## Index

Absorption effects 380–1 Acetylcholinesterase 72, 257 Acid deposition 23 modeling 179, 181, 190 Acidity measurements 104 Activity time data 207–10 Acute effects 375 Adverse effects definition 372 masked by non-adverse effects 372 Aerosols	Analytical methods 89–112 aerosols 100–7 air 89–112 biological materials 60–1 biological monitoring 336–8 decreasing detection levels 337 dietary intake 241–3 ecological monitoring 78–80 elements 59 particles 94–100 quality control 338
acidity measurements 104 analytical methods 100–7 deposition of 54–5 sampling 95–100 filter medium 100	water 228–30 see also under specific methods Analytical quality assurance (AQA) 242 Analytical quality control (AQC) 230
Aflatoxin B <sub>1</sub> 244, 298, 303, 304, 306 Aflatoxin M <sub>1</sub> 304 Age in differential susceptibility 358–9	Animals biological exposure markers 72, 75–6
AGIS Health System 195 Air, analytical methods 89–112 Air pollution concentrations in urban areas 199	cold-blooded 55 in terrestrial ecosystems 23 multicellular 55 warm-blooded 55
disparities between indoor and outdoor levels 24	Anodic stripping voltammetry (ASV) 229
episodes 364 exposure studies 200 human exposure 18–21	Anopheles mosquitoes 263 Antibody methods for measuring carcinogen + DNA
human gastro-intestinal exposure 21–2	adducts 70 for measuring macromolecular
human skin exposure 21–2 long-range transport of 41 personal monitoring 23 plant exposure 23 see also Atmospheric models	binding 301–4 Aquatic systems 393–404 ambient toxicity testing 395–9 field validation 402–3 predictive studies 399–401
Alcohol 364 Aldrin 328 Ambient (environmental) monitoring (EM), definition 51	system level effects 399–401 Aquifers. See River/aquifer interfaces Aromatic amines 69, 298 Aryl hydrocarbon hydroxylase (AHH) 275, 360
Ambient toxicity testing 82 aquatic systems 395–9 4-Aminobiphenyl 306	Asbestos exposure 357, 363, 364 Assimilation effects 380–1

Association of Official Analytical	as indicators of exposure in non-
Chemists 242	human targets 72-3
Ataxia telangiectasia (AT) 316	as indicators of exposure to
Atmospheric models 32–3	carcinogens and mutagens
applications of 187–91	64-6
characterisation 182-3	costs 77, 274
chemical behaviour requirements	criteria for evaluation of 77-8,
178–9	273–80
continental-scale problems 178	definitions 269-71
data requirements 180-2	epidemiology 74-5, 267-85
factors influencing 176-82	evaluation 280
geographically-based 175-94	historical background 267-9
global-scale problems 178	in animal experiments 75-6
local pollution problems 177-8	in clinical, preventive and
local-scale 183	occupational medicine 76-7
regional-scale problems 178	in non-human targets 65
time and space scales 176-8	intrapersonal variation 275-6
types of 182–7	invasiveness 77, 274
Atmospheric processes 179-80	legal and ethical implications of
global scale 180	research in humans 280-2
local scale 180	limitations of 77
regional scale 180	non-specific 66-8
Atmospheric transport	poisoning 282
organic chemicals 189	precision reproducibility 275
trace metals 189	reproducibility 78
Atomic absorption spectrometry	specificity of 63
228–9, 335	temporal significance 78, 276-8
Atomic absorption spectrophotometry	validation 78, 278-80
103, 251	variation 78
Atomic absorption spectroscopy 291	Biological materials, analysis of 60-1
ATP 253	Biological monitoring 49-87, 331-46
Average rate of exposure per person	advantages of 332-3
12, 15	and environmental monitoring
Average time-weighted summation	342-1
formula 206	cadmium. See Cadmium
Azodrin 82	complementarity to environmental
Racillus enhagricus 250	monitoring 374
Bacillus sphaericus 259 Bacillus thuringiensis 259	definitions 51, 331–2
Bayesian approach 40	developments in analytical
Behavioural effects 378	chemistry 336–8
Benzene 24, 312, 317, 325	inconvenience 335
biological monitoring of exposure	individual 339–40
to 58	limitations of 333–6
Benzo(a)pyrene 306	measurement strategies 338-9
Beta-2-microglobulin 63, 64, 290	number of agents to be monitored
Biochemical oxygen demand (BOD)	334-5
models 132–4	peak exposures 336
Biological Guideline 342–3	prerequisities of 52
Biological markers 26, 49, 62–80	quality assurance in 58
accidents 282	surface-acting agents 335
advantages of 73–7	Biological Quality Guide (BQG) 342
	Diological Quality Oulde (DQO) 342

Biological responses in ecological monitoring 78–80 Biological specimen banking 343–4 Black box models 131, 156 Blackfoot disease 336 Bleomycin 311 Blood analysis for biological effects of mutagens and carcinogens 66–72 chemicals in 56	c-AMP 253 Cancer 367 genetic host-factors in susceptibility to 316 identification of populations at risk 317–18 induction. See Carcinogens predisposition to 316 Capitell capitala 81 CAPTEX experiment 182 Carbamate pesticides 257
lead in 293, 338, 340, 342–3 metals in 336 Blood cells 379 mutation screening in 67–8 Blood dyscrasias 378 Blood gas binding capacity 379–80 Bloom's syndrome 316	Carbon analysis 104–7 Carbon dioxide (CO <sub>2</sub> ) 35, 187 Carbon monoxide (CO) 26, 63, 200, 347–9, 351–4, 357, 361, 363 automobile commuter exposure 210–11 comparison of estimates of exposure
Bollworm 82 Bombay, TSP concentrations 199–204 Bombay mori 262 Bones, lead in 56 Bronchitis 361, 362	distribution 213–15 concentration data 210–11 exposure estimation methods 206–' exposure profiles 23–4 in air 339 in blood 339
Cadmium biological monitoring 57–8, 287–307 concentration in urine 338 determination in air 291–2 determination in blood and urine 289, 291, 293 dose/response curve 292 early signs of kidney injury 289–90 effects of chronic exposure on kidney function 289–90 health-based limits in exposure to	micro-environment monitoring (MEM) 205–17 micro-environment type (MET) approach 205–17 passive survey sampler 108, 125 personal exposure monitoring 91, 119–20, 205–17 portable continuous monitors 108, 125 toxicity mechanism 63 Carbon tetrachloride 24
in kidney cortex 343 investigations in general population 293 investigations in workplace conditions 291–2 period of exposure 292 ratios of mean values of Cd-B to	Carboxyhaemoglobin (COHb) 63 Carboxylesterases 255–6 Carcinogens 52 animal experiments 299–300 antibodies against 303 biological markers as indicators of exposure to 64–6 blood analysis for biological effects of 66–72
Cd-A concentrations 292 recommendations for safe levels in biological material 289–90 selection of method of evaluation of exposure 289–90 toxicity mechanism 63, 287–9 toxicokinetics 287–9	cytogenetic surveillance 309–22 faecal analysis for biological effects of 71–2 hypersensitivity to 316 macromolecular adduct determination 68–70
Cadmium in liver and kidneys 56	macromolecular binding of 300-6

Carcinogens (contd.)	long half-life 55
measurement of macromolecular	metabolites as indicators of exposure
adducts as indicators of	to 323–30
297–307	modeling of transport and alteration
mechanism of action 297-9	of 29–47
metabolism 297–8	monitoring in insect tissues 250-1
noninvasive sampling 306–7	potential environmental exposure
reaction with serum proteins 68–9	estimation 115–30
reactions with DNA 69-70	regulation of 364-5
studies in humans 299–307	short half-life 55
urine analysis for biological effects	suspicion about hazardous effect of
of 71–2	50
see also Macromolecular binding	systemic responses to exposure to
Cardiovascular effects 375–6 Cardiovascular illness 357, 367	371–91
	Chlorinated hydrocarbon solvents 338
Cascade impactor 96–7	Chromosomal aborrations 210, 215, 18
Central nervous system (CNS) 377 Ceriodaphnia reticulata 82, 397, 398	Chromosomal aberrations 310, 315–18
c-GMP 253	as indicators of exposure to
Chemical analysis. See Analytical	clastogenic agents 309 in peripheral lymphocytes 66
methods	Chromosomal changes induced by
Chemical exposure markers	exogenous agents 310–11
peptides 254-7	Chromosomal instability conditions
proteins 254–7	316
Chemical field equations 173-4	Chromosome structure in insects,
Chemical modeling 179	cytogenetic methods to detect
Chemical speciation 38–9	changes in 262
Chemical transformations 179	Chronic effects 375
Chemical transport	definition 372
in subsurface, field equations 172-4	Cigarette smoking 304, 357, 359,
modeling in unsaturated zone of	361–4
subsurface 163-74	Clastogenic agents, chromosomal
numerical dispersion and oscillatory	aberrations as indicators of
behaviour in solution vector	exposure to 309
for 164–7	Clean Air Act 1969 365
Chemicals	Coefficient estimation 37-8, 40-1
age effects on susceptibilities to	Commuter study links data base 211
358–9	Compartment models 33–5
atmospheric behaviour. See	fundamental problems of 151
Atmospheric models biological	linear 159
monitoring of exposure to	see also Time-integrated
49–87	compartment models
biologically stipulated susceptibilities to 359–61	Compliance monitoring 341
	Computer-assisted scanning electron
estimation of exposure of fish in river water 220	microscopy 106
estimation of human exposure in	Concentration profiles 37
	Convection—dispersion equation 138–9
water supply 219 in blood or urine 56	
in food 233–48	Convection equation 145 Convolution method 21, 206
in water samples 220–2	Costs, biological markers 274
indicators of exposures to 393	Cotinine in urine 324–5

INDEX	409
Crystalline materials 105–6  Culex mosquitoes 257  Cyclic AMP 378  Cyclone samplers 98  Cytochemistry 252  Cytochrome P-450 255, 275  Cytogenetic surveillance 309–22  applied to workers populations  312–15  "high-exposure" occupational  situations 317  to detect changes in chromosome  structure in insects 262  Cytogenic surveillance, significance of  results for human health 315–18  Darcy's law 146	Diffusion equation 145 Diffusion models 37, 144, 183 Digestion effects 380–1 Dimethylarsinic acid (DMAA) 336 Diptera 262 Direct personal monitoring 25 Dispersion coefficients 142–4 Dispersion equation 146 Dispersion models 143, 145 Dissolved oxygen (DO) models 132–4 DNA 254 carcinogens binding to 300–4 damage 309, 310, 311 interaction of carcinogens with 298 <sup>32</sup> P post-labeling analysis of 305 reaction of carcinogens and mutagens with 69–70
Data collection methods 352	repair synthesis 67
Data management, monitoring systems	synthesis
243 DDF 337 8	in peripheral lymphocytes 67
DDE 327–8 variations in species sensitivity to	unscheduled 67 Dominant lethal mutations (DLM) 261
79	Dose
DDT 179, 189, 239, 244, 263, 327-8,	definition 44
363	to an organ 44
variations in species sensitivity to	to nuclear DNA 44
79 Decision analysis 40	Dose-commitment method 151
Decision-tree models 50, 52	Dose/effect studies 23 Dose markers 270
Deconvolution 145	Down's syndrome 316
Degradation mechanisms for chemicals	Drosophila 260, 262, 263
in subsurface 168	Drosophila melanogaster 260
Delay-diffusion equation 143	Dust accumulation 55
Delta-aminolevulinic acid dehydratase	F 1 270
(delta-ALAD) 271	Early response markers 270
Demographic trends	Ecological monitoring, relative value of chemical analysis and biological
Demographic trends and heterogeneity 366–7	responses for 78–80
masking progress against pollution 365–6	Ecological responses as exposure indicators 80–3
Dense gas dispersion 187-8	Economic models 135
Diabetes 362	Ecosystems, evaluations of effects of
Dialkylphosphoric acids 256	chemicals on 394
Dialkylthiophosphoric acids 256	Ecotoxicological approaches 82
3,4-Dichloronitrobenzene 256	Eigenvalues 160 Eigenvectors 160
Dichotomous sampler 97–8 Dieldrin 244, 263, 328	Electron capture detector 250
Dietary exposure studies 21	Electrophoresis 256, 257
Dietary intakes	Elemental analysis 101
analytical methods 241-3	ELISA 303
monitoring systems 233-48	Endocrine system 383-4
of contaminants 233–48	Energy dispersive X-ray fluorescence
Diffusion coefficient 40–1	(XRF) analysis 101-2

Enhanced personal monitoring (EPM) 19, 206	approaches for 13–15 direct approach 14
Environmental contaminants, human	indirect approach 14–15
responses to 357-70	use of existing data 23-5
Environmental monitoring 332, 374	Exposure monitoring
and biological monitoring 341-2	devices for 16
Environmental pollution	multimedia assessment 195-7
human exposure to 347-55	Extrapolation methods 38
risk model of 9	B 1 1 1 2 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Enzyme induction by xenobiotics 255, 256	Faecal analysis for biological effects of mutagens and carcinogens 71–2
Enzyme inhibition by xenobiotics 255	Fanconi's anaemia 316
EPA/NBS sampler 122	FCM programme 242
Epichlorohydrin 314–15, 317	Field measurements 37–8
Epidemiology	Field protocols 353
biological markers in 74-5, 267-85	Field studies 17, 353–4
characteristics of difficult diseases	multimedia 26
for 272–3	survey design 16
of food safety 233	Filter media 100
systemic toxic effects 373–4	Finite-difference approach 33
EPM 26	Fish, estimation of exposure to
Erythrocyte oxidant stress 357	chemicals in river water 220
Erythrocyte protoporphyrin (EP) 271	Flame ionisation detector 250 Flow coefficients 158
Estimation methods, model selection	Flow equation 146
39–40	Fluorescence spectroscopy 306
Estimation models 39	Fluorogenic techniques 252
Estimation process 40	Food, chemicals in 233–48
Estuarine waters, geographical models 131–49	Food consumption
	data and sampling approaches for
Estuary flow models 138–9 Ethylene oxide 305–6 315 317	contaminant analysis 236
Ethylene oxide 305–6, 315, 317 Eulerian–Lagrangian methods 32	questionnaires 21
Eulerian method 32	survey 21
Eulerian models 184–5	Food contaminants, monitoring
	systems 234-41
European Monitoring and Evaluation Program 190	Food safety, epidemiology of 233
Evaluation data 181	Forecasting models 39, 40
Exposure	Forest decline syndrome 23
calculation 43–5	Forest soil pH 191
definition 10–12, 44	Formaldehyde 335
ecosystem 45	passive sampler 109, 126–7
Exposure assessment	personal exposure monitoring 92,
insects. See Insects	121–2
models in 29–47	C-11-1-11-11-11-250
objectives of 12	Galleria mellonella 259
presentation of results 230–1	Gambusia affinis 394
purposes of 116-18	Gas chromatography (GC) 229, 250, 256
toxicokinetics 56–7	
Exposure indicators	Gas chromatography–mass spectrometry (GC–MS) 229
ecological responses as 80–3 for chemicals 393	Gases, personal exposure monitors 91–3
Exposure measurement 9–28	Gastrointestinal system 380–1

II ID DII	
Gaussian plume model 183 General circulation models (GCMs) 187 Genetic changes as indicators of chemical exposure 260–4 Genetic host-factors in susceptibility to cancer 316 Genotoxic agents, exposure to 309 Geographical models 32 atmospheric 175–94 estuarine waters 131–49 river/aquifer interfaces 131–49 surface waters 131–49 water 131–49 Global models 36, 38, 131, 147, 187 Glucose-6-phosphate dehydrogenase (G-6-PD) deficiency 360 Glutathione S-transferases 255, 256 Gravimetric devices for personal monitoring 122 Grey box models 34, 131	Histochemistry 252 HPLC-ICPMS 229 HPLC-MS 229 Human activity patterns 27 Human exposure field studies 16, 353-4 gastrointestinal 21-2 importance of accurate measures of 347-8 models 27 to air pollution 18-22 to chemicals in water supply 219 to environmental pollutants 347-55 Human responses to environmental contaminants 357-70 Hyalophora cecropia 259 Hydraulic conductivity 168 Hydraulic models 33 Hydrodynamic dispersion 167 Hydrosphere modeling 33
Groundwater flow equation 146 flow transfer coefficients 41 models 34 Groundwater/surface water relationships 145–7 Gut microflora 381	Immune responses as possible toxicity indicators 258–9 Immune system 384–5 Immunoglobulin A (IgA) 358 Impulse/Response Curve (IRC) 340 Incentives in stimulating respondent cooperation in field study 17
Habrobracon juglandis 262 Haemocytes as possible toxicity indicators 258–9 Haemoglobin alkylation 68 Haemopoietic system 378–80 Halogenated hydrocarbons 298, 299 Harvard–EPRI sampler 122 Health risks 52 Health surveillance 52, 332 Hearing disorders 377 Hemolytic precipitators 357	Inductively-coupled plasma mass spectrometry (ICPMS) 229 Inductively-coupled plasma optical emission spectrometry (ICPOES) 229 Initial boundary conditions 181 Inorganics, analysis in water 228–9 Insecticides 82, 363 chlorinated 250 resistance to 263 Insects
Hepatic mixed function oxidases 72 Herbicides, methylated chlorophenoxy 250 Heterogeneity acquired factors 361 and demographic trends 366–7 and regulation of chemicals 364–5 models 367–8	cytogenetic methods to detect changes in chromosome structure in 262 detection of immediate damage at cellular and subcellular levels 251–2 determination of xenobiotics in tissues and organs 249–52
High molecular weight proteins 290 High performance liquid chromatography (HPLC) 229, 251 High-volume mass sampler 96	detoxication systems in 255 effects of exposure on metabolism and metabolites 257–8 exposure assessment methods 249–66

Insects (contd.)	Macromolecular adducts
genetic changes as indicators of	as indicators of carcinogen
chemical exposure 260-4	exposure 297–307
haemocytes as possible toxicity	determination of 68-70
indicators 258–9	Macromolecular binding
immune responses as possible	measurement of 301-4
toxicity indicators 258-9	by physico-chemical methods
indirect effects on cells and tissues	305–6
253-9	of carcinogens 300-6
methods of studying effects of	Magnesium 357
xenobiotics 263-4	Magnetopneumography 56, 274
mutagenicity testing in 260-2	Mandelic acid in urine 326-7
resistance to insecticides 263	Mass analysis 100-1
respiratory metabolism 258	Mass balance equation 157
Instrumental neutron activation analysis	Mass spectrometry (MS) 229
(INAA) 102-3	Maximum likelihood estimates (MLE)
Integrated exposure 11, 15, 17, 18	40
Integrated personal monitor 25	MBTH (3-methyl-2-benzothiozolinone
Interchange surfaces 15	121
Internal dose, determination of 59-61	Mercuric nitrate/potassium
Internal exposure to metallic	ferrocyanide 250
compounds 59	MESOS 189
Inverse methods 145	Mesothelioma 364
Ionising radiation 310	Metabolism, effects of exposure in
Iron containing dusts 56	insects 257–8
	Metabolites
Kidney functions 383	as indicators of exposure to
Kolmogorov–Smirnov test 214	chemicals 323-30
Kriging codes 39–40	effects of exposure in insects 257-
( a h a mata mar a mar mar mar mar mar mar mar mar	internal exposure to 60
Laboratory experiments 40–1	Metallic compounds, internal exposure
Lagrangian approach 32	to 59
Lagrangian models 185–6, 188, 190	Metals in blood and urine 336
Lagrangian puff trajectory model 189 Lead 179	Meteorological data evaluation in
in blood 293, 338, 340, 342–3	conjunction with chemical
in bones 56	measurements 186
Least-squares estimation 40	Methodological investigations 25
Legislation 364–5	8-methoxycaffeine 311
Leukemia 316	7-methylguanine 306
Linear donor controlled models	m-methylhippuric in urine 326
159–60	Micro-environment monitoring (MEM)
Liver effects 382–3	19, 25, 26
Local models 34, 37, 38, 131, 137-8,	CO 205-17
147, 183	Micro-environment types (METs)
ong-range transport models 184-7, 189	18–21, 25, 26
ow-molecular-weight proteins 290	Micronuclei 67
ow-molecular-weight substances,	Microscopic interferometry 252
assessment of effects of	Microsomal oxidases 255
xenobiotics on 253-4	MINIRAM, light scattering device 99
Lucilia cuprina 263	Modeling process
Luecophaea maderae 253	flowchart of 30
ung cancer 336, 357, 362, 363	stages of 30

Models in exposure assessment 29–47 simple 35–6	Nitrogen dioxide (NO <sub>2</sub> ) 26, 200 personal exposure monitoring 91–2, 120
single-chemical 35 summary of 31	portable continuous monitors 108,
terminology 34-5	Nitrosamines 298
Moisture content field equations 172–3 Moisture tension 168	Nitrosodimethylamine 244 Nitrous oxide (N <sub>2</sub> O) 187, 357
Monitoring systems	Non-adverse effects
data management 243	definition 372
dietary intakes 233–48	masking adverse effects 372
food contaminants 234–41	Non-human exposure assessment 22–3
	Non-specific effects 375, 381
Monomethylarsonic-acid (MMAA) 336	
Morbidity records 374	Non-stochastic effects 375
Mortality records 374	Nucleic acids
Multifactorial effects 375	changes caused by exposure to
Multimedia exposure 22	xenobiotics 254
monitoring assessment 195-7	detection of effects of xenobiotics
Multimedia field studies 26	on 254
Multi-species models 39	Numerical diffusion 145
Musca domestica 262, 263	Numerical dispersion in solution vector
Musculoskeletal system 384	for chemical transport 164–7
Mutagens 52	Numerical problems 38
biological markers as indicators of	Numerical solution 38
exposure to 64–6	Nutritional deficiencies 359, 362
blood analysis for biological effects	
of 66–72	Occupational Safety and Health Act
faecal analysis for biological effects	(OSHA) 1970 365
of 71–2	Octanol/water partition coefficient 168
hypersensitivity to 316	Organic chemicals 105, 109, 126, 179
macromolecular adduct	analysis in water 229-30
determination 68–70	atmospheric transport 189
reactions with DNA 69–70	Organochlorine pesticides 93, 328
testing in insects 260–2	personal exposure monitoring 122
urine analysis for biological effects	Organonitrogen pesticides 93
of 71–2	Organophosphates 82
Mutation screening in blood cells 67–8	Organophosphorus pesticides 93, 251,
Myzus persicae 257	256, 257
Notional Ambient Air Ovelite	Oscillatory behaviour in solution vector
National Ambient Air Quality	for chemical transport 164–7
Standards (NAAQS) 347–8, 354	Outdoor monitoring station data 25
National Food Disappearance data 239	Ozone 357
Nephelometers 99	227
Nervous systems 376–8	<sup>32</sup> P post-labeling analysis of DNA 305
Neurobehavioural functional deficits	<sup>32</sup> P post-labeling methods 69
378	P-450 cytochrome 255, 275
Neurochemical changes 378	Parameter identification 144–5
Neurological test procedures 376	para-rosaniline methods 121
Neuropathological changes 378	Partial hepatectomy 382
Neurotoxicity 64	Particles
Neutron-activation analysis 56, 59, 274	analytical methods 94–100
N-3-(2-hydroxyethyl) histidine 306	deposition of 54-5
Nicotine in urine 324–5	individual particle analysis 106

Particles (contd.)	Phenylglyoxylic acid (PGA) in urine
personal exposure monitoring 94,	327
122-3 respirable particulate matter 108-9,	Phosphorus dilution in stream systems 135
125–6	Photochemical oxidants 179
size distributions and origins of 94-5	Physico-chemical analytical methods 22
see also RSP (respirable suspended particulate matter); Total	for measuring carcinogen + DNA adducts 70
suspended particulate matter	Piezobalance 98-9, 123
(TŠP)	Piezoelectric portable monitor 123
PC-naphthalenes (PCNs) 337	Pimephales promelas 82, 397
Peptides, chemical exposure markers	Plants
254-7	aquatic 73
Peripheral lymphocytes 310, 311, 314, 315	biological markers as indicators of exposure in 72–3
chromosome aberrations in 66	exposure to air pollution 23
DNA synthesis in 67	growth reduction in 73
sister chromatid exchanges (SCE)	terrestrial 72-3
in 66–7	uptake estimation 23
Personal exposure monitoring 25,	Pneumonia 362 Pollen transport 188–9
89–100, 349, 353 carbon monoxide (CO) 91, 119–20,	Pollutant transport modeling 36–9
205–17	Pollution levels, measurement of 196
formaldehyde 92, 121–2	Polyacrylamide gels 256
gases 91–3	Polychlorinated biphenyls (PCBs) 93,
instrumentation for 116–18	122, 179, 189, 336, 358
nitrogen dioxide (NO <sub>2</sub> ) 91-2, 120	Polychlorinated quaterphenyls (PCQs)
organochlorine pesticides 122	337
particles 94, 122-3	Polychlorodibenzofuran (PDCFs) 337
pesticides 93, 122	Polycyclic aromatic hydrocarbons
polycyclic aromatic hydrocarbons	(PAHs) 80, 105, 298
(PAHs) 123–4	personal exposure monitoring
polynuclear aromatic hydrocarbons	123–4 Polynuclear aromatic hydrocarbons
(PAHs) 92	(PAHs) 26, 69
sampling equipment 118–19	personal exposure monitoring 92
volatile organic compounds (VOC)	Polyurethane foam (PUF) 93, 122
92, 120–1  Posticido surveillones index 222	Population health status 196
Pesticide surveillance index 233 Pesticides 26, 179	Pregnancy 357, 362, 363
carbamate 257	Probability distribution functions 41
degradation of 256	Probability sampling methods 16, 17,
organochlorine 328	25
organophosphorus 251, 256, 257	Protein synthesis, inhibition of 255
personal exposure monitoring 93,	Proteins, chemical exposure markers
122	254-/
pyrethroid 93	Proton induced X-ray emission analysi
resistance to 263	(PIXE) 102 Pyrethroid pesticides 93
pH effects 81, 191, 221	Tyreamora pesticides 73
Phase boundaries, uncertainty in	
transfer coefficients across 42	Quality assurance in biological
Phenol in urine 325	monitoring 58

Quality control, analytical methods Sensitivity testing 181 SHAPE model 20, 24, 206 Ouantal effects 375 Silver nitrate/phenoxyethanol 250 Simulation modeling 20, 183, 191 Quantitative cytochemistry 252 Simulation of Human Air Pollution Questionnaires, symptom-based 377 Exposure (SHAPE) model. See Radioisotopes, atmospheric dispersion SHAPE model of 189-90 Sister chromatid exchanges (SCEs) 310-18 Random dilution models 134-6 Random mass balance models 134-6 in peripheral lymphocytes 66-7 Random walk techniques 144 Skin cancer 336 Receptor modeling 186 Skin effects 380 Recessive lethal mutations (RLM) Skin exposure to air pollution 21-2 261 - 2SO<sub>2</sub> 81, 190, 200 Regional-scale climatological SO<sub>4</sub> 190 concentration and deposition 188 Soil/plant transfer coefficients 23 Regional-scale models, source/receptor Soil pollution 23 relationships 190-1 Soluble ionic species 104 Renal-cell carcinoma 316 Somatochlora cingulata 264 Renal failure 383 Sorption coefficients 168 Reservoir models 144 Source/receptor relationships, regional-Residence time 136-7 scale models 190-1 Resolution methods 141–2 Specific effects 375 Respirable suspended particulate matter Spectrophotometry 250, 257 (RSP) 201 Statistical methods 196, 347–55 Respiratory effects 375-6 Statistical models 20, 186 Respiratory illness 364 Statistical sampling 350–2 Retention coefficient 154 Stochastic effects 375 Retention function 152, 154 Stratification 14 Retinol binding protein (RBP) 291, Stratified random sample 14 338 Streaker sampler 96 Risk assessment, biological markers in Stream flow models 139-41 76 - 7Streeter–Phelps equations 132 Risk estimation 52 Streptonigrin 311 Risk model of environmental pollution Study designs direct approach 15-17 River/aquifer interfaces, geographical indirect approach 17-21 models 131-49 Styrene 24, 313-14, 317, 326-7 River water, estimation of exposure of Sulphate 200 fish to chemical present in 220 Supercritical fluid chromatography-MS RNA 254 carcinogens binding to 300-4 Superoxide dismutase (SOD) 358–9 synthesis inhibition 255 Surface-acting agents, biological monitoring 335 Sample selection techniques 350-2 Surface water Scientific Group on Methodologies for flow equation 146 the Safety Evaluation of geographical models 131-49 Chemicals (SGOMSEC) 3 models 34 S-dependent agents 310-11 see also Groundwater/surface water Sediment-contaminant transport relationships model 141 Survey research methods 25 Sensitivity analysis 38, 43 Survey response rate 16–17 Sensitivity coefficients 43

Survey techniques 16	and exposure assessment 56-7
Susceptibility markers 270	development of general strategies
Symptom-based questionnaires 377	57–8
System level effects in aquatic	factors to be considered in
environment 399	monitoring human exposure
Systemic responses to exposure to	53–4
chemicals 371-91	Trace elements 101
Systemic toxicity	Trace gases 94
epidemiology 373-4	Trace metals, atmospheric transport
methods of assessing 374-85	189
_	Transboundary pollution 190
Tap water 25	Transfer coefficients 154, 155, 190
TEAM study 22, 24, 350-4	uncertainty of 41-2
Temperature field equations 173	Transfer functions 136-7, 153, 154
Tenax TM personal monitors 24	Transformation mechanisms for
Terrestrial ecosystems 23	chemicals in subsurface 168
Test protocols, development of 107–8,	Transport models
124	data requirements for 167-9
Tetrachloroethene 337	long-range 184-7, 189
Tetrachloroethylene 24	Transverse dispersion coefficients 144
Thalassemia 360–1	Trichloroacetic acid in urine 338
Thalassia 400–1, 403	1,1,1-trichloroethanol 24
Thalassia testudinum 83, 399	Trichloroethene 337, 340
Thermal conductivity detector 250	Trichloroethylene 24
Thin layer chromatography (TLC)	Triple-quad MS-MS 230
250, 256	TSP concentrations. See Total
Time-allocation data 19–21, 26	suspended particulate matter
Time-dependent compartment models	Turbulent-diffusion theory 33
156–60	Two-stage model 40
Time-dependent differential equations	
33–4	Uncertainty of transfer coefficients
Time-dependent diffusion coefficient	41-2
143	Urban residence 364
Time-dependent models 35	Urban Scale Study 210
Time-integrated approach 35	Urinary excretion 56
Time-integrated compartment models	Urine analysis for biological effects of
151–61	mutagens and carcinogens 71–2
Time resolution 12	USSR 195
Time-weighted summation formula 21	Validation 242
Tobacco smoke 109, 126, 324-5	alternative approaches to 42–3
TOC (total organic carbon) 231	of biological markers 78
Toronto, TSP concentrations 199–204	Vinyl chloride 313, 317
Total Exposure Assessment	Virtually safe doses (VSD) 244
Methodology (TEAM). See	Vitamin A 357
TEAM study	Vitamin C deficiency 362
Total human exposure	Vitamin E 357
new approaches to measuring 348-9	Volatile organic compounds (VOCs)
pilot studies 349–50	24, 26, 350, 354
Total suspended particulate matter	personal exposure monitoring 92,
(TSP) 199–204	120–1
Toxic Substances Control Act (TSCA)	
1976 365	Washington Micro-environment Study
Toxicokinetics 52–9	205 210

Water analysis 228–30 chemicals present in 220–2 estimation of human exposure to chemicals in 219	Weighted probability sampling technique 24 Wilm's tumour 316 Wind directions 32–3 Wind rose 32–3
geographical models 131–49 modeling limitations 143–5 sampling and analysis to assess exposure 219–32	Xenobiotics assessment of effects on low- molecular-weight substances 253-4
Water quality models for various contaminants 134–6	detection of effects on nucleic acids 254
Water sampling compositing 227 extraction/concentration/clean-up methods 227–8 locations 223–4 processing for analysis 227–8 program design 222–5 definition of determinants 222 required accuracy of analytical results 225 times 224 treatment and storage 225–6 Water sub-sampling 227	determination in insect tissues and organs 249–52 enzyme induction by 255, 256 enzyme inhibition by 255 nucleic acid changes caused by exposure to 254 see also Insects X-ray diffraction (XRD) patterns 105–6 X-ray energy spectroscopy (SAX) 106 X-ray fluorescence 56, 59, 274 m-Xylene 326
Water supply treatment plants 25 Weather conditions 32	Zagreb, TSP concentrations 199–204  Index compiled by Geoffrey C. Jones
Weather conditions 32	inuca complica by debijitey c. somes