

evidence does not suggest that 2,4-D derivatives are potent mutagens. The carcinogenic potential of 2,4-D and its derivatives such as the amine salts and esters has not been adequately tested. The reports on animal bioassays carried out so far are either too brief for proper evaluation, or have become the subject of scientific controversy.

Effects on human beings

2,4-D drug trials and studies on volunteers have shown that doses of between 5 and about 30 mg/kg body weight do not cause any acute toxic effects. Accidental and intentional 2,4-D poisonings indicate that the toxic effects of 2,4-D are the same in human beings as in other mammals. The lethal single oral dose is uncertain. It is uncertain whether the chronic toxic effects of 2,4-D products reported in occupationally-exposed people are solely attributable to 2,4-D.

Scientifically valid studies on teratogenic and reproductive effects have not shown any adverse reproductive effects in human beings accidentally or occupationally exposed to 2,4-D. The results of studies on mutagenic effects suggesting the occupational exposure to 2,4-D may result in chromosome abnormalities are equivocal. The results of some epidemiological studies have suggested an association between exposure to phenoxy herbicides and increased incidences of malignant tumours and tumour mortality. It is not clear, at present, whether this represents a true association, and if so, whether it is specifically related to 2,4-D.

Recommendations for further studies

Methods not requiring highly sophisticated and expensive equipment are available for the accurate, specific, and sensitive determination of 2,4-D residues in a wide variety of environmental and biological materials. However, it would be desirable to develop simpler but specific methods for the detection and quantification of dioxin contaminants.

Further studies should be undertaken to determine the total 2,4-D intake of various sub-populations in areas of 2,4-D use. It would be desirable to monitor 2,4-D residues in aquatic organisms taken from lakes or rivers receiving discharges or treatment with 2,4-D. Further work on the relationship between the factors influencing the dermal absorption of various 2,4-D formulated products in human beings and animals should be carried out.

More animal studies are desirable to investigate the possible interactions between 2,4-D and other herbicides commonly used in conjunction with 2,4-D. Further work is required to accurately define the no-observed-adverse-effect level for 2,4-D in long-term exposures. Where unknown, the chronic toxicity of the alcohols and amines used in preparing 2,4-D derivatives should be investigated. More studies are needed to assess the mutagenic potential of 2,4-D derivatives.

In the case of occupationally-exposed workers further consideration should be given to the chemobiokinetics of 2,4-D under repeated exposure conditions.

Source: 'Environmental Health Criteria 29: 2,4-Dichlorophenoxyacetic Acid (2,4-D).' International Programme on Chemical Safety, World Health Organization, Geneva, Switzerland (1984).

DIOXINS¹

A report entitled 'Dioxins in Canada: The Federal Approach' that was prepared by the Interdepartmental

¹ Dioxins are a group of 75 chemicals identified by the number and position of their chlorine atoms. The simultaneous use of dioxin(s) to mean both the specific chemical 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, one of 22 tetrachlorodibenzo-*p*-dioxins, as well as all 75 polychlorinated dibenzo-*p*-dioxins has led to some confusion. Therefore, in this document, the abbreviation used for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin is 2,3,7,8-TCDD. The term dioxin(s) is used to refer generally to all 75 polychlorinated dibenzo-*p*-dioxins.

Committee on Toxic Chemicals which included representatives of the Departments of Environment, Agriculture, National Health and Welfare, and Fisheries and Oceans, was released by the Canadian Government on 16 December 1983. It states that: 'To reduce or eliminate the major sources of dioxins into the Canadian environment is pragmatically and economically more effective than continued rigorous assessment of the risks of dioxins.' The following is the executive summary of this report.

'The Federal Approach to dioxins attempts to set out, in an orderly fashion, the magnitude of the potential problems in Canada with dioxins and develop, within this context, actions to be taken by the federal government, often in collaboration with provincial agencies, to reduce these problems. This approach can be readily applied to a *co-contaminant*, the polychlorinated dibenzofurans (furans). Although far less is known about furans, they are likely to have "similar" toxic properties to dioxins. Action to control release of dioxins will also control furans.

Background

In December 1981, the National Research Council published a report "Polychlorinated dibenzo-*p*-dioxins: Criteria for their effects on man and his environment" which reviewed and assessed the scientific knowledge of the sources, amounts, pathways, persistence and fate of dioxins in the environment, and evaluated the parameters available for assessing the toxicity of dioxins.

At the same time, the former Minister of the Environment, the Honourable John Roberts, and the Minister of National Health and Welfare, the Honourable Monique Bégin, established the Ministers' Expert Advisory Committee on Dioxins under the Environmental Contaminants Act. This committee was charged with providing advice on the sources of dioxins, the pathways into and through the environment, the potential and actual exposures of human and non-human populations to dioxins, the toxicity of the dioxin congeners, the risks to humans and non-humans from dioxins, and to recommend any appropriate controls.

A number of federal departments, primarily Environment Canada, Agriculture Canada, National Health and Welfare, and Fisheries and Oceans, which were working on aspects of the dioxin issue, had recognized the need for a more formal integrated collaborative effort. This led to the formation of a working group under the Interdepartmental Committee on Toxic Chemicals to review and recommend the most appropriate actions that could be taken with regard to dioxins in Canada. The rationale for immediate action to control major known sources of dioxins was that this would be more cost-effective than any further refinement in the assessment of the risks of dioxins. It has already taken ten years of intensive worldwide research, at a cost of \$100 million, to document the hazard of 2,3,7,8-TCDD. To repeat this for other dioxins (theoretically 74 other congeners could exist) could cost \$1 billion and could take at least another ten years. While this would provide important information about the effects and environmental pathways of dioxins, it would, by itself, do nothing to alleviate any problems that may exist.

Federal Approach to dioxins

The Federal Approach to dioxins is based on the premise that to reduce or eliminate the major sources of dioxins into the Canadian environment is pragmatically and economically more effective than continued rigorous assessment of the risks of dioxins. At the same time, it does recognize that additional investigations are necessary to provide information, to refine actions now being taken and to identify other areas requiring control or remedial