TOXIC METALS AND ENVIRONMENTAL POLLUTION

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ABSTRACT

Toxic metals, including "heavy metals," are individual metals and metal compounds that negatively affect people's health. In very small amounts, many of these metals are necessary to support life. However, in larger amounts, they become toxic. They may build up in biological systems and become a significant health hazard. This paper provides some information about toxic metals and systematic remediation technologies for heavy metal-contaminated environments

1. INTRODUCTION

Toxic metals comprise a group of minerals that have no known function in the body and, in fact, are very harmful to plant, animal and human bodies. Mankind today is exposed to the highest levels of these metals in recorded history.

This is due to their industrial use for the past 300 years, the burning of fossil fuels without scrubbers, and improper incineration of waste materials worldwide. Toxic metals are now everywhere, and affect everyone on planet earth. They have become a major cause of illness, aging and even genetic defects.

2. TOXIC METAL DANGERS

Today mankind is exposed to the highest levels in recorded history of lead, mercury, arsenic, aluminum, copper, nickel, tin, antimony, bromine, bismuth and vanadium. Levels are up to several thousand times higher than in primitive man. Toxic metals are also persistent and cumulative.

Most organic substances are degradable by natural processes. However, no metal is degradable. They are here to stay for a long time.

3. MODERN DIETS AND TOXIC METALS

The danger of toxic metals is greatly aggravated today by the low mineral content of most of our food supply. An abundance of vital minerals protects against toxic metals. Vital minerals compete with toxic metals for absorption and utilization in enzymes and other tissue structures.

However, when food is low in essential minerals, the body absorbs and makes use of more toxic metals. To continue the previous analogy, we are not stocking up sufficiently on factory parts, so we must use the greatly inferior replacement parts – toxic metals. Causes for the low mineral content of almost all agricultural products are primarily:

1. Hybrid crops are bred for production or disease resistance, rather than superior nutrition.
2. Superphosphate fertilizers produce higher yields by stimulating growth, but do not provide all the trace elements. Indeed, we simply do not replace all the trace minerals on our agricultural fields today. Instead, human animal manures too often are just flushed into the rivers and oceans, where they do not belong and are often pollutants.
3. Monoculture, the growing of just one crop over and over on the same piece of land, eventually depletes the soil
4. Toxic sprays damage soil microorganisms needed to help plants absorb minerals from the soil.
5. Food refining and processing almost always reduce the mineral content of our food. Whole wheat flour, when milled to make white flour, loses 40% of its chromium, 86% of its manganese, 89% of its cobalt, 78% of its zinc and 48% of its molybdenum. Refining cane into sugar causes even greater losses. EDTA may be added to frozen foods to retain their color. However, this chelating agent removes minerals that otherwise would cause the surface minerals to 'tarnish', discoloring the vegetables.

4. THE SOURCES AND SYMPTOMS OF THE COMMON TOXIC METALS

4.1. SOURCES:

4.1.1. Aluminum: cookware, beverages in aluminum cans, tap water, table salt, baking powders, antacids, processed cheese, anti-perspirants, bleached flour, vaccines and perhaps other medications, and occupational exposure. Virtually everyone has too much aluminum in their bodies.

4.1.2. Arsenic: pesticides, beer, table salt, tap water, paints, pigments, cosmetics, glass and mirror manufacture, fungicides, insecticides, treated wood and contaminated food.

4.1.3. Beryllium: air pollution (burning fossil fuels), manufacture of plastics, electronics, steel alloys and volcanic ash.

4.1.4. Cadmium: cigarettes, (tobacco and marijuana), processed and refined foods, large fish, shellfish, tap water, auto exhaust, plated containers, galvanized pipes, air pollution from incineration and occupational exposure.

4.1.5. Copper: copper water pipes, copper added to tap water, pesticides, swimming in pools, intra-uterine devices, vegetarian diets, dental amalgams, nutritional supplements - especially prenatal vitamins, birth control pills, weak adrenal glands and occupational exposure.

4.1.6. Lead: tap water, cigarette smoke, hair dyes, paints, inks, glazes, pesticide residues and occupational exposure in battery manufacture and other industries.

4.1.7. Mercury: dental amalgams, ALL fish (tiny fish are better), ALL shellfish, sea vegetables, some medications such as thiazide diuretics, air pollution, gold mining, and the manufacture of paper, chlorine, adhesives, fabric softeners and waxes. Most everyone has too much mercury in their body today.

4.1.8. Nickel: hydrogenated oils (margarine, commercial peanut butter and shortening), shellfish, air pollution, cigarette smoke, plating and occupational exposure.

4.2. SYMPTOMS:

4.2.1. Aluminum Alzheimer's disease, amyotrophic lateral sclerosis, anemia and other blood disorders, colic, fatigue, dental caries, dementia dialactica, hypoparathyroidism, kidney and liver dysfunctions, neuromuscular disorders, osteomalacia and Parkinson's disease.

4.2.2. Arsenic: abdominal pain, abnormal ECG, anorexia, dermatitis, diarrhea, edema, enzyme inhibitor, fever, fluid loss, goiter, hair loss, headache, herpes, impaired healing, interferes with the uptake of folic acid, inhibition of sulfhydryl enzyme systems, jaundice, keratosis, kidney and liver damage, muscle spasms, pallor, peripheral neuritis, sore throat, stomatitis, stupor, vasodilation, vertigo, vitiligo and weakness.

4.2.3. Beryllium: adrenal insufficiency, arthritis, bone spurs, bursitis, depression, fatigue, osteoporosis and symptoms of slow metabolism.

4.2.4. Cadmium - hypertension, arthritis, diabetes, anemia, arteriosclerosis, impaired bone healing, cancer, cardiovascular disease, cirrhosis, reduced fertility, hyperlipidemia, hypoglycemia, headaches, osteoporosis, kidney disease, schizophrenia and strokes.

4.2.5. Copper - acne, adrenal hyperactivity and/or insufficiency, agoraphobia, allergies, hair loss, anemia, anxiety, arthritis, autism, cancer, chronic candida albicans infection, depression, elevated cholesterol, cystic fibrosis, depression, diabetes, dyslexia, elevated estrogen, failure to thrive, fatigue, fears, fractures of the bones, headaches, heart attacks, hyperactivity, hypertension, hypothyroidism, infections, inflammation, insomnia, iron storage diseases, kidney and liver dysfunctions, decreased libido, multiple sclerosis, nervousness, osteoporosis, panic attacks, premenstrual syndrome, schizophrenia, strokes, tooth decay and vitamin C and other vitamin deficiencies.

4.2.6. Lead - abdominal pain, adrenal insufficiency, anemia, arthritis, arteriosclerosis, attention deficit, back problems, blindness, cancer, constipation, convulsions, deafness, depression,diabetes, dyslexia, epilepsy, fatigue, gout, impaired glycogen storage, hallucinations, hyperactivity, impotency, infertility, inflammation, kidney dysfunction, learning disabilities, diminished libido, migraine headaches, multiple sclerosis, psychosis, thyroid imbalances and tooth decay.

4.2.7. Mercury - adrenal gland dysfunction, alopecia, anorexia, ataxia, bipolar disorder, birth defects, blushing, depression, dermatitis, discouragement, dizziness, fatigue, headaches, hearing loss, hyperactivity, immune system dysfunction, insomnia, kidney damage, loss of self-control, memory loss, mood swings, nervousness, numbness and tingling, pain in limbs, rashes, excessive salivation, schizophrenia, thyroid dysfunction, timidity, tremors, peripheral vision loss and muscle weakness.

4.2.8. Nickel - cancer (oral and intestinal), depression, heart attacks, hemorrhages, kidney dysfunction, low blood pressure, malaise, muscle tremors and paralysis, nausea, skin problems, tetany and vomiting.

4.3. SOME TOXIC HEAVY METALS FOUND IN THE ENVIRONMENT:

4.3.1. Mercury (Hg): Enters the environment through the leaching of soil due to acid rain, coal burning, or industrial, household, and mining wastes. Causes damage to nervous system, kidneys, and vision.

4.3.2. Lead (Pb): Sources include paint, mining wastes, and incinerator ash, water from lead pipes and solder, and automobile exhaust. Causes damage to kidneys, nervous system, learning ability, ability to synthesize protein, and nerve and red blood cells.

4.3.3. Cadmium (Cd): Sources include electroplating, mining, and plastic industries, as well as sewage. Causes kidney disease.

4.3.4. Arsenic (As): Enters the environment through herbicides, wood preservatives, and mining industry. Causes damage to skin, eyes, and liver. May also cause cancer.

5. REMEDIATION: Systematic remediation technologies for heavy metal-contaminated environments include: Physical/Chemical Remediation, Phytoremediation, Microbial Remediation, and Integrated Remediation.

5.1. PHYTOREMEDIATION: It is the direct use of living green plants for in situ, or in place, removal, degradation, or containment of contaminants in soils, sludge, sediments, surface water and groundwater.

- Uptake of cadmium, lead and chromium-contaminated soils using *Jatropha curcas* L. According to the preliminary results and to previous works, *Jatropha* could be used for Phytoremediation of lead and cadmium polluted soil.
- Cleanup of heavy metal polluted soils by barley (*Hordium vulgare*), wheat (*Triticum sativum*,) and garden cress (*Lipidium sativum*)

5.2. MICROBIAL REMEDIATION: Heavy metal removal by biosorption has been extensively investigated during the last several decades. Some reviews have been published focusing on different aspects of heavy metal biosorption. Heavy metals biosorption using microorganisms; *Saccharomyces cerevisiae* (yeast), *Streptococcus equisimilis* (bacteria) and *Aspergillus niger* (fungi). The behaviour of the organisms differs considerably in metal uptake rate depending on some factors (e.g. metal, temperature, pH).

5.3. PHSYCAL/CHEMICAL REMEDIATION: Heavy Metal Removal from Aqueous Solution Using Libyan Natural Zeolite. Soil washing for remediation of heavy metal contaminated soils and sediments.

6. REFERENCES

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