Subject Index

Acceptable daily intake (ADI), 60, 73
Acetaminophen fluoride, derivatives, 50
Acidification of aquatic systems, 99
Activation of chemicals
carcinogenesis and mutagenesis, 37, 48, 50
definition, 37
Acute immobilization test (EC₅₀), 87
Acute toxicity test
dietary (LC₅₀), 86, 87, 88, 89
oral (LD₅₀), 86, 89
ADI (see Acceptable daily intake)
Aflatoxin and Liver cancer, 56
Age
effect on risk, 62-65
influence in assay, 41
modelling of, 64-65
Alcohol, consumption of, 65
Aldrin, 22
Algae, 92, 96
Algal growth test, 86, 87
Alkylation agents, 50, 64
Aluminium, 99
Ames Salmonella test, potency estimation, 60
Analytical studies, use in epidemiology, 56-59
Angiosarcoma, 58
Aniline, 20
Antibodies, monoclonal, DNA analysis, 33
Aphid, 94, 95
Armitage-Doll model, 59
Arsenic, 21
Arthropod, 93
Asbestos, 30, 58, 64, 65
Assay
delayed response, 88
dose schedule, 45-46
eyearly life-cycle, 90
full life-cycle, 90, 91
lifetime protocol, 46
long-term and carcinogenesis, 41-47, 51, 52
population, 87
potency, 50-51
quantification of results, 46-47
Salmonella plate incorporation, 48, 49, 50, 51
short-term
extrapolation to long-term, 50, 51, 52, 68
use of, 48-51, 86, 95
time of observation of tumour response, 46
variables in, 43-45, 46
Bacteria, 96
Banks of data, 6, 70, 71
Batch cultures, use in assays, 87
Beetles, 94
Behaviour, abnormalities, non-human, 90, 91, 93-94, 100
Benzene, 20
Benzidine, 20
Benzo(a)pyrene, 66
Best point estimate, 76
Bioaccumulation, 88, 90
Bioanalysis (see Biological monitoring)
Biological monitoring
definition of, 19
models, 19
use of, 5, 10, 20, 21, 22, 23
Biological variables, ranking of, to estimate effect, 91
Biotransformation, 18, 75
Birds, as test species, 89, 90
Bladder, carcinogenesis
human, 56, 61
rat, 36
Blood, use in monitoring, 20, 23

675
Bronchus
  carcinomas, 47
  model of, 42
Butter yellow derivatives, 50

Cadmium, 18, 20, 21, 88
Calcium, 99
Carbon dioxide, evolution, 96
Carcinogenesis, 6, 29, 33–71
  epidemiology, 53, 54–71
  stages of, 33–35, 38, 39, 41, 61
Case-control studies, use in epidemiology, 57–58
Cell membrane and promoters, 36
Chemical transfer in environment, 12, 13, 14, 24
Chlorinated dibenzodioxins, 71
Chlorination, water, 56
Chlorophenols, 71
Chlorophyll, 99
Chromatography, gas, 20
Chromosome
  damage, 49, 71
  mutations, 32, 33, 38, 39, 55
Chronic toxicity tests, 90
Cigarette smoking, 30, 56, 57, 64, 65, 66, 67, 68
Clone, proliferation of cells, 34, 36, 37
Cohort studies, use in epidemiology, 57
Coke oven emissions, 68
Colon
  carcinomas, significance, 47
  human, carcinogenesis, 56
Community
  diversity, 100
  effects of chemicals, 91, 92, 93, 97
  98, 99, 100
  plant, 88, 89, 93
Comparative potency, method of cancer risk estimation, 68
Competitive interactions, 92–93
Confidence limit, 76
Continuous cultures, use in assays, 87
Copper, 100
Correlation
  demographic, use in epidemiology, 55–56
  geographic, use in epidemiology, 55, 56
  use in determining critical organ, 23
Critical organ, definition of, 22, 23
Croton oil, 37

Cultures, batch, use in assays, 87
Cytokinetics, use in risk estimation, 44

Daphnia, acute toxicity test, 86, 87, 88
Data banks, 6, 70, 71
DDT, 20, 22, 36
Decomposition, organic, 98
Deoxyribonucleic acid (see DNA)
Detoxification of chemicals, 88
  carcinogenesis and mutagenesis, 48, 50
Development, cells, 32, 38, 39
Diatom, 92
Diesel engines, 68
Diethylphenyltrichloroethane (see DDT)
Differentiation, cells, 32, 34, 36, 37, 38, 39
Dimethylformamide, 20
Dioxins, 36, 71
DNA
  adducts, use in risk estimation, 44
  analysis of, 33
  binding with initiators and promoters, 35
  carcinogenesis, 37, 38
  damage to, as screening test, 48
  mutations, 31–33, 38
  repair, 32, 33, 38, 39
  structural modifications, 32
  synthesis in mammals, as screening test, 48
  transcription, 31
Domestic animals, acceptable risk, 85
Dose
  applied and effective, 59
  definition of, 8
  determination of, 21, 22
  extrapolation, 5, 24, 30, 53, 59–60
  64–68, 73, 74, 76, 77
  rate, importance of, 61
  schedule, in assay, 45–46, 51
Dose–response relationship, 42, 43, 45, 46, 49, 50, 59, 65–68, 69, 70, 71, 75, 77, 88
  carcinogenesis and non-carcinogenesis, 74
  model of, 59, 65–67
  linear, 65–66, 70
  quadratic, 66–67
  sources of error, 66–67
Dose–time–response models of, 60–64
relationships, 53, 58, 60-64, 71, 88
Doses, comparison of, 50
Drosophila
  genetic fitness studies, 93
  mutations in, as screening test, 48, 51
EC$_{50}$ (see Acute immobilization test)
Ecosystem
  aquatic, 90, 93, 96, 100
  assessment of damage, 85
  definition of damage, 85
  limitations of tests, 100-102
  models, 12, 14, 86, 95-98, 101, 102
  generic approach, 95, 96
  realistic, 96
  study of, 5, 85-103
  terrestrial, 96, 100
Eggshell thinning, 90
EMTD (see Estimated maximum tolerated dose)
Endangered species, acceptable risk, 85
Endometrium, human, carcinogenesis, 56
Energy flow, fluctuation in environment, 85, 95
Engines, diesel, 68
Epidemiology
  and carcinogenesis, 53, 54-71
  design of studies, 58-59, 77
  determination of carcinogenesis, 30, 33, 51, 52
  limitations, 53-54
  occupational, 57
  uses, 3, 4, 29, 54, 71, 72, 73, 74, 75, 76
Epigenetic carcinogen, definition of, 41
Error, models, 15, 16, 25
Esters, 36, 37
Estimated maximum tolerated dose (EMTD), 42
Excretion, 75
Experimental organisms, choice of, 40, 41, 42, 89, 90, 94, 95, 105
Expired air, use in monitoring, 20, 23
Exposure
  commitment, 8, 13
  definition of, 7, 8, 25
  human, 6, 24
    environmental monitoring, 5
    length in assay, 42
  method of estimating, 7-25
  non-human biota, 5, 6, 24
  population, 10-11
Fat, use in monitoring, 20
Fertility, 75
Field studies
  extrapolation from short-term to long-term, 100
  use of, 86, 87, 91, 92, 95, 97, 98, 100, 101, 102
Fingernails, use in monitoring, 23
Fish
  acceptable risk, 85
  use in tests, 93, 94, 100
Fly, 48, 51, 93, 95, 99
Food chain, 14, 15, 87, 94, 98, 100
Fungus, 95
Gastrointestinal tract, model of, 18
Gene
  activation, 32
  amplification, 32
Grass, 92
Grazing, use in risk estimation, 92, 95
Hair, use in monitoring, 21, 23
Healthy worker effect, 47
Hepatomas, mice, 47
Histochemical markers, use in risk estimation, 44
Histogenesis, use in risk estimation, 44
Histopathology, use in risk estimation, 44
Hydrocarbons, 20, 50, 51
Immobilization test, 86
Immunochromatographic markers, use in risk estimation, 44
Initiators, 35-37, 39, 61, 66
Insects
  acceptable risk, 85
  use in risk assessment, 89, 94, 95, 103
Intake, definition of, 8
Interspecies, variation in response (see Non-human organisms, extrapolation to humans)
Intervention studies, use in epidemiology, 58
Intraspecies variation
  carcinogenesis, 66, 70
  human, 63, 73
Invertebrate, 100
Iron, 99
Kidney, use in monitoring, 20, 21
Index

Metastases and malignancy, 47
Methylmercury, 21
Mice
deer, 95
SENCAR, 42
strain A, 42
Microbes, 96, 99
Microcosm, 86, 91, 96, 97-98, 101, 102
Microenvironment and carcinogenesis, 38, 39
Microinvertebrates, 86, 96
Micronuclei, in mice, as screening test, 48
Microorganisms, 86
Mineralization of nitrogen, 96
Mink, 90
Mite, test system, 94
Mixtures of chemicals, 5, 53, 101
Models
accessibility, 16
Ames Salmonella test, 60
Armitage–Doll, 59
classification of malignancy, 47
dispersion, 12, 13, 24
dose–response relationship, 53, 59–60
ecosystem, 12, 14, 86, 95–98, 101, 102
effect of age on risk, 64–65
error, 15, 16, 25
food chain, 12, 14, 15
general description of, 12
metabolic, 18, 19, 24, 75
metal toxicity, 74, 77
multihit, carcinogenesis, 34
multiple, 15, 33, 34
multistage, carcinogenesis, 33, 34, 60, 61–67, 69
neurogenic tumours, 42
probit, non-carcinogenic effects, 74
risk in man, 44
transport, 12, 13, 14, 24, 25
use
in estimating exposure, 9–11
in risk estimation, 5, 6, 30, 51, 97
validation, 15, 16, 17, 25, 71, 97, 102
Weibull, non-carcinogenic effects, 74
Monitoring, environmental, 9–11, 16–18, 24, 25
and modelling, 16, 17
Monte Carlo, 16
Multiple effects, 69
Multispecies tests, 86, 91–103
Mutagenesis, 6, 29–33, 36–71
Mutation rate, increase, 54–55

Laboratory studies
use of, 73, 74, 76, 77, 91, 92, 98
validation of, 100
Larynx, carcinomas in, 47
Late-stage factor, 56
LC50 (see Acute toxicity test)
LD50 (see Acute toxicity test)
Lead, 10, 11, 18, 19, 20
Leaf, chlorosis, 100
Legislation and risk assessment, 67–69, 70, 71, 98
Legumes, 92, 95
Leukaemia, 65
Lifetime protocol, assay, 46
Linear interpolation method, 74
Liver
human, carcinogenesis, 56, 58, 61
rodent, carcinogenesis, 36
Logging, 99, 100
Lung
adenomas, mice, 42, 47
exposure route, 20
human, carcinogenesis, 56, 64, 65, 66, 68
model of, 18
Lymphocyte, effect of promoters, 35
Lymphoma
hamster, 50, 51
mice, 50, 51
thymus, 43
Macroconsumer, study of, 98
Magnesium, 99
Malignancy, classification of, 47
Mammary gland
human, carcinogenesis, 61
rat, carcinogenesis, 36, 47
Markers
histochemical, use in risk estimation, 44
immunochemical, use in risk estimation, 44
Median lethal concentration (LC50), dietary (see Acute toxicity test)
Mercury
exposure, 9, 10, 15
methyl, 21
Mesothelioma, 58, 65
Metals
aquatic systems, 100
soil, 96
toxicity of, and models, 74, 77
Index 679

<table>
<thead>
<tr>
<th>Term</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutations, measurement of</td>
<td>32-33</td>
</tr>
<tr>
<td>Mycorrhiza, 92, 95</td>
<td></td>
</tr>
<tr>
<td>Neoplastic transformation, mammalian cells, as screening test</td>
<td>48, 49</td>
</tr>
<tr>
<td>Nitrobenzene, 20</td>
<td></td>
</tr>
<tr>
<td>Nitrosamines, 50</td>
<td></td>
</tr>
<tr>
<td>No-effect-level (NOEL), use in risk assessment</td>
<td>72, 73, 77, 88</td>
</tr>
<tr>
<td>Non-carcinogenic risk estimation, 72-77</td>
<td></td>
</tr>
<tr>
<td>Non-human organisms, extrapolation to humans, 29, 42, 44, 45, 47, 54, 59, 67, 68, 70, 72, 73, 74, 76, 77</td>
<td></td>
</tr>
<tr>
<td>Notification, use in monitoring, 10</td>
<td></td>
</tr>
<tr>
<td>Nutrient, cycling, 86, 93, 95, 96, 97, 98</td>
<td></td>
</tr>
<tr>
<td>Nutrients</td>
<td></td>
</tr>
<tr>
<td>fluctuation in environment, 85, 99</td>
<td></td>
</tr>
<tr>
<td>leaching, 96, 100, 101</td>
<td></td>
</tr>
<tr>
<td>permissible load, 87</td>
<td></td>
</tr>
<tr>
<td>Oesophagus, human, carcinogenesis, 65</td>
<td></td>
</tr>
<tr>
<td>Oral toxicity test, 86</td>
<td></td>
</tr>
<tr>
<td>Organisms, experimental, choice of, 40, 41, 42, 89, 90, 94, 95, 105</td>
<td></td>
</tr>
<tr>
<td>Organochlorine, 72, 88</td>
<td></td>
</tr>
<tr>
<td>Organometallic compounds, toxicity of, and models, 74</td>
<td></td>
</tr>
<tr>
<td>Pancreas carcinomas, 47</td>
<td></td>
</tr>
<tr>
<td>Parasites, 94</td>
<td></td>
</tr>
<tr>
<td>Parathion, 20</td>
<td></td>
</tr>
<tr>
<td>Particulate exhaust, 68</td>
<td></td>
</tr>
<tr>
<td>Pathology, need for, 43, 52, 75</td>
<td></td>
</tr>
<tr>
<td>PCBs, 10, 71, 90, 92</td>
<td></td>
</tr>
<tr>
<td>Periphyton, 100</td>
<td></td>
</tr>
<tr>
<td>Pesticides, 100, 103</td>
<td></td>
</tr>
<tr>
<td>Pharmaceuticals, risk estimation, 72, 77</td>
<td></td>
</tr>
<tr>
<td>Phenobarbital, 36</td>
<td></td>
</tr>
<tr>
<td>Phenotype, changes in, 31-33, 38, 49, 55</td>
<td></td>
</tr>
<tr>
<td>Phenoxyacetic acid, 71</td>
<td></td>
</tr>
<tr>
<td>Photosynthesis</td>
<td></td>
</tr>
<tr>
<td>alteration of, 88, 89, 90, 99</td>
<td></td>
</tr>
<tr>
<td>effect of chemicals, 86</td>
<td></td>
</tr>
<tr>
<td>Phytoplankton, 87, 92, 94, 95</td>
<td></td>
</tr>
<tr>
<td>Phytotrons, use of, 88</td>
<td></td>
</tr>
<tr>
<td>Plant</td>
<td></td>
</tr>
<tr>
<td>community, 88, 89, 93</td>
<td></td>
</tr>
<tr>
<td>effects of chemicals, 92</td>
<td></td>
</tr>
<tr>
<td>pigments, 88</td>
<td></td>
</tr>
<tr>
<td>populations, 85, 93</td>
<td></td>
</tr>
<tr>
<td>respiration, 89</td>
<td></td>
</tr>
<tr>
<td>terrestrial, variables in response to chemicals, 88, 89</td>
<td></td>
</tr>
<tr>
<td>variation in growth, 89</td>
<td></td>
</tr>
<tr>
<td>Plant-grazer, interaction, 95</td>
<td></td>
</tr>
<tr>
<td>Polychlorinated biphenyls (see PCBs)</td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td></td>
</tr>
<tr>
<td>animal, fluctuations in, 85</td>
<td></td>
</tr>
<tr>
<td>assay, 87</td>
<td></td>
</tr>
<tr>
<td>dynamics, 98, 100</td>
<td></td>
</tr>
<tr>
<td>human</td>
<td></td>
</tr>
<tr>
<td>exposure, 10-11, 30</td>
<td></td>
</tr>
<tr>
<td>high risk, 55</td>
<td></td>
</tr>
<tr>
<td>interactions, effects on ecosystem, 91, 97</td>
<td></td>
</tr>
<tr>
<td>plant</td>
<td></td>
</tr>
<tr>
<td>fluctuations in, 85</td>
<td></td>
</tr>
<tr>
<td>shifts in dominance, 93</td>
<td></td>
</tr>
<tr>
<td>Potassium, 99</td>
<td></td>
</tr>
<tr>
<td>Potency</td>
<td></td>
</tr>
<tr>
<td>assays, 50-51</td>
<td></td>
</tr>
<tr>
<td>estimation of, 49, 50, 60</td>
<td></td>
</tr>
<tr>
<td>rodents, 49-51</td>
<td></td>
</tr>
<tr>
<td>Predation, in testing, 86, 92, 93-95</td>
<td></td>
</tr>
<tr>
<td>Primary producers, 87</td>
<td></td>
</tr>
<tr>
<td>Productivity, 96, 98, 99, 100</td>
<td></td>
</tr>
<tr>
<td>Promoters, 35-37, 39, 61, 66</td>
<td></td>
</tr>
<tr>
<td>Radiochromatography, DNA analysis, 33</td>
<td></td>
</tr>
<tr>
<td>Radiolabelling, 87</td>
<td></td>
</tr>
<tr>
<td>Radionuclides, 98</td>
<td></td>
</tr>
<tr>
<td>Rectum, human, carcinogenesis, 56</td>
<td></td>
</tr>
<tr>
<td>Replication</td>
<td></td>
</tr>
<tr>
<td>cells, 32</td>
<td></td>
</tr>
<tr>
<td>chromosome, 32</td>
<td></td>
</tr>
<tr>
<td>DNA, 32</td>
<td></td>
</tr>
<tr>
<td>Reproduction</td>
<td></td>
</tr>
<tr>
<td>capacity, test for, 90</td>
<td></td>
</tr>
<tr>
<td>Daphnia test, 86</td>
<td></td>
</tr>
<tr>
<td>potential, acceptable risk, 85</td>
<td></td>
</tr>
<tr>
<td>Reticulum, cell sarcoma, mice, 43</td>
<td></td>
</tr>
<tr>
<td>Rhizobia, 95</td>
<td></td>
</tr>
<tr>
<td>Risk, definition of, 52, 53</td>
<td></td>
</tr>
<tr>
<td>Rodents as experimental organisms, 40, 41, 89, 90</td>
<td></td>
</tr>
<tr>
<td>Roofing tar emissions, 68</td>
<td></td>
</tr>
<tr>
<td>Ruthenium, 98</td>
<td></td>
</tr>
<tr>
<td>Saccharin, 36</td>
<td></td>
</tr>
<tr>
<td>Safety factor, estimate or use of, 73, 77</td>
<td></td>
</tr>
<tr>
<td>Salmonella, 48, 49, 50, 51, 60</td>
<td></td>
</tr>
<tr>
<td>Sample size</td>
<td></td>
</tr>
<tr>
<td>in epidemiology, 53, 58</td>
<td></td>
</tr>
</tbody>
</table>
of animals in assay, 41
Sediment, cores, use of, 96
Serial sacrifice protocol, assay, 46
Sex, influence in assay, 41
Shrimp, 93
Skin
carcinogenesis, 61
exposure route, 20
mouse
carcinogenesis, 36, 37
tumours, 35, 37, 42, 47
Soil, cores, use of, 96
Species, interaction, 100
Stomach, human, carcinogenesis, 56
Styrene, 20
Sulphate, 99
Symbiosis, use in risk estimation, 92, 95
Synergism, 30, 38, 39
TCDD, 36
Terminal sacrifice protocol, assay, 46
Tetrachlorodibenzo-p-dioxin (see TCDD)
Tetradecanoylphorbol acetate, 37
Thalassiosira pseudonana, 92
Thymus, lymphoma, 43
Time-trend analyses, 55
Tissues, use in monitoring, 21
TPA, 37
Transformation, of chemicals, 14, 15, 24, 97

Tribolium, 93
Trichloroethylene, 20
Toluene, 20
Tumour
acceleration, definition of, 47
carcinogenesis, 33-47
induction, 47
experimental method, 43, 44
initiators and promoters, 35-57, 39
latency time, 43
multiplicity, 43

Urea-formaldehyde, 68
Urine, use in monitoring, 20, 21

Vanadium, exposure, 9, 10
Variables, in assays, 43-45
Vertebrate-arthropod, test system, 95
Vinyl chloride, 58

Wall effects, 96
Water, chlorination, 56

X-rays, 57

Yeast, effect of promoters, 35

Zinc, 99
Zooplankton, 93, 94, 95
Zymbal gland, rat, 42