

Other titles available in the ENVIRONMENTAL HEALTH CRITERIA series include:

1. Mercury
2. Polychlorinated Biphenyls and Terphenyls
3. Lead
4. Oxides of Nitrogen
5. Nitrates, Nitrites, and N-Nitroso Compounds
6. Principles and Methods for Evaluating the Toxicity of Chemicals, Part I
7. Photochemical Oxidants
8. Sulfur Oxides and Suspended Particulate Matter
9. DDT and its Derivatives
10. Carbon Disulfide
11. Mycotoxins
12. Noise
13. Carbon Monoxide
14. Ultraviolet Radiation
15. Tin and Organotin Compounds
16. Radiofrequency and Microwaves
17. Manganese
18. Arsenic
19. Hydrogen Sulfide
20. Selected Petroleum Products
21. Chlorine and Hydrogen Chloride
22. Ultrasound
23. Lasers and Optical Radiation
24. Titanium
25. Selected Radionuclides
26. Styrene
27. Guidelines on Studies in Environmental Epidemiology
28. Acrylonitrile
29. 2,4-Dichlorophenoxyacetic Acid (2,4-D)
30. Principles for Evaluating Health Risks to Progeny Associated with Exposure to Chemicals during Pregnancy
31. Tetrachloroethylene
32. Methylene Chloride
33. Epichlorohydrin
34. Chlordane
35. Extremely Low Frequency (ELF) Fields
36. Fluorine and Fluorides
37. Aquatic (Marine and Freshwater) Biotoxins
38. Heptachlor
39. Paraquat and Diquat
40. Endosulfan
41. Quintozene
42. Tecnazene
43. Chlordecone

continued on p. 96

This report contains the collective views of an international group of experts and does not necessarily represent the decisions or the stated policy of the United Nations Environment Programme, the International Labour Organisation, or the World Health Organization

Environmental Health Criteria 84

2,4-DICHLOROPHENOXYACETIC ACID (2,4-D) – ENVIRONMENTAL ASPECTS

Published under the joint sponsorship of the United Nations Environment Programme, the International Labour Organisation, and the World Health Organization



84



World Health Organization
Geneva, 1989

The **International Programme on Chemical Safety (IPCS)** is a joint venture of the United Nations Environment Programme, the International Labour Organisation, and the World Health Organization. The main objective of the IPCS is to carry out and disseminate evaluations of the effects of chemicals on human health and the quality of the environment. Supporting activities include the development of epidemiological, experimental laboratory, and risk-assessment methods that could produce internationally comparable results, and the development of manpower in the field of toxicology. Other activities carried out by the IPCS include the development of know-how for coping with chemical accidents, coordination of laboratory testing and epidemiological studies, and promotion of research on the mechanisms of the biological action of chemicals.

ISBN 92 4 154284 5

© World Health Organization 1989

Publications of the World Health Organization enjoy copyright protection in accordance with the provisions of Protocol 2 of the Universal Copyright Convention. For rights of reproduction or translation of WHO publications, in part or *in toto*, application should be made to the Office of Publications, World Health Organization, Geneva, Switzerland. The World Health Organization welcomes such applications.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

ISSN 0250-863X

PRINTED IN FINLAND

88/7853 — VAMMALA — 5000

CONTENTS

ENVIRONMENTAL HEALTH CRITERIA FOR 2,4-DICHLOROPHENOXYACETIC ACID (2,4-D) - ENVIRONMENTAL ASPECTS

1. SUMMARY AND CONCLUSIONS	9
1.1 Uptake, accumulation, elimination, and biodegradation	9
1.2 Toxicity to microorganisms	9
1.3 Toxicity to aquatic organisms	10
1.4 Toxicity to terrestrial organisms	10
1.5 Effects of 2,4-D in the field	11
2. PHYSICAL AND CHEMICAL PROPERTIES	12
2.1 Synthesis of 2,4-D	12
2.2 Important chemical reactions of 2,4-D	15
2.3 Volatility of 2,4-D derivatives	15
3. SOURCES OF ENVIRONMENTAL POLLUTION	16
3.1 Production of 2,4-D herbicides	16
3.2 Uses	16
3.3 Disposal of wastes	16
4. UPTAKE, ACCUMULATION, ELIMINATION, AND BIODEGRADATION	18
4.1 Biodegradation	18
4.2 Uptake and accumulation by organisms	22
4.2.1 Laboratory studies	22
4.2.2 Field studies	25
4.3 Elimination	27
5. TOXICITY TO MICROORGANISMS	29
5.1 Aquatic microorganisms	29
5.2 Soil microorganisms	31
6. TOXICITY TO AQUATIC ORGANISMS	35
6.1 Toxicity to aquatic invertebrates	35
6.1.1 Short-term toxicity	35
6.1.2 Behavioural effects	43
6.2 Toxicity to fish	43