

SAFETY OF PYRETHROIDS FOR PUBLIC HEALTH USE

The cover features several chemical structures of pyrethroids. At the top left is a pyrethrin-like structure with a cyclopropane ring and a diene system. Below it is a pyrethroid with a dichlorovinyl group and a benzoyl ester. To the right is another pyrethroid with a brominated diene and a benzoyl ester. In the center is a large, detailed structure of a pyrethroid with a brominated diene, a cyanoethyl ester, and a biphenyl group. At the bottom right is a pyrethroid with a diene system and a biphenyl ester. At the bottom left is a pyrethroid with a diene system and a biphenyl ester.

World Health Organization
Communicable Disease Control, Prevention
and Eradication
WHO Pesticide Evaluation Scheme (WHOPES)
&
Protection of the Human Environment
Programme on Chemical Safety (PCS)

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PREFACE

The purpose of this document is to critically review current knowledge on the safety of pyrethroids and whether existing WHO recommendations for pyrethroid applications should be revised or modified. This review does not consider the use of pyrethroids in space spraying and vapour applications (e.g. in mosquito coils and aerosols).

The first draft of this document was prepared by Dr Claudio Colosio, Teresa Mammone, Manuela Tiramani and Marco Maroni from the International Centre for Pesticide Safety, Busto Garolfo, Italy. The document was sent for peer review by a number of individuals and institutions known for their expertise in pesticide toxicity and risk assessment. Comments were received from Dr Klaus E. Appel, Federal Institute for Risk Assessment, Berlin, Germany; Dr A. Bartholomaeus, Department of Health and Ageing, Canberra, Australia; Professor A. Boobis, Imperial College London, UK; Dr E. Bosshard, Federal Office for Agriculture, 3003 Bern, Switzerland; Dr D. McGregor, Lyon, France; Professor J.G. McLean, Victoria, Australia; Ms J. Murawski, Association of Flight Attendants, American Federation of Labor – Congress of Industrial Organizations, AFL–CIO; Dr J. Palermo Neto, MS, PhD, Universidade de São Paulo, Brazil; Dr J. Pauluhn, Institute of Toxicology, Bayer AG, Wuppertal, Germany; Dr W. Phang, Office of Pesticide Programs, US EPA; Dr D. Renshaw, Food Standards Agency, UK; and Dr L. Ritter, University of Guelph, Ontario, Canada. The authors revised the document on the basis of comments received, and the staff of the WHO Programme on Chemical Safety (PCS) and the WHO Pesticide Evaluation Scheme (WHOPES) verified that the comments had been dealt with appropriately. WHOPES and PCS are most grateful to the authors and peer reviewers for their important contribution, and also acknowledge the financial support provided by the Global Collaboration for Development of Pesticides for Public Health (GCDPP).

1 INTRODUCTION

Pyrethroids are widely used in public health because of their relative safety for humans, high insecticidal potency at low dosages and rapid knock-down effects. The safety and efficacy of pyrethroids for different applications in vector control, as well as in disinsection of aircrafts, have been assessed by the World Health Organization (WHO). WHO recommendations on the use of pyrethroids include the following compounds:

- *Indoor residual spraying*: alpha-cypermethrin, bifenthrin, cyfluthrin, deltamethrin, etofenprox and lambda-cyhalothrin.
- *Treatment of mosquito nets*: alpha-cypermethrin, cyfluthrin, deltamethrin, etofenprox, lambda-cyhalothrin and permethrin.
- *Aircraft disinsection*: permethrin and D-phenothrin.

The purpose of this document is to critically review current knowledge on the safety of pyrethroids to establish whether existing WHO recommendations for pyrethroid applications should be revised or modified in light of new information on health risks. This review does not consider the use of pyrethroids in space spraying and household insecticide products (e.g. in mosquito coils).

The most recent WHO assessments of the safety of these chemicals (*Table 1*; bifenthrin: IPCS, 1993; cyfluthrin: IPCS, 1997b; λ -cyhalothrin: IPCS, 2000a, 2004a; α -cypermethrin: IPCS, 1996, 2004b; deltamethrin: IPCS, 2001; etofenprox: IPCS, 1994; permethrin: IPCS, 2000b; D-phenothrin: IPCS, 1989, 1990e) were used as the basis for this review, with additional information that became available afterwards. For this purpose the following databases were searched: EXTOTOXNET, EPA, IARC, the International Programme on Chemical Safety (IPCS), Joint FAO/WHO Meeting on Pesticide Residues (JMPR), WHO Pesticide Data Sheets and other relevant WHO

publications. A systematic search in the literature database PubMed, with particular attention to papers published after 1990, was also carried out. Furthermore, reports on cases were considered where exposure to pesticides, notably from aircraft disinsection, was alleged to have induced adverse health effects. The available literature is listed at the end of this document.

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