

Preventing Disease Through Healthy Environments

ACTION IS NEEDED ON CHEMICALS OF MAJOR PUBLIC HEALTH CONCERN

The production and use of chemicals continues to grow worldwide, particularly in developing countries. This is likely to result in greater negative effect on health if sound chemicals management is not ensured. Multisectoral action is urgently needed to protect human health from the harmful effects of improperly managed chemicals. The following Sections summarize scientific evidence and provide risk management recommendations for 10 chemicals or groups of chemicals of major public health concern.

Air pollution

Indoor air pollution from solid fuel use and urban outdoor air pollution are estimated to be responsible for 3.1 million premature deaths world-wide every year and 3.2% of the global burden of disease. More than half of the health burden from air pollution is borne by people in developing countries. Air pollutants have been linked to a range of adverse health effects, including respiratory infections, cardiovascular diseases and lung cancer. Reduction of air pollution levels will decrease the global burden of disease from these illnesses. Pollution prevention requires policies on air quality and transport, air pollution control regulations in cities, emission controls in industry and promotion of clean, renewable energy sources. Interventions to reduce indoor air pollution include switching from home use of solid fuel to cleaner fuels and technology and ventilation in homes, schools and the working environment, and stopping smoking. Efforts to significantly reduce air pollutants will also help to decrease greenhouse gas emissions and mitigate the effects of global warming.

Arsenic

Soluble inorganic arsenic is acutely toxic. Intake of inorganic arsenic over a long period can lead to chronic arsenic poisoning (arsenicosis). Effects, which can take years to develop depending on the exposure level, include skin lesions, peripheral neuropathy, gastrointestinal symptoms, diabetes, renal system effects, cardiovascular diseases, and cancer. Organic arsenic compounds, which are abundant in seafood, are less harmful to health, and are rapidly eliminated by the body. Human exposure to elevated levels of inorganic arsenic occurs mainly through the consumption of groundwater containing naturally high levels of inorganic arsenic, food prepared with this water, and food crops irrigated with high arsenic water sources. In one estimate, arsenic-contaminated drinking-water in Bangladesh alone was attributed 9,100 deaths and 125,000 Disability Adjusted Life Years (DALYs) in 2001. Reduction in human exposure to arsenic can be achieved by screening of drinking-water supplies, clearly identifying those delivering water above the WHO guideline 10 µg arsenic per litre or national permissible limits, together with awareness-raising campaigns. Mitigation options include use of alternative groundwater sources, use of microbiologically safe surface water (e.g. rainwater harvesting), or use of arsenic removal technologies.



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Asbestos

All types of asbestos cause lung cancer, mesothelioma, cancer of the larynx and ovary, and asbestosis (fibrosis of the lungs). Exposure to asbestos occurs through inhalation of fibres in air in the working environment, ambient air in the vicinity of point sources such as factories handling asbestos, or indoor air in housing and buildings containing friable (crumbly) asbestos materials. Currently about 125 million people in the world are exposed to asbestos at the workplace. In 2004, asbestos-related lung cancer, mesothelioma and asbestosis from occupational exposures resulted in 107,000 deaths and 1,523,000 DALYs. In addition, several thousands of deaths can be attributed to other asbestos-related diseases, as well as to non-occupational exposures to asbestos. Elimination of asbestos-related diseases should take place through the following public health actions: a) recognizing that the most efficient way to eliminate asbestos-related diseases is to stop the use of all types of asbestos; b) replacing asbestos with safer substitutes and developing economic and technological mechanisms to stimulate its replacement; c) taking measures to prevent exposure to asbestos in place and during asbestos removal (abatement), and; d) improving early diagnosis, treatment, social and medical rehabilitation of asbestos-related diseases and establishing registries of people with past and/or current exposures to asbestos.

Benzene

Human exposure to benzene has been associated with a range of acute and long term adverse health effects and diseases, including cancer and aplastic anaemia. Exposure can occur occupationally and domestically as a result of the ubiquitous use of benzene-containing petroleum products including motor fuels and solvents. Active and passive exposure to tobacco smoke is also a significant source of exposure. Benzene is highly volatile and exposure occurs mostly through inhalation. Interventions to reduce both work and general population exposure include promoting the use of alternative solvents in industrial processes, developing and implementing policies and legislation to remove benzene from consumer products, discouraging domestic use of benzene-containing products, stopping smoking, and promoting building codes requiring detached garages.

Cadmium

Cadmium exerts toxic effects on the kidney, the skeletal and the respiratory systems, and is classified as a human carcinogen. It is generally present in the environment at low levels; however, human activity has greatly increased those levels. Cadmium can travel long distances from the source of emission by atmospheric transfer. It is readily accumulated in many organisms, notably molluscs and crustaceans. Lower concentrations are found in vegetables, cereals and starchy roots. Human exposure occurs mainly from consumption of contaminated food, active and passive inhalation of tobacco smoke, and inhalation by workers in the non-ferrous metal industry. Interventions to reduce global environmental cadmium releases and occupational and environmental exposure include increased recycling of cadmium, minimizing emissions and discharges from activities such as mining and waste management, promoting safe working conditions for workers manipulating cadmium-containing products, and stopping smoking.

Dioxins & dioxin-like substances

Dioxins and dioxin-like substances, including PCBs, are persistent organic pollutants (POPs) covered by the Stockholm Convention. They can travel long distances from the source of emission, and bioaccumulate in food chains. Human exposure to dioxins and dioxin-like substances has been associated with a range of toxic effects, including immunotoxicity, developmental and neurodevelopmental effects, and changes in thyroid and steroid hormones and reproductive function. Developmental effects are the most sensitive toxic endpoint making children, particularly breast-fed infants, the population most at risk. These substances are by-products of combustion and various industrial processes, such as chlorine bleaching of paper pulp and smelting. While manufacture of PCBs should have been discontinued, release into the environment still occurs from disposal of large scale electrical equipment and waste. Human exposure to dioxin and dioxin-like substances occurs mainly through consumption of contaminated food. Actions to reduce emissions of these substances are required by the Stockholm Convention. Interventions to reduce human exposure include identifying and safely disposing of material containing or likely to generate dioxin and dioxin-like substances such as electrical equipment, ensuring appropriate combustion practices to prevent emissions, implementing FAO/WHO strategies to reduce contamination in food and feed, and monitoring of food items and human milk.

Inadequate or excess fluoride

Fluoride intake has both beneficial effects – in reducing the incidence of dental caries – and negative effects – in causing enamel and skeletal fluorosis following prolonged high exposure. The ranges of intakes producing these opposing effects are not far apart. Public health actions are needed to provide sufficient fluoride intake in areas where this is lacking, so as to minimize tooth decay. This can be done through drinking water fluoridation, or, when this is not possible, through salt or milk fluoridation. Excessive fluoride intake usually occurs through the consumption of ground water naturally rich in fluoride, or crops that take up fluoride and are irrigated with this water. Such exposure may lead to crippling skeletal fluorosis, which is associated with osteosclerosis, calcification of tendons and ligaments and bone deformities. While the global prevalence of dental and skeletal fluorosis is not entirely clear, it is estimated that excessive fluoride concentrations in drinking water have caused tens of millions of dental and skeletal fluorosis cases world-wide over a range of years. Although removal of excessive fluoride from drinking-water may be difficult and expensive, low-cost solutions that can be applied at a local level do exist. It is important that local authorities consider the causes of fluorosis carefully and choose the best and most appropriate means of dealing with excess fluoride exposure taking into account the local conditions and sensitivities.

Lead

Lead is a toxic metal whose widespread use has caused extensive environmental contamination and health problems in many parts of the world. It is a cumulative toxicant that affects multiple body systems, including the neurologic, hematologic, gastrointestinal, cardiovascular, and renal systems. Children are particularly vulnerable to the neurotoxic effects of lead, and even relatively low levels of exposure can cause serious and in some cases irreversible neurological damage. Lead exposure is estimated to account for 0.6% of the global burden of disease, with the highest burden in developing regions. Childhood lead exposure is estimated to contribute to about 600,000 new cases of children with intellectual disabilities every year. Recent reductions in the use of lead in petrol, paint, plumbing and solder have resulted in substantial reductions in blood lead levels. However, significant

sources of exposure still remain, particularly in developing countries. Further efforts are required to continue to reduce the use and releases of lead and to reduce environmental and occupational exposures, particularly for children and women of child-bearing age. Interventions include eliminating non-essential uses of lead such as lead in paint, ensuring the safe recycling of lead-containing waste, educating the public about the importance of safe disposal of lead-acid batteries and computers, and monitoring of blood lead levels in children, women of child-bearing age and workers.

Mercury

Mercury is toxic to human health, posing a particular threat to the development of the child *in utero* and early in life. Mercury exists in various forms: *elemental* (or metallic); *inorganic* (e.g. mercuric chloride); and *organic* (e.g., methyl- and ethylmercury), which all have different toxic effects, including on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes. It has been estimated that among selected subsistence fishing populations, between 1.5/1000 and 17/1000 children showed cognitive impacts caused by the consumption of fish containing mercury. Mercury releases in the environment result mainly from human activity, particularly from coal-fired power stations, residential heating systems, waste incinerators and as a result of mining for mercury, gold and other metals. Once in the environment, elemental mercury is naturally transformed into methylmercury that bioaccumulates in fish and shellfish. Human exposure occurs mainly through inhalation of elemental mercury vapors during industrial processes and through consumption of contaminated fish and shellfish. Interventions to prevent environmental releases and human exposure include eliminating the use of mercury wherever possible, promoting the development of mercury-free alternatives e.g. for manometers and thermometers, ensuring proper disposal of mercury-containing devices, and implementing safe handling, use and disposal of mercury-containing products and waste.

Highly hazardous pesticides

Highly hazardous pesticides may have acute and/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. Available data are too limited to estimate the global health impacts of pesticides, however the global impact of self-poisoning (suicides) from preventable pesticide ingestion has however been estimated to amount to 186,000 deaths and 4,420,000 DALYs in 2002. Environmental contamination can also result in human exposure through consumption of residues of pesticides in food and, possibly, drinking water. While developed countries have 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, as well as proper storage and handling, are available from international organizations and international conventions; these should be implemented globally.

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