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CONCEPTUAL STUDY ON HEAVY METAL TOXICITY AND ITS EFFECT ON HEALTH IN HUMANS

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ABSTRACT

Heavy metal toxicity has proven to be a major threat and are toxic in low concentration. There are several health risks associated with it. The commonly found heavy metals include arsenic, lead, copper, cadmium, chromium, nikel and zinc. Few metals, such as aluminium, can be removed through elimination activities, but some of the metals get accumulated in the body. These metals gets accumulated in body through water, food and chemicals present in industries etc. Metal toxicity depends upon the absorbed dose, the route of exposure, i.e acute and chronic. and food chain, exhibiting a chronic nature. Various public health measures have been undertaken to control, prevent and treat metal toxicity occurring at various levels, such as occupational exposure and environmental factors.

KEYWORDS: Heavy metals, metal toxicity.

INTRODUCTION

The most commonly found heavy metals in waste water include arsenic, cadmium, chromium, copper, lead, nikel and zinc. Heavy metals enter the surroundings by natural means and through human activities. These heavy metals contamination mainly occurs due to food, water fertilizers etc. These heavy metals are commonly found in the environment and diet. In small amounts they are valuable for maintaining good health but in larger dose they become toxic. Heavy metal toxicity can lower down the energy levels and damages the functioning of the organs such as kidney, liver, brain, lungs, blood composition and other important organs. Long-term exposure can lead to physical, muscular, and neurological degenerative processes that imitate diseases such as Parkinson's disease, multiple sclerosis, Alzheimer disease and muscular dystrophy. Long term exposure of some metals may even cause cancer.

MATERIAL AND METHOD

Sources and toxic effects of heavy metals[1]

Metal	Sources	Toxic effects
Mercury	Coal power plant, pesticides, cosmetics, paper and pulp, cement, mining, electrical equipment	- Minimata disease - Memory problems, fatigue, hairloss, headache - Mecury vapours causes bronchitis, asthama, temporary respiratory problems
Arsenic	pesticides, Fungicides, metal smelters	- skin pigmentation, keratosis, Lung cancer - Bronchitis, Dermatitis - priking sensation on legs and hands, Neurological problems, hypertention, cardiovascular disease
Lead	coal, mining, automobiles, petrochemicals	- Acute exposure causes abdominal pain, headache, vertigo , fatigue, arthritis, - Chronic exposure causes paralysis, brain and kidney damage, psychosis, muscular

		weakness and even death - Mental retardation, learning disability
Zinc	phosphate fertilizer, distillery, Pharmaceuticals	- Fever
Copper	Intrauterine devices, Dental amalgams, occupational exposures, birth control pills, pesticides	- artritis Hypothyroidism, kidney and liver dysfunction, cancer, hairloss, allergies, heart attacks
Cadmium	toys , Ceramics, coal, nuclear and coal power plant	- Itai Itai disease - diarrhea, Osteoporosis, vomiting, fragile bones, formation of renal stones, kidney damage, lung damage
Uranium	Mining	- Cancer
Alluminium	water, food, Tap water, backing powder, bleached flour, aluminium containg drugs, antacids	- Adverse effects on nervous system causing brain damage, loss of memory, loss of coordination - contact dermatitis, Parkinson's disease, hypoparathyroidism, alzeimer disease,
Chromium	fertilizers, Thermal power plant, mining, leather, textile photography	- allergies, Bronchial asthama - Ulcers on nasal septum

Treatment for heavy metal poisioning[2]

Chelation therapy

- ✓ The treatment for most heavy metal poisoning is chelation therapy.
- ✓ The three most common chelating agents are calcium disodium edetate, dimercaprol (BAL) and penicillamine.
- ✓ A chelating agent is given either orally, intramuscularly, or intravenously.
- ✓ The chelating agent encircles and binds to the metal in the body's tissues, forming a complex, that complex is then released from the tissue to travel in the blood stream. The complex is filtered out of the blood by the kidneys and excreated in the urine.
- ✓ Chelation therapy is effective in treating lead, mercury, and arsenic poisoning, but is not useful in treating cadmium poisoning.
- ✓ In cases of acute mercury, arsenic, or thallium ingestion, vomiting may be induced. Activated charcoal may be given in cases of thallium poisoning. Washing out the stomach may be useful. The patient may also require treatment such as intravenous fluids for such complications of poisoning as shock, anemia, and kidney failure.

Intravenous chelation therapy

- ✓ It involves intravenous injections of a chelating agent, EDTA (ethylene diamine tetra- acetic acid), a synthetic amino acid.
- ✓ Chelation therapy is treatment used in conventional medicine for removing heavy metals (including mercury) from blood.

Iron chelation therapy

- ✓ Iron chelation is a drug therapy for iron overload. This therapy uses drugs called iron chelators to remove extra iron from your body.
- ✓ There are two iron chelators that are approved by the U.S. Food and Drug Administration (FDA) for use in the United states. They are 1) Deferoxamine (Desferal) 2) Deferasirox (Exjade)

Lead chelation

- ✓ The most important step in treatment is to prevent further exposure to lead.
- ✓ Various lead chelating agents include Succimer, D-penicillamine, Edetate (EDTA) calcium disodium (CaNa2EDTA) Dimercaprol.

Copper Therapy

- ✓ Copper therapy is aimed at removing excess accumulated copper and preventing its reaccumulation.
- ✓ Copper overload results in Wilson disease.
- ✓ Chelation therapy drugs approved for treating Wilson disease include penicillamine (cuprimine and Depen) and trientine (syprine andTriengtuine Dihydrochloride) both of these drugs act by chelation or binding of copper, causing its increased urinary excretion.

COMMON ANTIDOTES

Poison	Antidotes
Arsenic	Dimercaprol
Lead	Calcium disodium edetate Dimercapto succinic acid
Iron	Deferoxamine Deferiprone
Mercury	Dimercaprol
Copper	Penicillamine
Gold	Dimercaprol
Cyanide	Sodium thiosulfate Amyl nitrite pearls Sodium mitrite

AYURVEDIC CONCEPT

- Most of the metal poisioning occurs accidently. Some of the Ayurvedic medicines such as

rasaushadhis mostly contains metals such as arsenic, mercury, lead etc.
- Overdose of rasaushadhis are also responsible for various systemic disorders.
- Before the preparation of medicines the shodhana purification of these metals is very essential. Otherwise the consumption of the medicines of which shodhan procedure is not done causes various diseases.
- Ayurvedic medicines should be standardized by ayurvedic parameters so that metals will not be in free form and will never cause toxicity.

Toxic symptoms of Heavy Metal According to Ayurveda

Heavy Metals	Symptoms
Mercury	- Pakshaghat - Bhagandar - Kushtha - Updansha - Nasabhanga - Dantapatan - Netra and mukhagatroga - Visarpa - Twachavaivarnya[3]
Tamra (copper)	- Aruchi - Chittasantaap - Kaanti, bal, virya hani - Kleda - Murcha - Bhrama - Kushtha[4]
Naag	- Kamala - Prameha - Kshay[5]
Tutha	- Vaman - Bhrama[6]
Vanga	- Vatvyadhi - Shoth - Saad - Bhagandar - Kushtha - Gulma - Kandu - Prameha[7]
Hartal (Yellow arsenic)	- Hraddaaha - Aamlavaman - Pitharidravitstruti - Rasagraha - Anaaha[8]
Gauripashaan (Arsenic)	Consumption of 1 ratti somal causes death[9]
Manshilaa (Realgar)	- Mutravrodh - Mutrakrucha - Balanash - Malavishthambha[10]

Some of the ayurvedic medicines containing metals

Parad (mercury)- Makardhwaj, sameerpannag, mallasindur, lohaparpati, rasaparpati

Manshila- Shwaskutharras, manshiladyavarti, Tralokyachintamaniras, manshiladighrut, mrutsanjivani

Nag (Lead) - Tralokyachintamaniras, jwarariras, manikyaras, yogeshwarras, mahanilkantharas

Tamra (copper)- kanchanabhraras, tamreshwarras, Arogyavardhinivati, laxmivilasras, aamvateshwarras

Vanga (Tin)- Induvati, kanchanabhraras, talkeshwarras, nityanandaras, laxmivilasras, mehakesariras, aamvatgajsinha modak, mohadadhiras

Tutha (Blue vitriol) Kanaksundarras, agnikumarloha, jatyadighrut, jatyaditail, tralokyachintamaniras, mahajwarankushras, mhamrutunjayras

Gauripashaan (Arsenic) Mallasindur, vadvanalras, ardhavabhedharyog, sameerpanagras, suchikabharanras

Hartal (Yellow arsenic) Rasmanikya, sameerpannag, kasturibhairav ras, talsindur, talakbhasma, nityanandaras

DISCUSSION

In present era there is increase in demand of cosmetics, overuse of vehicals, pesticides for agriculture, industrial waste water. All these things contains heavy metals such as arsenic, mercury, copper cadmium, beryllium. Exposure to these toxic elements causes hazardous effects on health such as developmental retardation, kidney damage, several types of cancer, endocrine disruption, immunological, neurological effects and other disorders. general Peoples are not aware of these adverse effects. Preventive measures should be taken, the people who works where there is exposure of these toxic element should be provided respirators and protective clothings to wore. These protective clothes should not be wore in home. It should be wore only in work site. People should be aware of these heavy metal toxicity its prevention, control and treatment. In modern method chelation therapy and antidotes are used whereas in Ayurveda shodhana procedures along with the prativisha should be used for treatment.

CONCLUSION

This review focus on certain heavy metals such as mercury, cadmium, aluminium, arsenic etc. Due to exposure of these metals they get accumulated in body by various means and causes various side effects and systemic damages. Effective legislation, guidelines and detection of the areas where there are higher levels of heavy metals are necessary. The treatment of heavy metal poision done by chelating therapy and by the use of antidotes. In ayurved granth also these heavy metal toxicity is described and their treatment by shodhan procedure and the use of prativisha is explained. As various ayurvedic medicine is prepared by the metals, shodan and maran procedure is used before preparation. If ashodhit metals are used they produced toxic symptoms. So, this review focus on heavy metal toxicity, exposure and treatment both modern and ayrvedic views. Monitoring the exposure to heavy metals in the environment and in humans can become a momentus step towards prevention.

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