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A GENERIC RISK ASSESSMENT MODEL FOR INSECTICIDE TREATMENT AND SUBSEQUENT USE OF MOSQUITO NETS



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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1. Purpose

The aim of this report is to develop a generic model that can be used for risk assessment of exposure to insecticides during the various stages in the production and use of insecticide-treated bednets. The model proposed covers the assessment of any risks to those treating bednets with insecticide in a domestic setting (operators) and to those sleeping under insecticide-treated bednets (users). While it is recognized that there is increasing interest in the commercial production of pretreated bednets, the generic model proposed is for the simplest situation of domestic treatment and use of nets; it does not include the special situation of commercial production of nets in a factory environment.

2. Background

2.1 Need for a generic risk assessment model

Pyrethroid insecticides have been used for several years for the treatment of bednets to protect against malaria-carrying mosquitoes. The effectiveness of such bednets in reducing morbidity and mortality from malaria has been documented elsewhere (WHO, 2000). The WHO Roll Back Malaria (RBM) project has made insecticide-treated bednets one of the cornerstones of the effort to reduce malaria, setting the goal in October 1999 of ensuring coverage of 60 million African families with insecticide-treated mosquito nets over a five-year period.

The present consensus is that pyrethroids – at the levels currently employed – are generally of low risk to human health, both for operators and for users of treated bednets. The WHO Pesticide Evaluation Scheme (WHOPES) currently recommends a number of insecticides, all pyrethroids, for the treatment of bednets (Najera & Zaim, 2002). A review of the safety of pyrethroid-treated bednets has been published (Zaim et al., 2000), and in a detailed risk assessment on the use of deltamethrin on bednets, Barlow; Sullivan & Lines (2001) support the safety-in-use of this particular insecticide. However, detailed assessments of the other WHOPES-approved compounds have yet to be published.

Because of the development of insect resistance to the commonly used pyrethroids, there is now a need to consider the use of alternative insecticide classes for vector control in the treatment of bednets. Alternatives under consideration include organophosphates and carbamates, which differ from the pyrethroids in their mode of action and are inherently more acutely toxic and less stable. Thus there is an urgent need for safety assessment of such treatments before they are used in the field. There is also a need to assess the risks from the various methods of bednet treatment that may be used, including the types of insecticide formulation used and the newer, more persistent insecticide treatments. A generic risk assessment model is therefore needed, based on typical scenarios for the preparation and use of insecticide-treated bednets and on average or "worst case" values for environmental and human parameters, and applicable to any insecticide.

2.2 Essential elements of a risk assessment model

In the context of this report it is important to distinguish between "hazard" and "risk". *Hazard* is defined as the inherent capacity of a chemical/exposure to cause adverse effects in animals or humans. *Risk* is defined as the probability that a particular

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