

PREVENTING DISEASE THROUGH HEALTHY ENVIRONMENTS

EXPOSURE TO HIGHLY HAZARDOUS PESTICIDES: A MAJOR PUBLIC HEALTH CONCERN

Highly hazardous pesticides (HHPs) may have acute or chronic toxic effects, posing particular risk to children, and are recognized as an issue of global concern. 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 as well as 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 HHPs – as well as on 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.

The International Code of Conduct on Pesticide Management¹ defines HHPs as pesticides that are acknowledged to present particularly high levels of acute or chronic hazards to health or environment, according to internationally accepted classification systems – such as from World Health Organization (WHO) or the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) – or their listing in relevant binding international agreements or conventions. In addition, pesticides that appear to cause severe or irreversible harm to health or the environment under conditions of use in a country may be considered to be and treated as highly hazardous.

Highly Hazardous Pesticides Criteria^{2,3}

Criterion 1: Acute Toxicity –WHO Recommended Classification of Pesticides by Hazard Classes Ia or Ib.

Criteria 2–4: Chronic Toxicity

- GHS Carcinogenicity Categories 1A and 1B
- GHS Mutagenicity Categories 1A and 1B
- GHS Reproductive Toxicity Categories 1A and 1B.

Criterion 5: Stockholm Convention – Pesticides listed in Annexes A and B.

Criterion 6: Rotterdam Convention – Pesticides listed in Annex III.

Criterion 7: Montreal Protocol – Pesticides listed.

Criterion 8: High incidence of severe or irreversible adverse effects.

Sources of exposure to HHPs

Agriculture and public health

The greatest exposure to HHPs 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.⁴

Occupants of homes sprayed with HHPs might be exposed through residues on internal surfaces and contamination of food and water.⁵

Domestic use

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

Food and drinking-water

Residues of HHPs can be found in food and environmental media. The general population is exposed mainly through consumption of residues of pesticides in food (e.g. treated agricultural produce or unintentionally exposed crops) and sometimes in drinking-water.⁶

Exposure of children

Children regularly undertake agricultural labour in many areas of the world or may be taken into fields with their mothers. Children are particularly at risk of being exposed to HHPs because of their behaviour (particularly hand to mouth behaviour) and may be more sensitive to effects associated with such exposures because of their potential for a greater intake on a body weight basis and because exposure may occur during crucial periods of development.⁷ Young children playing may be exposed to pesticide containers, to residues on surfaces, and through ingestion of contaminated soil. Exposure of children may also occur through their mothers via breastfeeding or in utero.⁶

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 likely to contaminate food.⁸ MRLs are published by the Codex Alimentarius Commission.⁹ Guidance for individual pesticides or pesticide components – including for a number of HHPs – can be accessed via the FAO, WHO, Codex or INCHEM websites 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 HHPs – 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, with ingestion of pesticides being one of the most common methods of suicide deaths and suicide attempts.¹² Available data are too limited to estimate the overall global health impacts of pesticides. However, most pesticide poisonings occur in low- and middle-income countries, where HHPs are responsible for a high proportion of incidences and many farmers are unable to meet the safety requirements for HHPs.¹³ Intentional ingestion of pesticides is estimated to account for one in five of all suicides globally,¹² and it was estimated that 155 488 deaths and 7 362 493 disability-adjusted life years (DALYs*) from pesticide self-poisoning could have been prevented in 2016 through sound management of pesticides.¹⁴ Studies have shown that introduction of regulations to ban the use of HHPs has saved lives.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. Short-term exposure

* 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.

can cause harmful effects on the liver, kidneys, blood, lungs, nervous system, immune system and gastrointestinal tract.³

- Chronic exposure to HHPs can result in effects on the skin, eyes, nervous system, cardiovascular system, gastrointestinal tract, liver, kidneys, reproductive system, endocrine system, immune system and blood.¹⁰ Some HHPs may cause cancer,^{3,15} including childhood cancer.¹⁰
- Children are more vulnerable to the effects of pesticides due to their smaller size and hence greater exposure (on a milligram per kilogram body weight basis), different metabolism, and still developing internal organs.

Risk mitigation recommendations

In 2015, the Strategic Approach to International Chemicals Management (SAICM) International Conference on Chemicals Management adopted a resolution that recognized HHPs as an issue of concern and called for concerted action among countries to address these substances, with emphasis on promoting agro-ecologically based alternatives and strengthening national regulatory capacity to conduct risk assessment and risk management.¹⁶ Several initiatives undertaken by international organizations, including WHO/FAO, support this resolution. These include the publication of several guidelines to support the International Code of Conduct on Pesticide Management, including those on Highly Hazardous Pesticides,⁶ Good Labelling Practice for Pesticides,¹⁷ Pesticide Legislation¹⁸ and numerous other important resources and guidance documentation to assist in the implementation of best practices,¹⁹ which have been brought together in a toolkit.³

The HHP risk reduction process consists of three main consecutive steps:^{3,6}

- Identification of HHPs by checking registered pesticides against the FAO/WHO criteria.
- Assessment of HHPs by assessing each product for risks and needs to determine whether action is desirable.[†]
- Mitigation of HHP risks by determining for each product whether risk mitigation measures are required, and if so, which options would be most appropriate.

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 and Environmental Health Criteria documents.¹⁰ In addition, WHO makes recommendations for use, sound management, regulation and procurement of pesticides.^{20,21} The WHO Prequalification Team for Vector Control assesses vector control products and manufacturing sites, providing lists of prequalified products to help agencies that procure vector control products and countries

[†] The FAO Pesticide Registration Toolkit³ provides practical guidance on conducting risk assessments for pesticide registration or review of existing registrations. For countries with limited capacity for risk assessment, it also contains guidance on the use of risk assessments from other countries and on bridging such information to national use conditions.

with limited capacity to assess pesticides.²² These materials provide the basis for understanding and mitigating health risks from pesticides in general, including from HHPs.

To reduce exposures to HHPs and their health impacts, the following actions are needed:

Handling, storage, use and disposal

- Promote implementation of the FAO guidance on the appropriate handling and use of pesticides globally. Provide advice and support nationally, based on this international guidance, to farmers and agricultural workers using pesticides.¹⁹
- Take account of specifications produced by FAO and WHO for HHPs.²³ These specifications detail the appropriate pesticide, formulation, rate of application and suitable equipment for specific pest and vector control.
- Obtain and use information provided by manufacturers (e.g. safety data sheets) on specific HHP formulations.
- Supply and ensure use of appropriate, comfortable and affordable personal protective equipment (PPE). Ensure that protective clothing is regularly and safely washed. Provide training for appropriate use of PPE.²⁴ Avoid use of pesticides requiring use of such equipment if these are not readily available.⁶
- 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 pesticides and washings should prevent exposure of humans and contamination of the environment.¹

Elimination and replacement of pesticide use

- Eliminate the use of persistent HHPs. Several pesticides are classified as persistent organic pollutants (POPs) under the Stockholm Convention.²⁵ 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 HHPs require prior informed consent under the Rotterdam Convention.²⁶
- Eliminate the use and inappropriate disposal of pesticides regarded as obsolete under the WHO classification scheme.⁴ A toolkit was developed to help countries plan a safe management and disposal programme for their obsolete pesticide stocks.¹⁹
- Consider opportunities for and promote integrated pest and vector management rather than relying primarily or solely on pesticides.⁶
- Improve availability of and promote the development and use of low-risk alternatives.

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.
- Raise awareness and understanding among pesticide users about the importance and ways of protecting health and the environment from the possible adverse effects of pesticides and the existence of less hazardous alternatives.¹

- Educate and inform health professionals on recognition and treatment of pesticide-related poisoning.

Regulation, monitoring and surveillance

- Establish national regulation of the marketing, purchase and use of pesticides, including HHPs, throughout their life cycle, and follow guidance provided in the International Code of Conduct Guidelines on Legislation of Pesticides,¹⁸ the FAO Pesticide Registration Toolkit³ and the Organisation of Economic Co-operation and Development (OECD)/FAO Guidance for Responsible Agricultural Supply Chains,²⁷ taking into consideration local conditions. Adequate numbers of appropriately trained personnel should be available to implement, promote and enforce the regulation.
- Introduce legislation to prevent the use of pesticides by and sale of pesticides to children.¹⁸
- Monitor exposure and effectiveness of risk mitigation measures and conduct health surveillance of users of pesticides and vulnerable populations nationally, as well as pesticides poisoning incidents, using harmonized tools where available,⁶ such as the WHO/FAO Guidelines on Developing a Reporting System for Health and Environmental Incidents Resulting from Exposure to Pesticides²⁸ and resources from WHO.²⁹

References

1. WHO/FAO (2014). *International code of conduct on pesticide management*. Rome, Food and Agriculture Organization of the United Nations; Geneva, World Health Organization (<http://www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/code/en/>).
2. 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).
3. FAO (2018). *Pesticide registration toolkit: Identification of HHPs*. Rome, Food and Agriculture Organization of the United Nations (<http://www.fao.org/pesticide-registration-toolkit/tool/nage/pret/hhp/identification-of-hhps>).

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