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COMPEREHENCIVE REVIEW OF SANKHIYA

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ABSTRACT

Sankhiya, Hartala and Manashila are important Arshenic compounds which are used in *Ayurveda* for treatment of disease. These are poisonous compounds. Without *Sodhana* process these are dangerous for human being. Our *Rasaacharyas* developed very safe *Aushdhi* and *Aushidhi yog* as after some important processes on these arsenic compounds. *Sankhiya* is most popular among them. *Sankhiya* commonaly is used in treating the disease like *kapha-vataroga, Shawasaroga, Jwara, Sandhivata, firangaroga, kshaya, Aganimanda* and *hartadorbalya* etc. *Sankhiya* is called as white arsenic with two molecules of arsenic and three molecules of oxygen. Administration of arsenic without proper *shodhana* causes fatal for life. Hence *shodhana* of *Sankhiya* is essential. Various *Sodhana* procedures explained in Rasa classics like *Rasa Rattan Samucchaya, Rasatatingini, Ayurved prakash*. In this paper *Sankhiya shodhana* procedure, different types, synonyms, dose. *Aushdhi yogas*, *Anupana*, indication has been discussed.

KEYWORDS: Sankhiya, Arsenic, Shodhan.

INTRODUCTION

In *Rasashastra* drugs are classified into various groups such as *Maharasa, Uparasa, Sadharanarasa, Dhatuvarga, Upadhatuvarga, Lavanavarga, Ksharavarga*. *Sankhiya* has been described under *Sadharana Rasa*.[1]

Rsagrantha have included under *Sthavaravisha* as *fenashma*. In *Rasshastra Sankhiya* known as subsidiary of *Parada*. It is a poisonous *Dravya* but *Rasaacharya* developed the *Shodhana* and *Marna* procedure. after *Shodhana* it become as a useful *Aushadhi* form. It has been used as a medicine since ancient time. it is found in very low amount as mineral form from natural. Artificially obtained from the fire palace of arsenopyrite factory. chemically it is combination of one eliment of arsenic and two oxygen eliment.it is often mixed with minerals like sulphur,iron,and copper etc. for more quantity the *Jarna* procedure done of arsenical pyrite.it is used in formation of *Ayurvedic Rasa Aushidhi*, Morden medicine, insecticide, fast acting posinious substance, glass and colour. Arsenic is a chemical element with the symbol as and atomic number 33. Arsenic occurs in many minerals, usually in combination with sulfur and metals, but also as a pure elemental crystal. Arsenic is a metalloid. It has various allotropes, but only the gray form, which has a metallic appearance, is important to industry. *Gaurīpāṣāṇa* refers to "arsenic stone" or "white arsenic". It is a term used in *Rasaśāstra* literature, such as the 13th-century *Rasaratnasamuccaya*. *Gaurīpāṣāṇa* refers to "arsenic", and mentioned in the *Rasaratnasamuccaya* a 13th century C.E. alchemical treatise, authored by *Vāgbhaṭa*, is a useful compilation related to preparation and properties of drugs of mineral and metallic origin.

Brief chemistry of arsenic

Arsenic (atomic number 33, atomic weight 75) is a member of the nitrogen group in the periodic table. It is classified as a transitional element or metalloid. Arsenic can exist in three different valence states: elemental arsenic (zero oxidation state); trivalent; or pentavalent arsenic. It forms alloys with metals and also readily reacts with carbon, oxygen and hydrogen, forming covalent bonds. The toxicity of an arsenical varies with the valence state (trivalent are more toxic than pentavalent compounds), the physical state of the compound, and the rates of absorption and elimination. Elemental arsenic (the metalloid) is non-toxic even if eaten in substantial amount.[2] Inorganic forms of arsenic are more toxic than organic forms. Arsenic has been shown to produce oxidative stress. Arsenic trioxide has been shown to cause a significant prolongation of cardiac action potential duration at many levels of re-polarization producing conduction delay and increased triangulation. Electrolyte imbalance appears to enhance this toxicity. The drug appears to inactivate endothelial nitric oxide synthesis, leading to a reduction in production and bioavailability of nitric oxide. It also has been associated with inducing/accelerating atherosclerosis, increasing platelet aggregation

and reducing fibrinolysis.[3] In addition, an apparent link exists between arsenic exposure and gestational diabetes and potential long-term effects on the infants born to mothers consuming arsenic-contaminated water among other during pregnancy.[4]

Table no. 1.1: Showing natural arsenic compound in ayurveda medicine.

Ayurveda Name	Popular name	Chemical formula	Therapeutic Uses in Ayurveda
Gouripasana	White Arsenic	AS_2O_3	Syphilis, Elephantiasis, Anemia, Psoriasis, Asthma, Osteoarthritis, Spleenomegaly, Impotency, cancer

Table no. 1.2: Showing pharmacological properties as per ayurveda.

Name of the Arsenicals	Therapeutic Dose	Pharmacological Properties	Anupana (Vehicle)
Gouripasana (AS_2O_3)	1-4mg (1/120-1/30 *Ratti*)	*Rasa- Katu , Guna- Ushana, Snigdha Virya- Ushana and Vipaka- Katu*	Honey, ghee, milk, sugar and decoction as per disease condition

Table no. 1.3: Showing well defined toxic effect and Purification methods of Arsenical compounds as narrated in Ayurveda.

Name of the drug	Toxic effect	Purification method
Gouripasana (AS_2O_3)	Burning, skin manifestation and death	Swedana (Boiling) with milk for three hours or putting inside bitter guard and boiling for three hours[5]

Table no. 1.4: Showing pharmacokinetics studies of arsenical compounds in ayurveda practice.

Name of the Drug	Bioavailability	System and findings
Gouripasana (AS_2O_3)	High	Human-Oral equals to Intravenous bioavailability

Table no. 1.5: Showing various toxicological studies of arsenicals used in ayurveda medicine.

Name of the drug	Short term toxicity	Long term toxicity	Remark
Gouripasana (AS_2O_3)	Sudden death, poisoning (LD50=32.29mg/kg)	Cardiac, skin and GI effect, No secondary cancer report	Dose dependant, Tolerable

Table no. 1.6: Showing formulation and Uses of arsenic compounds based on ayurveda pharmacopoeia.

Name	Ayurveda formulation	Therapeutics Uses
Gouripasana (AS_2O_3)	*Ardhababhedahara yoga, Kalanala Rasa, Chandeswar Rasa, Tandabarilauha, Nityoditarasa, Malla vati, Mallasindura, Badabanala rasa, Shankhavishodaya rasa, Sannipatavairaba Rasa, Samirapannaga rasa, Suchikabhorana rasa*[6]	Hemi crania, Headache, sinusitis

Biological responses to arsenic

Compounds Arsenicals compound has been used to control the blood counts of the patient with hematological malignancies. There is some observation of the treatment of various solid tumors by contemporary Ayurveda practitioners such as in Nasal polyps, Hemorrhoid and Elephantiasis. It may be due to the induction of apoptosis. The mechanism of Arsenic – induced cell death is well understood in the application of AS2O3, which is a potent cytotoxic and antitumor activies in vitro and vivo. An important initial cellular event that occurs during treatment of target cells with As2O3 involves elevation of ROS. Such generation of ROS appears to be regulated, at least in part, by activation of NADPH oxidase and NO synthase isozymes. Also, arsenic-containing compounds are potent modulators of the thioredoxin system that includes thioredoxin, thioredoxin reductase, and NADPH. The thioredoxin system controls, to a large extent, intracellular redox reactions, regulates apoptosis, and protects cells from stress damage , and the ability of arsenic-containing compounds to target and block thioredoxin reductase may be important in the induction of its pro-apoptotic effects. Overproduction of ROS is linked to the induction of apoptosis by As2O3. Accumulation of hydrogen peroxide (H2O2) leads to decreases in the mitochondrial membrane potential, resulting in cytochrome c release and activation of the caspase cascade. This appears to be a common mechanism of induction of cell death in diverse cellular backgrounds.[7] Arsenic compounds frequently target element s and oncogenes selectively expressed in certain malignancies. The poly herbo-mineral compounds are comparatively safe, when appropriately manufactured and consumed as per directed instructions. It also re-emphasizes that the mere presence of a chemical compound of metallic origin does not contribute to the toxicity of the finished product as the standard manufacturing process

inflicts intense changes and components of herbal origin after sequential reactions with diverse components of processing is responsible for the therapeutic action.[8,9]

CONCLUSION

This prospective analysis of Arsenicals used in Ayurveda medicine has given some light regarding the modern understanding of bioavailability, metabolism, toxicity, biological and pharmacological responses with the background of Ayurveda literature. Gouripasana (arsenic trioxide) is highly toxic so *shodhana* process must be done. The bioavailability of Gouripasana is high. After *shodhana* it is used in many diseases. Malla sindura and Rasa Manikya are two derivatives of White arsenic and Orpiment respectively used in certain cases of cancer and solid tumor by the contemporary Ayurveda Practitioners and traditional healers of North East India. Gouripasana (arsenic trioxide) has been a major breakthrough as a cure for human leukemias. Total arsenic content alone is not sufficient for evaluating the safety of Arsenic containing Ayurveda medicine, the detailed bioavailability of individual formulation and risk/benefit should be considered for safety evaluation.

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