

PREVENTING DISEASE THROUGH HEALTHY ENVIRONMENTS

EXPOSURE TO HIGHLY HAZARDOUS PESTICIDES: A MAJOR PUBLIC HEALTH CONCERN

Highly hazardous pesticides may have acute or chronic toxic effects and pose particular risk to children. Their widespread use has caused health problems and fatalities in many parts of the world, often as a result of occupational exposure and accidental or intentional poisonings. Environmental contamination can also result in human exposure through consumption of residues of pesticides in food and, possibly, drinking-water. Although developed countries have sophisticated systems already in place to register pesticides and control their trade and use, this is not always the case elsewhere. Guidance and legal frameworks on the use, management and trade of pesticides—including highly hazardous pesticides—as well as proper storage and handling are available from international organizations and international conventions; these should be implemented globally.

What are highly hazardous pesticides?

Pesticides are used in agriculture, horticulture and public health for the control of pests such as insects and rodents, disease organisms and disease vectors. They are biologically active compounds designed to kill target organisms. They are also used in veterinary and human medicine to control parasites. Some older pesticides are both persistent and bioaccumulative.

Highly hazardous pesticides are defined by the FAO/WHO Joint Meeting on Pesticide Management as having one or more of the following characteristics: acute toxicity (classes Ia and Ib of the World Health Organization [WHO] Recommended Classification of Pesticides by Hazard); carcinogenicity; mutagenicity; reproductive toxicity; listing under the Stockholm Convention on Persistent Organic Pollutants, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Pesticides and Industrial Chemicals in International Trade or the Montreal Protocol on Substances that Deplete the Ozone Layer; or evidence of severe or irreversible adverse effects on human health.¹⁻⁵

Sources of exposure to highly hazardous pesticides

Agriculture and public health

The greatest exposure to highly hazardous pesticides is for agricultural and public health workers during handling, dilution, mixing and application. Exposure is mainly by the dermal route for preparation of sprays and by the dermal and inhalation routes during application. Ingestion might occur through consumption of contaminated food during or following work or through oral contact with contaminated hands. Contaminated clothing is a significant source of exposure. Bystanders might be exposed to the sprayed pesticides dermally and via inhalation. Stocks of obsolete pesticides still represent a hazard in many countries, in particular if storage or disposal is inappropriate.⁶

Occupants of homes sprayed with highly hazardous pesticides might be exposed through residues on internal surfaces and contamination of food and water.⁷

Domestic use

The general population controls pests in gardens or smallholdings or in their houses. Products intended for domestic use are generally weaker than professional products, so exposure of the general population to highly hazardous pesticides is lower. In countries where regulation is poor, agricultural-strength pesticides may regularly be used in the home.

Food and drinking-water

Residues of highly hazardous pesticides can be found in food and environmental media. The general population is exposed mainly through consumption of residues of pesticides in food and, sometimes, drinking-water.⁶

Exposure of children

Children regularly undertake agricultural labour in many areas of the world. Children are particularly at risk of being exposed to highly hazardous pesticides because of their immature behaviour. Young children playing may be exposed to pesticide containers, to residues on surfaces and through ingestion of contaminated soil.

WHO guidance values for pesticides

Maximum residue limits (MRLs) in food

The Joint Food and Agriculture Organization of the United Nations (FAO)/WHO Meeting on Pesticide Residues (JMPR) evaluates those pesticides where contamination of food is likely.⁸ MRLs are published by the Codex Alimentarius Commission.⁵ Guidance for individual pesticides or pesticide components—including for a number of highly hazardous pesticides—can be accessed via the FAO, WHO, Codex or INCHEM web sites and in hard copy publications.^{8–10}

Drinking-water

WHO water quality guidelines exist for some pesticides used in agriculture and public health—including for some highly hazardous pesticides—where there is a likelihood of drinking-water contamination.¹¹

Health effects

- Unintentional and self-inflicted (suicides) acute poisonings by pesticides are a serious public health problem in many parts of the world. Available data are too limited to estimate the global health impacts of highly hazardous pesticides. However, the global impact of self-poisoning from preventable pesticide ingestion was estimated to amount to 186 000 deaths and 4 420 000 disability-adjusted life years (DALYs^{*}) in 2002.¹²
- The acute hazard is highly variable depending on the pesticide and includes peripheral and central neurotoxicity and reduced blood clotting capacity. The specific pesticide formulation can significantly affect both exposure and toxicity.^{1,13}

* The DALY combines the burden due to death and disability in a single index. Use of such an index permits the comparison of the burden due to various environmental risk factors with those from other risk factors or diseases. One DALY can be thought of as 1 lost year of healthy life.

- Chronic exposure to highly hazardous pesticides can result in effects on skin, eyes, nervous system, cardiovascular system, gastrointestinal tract, liver, kidneys, reproductive system, endocrine system and blood.¹⁰
- Children are more vulnerable to the effects of pesticides because of their smaller size and hence greater exposure (on a milligram per kilogram body weight basis), different metabolism and still developing internal organs.
- Although the evidence is less clear, some highly hazardous pesticides may also affect the immune system, and some obsolete pesticides may cause cancer, including childhood cancer.¹⁰

Risk mitigation recommendations

WHO produces extensive evaluations of the hazards and risks of pesticides, guidance values and advice on medical treatment of poisoning. Its output includes JMPR evaluations (in partnership with FAO), cancer classifications in International Agency for Research on Cancer (IARC) monographs, International Chemical Safety Cards (in partnership with the International Labour Organization), Poison Information Monographs, Environmental Health Criteria documents and Concise International Chemical Assessment Documents.¹⁰ In addition, the WHO Pesticide Evaluation Scheme (WHOPES) evaluates new public health pesticides and makes recommendations for their proper use, produces training packages on their sound management and provides guidance on pesticide regulation.^{7,13} This material provides the basis for mitigating health risks from pesticides in general, including from highly hazardous pesticides.

To reduce exposures to highly hazardous pesticides and their health impacts, the following actions are needed:

Handling, storage and use

- Promote the implementation of the FAO guidance on the appropriate handling and use of pesticides globally.^{7,13,14} Provide advice and support nationally, based on this international guidance, for farmers and agricultural workers using pesticides.¹⁵
- Take account of specifications produced by FAO and WHO for highly hazardous agricultural pesticides and by WHOPES for highly hazardous public health pesticides. These specifications detail the appropriate pesticide, formulation, rate of application and suitable equipment for specific pest control.
- Obtain and use information provided by manufacturers (e.g. material safety data sheets) on specific highly hazardous pesticide formulations.
- Supply and ensure use of appropriate and affordable personal protective equipment. Ensure that protective clothing is regularly and safely washed.^{6,16,17}
- Train pesticide applicators in the appropriate use of pesticides, including highly hazardous ones.
- Ensure proper storage of containers of pesticides to prevent access by the general public and children in particular. Proper disposal of containers, unused spray and washings should prevent exposure of humans and contamination of the environment.⁷

Elimination and replacement of pesticide use

- Eliminate the use of persistent highly hazardous pesticides. Several pesticides are classified as persistent organic pollutants (POPs) under the Stockholm Convention. International efforts are being made to eliminate their use. National effort is required from governments to implement these conventions locally. Trade and transport of these POPs and other specified highly hazardous pesticides require prior informed consent (PIC) under the Rotterdam Convention.^{3,4}
- Eliminate the use of pesticides regarded as obsolete under the WHO classification scheme. National action is required.²
- Consider opportunities for integrated pest and vector management rather than relying primarily or solely on pesticide use.¹⁸

Education

- Educate young people on the proper handling of pesticides in general. The subject should be included in the curricula of schools, including colleges and universities.
- Educate and inform health professionals on recognition and treatment of pesticide-related poisoning.

Regulation, monitoring and surveillance

- Establish national regulation of the purchase and use of pesticides—including highly hazardous pesticides—and follow guidance¹⁸ on its structure and function. Adequate personnel, appropriately trained, should be available to implement and enforce the regulation.^{19–21}
- Monitor exposure and conduct health surveillance of users of pesticides and vulnerable populations nationally.

References

1. FAO/WHO (2008). *Second session of the FAO/WHO meeting on pesticide management and 4th session of the FAO panel of experts on pesticide management. Recommendations*. Rome, Food and Agriculture Organization of the United Nations; Geneva, World Health Organization (http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/Recommendations08_01.pdf).
2. WHO (2009). *The WHO recommended classification of pesticides by hazard and guidelines to classification 2009*. Geneva, World Health Organization, International Programme on Chemical Safety (http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf).
3. *Stockholm Convention on Persistent Organic Pollutants (POPS)*. Geneva, Secretariat of the Stockholm Convention (<http://chm.pops.int/>).
4. *Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Pesticides and Industrial Chemicals in International Trade*. Geneva and Rome, Secretariat of the Rotterdam Convention (<http://www.pic.int/>).
5. *The Montreal Protocol on Substances that Deplete the Ozone Layer*. Nairobi, Secretariat of the Montreal Protocol (<http://ozone.unep.org>).
6. WHO/UNEP (2006). *Sound management of pesticides and diagnosis and treatment of pesticide poisoning. A resource tool*. Geneva, World Health Organization and United Nations

Environment Programme

(http://www.who.int/whopes/recommendations/IPCS/Pesticide_ok.pdf).

7. WHO (2010). *Technical guidance for management of public health pesticides*. Geneva, World Health Organization, WHO Pesticide Evaluation Scheme (WHOPES) (http://www.who.int/whopes/recommendations/who_fao_guidelines/en/index.html).
8. FAO/WHO (2009). *JMPR: Joint FAO/WHO Meeting on Pesticide Residues*. Rome, Food and Agriculture Organization of the United Nations; Geneva, World Health Organization (<http://www.who.int/ipcs/food/jmpr>).
9. FAO/WHO (2010). *Pesticide residues in food: Maximum residue limits / extraneous maximum residue limits*. Rome, Food and Agriculture Organization of the United Nations and World Health Organization, FAO/WHO Food Standards Programme, Codex Alimentarius Commission (http://www.codexalimentarius.net/mrls/pestdes/jsp/pest_q-e.jsp).
10. IPCS (2010). *INCHEM: Chemical safety information from intergovernmental organizations*. Geneva, World Health Organization, International Programme on Chemical Safety (<http://www.inchem.org>).
11. WHO (2008). *Guidelines for drinking-water quality*, 3rd edition incorporating 1st and 2nd addenda. Vol. 1. *Recommendations*. Geneva, World Health Organization (http://www.who.int/water_sanitation_health/dwq/chemicals).
12. WHO (2006). *Preventing disease through healthy environments: Towards an estimate of the environmental burden of disease*. Geneva, World Health Organization (http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf).
13. WHO/FAO (2006). *Manual on development and use of FAO and WHO specifications for pesticides. March 2006 revision of the first edition*. Rome, World Health Organization and Food and Agriculture Organization of the United Nations (http://whqlibdoc.who.int/publications/2006/9251048576_eng_update2.pdf).
14. FAO (2003). *International code of conduct on the distribution and use of pesticides—Revised version*. Rome, Food and Agriculture Organization of the United Nations (<http://www.fao.org/DOCREP/005/Y4544E/y4544e00.htm>).
15. WHO (2001). *Preventing health risks from the use of pesticides in agriculture*. Geneva, World Health Organization (Protecting Workers Health Series, No. 1; <http://whqlibdoc.who.int/pwh/2001/9241590998.pdf>).
16. WHO (2006). *Safer access to pesticides: Community interventions*. Geneva, World Health Organization (http://www.who.int/mental_health/prevention/suicide/pesticides_safer_access.pdf).
17. FAO (1990). *Guidelines for personal protection when working with pesticides in tropical climates*. Rome, Food and Agriculture Organization of the United Nations (<http://www.fao.org/ag/AGP/AGPP/Pesticid/Code/Download/PROTECT.pdf>).
18. WHO (2008). *WHO position statement on integrated vector management*. Geneva, World Health Organization (WHO/HTM/NTD/VEM/2008.2; http://whqlibdoc.who.int/hq/2008/WHO_HTM_NTD_VEM_2008.2_eng.pdf).
19. FAO (2006). *International code of conduct on the distribution and use of pesticides. Guidelines on compliance and enforcement of a pesticide regulatory programme*. Rome, Food and Agriculture Organization of the United Nations (<http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Code/Download/Compliance06.pdf>).
20. WHO (2004). *Decision-making for the judicious use of insecticides. Participant's guide. Trial edition*. Geneva, World Health Organization, WHO Pesticide Evaluation Scheme



(WHO/CDS/WHOPES/2004.9a;

http://whqlibdoc.who.int/hq/2004/WHO_CDS_WHOPES_2004.9a.pdf).

21. WHO (2004). *Decision-making for the judicious use of insecticides. Facilitator's guide. Trial edition*. Geneva, World Health Organization, WHO Pesticide Evaluation Scheme

(WHO/CDS/WHOPES/2004.9b;

http://whqlibdoc.who.int/hq/2004/WHO_CDS_WHOPES_2004.9b.pdf).

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