

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

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-D

Environmental Health Criteria 30

PRINCIPLES FOR EVALUATING HEALTH RISKS TO PROGENY ASSOCIATED WITH EXPOSURE TO CHEMICALS DURING PREGNANCY

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



33



World Health Organization
Geneva, 1984

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 154090 7

© 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
84/5990 - VAMMALA - 6200

CONTENTS

	<u>Page</u>
PREFACE	12
1. INTRODUCTION	15
2. PROCESSES INVOLVED IN NORMAL AND ABNORMAL DEVELOPMENT	18
2.1 Basic events underlying normal development	18
2.1.1 DNA and chromosomes	18
2.1.2 Transcriptional control	19
2.1.3 Translational control	20
2.1.4 Post-translational control and significance of membrane proteins	20
2.1.5 Placentation	21
2.2 Abnormal development	22
2.2.1 Genetic influences	24
2.2.2 Nutrition	25
2.2.3 Critical and sensitivity periods during development	25
2.2.4 Abnormalities of placental development	26
2.2.5 Toxicokinetics and toxicodynamics	27
2.2.5.1 Placental transfer	27
2.2.5.2 Biotransformation	28
2.2.6 Structure-activity relationship	29
3. METHODS OF ASSESSING PRENATAL TOXIC MANIFESTATIONS	30
3.1 Human studies	30
3.1.1 Measures of reproductive outcome	30
3.1.1.1 Abortion	30
3.1.1.2 Stillbirths and neonatal deaths	32
3.1.1.3 Birth weight	32
3.1.1.4 Congenital malformations	33
3.1.2 Prenatal diagnostic procedures	34
3.1.2.1 Invasive intrauterine techniques	34
3.1.2.2 Non-invasive techniques	34
(a) Ultrasound investigations	34
(i) Visualisation	34
(ii) Fetal heart rate monitoring	35
(b) X-rays	35
(c) Analysis of maternal blood	35
(d) Analysis of maternal urine	35
3.1.3 Epidemiological methods	36