Yellow Courtyard Newsletter
From Practitioner to Practitioner
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Environmental Corner:

A Heavy Load: Health Risks Associated with Heavy Metals

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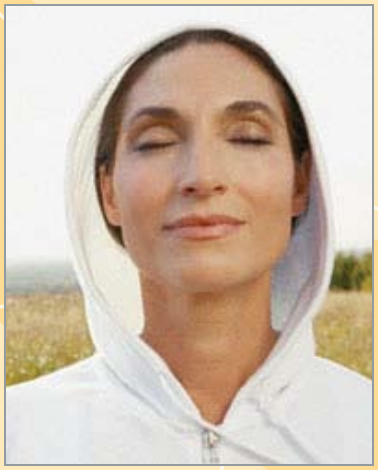
As American life expectancy continues to increase, the pressing concern for many people has shifted from living longer to living healthier. Good nutrition, physical activity, and stress reduction are integral parts of the healthy living equation, and health practitioners are always looking for innovative ways to encourage healthy behaviors. However, try as we might, we cannot escape the many environmental chemical exposures we come into contact with daily.

Many of the diseases we have been taught to think of as part of "normal" aging may, in fact, be manifestations of our body's accumulation of heavy metals and other toxins. This is an additional factor to consider when focusing on living healthier.

The term heavy metal refers to any metallic chemical element that has a relatively high density (molecular weight) and is toxic or poisonous at low concentrations. Heavy metals are natural components of the Earth's crust. They cannot be degraded or destroyed. To a small extent they enter our bodies via food, drinking water and air. As trace elements, some heavy metals (e.g. copper, selenium, zinc) are essential to maintain crucial processes in our bodies[1] metabolism. However, at higher concentrations they can lead to poisoning. Heavy metal poisoning could result, for instance, from drinking water contamination (e.g. lead pipes), high ambient air concentrations near emission sources, or intake via the food chain. Heavy metals can enter a water supply by industrial and consumer waste, or even from acidic rain breaking down soils and releasing heavy metals into streams, lakes, rivers, and groundwater.



Examples of heavy metals include mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), thallium (Tl), and lead (Pb). Heavy metals are dangerous to our health because they tend to bioaccumulate. This means that even small concentrations of the chemical in a person can continue to increase over time. Compounds accumulate in living things any time they are taken up and stored faster than they are broken down (metabolized) or excreted. Studies show that heavy metals in the body may be implicated in everything from Alzheimer[1]s to cardiovascular disease, from behavioral problems and IQ, to kidney dysfunction, Parkinson[1]s disease, autism and epilepsy. The heavy metals mercury, lead, and cadmium, have even been found in cord blood of babies whose mothers were smokers.

Overview Of Heavy Metals

Lead

Lead exposure from the environment can occur through drinking water, food, air, soil and dust from old paint containing lead. In the general non-smoking, adult population the major exposure is from food and water. Food, air, water and dust/soil are the major potential exposure pathways for infants and young children. The EPA estimates that 10 to 20 percent of human exposure to lead may come from lead in drinking water. Infants who consume mostly mixed formula can receive 40 to 60 percent of their exposure to lead from drinking water.

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Generally, lead levels of under 10mcg (micrograms) per decilitre of blood have been considered safe. However, researchers found that people with between 3.6mcg and 10mcg had a 55 per cent higher risk of death from cardiovascular diseases, 89 per cent higher risk of dying from a heart attack and were two and a half times more likely to die from a stroke than those with less than 1.9mcg. All this equated to a 25 per cent greater risk of fatal heart disease. Lead has been implicated in hypertension, heart disease, peripheral artery disease, and stroke mortality. In a 2007 study of patients under the age of 50 who had heart attacks, it was found that a significant number of the early heart attack victims had chemical pollution from occupational exposures.

Exposure to lead can result in a wide range of biological effects depending on the level and duration of exposure. High levels (of exposure) may result in toxic effects and cause problems in the synthesis of hemoglobin, stress the kidneys, gastrointestinal tract, joints and reproductive system, and acute or chronic damage to the nervous system. Lead poisoning, which is so severe as to cause evident illness, is now very rare. However, at intermediate concentrations, there is persuasive evidence that lead can have small, subtle, subclinical effects, particularly on neuropsychological developments in children. With the elimination of lead-based house paint, and the increased use of lead-free gasoline, lead poisoning is certainly less prevalent. However, low-level toxicity is still an issue. The EPA warns that if lead is not detected early, children with high levels of lead in their bodies can suffer from damage to the brain and nervous system, behavior and learning problems (such as hyperactivity), slowed growth, headaches, and more. Adults are still at risk and can suffer from reproductive problems (in both men and women), high blood pressure, digestive problems, nerve disorders, memory and concentration problems, and muscle and joint pain.

Lead is still used in the manufacturing, construction and chemical industries. Coal burning power plants still spew lead into the atmosphere. The major areas lead is still used in include: batteries, alloys, pigments and compounds, cable sheathing, shot and ammunition. Lead pipes used to supply water have largely been replaced but still exists in some places.

Cadmium

Cadmium derives its toxic effects from its chemical similarity to zinc, an essential micronutrient for plants, animals and humans. Cadmium has become a more prevalent cause for concern in recent years. Like lead, it is an underground mineral that did not enter our air, food, and water in significant amounts until it was mined as part of zinc deposits. Now there is widespread environmental contamination with cadmium. Cadmium may actually displace zinc in some of its important enzymatic and organ functions and can interfere with these functions. The zinc-cadmium ratio is very important, as cadmium toxicity and storage are greatly increased with zinc deficiency, and good levels of zinc protect against tissue damage by cadmium. The refinement of grains reduces the zinc-cadmium ratio, so zinc deficiency and cadmium toxicity are more likely when the diet is high in refined grains and flours.

Cadmium is biopersistent. Once it is absorbed, it stays in the body for years (even decades), although it is eventually excreted. We get most of our exposure from our food via the soil it[1]s

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grown in. Luckily, cadmium is not well absorbed by digestion. We may have as much as 40 mg. of cadmium in our body and probably consume at least 40 mcg. daily. Given that absorption from ingestion is only about 5%, which would make the average daily intake for humans about 0.15mcg. from air and 1mcg. from water. There may be some in water from contamination and water pipes. Cigarette smoke plus industrial burning of metals puts some cadmium into the air. Cadmium levels in the atmosphere are much higher in industrial cities and it is more harmful when inhaled. Soil levels of cadmium are increased by cadmium in water, by sewage contamination, by cadmium in the air, and by high-phosphate fertilizers.

Coffee and tea may contain significant cadmium levels. Root vegetables such as potatoes may pick up more cadmium in the soil, and grains can concentrate cadmium. Seafood, particularly crustaceans, such as crab and lobster, and mollusks, such as clams and oysters, has higher cadmium levels, though many are also higher in zinc, balancing the cadmium. During the growth of grains such as wheat and rice, cadmium (from the soil) is concentrated in the core of the kernel, while zinc is found mostly in the germ and bran coverings. With refinement, zinc is lost, increasing the cadmium ratio. Refined flours, rice, and sugar all have relatively higher ratios of cadmium to zinc than do the whole foods.

One pack of cigarettes contains about 20 mcg. of cadmium, or about 1 mcg. per cigarette. About 30 percent of that goes into the lungs and is absorbed, and the remaining 70 percent goes into the atmosphere to be inhaled by others or to contaminate the environment. With long-term smoking, the risk of cadmium toxicity is increased. Though most of it is eliminated, a little bit is stored every day. Marijuana may also concentrate cadmium, so regular smoking of cannabis may also be a risk factor for toxicity from this metal.

Occupational/Industrial Exposure

The most significant use of cadmium is in nickel/cadmium batteries and ore and smelter dust. Other uses of cadmium are in electroplating, welding, cadmium coatings in marine and aerospace applications, pigments, stabilizers for PVC, and alloys and electronic compounds. Cadmium is also present as an impurity in several products, including phosphate fertilizers, detergents, dental materials and refined petroleum products. Cadmium is found in some industrial and fine art paints and may represent a hazard when sprayed. Operations involving removal of cadmium paints by scraping or blasting may similarly pose a significant hazard. Cadmium exposure is known in pottery factory workers, teachers, and studio potters working with certain glazes. In the wet state these glazes are certainly much less hazardous than in the dry state with consequent dust (main route of entry being inhalation). Industrial workers, metal workers, zinc miners, and anyone who works with zinc galvanization may accumulate more cadmium. Those who drink soft water, smoke or inhale second hand smoke, drink coffee and tea, and those who eat refined flours, sugars, and white rice, are all likely to receive greater exposure to cadmium.

Health Consequences

In humans, long-term exposure is associated with kidney disease. Renal cadmium may be associated with hypertension, sodium retention, glucose intolerance, problems with blood lipids,

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and zinc deficiency. High exposure can lead to obstructive lung disease. Cadmium appears to depress some immune functions, mainly by reducing host resistance to bacteria and viruses. Occupational exposure to cadmium has been implicated in a significant increase of lung and prostate cancer. The IARC has determined that there is sufficient evidence in humans for the carcinogenicity of cadmium compounds. It also appears that cadmium has the capability to alter genetic materials, particularly chromosomes. Cadmium toxicity has been implicated in generating prostate enlargement, possibly by interfering with zinc. Cadmium may also produce bone defects (osteomalacia, osteoporosis) in humans and animals. In addition, the metal can be linked to anemia, yellow teeth discoloration and loss of smell (anosmia).

Aluminum

It has been known for 20 years that once aluminum enters the body, it accumulates in brain tissue where it can destroy neurons, leading to memory loss. Significant amounts of aluminum can be found in food emulsifiers, antiperspirant deodorants, hair sprays, baking powder, many types of toothpaste, much of our drinking water, and most of our cookware, expose us to a lot of aluminum over the course of one's lifetime. There has been much speculation, therefore, that aluminum may be one of the prime factors contributing to the onset of Alzheimer's disease. The connection between aluminum and Alzheimer's disease became more evident, when in 1995 when the Journal, Neurotoxicology reported that the widespread use of aluminum salts to purify water could account for the large numbers of people suffering from Alzheimer's.

Recently, the final piece of the puzzle may have fallen into place: the connection between aluminum and fluoride. New research has revealed that fluoride in drinking water makes the aluminum that we ingest more bio-available. As was reported in Brain Research (Vol.7 84:98), the combination of aluminum and fluoride causes the same pathological changes in brain tissue found in Alzheimer's patients.

Note: There is a significant difference between metallic aluminum and plant-derived aluminum, which is in the form of aluminum hydroxide. No studies have ever shown a connection between aluminum hydroxide and toxic levels of aluminum in the human body -- which is a good thing, because there is a lot of it in our food supply.

Mercury

Mercury is another heavy metal that has toxic clinical effects and bioaccumulates. Mercury is naturally occurring and is found in soil, rocks, wood, and fuels like coal and oil. Simple soil erosion deposits mercury in rivers and lakes, but concentrations generally remain low, unless erosion reaches extraordinary levels. Common exposures include: eating fish or shellfish contaminated with methylmercury, breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels, release of mercury from dental work and medical treatments, breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).

The major source of mercury in our food chain, responsible for about 1/3 of the levels found in our bodies, a result of burning of coal to generate electric power. That is the single greatest contributor to the problem. Mercury that natu-

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rally occurs in the coal is released during burning and enters the air; it is then precipitated into the oceans, lakes, and rivers by rain. According to the EPA, coal-fired power plants in the United States emit about 48 tons of mercury into the air every year -- and more than half of this mercury falls within 5 miles of the plant itself. When it reaches the water, microorganisms consume it and convert it into a substance called methyl mercury. Methylmercury works its way up the food chain, reaching high concentrations among populations of some species. Larger species of fish, such as tuna or swordfish, are usually of greater concern than smaller species. The U.S. Food and Drug Administration (FDA) and the U.S. Environmental Protection Agency (EPA) advise women of child-bearing age, nursing mothers, and young children to completely avoid swordfish, shark, king mackerel and tilefish (golden bass), to limit consumption of albacore ("white") tuna to no more than 6 oz (170 g) per week, and of all other fish and shellfish to no more than 12 oz (340 g) per week. A 2006 review of the risks and benefits of fish consumption found that for adults the benefits of one to two servings of fish per week outweigh the risks, even (except for a few fish species) for women of childbearing age, and that avoidance of fish consumption could result in significant excess coronary heart disease deaths and suboptimal neural development in children. The consumption of fish is by far the most significant source of ingestion-related mercury exposure in humans, although plants and livestock also contain mercury due to bioaccumulation of mercury from soil, water and atmosphere. Exposure to mercury can occur from improper use or disposal of mercury and mercury-containing objects, for example, after spills of elemental mercury or improper disposal of fluorescent light bulbs or old mercury thermometers.

Human-generated sources such as coal plants emit approximately half of atmospheric mercury, with natural sources such as volcanoes responsible for the remainder. An estimated two-thirds of human-generated mercury comes from stationary combustion, mostly of coal. Other sources include gold production, non-ferrous metal production, cement production, waste disposal, crematoria, caustic soda production, pig iron and steel production, mercury production (mostly for batteries), and biomass burning. Mercury and its compounds are commonly used in chemical laboratories, hospitals, dental clinics, and facilities involved in the production of items such as fluorescent light bulbs, batteries, and explosives.

Health Effects

The nervous system is very sensitive to all forms of mercury. Methyl mercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, tremors, changes in vision or hearing, and memory problems. The term, "Mad Hatter," refers to 19th Century workers who used mercury to make hats and went bald and suffered from severe muscular tremors, dementia, and fits of wild, uncontrollable laughter.

Short-term exposure to high levels of metallic mercury vapors may cause effects that include lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation. Mercury toxicity has been associated with hypertension, decline in cognitive function, Autism, Alzheimer¹s Disease, coronary heart disease, stroke, generalized atherosclerosis, and kidney disease.

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The EPA has determined that mercuric chloride and methyl mercury are possible human carcinogens from studies that demonstrated that mercuric chloride increased several types of tumors in rats and mice, and methyl mercury caused kidney tumors in male mice. It has also been shown that mercury cuts the oxygen carrying capacity of blood by half. Researchers believe that this might account for many instances of chronic fatigue.

Children

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and it can pass to a nursing infant through breast milk therefore women should avoid dental work prior to and during pregnancy and breast feeding.

Mercury's harmful effects that can be passed from the mother to the fetus include brain damage, mental retardation, lack of coordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage. Mercury has an affinity for fetal tissue and accounts for its implication in birth defects. In 2002, the National Academy of Sciences found strong evidence for the toxicity of methyl mercury to children's developing brains, even at low levels of exposure. A recent study from the Centers for Disease Control found that as many as 637,233 American children are born each year with mercury levels of more than 5.8 micrograms per liter, the level associated with brain damage and loss of IQ.

Testing

Heavy metals can be easily tested in hair, urine and whole blood. One method of testing is using a urinary provocative challenge test and many practitioners believe that it is more accurate than others. It involves ingesting a chelating agent to draw the toxins into the urine from the tissues before collecting urine. Treatments can be pharmaceutical or one can use natural substances. Retesting to evaluate progress is recommended.

For heavy metal testing information and for elimination and detoxification programs contact: ACAM (www.ACAM.org) (see more on chelation information below).

Guidelines for Prevention of Heavy Metal Exposures

- Avoid exposures in the workplace, home, food chain
- Avoid new amalgam fillings and, if possible, have a dentist who understands the process to replace your existing fillings.
- Avoid aluminum cookware and aluminum based deodorants.
- Avoid high-mercury fish intake including swordfish, shark, roughy, and albacore tuna.
- Filter fluoride and lead out of your drinking water. Test your water at its source entering your home.
- Check for heavy metals several months prior to conception.
- Evaluate products around the home for toxic metals (e.g., fertilizers, fungicides, insect or rodent poisons, lead-based paint, refinishing chemicals, household cleaning agents, hobby supplies, photographic chemicals, batteries, etc.) Keep these products in their original containers and store safely.

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- Read labels every time you buy a product and choose safer products when at all possible.
- Keep all potentially toxic products well away from children.
- Dispose of light bulbs, batteries and other items safely.
- Become familiar with the symptoms of and first aid procedures for
- Avoid ingestion of substances containing toxic metals.

Chelation Therapy

In addition to certain lifestyle modifications, chelation therapy can help remove toxic metals and lower calcium deposits in the blood vessels. This combination helps in the treatment and prevention of diseases involving the blood vessels.

Holistic and integrative physicians have used chelation therapy for over four decades to help in the treatment of clogged arteries, hardened arteries, high blood pressure, angina and heavy metal toxicity.

* While chelation therapy is well-established for heavy metal toxicity and has been used for over 40 years to reduce the vascular plaque that cause cardiovascular disease, its effectiveness is still under study by the National Institutes of Health. While a number of physicians provide chelation and its safety is well-known, the role of heavy metal toxicity in cardiovascular disease is not widely accepted and the medical community does not accept that chelation has a role to play in cardiovascular treatment.