

Other titles available in the ENVIRONMENTAL HEALTH CRITERIA series include:

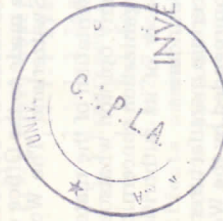
1. Mercury
2. Polychlorinated Biphenyls and Terphenyls
3. Lead
4. Oxides of Nitrogen
5. Nitrates, Nitrites and N-Nitroso Compounds
6. Principles and Methods for Evaluating the Toxicity of Chemicals, Part 1
7. Photochemical Oxidants
8. Sulfur Oxides and Suspended Particulate Matter
9. DDT and its Derivatives
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

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 Organization, or the World Health Organization

Environmental Health Criteria 37

AQUATIC (MARINE AND FRESHWATER) BIOTOXINS

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



40



World Health Organization
Geneva, 1984

CONTENTS

	Page
ENVIRONMENTAL HEALTH CRITERIA FOR AQUATIC (MARINE AND FRESHWATER) BIOTOXINS	8
SUMMARY WITH EVALUATION OF THE HEALTH RISKS OF EXPOSURE TO AQUATIC BIOTOXINS AND RECOMMENDATIONS FOR FURTHER ACTIVITIES	9
INTRODUCTION: AQUATIC BIOTOXINS AND HUMAN HEALTH	18
1. PARALYTIC SHELLFISH POISONS	21
1.1 Properties and analytical methods	21
1.1.1 Chemical properties	21
1.1.2 Methods of analysis for PSP in foods	23
1.1.2.1 Biological methods	23
1.1.2.2 Chemical methods	24
1.2 Sources and occurrence	25
1.2.1 Algal formation of toxins	25
1.2.1.1 Oceanographic conditions associated with blooms (red tide)	27
1.2.2 Occurrence in seafood	28
1.2.2.1 Accumulation in molluscs	28
1.2.2.2 Accumulation in crustacea	30
1.2.2.3 Transmission through zooplankton to fish	30
1.2.2.4 Accumulation in fish	31
1.3 Exposure	32
1.4 Metabolism	32
1.5 Effects in animals	32
1.5.1 Field observations	32
1.5.1.1 Fish	32
1.5.1.2 Sea birds	33
1.5.2 Experimental studies	34
1.5.2.1 Acute toxicity	34
1.5.2.2 Mode of action	37
1.6 Effects on man	38
1.6.1 Clinical studies	38
1.6.2 Epidemiological studies	39
2. CIGUATERA TOXINS	42
2.1 Properties and analytical methods	42
2.1.1 Chemical properties	42
2.1.2 Methods of analysis for foodstuffs	43
2.1.2.1 Biological methods	43

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 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 154097 4

©World Health Organization 1984

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.

PRINTED IN FINLAND

83/6227 - VAMMALA - 5500