



HEAVY METALS IN AYURVEDIC SYSTEM OF MEDICINE

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Abstract:

Ayurveda is a prominent traditional medical practice that started in India. It uses a combination of treatments and lifestyle adjustments to cure sickness and maintain health. Adjuvant heavy metals, known as bhasmas (nanoparticle of metal & mineral) in Ayurvedic medicine, are widely included into basic herbo-mineral (combination of herbal and metals) formulations for their attributed medicinal effects and to boost potency. Heavy metals found in Ayurvedic medicines include lead, arsenic, and mercury. The toxicity of heavy metals generated by Ayurvedic medicines is widely recognized in the literature. The metal is "purified" during the traditional production of bhasmas (nanoparticle of metal & mineral) by several cooling and heating cycles, as well as the use of particular "mineral herbs." However, owing to inadequate quality control, which allows for contamination, adulteration, or faulty purification, the quantity of heavy metals in current formulations may be excessive. However, the concentration of heavy metals in modern formulations may be excessive due to poor quality control, which allows for contamination, adulteration, or improper purification. Several metallic preparations known as Bhasma have been used in clinical practice since the 8th century AD, according to Ayurvedic descriptions. Ayurvedic Puta system (Heating system) states that metals or minerals should be heated to high temperatures for melting and then quenched in suitable media such as herbal juices or decoctions for specified times. These methods are repeated several times to obtain the Bhasma (incinerated metals). The toxic effects of the metals are not only neutralized, but also transformed into biologically active nanoparticles during this process.

Key words: Heavy metal, Bhasma (incinerated metals), mineral herbs, Nanoparticles, Arsenic

INTRODUCTION:

Metals are substances with high electrical conductivity, malleability, and luster that shed their electrons voluntarily. The vast majority of metals and metalloids, including those thought to be vital, are extremely toxic to living beings. These metals are required for the maintenance of various biochemical and physiological activities in living organisms when present in extremely low concentrations; when these concentrations are exceeded, they become toxic.¹

Heavy metals can impair the normal physiological function of organs such as the brain, kidney, liver, and blood. Heavy metal toxicity can have immediate or long-term consequences. Long-term heavy metal exposure can result in degenerative processes similar to Parkinson's disease, multiple sclerosis, muscular dystrophy, and Alzheimer's disease, among other disorders.

ABOUT HEAVY METAL:

The following are some of the several health impacts of heavy metal:

ARSENIC GROUP

Arsenic is one of the most toxic elements known to man. Despite their toxicity, inorganic arsenic bonds occur naturally in small amounts on Earth. Arsenic can enter the body through food, water, and the air. Skin contact with arsenic-containing soil or water can also result in exposure.

Arsenic levels in food are relatively low because it is not added due to its toxicity. However, arsenic levels in fish and seafood may be high because fish absorb arsenic from the water in which they live. Fortunately, this is primarily the relatively harmless organic form of arsenic, but fish containing significant amounts of inorganic arsenic may pose a risk to human health.²

Inorganic arsenic exposure can result in a variety of health effects, including stomach and intestine irritation, decreased production of red and white blood cells, skin changes, and lungs irritation. It has been suggested that consuming large amounts of inorganic arsenic can increase the chances of developing cancer, particularly skin cancer, lung cancer, liver cancer, and lymphatic cancer.

A high level of inorganic arsenic exposure can result in infertility and miscarriage in women, as well as heart disruptions and brain damage in both men and women. Finally, inorganic arsenic can cause DNA damage. A lethal dose of arsenic oxide is commonly thought to be 100mg. Organic arsenic does not cause cancer or DNA damage, but high doses can have negative effects on human health, such as nerve damage and stomach aches.

As a result of human interference, the arsenic cycle has expanded, resulting in large amounts of arsenic ending up in the environment and in living organisms. Arsenic is primarily emitted by copper-producing industries, but it is also produced during lead and zinc production and in agriculture. It cannot be destroyed once it has entered the environment.

Plants absorb arsenic fairly easily, so high concentrations may exist in food. The current concentrations of dangerous inorganic arsenics in surface waters increase the likelihood of fish genetic material being altered that contains significant amounts of arsenic and will die from arsenic poisoning as the fish decomposes in their bodies.

HARATALA (*Arsenic trisulphide*)

Haratala is the fifth mineral drug in the Uparasa group. It is known as 'orpiment' or 'yellow arsenic.' Chemically, it is known as 'arsenic trisulphide,' and its chemical formula is As_2S_3 . It is insoluble in water and brittle. When heated, it burns and emits 'sulphur dioxide' and 'arsenic oxide.' Arsenic in any form is extremely toxic. Arsenic doses ranging from 125 to 250 mg are lethal to humans.

A small amount of uncombined arsenic occurs naturally as microcrystalline masses in Siberia, Germany, France, Italy, Romania, and the United States. The majority of arsenic is found in minerals that contain sulphur, such as arsenopyrite, realgar, orpiment, and enargite.

PROPERTIES:

Haratala bhasma has katu-kasaya rasa, usna virya, and snigdha guna, and when used wisely for internal administration, it negates the effect of visa. It is used to treat kandu, kustha roga, other skin diseases, raktapitta, and vrana.³

Haratala bhasma, when used correctly, can cure severe and chronic phiranga roga. It is also beneficial in vatarakta, vicharchika, Kustha roga (skindisease), and fever. It can treat chronic wounds and vatarakta roga complications (gout).

If toxic effects are observed in a person's body as a result of consuming improperly purified haratala or any of its compound formulations, they can be eliminated by administering kushmanda swarasa (pumpkin juice) thrice daily in appropriate dosage along with sugar and jiraka.⁴

MANASHILA (*Arsenic disulphide*)

Manashila is the sixth mineral drug in the Uparasa family. In English, it is known as 'real-gar.' This is another reddish brown arsenic compound, arsenic disulphide, with the chemical formula As_2S_3 . It burns at high temperatures and produces no sulphur dioxide or arsenic trioxide as byproducts of combustion. This mineral's ore details and occurrence are identical to that of haratala.

PROPERTIES:

Manashila that has been purified will have katu-tikta rasa and snigdha-ushna-guru guna. It has the property of lekhana (scraping). When used correctly, it can help with kasa (cough) and swasa roga (asthma). It has been demonstrated that it is effective against all types of infectious diseases. It can be used in kandu and agnimandya (improved digestion) (itching). When used correctly, it is an excellent rejuvenator (Rasayana). It treats jwara roga, boosts virility, and acts as an antidote to visa (poison) in the body.

Toxic effects such as vomiting, thirst, dizziness, and so on can be eliminated by administering milk mixed with honey daily for three days after consuming improperly purified manashila or any of its compound formulations. The patient is advised to be cautious during this time.⁵

GOURIPASANA (*Arseneous trioxide*)

Gouripasana is the second mineral drug of sadharana rasa group. It is an arsenic compound. It is identified as 'white arsenic' or 'vitreous' in English. Chemically the drug is Arsenic trioxide.

Arsenic trioxide is the inorganic compound with the formula As_2O_3 . Arsenic trioxide can be generated via many routine processing of arsenic compounds including the oxidation (combustion) of arsenic and arsenic-containing minerals in air.

Despite the well-known toxicity of arsenic, arsenic trioxide has long been of biomedical interest, dating to traditional Ayurvedic and Chinese medicine. It is still used to treat cancer and other conditions.

Arsenic trioxide, sold under the brand name Trisenox, is an idiopathic chemotherapeutic agent used to treat leukaemia that has not responded to "first line" treatments. Arsenic trioxide is thought to cause cancer cells to go through apoptosis. This drug carrier poses a serious risk because arsenic is toxic. used as a cytostatic agent in the management of acute myeloid leukaemia of the refractory promyelocytic subtype.

Additionally, arsenic trioxide seems to hold promise as a treatment for autoimmune disorders. Arsenic trioxide has recently been found to target the enzyme thioredoxin reductase.

Arsenic trioxide decreases intracellular glutathione to a greater extent when combined with ascorbic acid and buthionine sulfoxide, making malignant cells more susceptible to apoptosis. Ascorbic acid does not increase the amount of apoptosis induced by arsenic trioxide in normal cells, indicating that this combination may be specifically toxic to some malignant cells. European nations and parts of China are where you can find this mineral's ores. Along with iron pyrite ores, it is found in India's Bihar and Kashmir. It will be snigdha (wet) to touch Suddha Gauripasana. It lessens kapha, pitta, and vata dosa. It performs parada bhandara. If consumed wisely for a month, it can help with severe swasa roga. It can also help with slipadajanya jwara and all forms of kusta roga. Its external application alleviates inflammations, Burning sensation and local temperature.

The following actions may be taken in the event that suddha gouripasana administration causes any toxicity: (until the symptoms subside). Consumption of milk, ghee, sugar, and tila churna The bitter ground's juice is given with water using a tankana.⁶

Absorption Mechanism:

Insoluble compounds, such as arsenic disulphide, are poorly absorbed after ingestion. Absorption efficiency varies with particle size; fine powders absorb better than larger particles.

Following inhalation, irrespirable particles are trapped in the upper airways and deposition in the gastrointestinal tract by mucociliary clearance. There is limited direct evidence of transcutaneous arsenical absorption in humans.

Distribution Mechanism:

Arsenic is absorbed and distributed throughout the body. Due to sulfhydryl group binding, high concentrations would be expected in keratin-rich tissues such as hair, skin, and nails.

In the liver, trivalent arsenic is methylated to form methylarsonic acid and dimethylarsinic acid. Short-term human studies show that daily intakes in excess of 05mg gradually but not completely saturate the capacity to methylate inorganic arsenic.

Excretion Mechanism:

The half-life of arsenic in blood is approximately 60 hours, with rapid renal excretion primarily as mono- and dimethyl-derivatives. The whole body half-life of arsenic in six human volunteers fitted with a three compartment system was 65.9% of orally administered arsenic acid having a half-life of 2.1 days, 304% a half-life of 9.5 days, and 37% a half-life of 38.4 days.

In animal studies, a trace of parenterally administered arsenic trioxide was found in the faeces, indicating minor biliary clearance.

MERCURY

Chemical experts refer to mercury, also known as parada, as "hydrargyrum" or "quick silver." Mercury is a silver-colored liquid metal. Boiling point is 357 °C, specific gravity is 13.6, and atomic weight is 200.6. It has the symbol Hg and solidifies at -39°C. At room temperature, it doesn't oxidise, but it tarnishes when traces of hydrogen sulphide are present in the air. It is unaffected by hydrochloric acid, whether it is diluted or concentrated (Hcl). It dissolves in concentrated sulfuric acid, releasing sulphur dioxide and forming mercuric sulphate in the process. It also dissolves in diluted cold nitric acid to form mercury nitrate, but when nitric acid is heated to a high concentration, mercury nitrate is produced instead. Mercury can be found in ores or in its natural state.⁷

Gold, zinc, and many other metals combine with mercury to form amalgams after it dissolves. Tantalum, tungsten, and platinum are among the metals that do not amalgamate with mercury. High-pressure sodium lamps and organic synthesis frequently use sodium amalgam as a reducing agent.

When two pure metals come in contact, mercury and aluminium easily combine to form mercury-aluminum amalgam. Because amalgam dissolves the layer of aluminium oxide that shields metallic aluminium from oxidising deeply (similar to how iron rusts), even minute amounts of mercury can cause aluminium to corrode severely. Because of the possibility that it will amalgamate with exposed aluminium components in the aircraft, mercury is generally not permitted to leave an aircraft.

The highly toxic nature of mercury (Hg) and its compounds is particularly According to a few studies; even small increases in methylmercury exposure can harm the cardiovascular system and result in gastritis, upper gastrointestinal blisters, vomiting, pain in the stomach, and constipation. Glomerulonephritis with proteinuria (glomerular and tubular) and nephritic syndrome are symptoms of organic renal toxicity.

NAGA (LEAD)

With the atomic number 82 and the symbol Pb(plumbum), lead is a prominent member of the carbon group of elements. It is included in the list of heavy metals. After being freshly cut, metallic lead has a bluish-white colour, but when exposed to air, it soon tarnishes to a dull grey colour.

Exposed to lead and lead chemicals can occur through inhalation, ingestion and dermal contact. Most exposure occurs through ingestion or inhalation. Lead is poisonous to people when exposed to it at certain levels. It causes brain disorders and harms the nervous system and causes the brain disorders.

PROPERTIES:

It is madhura and Tikta rasa and Snigdha, ushna, guru, lekha, and sara guna. It improves the digestive power. It is useful in curing prameha roga, grahani roga, all type of vrana (wound). Its judicious use improves the physical strength. The general dose of naga bhasma is quarter ratti(31mgs) to one ratti(125mgs).⁸

In order to treat toxic symptoms brought on by consuming lead that has not been properly purified in any form, suddha gandhaka should be taken daily.

VANGA (TIN)

Tin is a chemical element with the atomic number 50 and the symbol Sn (stannum). It belongs to the periodic table's group 14 and is a main group metal. Around 3000 BC marks the beginning of the Bronze Age, when tin was first extracted and used. It is a ductile, crystalline, malleable metal that is silvery-white in colour.

Because small amounts of bismuth, antimony, cadmium, and silver increase its hardness, commercial grades of tin (99.8%) resist transformation. Tin readily forms hard, brittle intermetallic phases, which are frequently undesirable. In general, it does not form wide solid solution ranges in other metals, and only a few elements have appreciable solid solubility in tin.

PROPERTIES:

The proper administration of vanga bhasma removes the kapha dosa that adheres to the respiratory tract walls. It also effectively reduces vitiated vata dosa in mental illnesses. One ratti (125mg) to two ratti is the typical dose of Vanga Bhasma (250mgs). In the event of vanga bhasma toxicity, the patient should be advised to take mesashrunji churna+sugar for three days in a row to counteract it.⁹

DISCUSSION & CONCLUSION:

Adjuvant heavy metals are frequently added to primary herbal formulations in Ayurvedic medicines, known as bhasmas, typically for their purported therapeutic properties and to increase potency. Lead, arsenic, and mercury are three heavy metals that are frequently present in Ayurvedic treatments. Present Review study concluded that users of Ayurvedic medicines may be at risk of heavy metal toxicity and proposed that testing for toxic heavy metals in Ayurvedic products be made mandatory. Heavy metals were found in 17 percent of purely herbal products and 40 percent of Rasa shastra products. Rasa shastra, which translates to "mercury science," is an ancient practise that involves combining herbs with "purified" gems, minerals, and metals. Because of heavy metal concerns, AYUSH reported that herbometallic compounds are not being officially exported, and that only purely herbal Ayurveda, Unani, and Siddha medicines are being exported from India as of 2006, and only after certification of heavy metals below the permissible limit.

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