CONTENTS

Page

ENVIRONMENTAL HEALTH CRITERIA FOR TETRAMETHRIN, CYHALOTHRIN, AND DELTAMETHRIN 10

INTRODUCTION 11

1. SUMMARY AND EVALUATION, CONCLUSIONS AND RECOMMENDATIONS 15

1.1 Summary and evaluation 15
1.1.1 Identity, physical and chemical properties, analytical methods 15
1.1.2 Production and uses 15
1.1.3 Human exposure 16
1.1.4 Environmental exposure and fate . . . 16
1.1.5 Uptake, metabolism, and excretion . . 17
1.1.6 Effects on organisms in the environment 17
1.1.7 Effects on experimental animals and in vitro test systems 18
1.1.8 Effects on human beings 19
1.2 Conclusions 20
1.3 Recommendations 20

2. IDENTITY, PHYSICAL AND CHEMICAL PROPERTIES, ANALYTICAL METHODS 21

2.1 Identity 21
2.2 Physical and chemical properties 22
2.3 Analytical methods 22

3. SOURCES OF ENVIRONMENTAL POLLUTION AND ENVIRONMENTAL LEVELS 29

3.1 Industrial production 29

Page

3.2 Use patterns 29
3.3 Residues in food 30
3.4 Levels in the environment 30

4. ENVIRONMENTAL TRANSPORT, DISTRIBUTION, AND TRANSFORMATION 31

4.1 Transport and distribution between media . . . 31
4.2 Abiotic degradation in air and water 32
4.3 Environmental fate 34
4.4 Bioaccumulation 39

5. KINETICS AND METABOLISM 41

5.1 Metabolism in experimental animals 41
5.2 Metabolism and fate in farm animals 45
5.3 Enzymatic systems for biotransformation 46
5.4 Metabolism in human beings 47

6. EFFECTS ON ORGANISMS IN THE ENVIRONMENT 49

6.1 Aquatic organisms 49
6.1.1 Acute toxicity for fish 49
6.1.2 Acute toxicity for other aquatic organisms 51
6.1.3 Field studies and community effects . . 52
6.1.4 Appraisal 53
6.2 Terrestrial organisms 53
6.2.1 Plants 53
6.2.2 Soil microorganisms 54
6.2.3 Soil fauna 54
6.2.3.1 Earthworms 54
6.2.3.2 Slugs 54
6.2.3.3 Soil arthropods 55
6.2.4 Beneficial insects 56
6.2.4.1 Honey-bees 56
6.2.4.2 Foliar insects 56

Page

6.2.5 Birds 58
6.2.5.1 Laboratory studies 58
6.2.5.2 Field studies on birds 59

7. EFFECTS ON EXPERIMENTAL ANIMALS AND *IN VITRO* TEST SYSTEMS 60

7.1 Single exposures 60
7.1.1 Mouse 65
7.1.2 Rat 65
7.1.3 Rabbit 66
7.1.4 Dog 66
7.2 Irritation and sensitization 66
7.2.1 Skin irritation 66
7.2.2 Eye irritation 67
7.2.3 Sensitization 68
7.3 Short-term exposure 68
7.3.1 Rat 68
7.3.2 Dog 69
7.4 Long-term exposure and carcinogenicity 70
7.4.1 Mouse and rat 70
7.4.2 Dog 72
7.5 Mutagenicity 72
7.5.1 Microorganisms 72
7.5.2 Cultured cells 73
7.5.3 Mouse 74
7.5.4 Appraisal 75
7.6 Teratological and reproductive effects 75
7.6.1 Teratology 75
7.6.1.1 Mouse 75
7.6.1.2 Rat 76
7.6.1.3 Rabbit 77
7.6.2 Reproduction studies 77
7.7 Neurotoxicity and behavioural effects 78
7.8 Miscellaneous effects 80
7.9 Potentiation 81
7.10 Mechanism of toxicity (mode of action) 81
7.11 Experimental studies on antidotes 83

Page

8. EFFECTS ON MAN 84

8.1 General population – poisoning incidents 84
8.2 Occupational exposure 84
8.2.1 Acute toxicity – poisoning incidents . . 84
8.2.2 Effects of short- and long-term exposure 85
8.3 Clinical studies 88

9. PREVIOUS EVALUATIONS BY INTERNATIONAL BODIES 89

REFERENCES 91

APPENDIX 1 112

RESUME 119

RESUMEN 127