 155
  - anionic 274
  - antitumor 16
  - binding 270
  - bioactivity 227
  - biocorona 247
  - biodistribution 244, 246, 254
  - cancer chemotherapeutic 247
  - clearance 268–69
  - cobalt–chromium 87
  - colloidal 86
  - complex self-assembled 21

- composition 252
- corona 95
- descriptors 227
- fullerene 273
- high-solubility 90
- insoluble 192
- layered silicate 95
- low-solubility 90
- man-made 271
- multifunctional 274
- natural polymer-based 19
- neurotoxicity of 409–10, 415, 426, 430
- physicochemical
  - characteristics 266, 271
- respirable 160
- rod-shaped 88
- rutile 239
- silica-based 20
- surface functionalization 279
- surface modification 270
- synthesis 390
- synthetic polymer-based 20
- therapeutic 276
- titania 232
- toxicity 203
- toxicity testing of 154, 202
- transferrin-functionalized 98
- ultrafine 3
- nanosilver 195, 260
- nanosilver particles 195, 202
- nanospheres 50, 390, 392
- nanotoxicity 154
- nanotoxicology 3, 21, 30, 43–46, 48, 50, 52, 54, 56, 58, 113–16, 126–34, 138–40, 153–54, 289
- predictive 221–22, 224, 226, 228, 230, 232, 234, 236, 238, 240
- reproductive 469, 471, 473, 475, 477, 479
- nanowired drug delivery 429
- neuronal damage 410, 420, 424–25, 427
- neurons 321, 410–12, 414, 421–22
- neuroprotection 408–9, 414–15, 427–30
- neurotoxicity 131, 410–11, 413–15, 419, 421–28, 430
- developmental 116, 118, 469
- neutrophils 57, 177, 185, 188–89, 271, 294, 323–25, 330–32
- nitric oxide 395, 398–99
- OSE, *see* ovarian surface epithelium
- ovarian surface epithelium (OSE) 464, 470
- ovaries 462, 464, 472
- oxidative DNA damage 178, 183–84, 364, 366
- oxidative stress 16–17, 26, 49, 56, 162, 168, 176, 180, 225, 230–32, 355, 359, 366–67, 370, 392–93
- oxide nanoparticles 231
  - metal 90, 225
  - neutral iron 247
- PAF, *see* platelet-activating factor
- Parkinson's disease 248, 423
- particle endocytosis 237
- PBS, *see* phosphate-buffered saline
- PDGF, *see* platelet-derived growth factor
- PEGylated gold nanoparticles 21
- PEGylated liposomes 16, 272–73
- personalized medicine 500, 503–6, 515, 531
- phagocytes 48, 268–69
- phagocytic cells 246, 268–69, 334
- phagolysosomal simulating fluid (PSF) 324, 327–28
- pharmacokinetics 7, 11, 15, 17, 21, 24–26, 57, 244, 248–49, 272, 321
- pharyngeal aspiration 97, 161–62, 168, 170, 176, 200, 332, 392–93, 395



- phosphate-buffered saline (PBS) 158, 185–86
- placenta 27, 183, 462, 464–65, 471–74, 480
- platelet-activating factor (PAF) 306
- platelet-derived growth factor (PDGF) 18, 168, 393
- polycyclic aromatic hydrocarbons 330, 333, 344
- polymer-coated nanoparticles 303
- polymer therapeutics 13–14, 24, 31
- polymeric nanomaterials 358–59
- polymeric nanoparticles 100, 244, 275, 358
- polystyrene nanoparticles 96–97
- protein–nanoparticle, conjugates 95
- proteins
  - inhibitor 294–96
  - membrane cofactor 294
- PSF, *see* phagolysosomal simulating fluid
- pulmonary exposure 157, 166, 185, 196, 199, 366, 390–99
- pulmonary inflammation 157, 167, 172, 176, 188–89, 399
- pulmonary toxicity 160, 166, 170, 175, 180, 185–86, 200, 393
  - acute 185
- pulmonary toxicology 184, 200
- QDs, *see* quantum dots
- QSAR, *see* quantitative structure–activity relationship
- quantitative structure–activity relationship (QSAR) 92, 221, 223, 225, 227, 258
- quantum dots (QDs) 50–52, 78–79, 247–49, 252–55, 258, 260, 350, 353, 445, 449, 451, 454–55, 462–63, 470, 480
- quartz particles 185–86
- radioiodine 416, 423–27
- reactive nitrogen species (RNS) 344, 353, 365
- reactive oxygen species (ROS) 26, 49, 56, 90, 125, 174, 230, 341, 343–45, 354, 361–63, 365, 398–99, 473, 478
- reduced graphene oxide (RGO) 324–25, 329
- reproductive, organs 131, 165, 466, 469, 472, 475
- reproductive toxicity 131, 165, 468–72, 481
- respiratory tract, lower 158–59, 162–63, 173
- respiratory tract toxicity 190
- RGO, *see* reduced graphene oxide
- RNS, *see* reactive nitrogen species
- ROS, *see* reactive oxygen species
- secondary genotoxicity 362–63, 365–66
  - nanomaterial-induced 365
- Sertoli cells 466, 478–79
- serum proteins 98, 414, 420
- silica 19, 55, 70, 73–74, 76, 124, 188, 253, 255, 366, 462–63
  - pyrogenic 70, 75–76
- silica gels 70, 74–75
- silica nanoparticles 14, 96, 246, 253
  - colloidal mesoporous 94
  - multimodal 21
- silica particles 274, 477–78
- silver 19, 49, 53, 71, 195, 197, 202, 253, 255, 350, 354–55, 363–64, 462, 472, 476
- silver nanoparticle exposure 198
- silver nanoparticles 14, 89, 117, 195–98, 202, 252, 254, 355, 369, 419, 426–29, 472, 474–76
  - inhaled ultrafine 196
  - oral toxicity of 197

- single-walled carbon nanotubes (SWCNTs) 97, 99, 162, 165–69, 175–78, 304–5, 320–21, 324–32, 350–54, 363–64, 393, 395, 397–98, 424–25, 473
- SiO<sub>2</sub> exposure 422–23
- SiO<sub>2</sub> nanoparticles 354, 357, 370, 422
  - neurotoxicity of 422
- skin, psoriatic 193, 452
- skin absorption 127, 163, 201
- skin barrier 451, 456
- skin cells, human 78
- skin corrosion 126–27
- skin corrosivity 122–23
- skin irritation 122–23, 127, 181, 192, 198
- skin sensitization 121, 129–30
- spermatogenesis 466–67, 478–79
- spinal cord 302, 411–12, 418, 421–22, 424, 430
- spinal cord injury 275, 427, 429
- spleen 178, 182, 189, 193–97, 245–47, 254, 259, 266, 360, 529
- SWCNTs
  - see* single-walled carbon nanotubes
  - carboxylated 324, 326–28, 330, 332
  - degradation of 327–28, 332
  - pristine 326–27, 473
- systemic toxicity 131, 138, 173, 193, 201, 526
- T-cells 178, 276, 278–79
- TEM, *see* transmission electron microscopy
- TiO<sub>2</sub> nanoparticles 90–91, 186, 188, 192–94, 201, 356, 362–64, 366, 369–70, 399, 424, 474, 479
  - neurotoxicity of 424
  - uncoated 188
- toxicity
  - chronic 17, 27, 29, 56, 115, 132, 174
  - epithelial 471
  - fullerene 181
  - nanomaterial-induced 442
  - organ 195, 290
  - particle 49
  - repeated-dose 132
  - vascular 252–53
- toxicokinetics 7, 24, 130, 155, 200
- toxicology 21, 55, 58, 69, 113–17, 119, 121, 123–25, 135, 138, 140, 289, 461, 482
  - developmental 7, 24
  - particle 154
  - regulatory 92, 114, 138
- toxicology assays 47, 58
- toxins, environmental 343–44, 348
- transmission electron microscopy (TEM) 79–80, 163, 167, 301, 328, 331, 416, 421, 450, 452–53, 477–78
- tumor suppressors 352, 370
- tumors 45, 47–48, 171, 247, 276, 352, 366, 370, 470
- ultrafine particle toxicology 3
- uterus 462, 464–65, 471, 473
- vagina 462, 464–65
- viruses 236, 292–93
- WBH, *see* whole-body hyperthermia
- whole-body hyperthermia (WBH) 426–29
- x-informatics 501–2
- ZnO nanoparticles 91, 354, 356–57, 366, 368, 370