

Heavy Metal Toxicity: A Blind Evil

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Heavy metals are natural components of the earth's crust and as such are the oldest toxins known to humans, having been used for thousands of years. Potential exposures to heavy metals include natural sources (e.g.: groundwater, metal ores), industrial processes, commercial products, folk remedies, and contaminated food and herbal products. Virtually all heavy metals are toxic in sufficient quantities.

Metal leads to various metabolic alterations and undesirable changes, which in many cases may cause severe injury and health hazards. Heavy metal toxicity can be a much more serious and insidious problem, as these are intrinsic components of the environment. Cadmium induced disturbances in calcium metabolism accompanied by softening of bones; fractures and skeletal deformations take place with a marked decrease in body height up to 30 cm. Over the centuries, arsenic has been used for various purposes. Hippocrates prescribed a paste of arsenic sulfide to treat skin conditions. The importance of arsenic as a health hazard, which is also known as 'slow killer' is now well recognized. Mercury (Hg) is considered to be highly toxic metal for living organisms. Even at very low concentration, Hg and its compounds present potential hazards due to enrichment in food chain. Poisoning by methyl mercury compounds presents a bizarre neurological picture as observed in large-scale outbreaks in Japan, China, Iraq and various parts of the world. Lead is the number one environmental poison amongst the toxic heavy metals all over the world, causing serious health hazards to humans, especially to young children. In developing countries like India and Nepal, lead poisoning remains a serious problem. The toxic metals mercury, lead, and cadmium have also been found to have reproductive and endocrine system disrupting effects. Aluminium has been found to cause Alzheimer's disease in human beings reported from several parts of the world. Exposure to relatively low levels of these chemicals have been documented to have had ruinous effects on populations of Beluga whales, alligators, turtles, mink, otters, bald eagles, osprey, cormorants, terns, herring gulls, migratory birds, chickens, lake trout, chinook and coho salmon, etc. throughout the U.S. and Canada [1-3].

Heavy metal toxicity is more common than one can think. To many people, heavy metal toxicity is a problem associated with areas of intensive industry. However, roadways and automobiles now are considered to be one of the largest sources of heavy metals. Zinc, copper, and lead are three of the most common heavy metals released from road travel, accounting for at least 90 of the total metals in road runoff. Lead concentrations, however, consistently have been decreasing since leaded gasoline was discontinued. Smaller amounts of many other metals, such as nickel and cadmium, are also found in road runoff and exhaust. About half of the zinc and copper contribution to the environment from urbanization is from automobiles. On the road surface, most heavy metals become bound to the surfaces of road dust or other particulates and enter the soil or are channeled into a storm drain. Whether in the soil or aquatic environment, metals can be transported by several processes [4].

Metal behavior in the aquatic (streams, lakes and rivers) environment is surprisingly similar to that outside a water body. Streambed sediments exhibit the same binding characteristics found in the normal soil environment. As a result, many heavy metals tend to

be sequestered at the bottom of water bodies. Some of these metals will dissolve.

The aquatic environment is more susceptible to the harmful effects of heavy metal toxicity because aquatic organisms are in close and prolonged contact with the soluble metals. Severe heavy metal contaminations have been reported in South-East Asia; arsenic contamination of groundwater in major parts of Bangladesh, lead in gasoline in Indonesia, cadmium contamination of rice fields in Thailand, and mercury contamination from small scale and industrial gold mining activities in Indonesia and from medical instruments breakage in India. These represent but a few cases of the occupational and environmental risks due to heavy metals that are of importance to us.

The recommendation for prevention of heavy metal toxicity should a framework to develop and implement national and regional action plan for public health interventions and collaboration, addressing human exposure to metals must be identified, identification of preventive approaches, implementation of risk assessment methods, aiming priority health interventions at the most vulnerable groups; children, women, workers, ensuring higher standards of validation and quality control of laboratories, engaging industry to develop cost effective alternatives, stronger role and involvement of public interest national and international NGOs and academia, calling for a global regulatory instrument for toxic metals, networking at national, regional and global levels etc.

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