

## CONTENTS

LIST OF PARTICIPANTS .....	1
NOTE TO THE READER.....	5
INTRODUCTION .....	7
METHODS .....	11
Assessment of evidence for carcinogenicity from studies in humans .....	11
Assessment of evidence for carcinogenicity from studies in experimental animals .....	12
Assessment of data from short-term tests.....	12
Evaluation of carcinogenic risk to humans .....	13
RESULTS AND CONCLUSIONS.....	14
Table 1. Summary evaluations of carcinogenic risk to humans from chemicals, industrial processes and industries, based on evidence for carcinogenicity to humans and to animals and for activity in short-term tests.....	17
Descriptive summaries of the data on the basis of which the chemicals, industrial processes and industries were evaluated for carcinogenicity to humans:	
Acrylonitrile.....	25
Actinomycin D .....	27
Adriamycin.....	29
Aflatoxins .....	31
Aldrin .....	35
4-Aminobiphenyl.....	37
Amitrole.....	38
Anaesthetics, volatile .....	41
Analgesic mixtures containing phenacetin .....	47
Phenacetin .....	47
Aniline.....	49
Arsenic and arsenic compounds .....	50
Asbestos .....	52
Auramine (technical grade).....	53
Manufacture of auramine.....	53
Azathioprine .....	55
Benzene .....	56
Benzidine.....	57
Benzidine-based dyes:	
Direct-Black 38 (technical-grade).....	59
Direct Blue 6 (technical-grade).....	59
Direct Brown 95 (technical-grade) .....	59
Beryllium and beryllium compounds.....	60
<i>N,N</i> -Bis (2-chloroethyl)-2-naphthylamine (Chlornaphazine).....	62
Bis(chloroethyl nitrosourea (BCNU) .....	63
Bis(chloromethyl)ether and technical-grade chloromethyl methyl ether.....	64
Bleomycins .....	66
1,4-Butanediol dimethanesulphonate (Myleran).....	68

Cadmium and cadmium compounds .....	71
Carbon tetrachloride .....	74
Certain combined chemotherapy for lymphomas (including MOPP) .....	75
Chlorambucil .....	77
Chloramphenicol.....	79
Chlordane/Heptachlor .....	80
1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU).....	83
Chlorinated toluenes (production of):	
Benzyl chloride .....	84
Benzoyl chloride .....	84
Benzal chloride .....	84
Benzotrichloride.....	84
Chloroform .....	87
Chlorophenols (occupational exposure to).....	88
Chloroprene.....	89
Chromium and certain chromium compounds .....	91
Cisplatin .....	93
Clofibrate.....	95
Clomiphene .....	96
Cyclamates.....	97
Cyclophosphamide.....	99
2,4-D and esters.....	101
Dacarbazine .....	103
Dapsone .....	104
DDT .....	105
<i>ortho</i> -Dichlorobenzene and <i>para</i> -dichlorobenzene.....	108
3,3'-Dichlorobenzidine .....	110
Dichloromethane .....	111
Dieldrin .....	112
Diethyl sulphate.....	115
3,3'-Dimethoxybenzidine ( <i>ortho</i> -Dianisidine) .....	116
Dimethylcarbamoyl chloride .....	118
Dimethyl sulphate.....	119
1,4-Dioxane .....	121
Epichlorohydrin.....	122
Ethylene dibromide.....	124
Ethylene oxide.....	126
Ethylene thiourea .....	128
5-Fluorouracil .....	130
Formaldehyde (gas).....	131
Hexachlorocyclohexane .....	133
Hydralazine.....	135
Hydrazine .....	136
Industries:	
Boot and shoe manufacture and repair (certain occupations).....	138
Carpentry and joinery (certain exposures).....	139
Furniture manufacture .....	140
Leather goods manufacture .....	142
Leather tanning.....	142
Lumber and sawmill industry.....	143
Pulp and paper manufacture (certain exposures).....	144
Rubber industry (certain occupations).....	144

Iron dextran complex .....	145
Isonicotinic acid hydrazide .....	146
Lead and lead compounds.....	149
Manufacture of isopropyl alcohol (strong-acid process) .....	151
Isopropyl oils .....	151
Manufacture of magenta.....	152
Magenta (technical grade).....	152
Melphalan.....	154
6-Mercaptopurine.....	155
Methotrexate.....	157
Methoxsalen with ultra-violet A therapy (PUVA).....	158
Metronidazole.....	160
Mustard gas.....	163
1-Naphthylamine .....	164
2-Naphthylamine .....	166
Nickel refining.....	167
Nickel and certain nickel compounds .....	167
Nitrogen mustard .....	170
Oestrogens and progestins .....	173
Combined oral contraceptives.....	173
Sequential oral contraceptives .....	177
Other oestrogen-progestin combinations.....	178
Conjugated oestrogens .....	179
Oestrogens:	
Dienoestrol.....	183
Diethylstilboestrol.....	184
Ethinylloestradiol.....	186
Mestranol.....	188
17 $\beta$ -Oestradiol.....	190
Oestrone .....	191
Progestins:	
Chlormadinone acetate.....	192
Dimethisterone.....	193
Ethinodiol diacetate.....	194
17 $\alpha$ -Hydroxyprogesterone acetate .....	195
Lynoestrenol .....	195
Medroxyprogesterone acetate.....	196
Megestrol acetate .....	198
Norethisterone.....	199
Norethynodrel.....	201
Norgestrel .....	202
Progesterone.....	202
Oxymetholone .....	203
Pentachlorophenol .....	205
Phenazopyridine.....	207
Phenelzine.....	207
Phenobarbital .....	208
Phenoxyacetic acid herbicides (occupational exposure to).....	211
Phenylbutazone.....	212
<i>N</i> -Phenyl-2-naphthylamine .....	213
Phenytoin .....	215
Polychlorinated biphenyls.....	217

Prednisone .....	219
Procarbazine .....	220
Propylthiouracil.....	222
Reserpine .....	222
Saccharin .....	224
Soots, tars and oils .....	227
Benzo[a]pyrene.....	227
Spirolactone .....	229
Styrene.....	229
Styrene oxide .....	229
Sulfafurazole .....	233
Sulfamethoxazole.....	234
2,4,5-T and esters .....	235
Tetrachlorodibenzo- <i>para</i> -dioxin (TCDD) .....	238
Tetrachloroethylene.....	243
<i>ortho</i> -Toluidine .....	245
Treosulphan .....	246
Trichloroethylene.....	247
2,4,5-Trichlorophenol .....	249
2,4,6-Trichlorophenol .....	249
Tris(aziridinyl)- <i>para</i> -benzoquinone (Triaziquone).....	251
Tris(1-aziridinyl)phosphine sulphide (Thiotepa) .....	252
Underground haematite mining (with exposure to radon).....	254
Haematite .....	254
Uracil mustard.....	256
Vinblastine.....	257
Vincristine.....	259
Vinyl chloride.....	260
Vinylidene chloride.....	262
APPENDIX 1. <i>IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans</i> .....	265
APPENDIX 2. Chemicals evaluated in <i>IARC Monographs, Volumes 1-29</i> , for which there is considered to be <i>sufficient evidence</i> of carcinogenicity in experimental animals .....	267
APPENDIX 3. Summary table of results from short-term tests .....	271
CUMULATIVE INDEX TO IARC MONOGRAPHS VOLUMES 1-29 ON THE EVALUATION OF THE CARCINOGENIC RISK OF CHEMICALS TO HUMANS .....	277

## NOTE TO THE READER

The term 'carcinogenic risk' in the *IARC Monograph* series is taken to mean the probability that exposure to a chemical or complex mixture or employment in a particular occupation will lead to cancer in humans.

The fact that a monograph has been prepared on a chemical, complex mixture or occupation does not imply that a carcinogenic hazard is associated with the exposure, only that the published data have been examined. Equally, the fact that a chemical, complex mixture or occupation has not yet been evaluated in a monograph does not mean that it does not represent a carcinogenic hazard.

Anyone who is aware of published data that may alter an evaluation of the carcinogenic risk of a chemical, complex mixture or employment in an occupation is encouraged to make this information available to the Division of Environmental Carcinogenesis, International Agency for Research on Cancer, Lyon, France, in order that the chemical, complex mixture or occupation may be considered for re-evaluation by a future Working Group.

Although every effort is made to prepare the monographs as accurately as possible, mistakes may occur. Readers are requested to communicate any errors to the Division of Environmental Carcinogenesis, so that corrections can be reported in future volumes.