

# CONTENTS

---

<b>NOTE TO THE READER.....</b>	<b>1</b>
<b>LIST OF PARTICIPANTS .....</b>	<b>3</b>
<b>PREAMBLE.....</b>	<b>9</b>
<b>A. GENERAL PRINCIPLES AND PROCEDURES .....</b>	<b>9</b>
1. Background.....	9
2. Objective and scope.....	10
3. Selection of agents for review .....	11
4. Data for the <i>Monographs</i> .....	12
5. Meeting participants .....	12
6. Working procedures.....	13
<b>B. SCIENTIFIC REVIEW AND EVALUATION .....</b>	<b>14</b>
1. Exposure data.....	15
2. Studies of cancer in humans.....	16
3. Studies of cancer in experimental animals.....	20
4. Mechanistic and other relevant data.....	23
5. Summary .....	26
6. Evaluation and rationale.....	27
References.....	31
<b>GENERAL REMARKS .....</b>	<b>33</b>
<b>PERFLUOROOCCTANOIC ACID .....</b>	<b>37</b>
1. Exposure Data.....	37
1.1 Identification of the agent .....	37
1.2 Production and use.....	39
1.3 Occurrence and exposure.....	41
1.4 Regulations and guidelines .....	49

2. Cancer in Humans	49
2.1 Occupational exposure	49
2.2 Community studies of high exposure	54
2.3 Studies in the general population	60
3. Cancer in Experimental Animals	63
3.1 Rat	63
3.2 Rainbow trout	66
4. Mechanistic and Other Relevant Data	68
4.1 Toxicokinetic data	68
4.2 Genotoxicity and related effects	77
4.3 Other mechanistic data relevant to carcinogenesis	80
4.4 Organ toxicity	90
4.5 Susceptible populations	93
4.6 Mechanistic considerations	94
5. Summary of Data Reported	95
5.1 Exposure data	95
5.2 Human carcinogenicity data	96
5.3 Animal carcinogenicity data	97
5.4 Mechanistic and other relevant data	97
6. Evaluation	97
6.1 Cancer in humans	97
6.2 Cancer in experimental animals	97
6.3 Overall evaluation	98
References	98

<b>TETRAFLUOROETHYLENE</b>	<b>111</b>
1. Exposure Data	111
1.1 Identification of the agent	111
1.2 Production and use	112
1.3 Occurrence and exposure	113
1.4 Regulations and guidelines	115
2. Cancer in Humans	116
2.1 Cohort studies	116
2.2 Case-control studies	118
3. Cancer in Experimental Animals	118
3.1 Mouse	118
3.2 Rat	121
4. Mechanistic and Other Relevant Data	124
4.1 Toxicokinetic data	124
4.2 Genotoxicity and related effects	130
4.3 Biochemical and cellular effects	131
4.4 Organ toxicity	131
4.5 Susceptible populations	133
4.6 Mechanistic considerations	134

---

5. Summary of Data Reported .....	135
5.1 Exposure data .....	135
5.2 Human carcinogenicity data .....	135
5.3 Animal carcinogenicity data .....	136
5.4 Mechanistic and other relevant data .....	136
6. Evaluation .....	137
6.1 Cancer in Humans .....	137
6.2 Cancer in experimental animals .....	137
6.3 Overall evaluation .....	137
6.4 Rationale .....	137
References .....	137
<b>1,2-DICHLOROPROPANE .....</b>	<b>141</b>
1. Exposure Data .....	141
1.1 Identification of the agent .....	141
1.2 Production and use .....	142
1.3 Occurrence and exposure .....	143
1.4 Regulations and guidelines .....	145
2. Cancer in Humans .....	146
2.1 Cholangiocarcinoma among printing workers in Japan .....	146
2.2 Cholangiocarcinoma among printing workers outside Japan .....	152
3. Cancer in Experimental Animals .....	152
3.1 Mouse .....	152
3.2 Rat .....	155
4. Mechanistic and Other Relevant Data .....	156
4.1 Toxicokinetic data .....	156
4.2 Genetic and related effects .....	161
4.3 Biochemical and cellular effects .....	162
4.4 Organ toxicity .....	165
4.5 Susceptible populations .....	168
4.6 Mechanistic considerations .....	168
5. Summary of Data Reported .....	169
5.1 Exposure data .....	169
5.2 Human carcinogenicity data .....	169
5.3 Animal carcinogenicity data .....	170
5.4 Mechanistic and other relevant data .....	170
6. Evaluation .....	171
6.1 Cancer in humans .....	171
6.2 Cancer in experimental animals .....	171
6.3 Overall evaluation .....	171
References .....	171

<b>DICHLOROMETHANE</b> .....	<b>177</b>
1. Exposure Data .....	177
1.1 Identification of the agent .....	177
1.2 Production and use .....	179
1.3 Occurrence and exposure .....	181
1.4 Regulations and guidelines .....	184
2. Cancer in Humans .....	186
2.1 Introduction .....	186
2.2 Occupational cohort studies of workers exposed to dichloromethane .....	186
2.3 Case-control studies .....	192
2.4 Meta-analysis .....	206
3. Cancer in Experimental Animals .....	206
3.1 Mouse .....	206
3.2 Rat .....	212
3.3 Hamster .....	217
4. Mechanistic and Other Relevant Data .....	217
4.1 Toxicokinetic data .....	217
4.2 Genetic and related effects .....	225
4.3 Other mechanistic data relevant to carcinogenicity .....	231
4.4 Organ toxicity .....	233
4.5 Susceptible populations .....	236
4.6 Mechanistic considerations .....	237
5. Summary of Data Reported .....	240
5.1 Exposure data .....	240
5.2 Human carcinogenicity data .....	240
5.3 Animal carcinogenicity data .....	241
5.4 Mechanistic and other relevant data .....	242
6. Evaluation .....	242
6.1 Cancer in Humans .....	242
6.2 Cancer in experimental animals .....	243
6.3 Overall evaluation .....	243
6.4 Rationale .....	243
References .....	243
<b>1,3-PROPANE SULTONE</b> .....	<b>257</b>
1. Exposure Data .....	257
1.1 Identification of the agent .....	257
1.2 Production and use .....	258
1.3 Occurrence and exposure .....	259
1.4 Regulations and guidelines .....	260
2. Cancer in Humans .....	260
3. Cancer in Experimental Animals .....	260
3.1 Mouse .....	260
3.2 Rat .....	264

4. Mechanistic and Other Relevant Data .....	266
4.1 Toxicokinetic data .....	266
4.2 Genetic and related effects.....	266
4.3 Other effects relevant to carcinogenicity .....	269
4.4 Mechanistic considerations.....	269
5. Summary of Data Reported .....	270
5.1 Exposure data.....	270
5.2 Human carcinogenicity data.....	270
5.3 Animal carcinogenicity data.....	270
5.4 Mechanistic and other relevant data.....	270
6. Evaluation.....	271
6.1 Cancer in humans.....	271
6.2 Cancer in experimental animals.....	271
6.3 Overall evaluation .....	271
6.4 Rationale .....	271
References.....	271
<b>LIST OF ABBREVIATIONS.....</b>	<b>275</b>



## NOTE TO THE READER

---

The term ‘carcinogenic risk’ in the *IARC Monographs* series is taken to mean that an agent is capable of causing cancer. The *Monographs* evaluate cancer hazards, despite the historical presence of the word ‘risks’ in the title.

Inclusion of an agent in the *Monographs* does not imply that it is a carcinogen, only that the published data have been examined. Equally, the fact that an agent has not yet been evaluated in a *Monograph* does not mean that it is not carcinogenic. Similarly, identification of cancer sites with *sufficient evidence* or *limited evidence* in humans should not be viewed as precluding the possibility that an agent may cause cancer at other sites.

The evaluations of carcinogenic risk are made by international working groups of independent scientists and are qualitative in nature. No recommendation is given for regulation or legislation.

Anyone who is aware of published data that may alter the evaluation of the carcinogenic risk of an agent to humans is encouraged to make this information available to the Section of IARC Monographs, International Agency for Research on Cancer, 150 cours Albert Thomas, 69372 Lyon Cedex 08, France, in order that the agent 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 Section of IARC Monographs, so that corrections can be reported in future volumes.

