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CHEMICALS OF PUBLIC HEALTH CONCERN, A REVIEW

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Abstract

We encounter chemicals on a regular basis. Chemicals are an integral part of all matter, both living and nonliving, and they are also used in the production of almost every manufactured good. Many chemicals, when utilized correctly, may greatly enhance our health, well-being, and quality of life. However, when not handled correctly, some chemicals pose serious risks to human and environmental health. Chemical production and consumption are on the rise globally, especially in emerging nations. Lack of safe chemical management is likely to amplify the harmful effects on human health. Urgent action spanning several sectors is required to safeguard human health from the detrimental consequences of chemicals that are not well handled.

Keywords: Chemicals, Arsenic, Asbestos, Benzene, Cadmium

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Introduction

Any one-of-a-kind material having a consistently chemical makeup and identifiable features is considered a chemical substance. Any given chemical entity can be an element or a combination of elements. A chemical mixture can be formed when two or more compounds can be mixed together without reacting. A chemically pure material is one that has been extracted from a mixture to an acceptable level. The chemical makeup of a material remains unchanged regardless of its physical condition, which can include solids, liquids, gases, and plasma. When the temperature or pressure of a substance varies, it will shift between various phases. Chemical reactions allow for the combination or conversion of some chemical compounds into other chemicals. To put it simply, inert chemicals lack this capability. An example of a chemical substance is pure water, which always contains one oxygen atom bound to two hydrogen atoms (i.e., H2O). In every single mole of water, the proportion of hydrogen to oxygen is precisely 2:1. An example of a property that defines pure water is that it tends to boil at 100 °C (212 °F). Ionic compounds like table salt (NaCl) and organic compounds like refined sugar (C12H22O11) are among the other noteworthy chemical substances. Diamond is a type of carbon. Scientific evidence and recommendations for risk management for some substances or groupings of chemicals that pose a significant public health issue are provided by WHO.

01. Arsenic

As a metalloid element, arsenic may combine with other elements to generate several toxic compounds. It permeates the whole Earth's crust and can be discharged into the air and water as a result of both natural and man-made processes. For short periods of time, inorganic arsenic that is soluble is extremely harmful. Chronic arsenic poisoning, also known as arsenicosis, can develop from long-term exposure to inorganic arsenic. Skin lesions, peripheral neuropathy, gastrointestinal problems, diabetes, cardiovascular disorders, developmental toxicity, and skin and internal organ cancer are some of the effects that might manifest years after exposure. Seafood has a lot of organic arsenic compounds, which are safe and easily flushed out of the body. Groundwater that is naturally rich in inorganic arsenic (found in many countries), food that is cooked in this water, and crops that are irrigated with water that is high in arsenic are the major ways that humans are exposed to increased amounts of arsenic. Chronic arsenic poisoning was estimated to be responsible for over 43,000 fatalities per year in Bangladesh alone. Reduction in human exposure to arsenic can be achieved by screening drinking-water supplies and clearly identifying those delivering water that exceed the WHO provisional guideline of 10 micrograms arsenic per litre or national permissible limits, in conjunction with awareness-raising campaigns. Mitigation options include use of alternative groundwater sources, use of microbiologically safe sources such as rainwater and treated surface water, use of arsenic removal technologies, or dilution of high-arsenic-content source water with lower-arsenic-content source water that is microbiologically safe.

02. Asbestos

Mesothelioma, asbestosis (fibrosis of the lungs), asbestosis (lung cancer), and cancers of the larynx and ovaries are all caused by asbestos. Inhalation of asbestos fibers in the air can happen in a number of settings, including the workplace, near point sources like asbestos factories, or even inside in homes and buildings that include friable (crumbly) asbestos materials. Asbestos is still a problem in the workplace for almost 125 million workers worldwide. Occupational exposures to asbestos caused lung cancer, mesothelioma, and asbestosis, which led to 1,523,000 disability adjusted life years (DALYs) and 107,000 fatalities in 2004. Furthermore, asbestosis and other asbestos-related illnesses, as well as asbestos exposures outside of work, are responsible for thousands of fatalities. The following public health measures are necessary to eradicate asbestos-related illnesses:

01. Acknowledging that the best approach to eradicate asbestos-related illnesses is to completely phase out the material.

02. Finding safer alternatives to asbestos and creating financial and technical incentives to encourage its replacement.

3. Implementing measures to minimize exposure to asbestos both during its presence and removal (abatement).

4. Enhancing the early detection, treatment, social and medical rehabilitation of asbestos-related illnesses and creating databases of individuals with exposure histories to the material.

03. Benzene

Human exposure to benzene has been associated with a range of acute and long-term adverse health effects and diseases, including cancer and haematological effects. Exposure can occur occupationally, in the general environment and in the home 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, promoting building codes requiring detached garages, and implementing the WHO Framework Convention on Tobacco Control, including providing for protection from exposure to tobacco smoke in workplaces and public areas.

03. Cadmium

Cadmium exerts toxic effects on the kidneys as well as the skeletal and respiratory systems. It is classified as a human carcinogen. It is generally present in the environment at low levels; however, human activity has greatly increased levels in environmental media relevant to population exposure. Exposures potentially of particular concern for children include disposal and recycling of electronic and electrical waste, as well as toys, jewellery and plastics containing cadmium. Cadmium can travel long distances from the source of emission by atmospheric transfer. It is readily accumulated in many organisms, notably mollusks 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 a range of industries. Interventions to reduce global environmental cadmium releases and occupational and environmental exposure include:

1. Enhancing the efficiency and security of cadmium recycling;

2. Reducing emissions and discharges from industries like mining and waste management;

3. Ensuring that employees handling cadmium-containing products are exposed to safe working conditions;

4. Advocating for the complete removal of cadmium from products like plastics, jewelry, and toys; and

5. Putting into action the World Health Organization's Framework Convention on Tobacco Control, which includes measures to protect people from secondhand smoke in public and workplace settings.

05. Dioxins and dioxin-like substances

Persistent organic pollutants (POPs) included in the Stockholm Convention include dioxins and PCBs, among others. Long after they've been released, they can bioaccumulate in food webs. A wide variety of harmful consequences, such as chloracne, immunotoxicity, impacts on thyroid hormones, liver function, and tooth formation, have been linked to human exposure to dioxins and compounds with similar structures. They are also known to cause cancer. Children, especially breastfed newborns, are most vulnerable because developmental problems in males are the most sensitive toxic endpoint. Smelting, chlorine bleaching of paper pulp, and combustion all produce these chemicals as undesired byproducts. There is still some release into the environment from the disposal of large-scale electrical equipment and garbage, even though PCB fabrication is currently outlawed and their usage in equipment is to be phased out by 2025. While dioxins and dioxin-like compounds are most commonly consumed through tainted food, occupational exposure can reach greater amounts. The Stockholm Convention mandates measures to decrease emissions of certain chemicals. Prevention measures to lower human exposure levels encompass:

1. Discovering and properly disposing of electrical equipment and other materials that contain or could produce dioxins or substances with similar properties;

2. making sure that combustion practices are appropriate to lower emissions;

3. Putting FAO/WHO strategies into action to lessen contamination in feed and food; and

4. Keeping an eye on food, milk, air, and worker exposures to higher levels.

06. 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. Recent reductions in the use of lead in petrol, paint, plumbing and solder have resulted in a substantial reductions in population-level mean blood lead concentrations. 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. Lead paint and other non-essential uses of lead should be phased out. The proper recycling of lead-containing waste should be ensured. The public should be educated on the importance of properly disposing of lead-acid batteries and computers. Blood lead levels should be monitored in children, women of childbearing age, and workers.

7. 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, and 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:

1. Making sure that no one uses or produces mercury in any way, shape, or form;
2. Encouraging the use of renewable energy sources that don't involve burning coal;
3. Replacing mercury thermometers and sphygmomanometers in healthcare with alternatives; and
4. Making sure that everyone knows how to safely handle, use, and dispose of products and waste that contain mercury.

8. Inadequate or excess fluoride

Ingesting fluoride has mixed effects: it lowers the risk of dental caries, but it can also cause fluorosis of the teeth and bones after lengthy periods of exposure. These contrasting impacts are produced by intakes that are quite close to one another. With an estimated 2.4 billion adults and 486 million children affected by caries of permanent teeth and primary teeth, respectively, caries of the permanent teeth is the most common ailment in the world. Reduced tooth decay rates can be achieved by public health initiatives that increase fluoride consumption in regions where it is currently insufficient. A low-sugar diet and fluoridation of drinking water are two ways to achieve this goal; alternatives include fluoridating milk or salt when water fluoridation is not an option, and using fluoride-containing tooth care products. Groundwater that is naturally rich in fluoride is a common source of excessive fluoride intake, especially in warm regions where water consumption is larger or in areas where crops are irrigated or food is prepared using water that is high in fluoride. Fluorosis of the teeth or the skeleton, which can cause osteosclerosis, calcification of ligaments and tendons, and abnormalities in the bones, can result from such exposure. Excessive fluoride concentrations in drinking water are believed to have caused tens of millions of instances of dental and skeletal fluorosis globally over a range of years; however the exact incidence of these conditions is not fully known. While it may be challenging and costly to remove excessive fluoride from drinking water, there are low-cost local options that are available. In order to help communities limit fluoride exposures and strike a balance between preventing caries and protecting against harmful effects, the World Health Organization (WHO) has released guidelines. Nevertheless, it is important to consider local circumstances and sensitivities while implementing risk reduction strategies.

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