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A Critical review about *Haratala* (Orpiment)

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ABSTRACT

Haratala (Arsenic trisulphide) is an inorganic compound with the formula As_2S_3. The *Haratala* is used without proper purification the toxic effects are *Daha* (burning sensation), *Kampaka* (tremors), *Toda* (pricking pain), *Kshobha*, *Pida*, *Raktadusti* (vitiates blood), *Kushta* (skin disease), *Malinikaroti Gatram*, *Vata Kapha Prakopatamaka Roga*, *Mrtyusankakara*. Coarse powdered material is less toxic because it can be eliminated in faeces before it dissolves, experimental evidence has shown a high degree of gastro-intestinal absorption of both trivalent and pentavalent forms of arsenic. Arsenic is eliminated by many routes (faeces, urine, sweat, hair, skin, lungs) although most is excreted in urine of man.

Key words: *Ayurveda, Rasashastra, Haratala,* Orpiment [AS_2S_3].

INTRODUCTION

Haratala (Arsenic trisulphide) is an inorganic compound with the formula As_2S_3. This bright yellow solid is a well-known mineral orpiment. The word arsenic is derived from the Greek word *Arsenikon,* meaning "*potent*".[1] At the time of 2000 BC, the word becomes synonyms with poison. In fact, it was considered as the perfect poison for many reasons - its physical qualities (odourless and nearly tasteless with a sugar like appearance), its ability to cause a slow painful death and the inability to detect it in the body.[2] In ancient days arsenic was used to treat diseases and such functions were described by Hippocrates, Aristotle, Pliny the Elder and Paracelsus. It was used to treat dietary deficiencies (pellagra, anorexia), neuralgia, rheumatism, asthma, chorea, tuberculosis, diabetes, fever, skin disorders, malaria and syphilis and it is still being used for the treatment of some protozoal infections. [3]

Acharya Charaka has mentioned *Haratala* in *Kushta*, Unmada, *Hikka*, *Svasa*, *Kasa* and in *Visha Chikitsa* in the form of *Taila* and *Sura* etc. In Sushruta Samhita, *Haratala* has been counted in *Sthavara Vishas*. Moreover, he has described *Somala* and *Haratala* as two *Dhatu Vishas*. In Chikitsa Sthana, they are mainly in the subject of *Vrana Sodhana* (wound cleaning), *Pandu Karma* (Coloring the skin after scars of wounds), *Arsha* (Piles), various skin disorders, *Granthi* (nodules) *Upadamsa* (Syphletic pimples) *Visarpa* (spreading poisonous wounds) and as a hair remover in different *Yogas*. Simultaneously in *Uttara Tantram*, seven references are available in the subject of *Krimi*, eye diseases, skin diseases and several paediatric disorders in the form of *Taila*, *Churna* and *Dhumapana*.[4] Acharya Vagbhata has applied *Haratala* mainly on *Nasa Rogas*, (Nasal diseases), *Shotha* (oedema), *Vriscika Dansa* (scorpion sting).[5] The texts of 12th and 13th centuries as *Rasa Prakasa Sudhakara*, *Rasendra Sarasangraha*, *Rasa Sara*, *Rasacintamani*, *Rasa Ratna Kara* (By *Nityanatha*) have described *Shodhana*, *Marana* and various formulations of *Haratala* thoroughly. The author of

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Rasakamadhenu compiled the uses of *Haratala* and remedies according to diseases and systems. The description of *Haratala* been modified in *Rasatarangini*, *Rasacandansu*, *Rasajalanidhi*. Two atoms of arsenic are combined with three atoms of sulphur to form AS_2S_3 (orpiment). The mineral shows a relation to stibnite in its crystalline structure and perfect cleavage in one direction. The colours is bright, lemon yellow and bright, smooth and cleavage surface have a pearly appearance The name orpiment is a corruption of the Latin name "Auripigmentam" which means gold coin. The pigment known as king's yellow is however prepared now-a-days artificially. In recent years however, only small quantities of orpiment have been obtained. Now a days it is available in all over the world particularly, it is obtained from Italy, Turk, Iran, China, Russia, U.S.A., Germany and Spain. In India, it is available in Bihar in small quantity.

Types of *Haratala*

1. *Patra Haratala*, 2. *Pinda Haratala,* [6] 3. *Godanti Haratala*; It is not actually orpiment, so, it has not been counted in the types of *Haratala* by *Rasacaryas*. 4. *Bagdadi* or *Tabaki* or *Varki Haratala*: It is the fourth type of orpiment which is prepared artificially in modern age.

Table 1: Different *Shodhana* method of *Haratala*[7],[8],[9]

No	Principle	*Dravya*	*Yantra*	Duration	Reference
1.	*Swedana*	*Kushmanda Rasa / Tilakshara Jala/lime water*	*Dola Yantra*	-	R.R.S-3/74 ; R.M.-3
2.	*Bhavana*	*Lemon juice (7), Kanji (7)*	*Khalva Yantra*	-	R.R.S-3/76-77
	Swedana	*Kanji*/lime water	*Dola Yantra*	1 day	
3.	*Swedana*	lemon juice	*Dola Yantra*	3 *Prahara*	R.T.-11/23
4.	*Swedana*	*Shalmali Moola Rasa*	*Dola Yantra*	3 *Prahara*	R.T. 11/23
5.	*Swedana*	*Triphala Kwatha,Tila Taila*	*Dola Yantra*	4 *Prahara*	A.P.-2/183
6.	*Swedana*	*Churnodaka, Tila Taila*	*Dola Yantra*	1 *Prahara*	R.R.S.-1/179
7.	*Swedana*	*Kanji* *Kushmand Swarasa* *Tila Taila* *Triphala Kwatha*	*Dola Yantra*	1 *Prahara* 1 *Prahara* 1 *Prahara* 1 *Prahara*	R.R.S.-1/181-189; R.C.7/75-76
8.	*Swedana*	*Jala , lime water, Triphala Kwatha*	*Dola Yantra*	5 hours	R.S.2/12
9.	*Bhavana*	*Kushmanda Swarasa*	*Khalva Yantra*	7 times	R.K.2/62
10.	*Swedana*	*Kushmanda Swarasa*	*Dola Yantra*	1 *Prahara*	B.R.P.2/62
11.	*Swedana*	*Kushmanda Swarasa, Kshara Jala*	*Dola Yantra*	-	R.P.S.6/5
12.	*Swedana*	*Petha Swarasa,* *Triphala Kwatha*	*Dola Yantra*	3 *Prahara* 3 *Prahara*	R.P.4/11
13.	*Swedana*	*Petha Swarasa, lime water, Triphala Kwatha, TilaTaila.*	*Dola Yantra*	3-3 *Prahara*	R.A.4/4-6

Table 2: Different *Marana* methods of *Haratala*[10],[11],[12],[13]

No	Principle	*Dravya*	*Yantra*	*Puta*	Reference
1.	*Bhavana*	*Palasha Kwatha, Golaka* 10 *Upala*	*Khalva Yantra*	3	R.R.S.-3/78-79
2.	*Bhavana*	*Kumari Rasa* (*Haratala* + *Shukti Bhasma*) *Gutika* of it	*Khalva Yantra*	1 *Prahara*	R.T.-11/39-41

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3.	*Bhavana*	*Punarnava Rasa, Chakrika* with *Punarnava Kshar*	*Khalva Yantra*	1 day	A.P.-2/184-189
4.	*Bhavana*	*Punarnava Rasa, Chakrika* -	*Khalva Yantra*	1 day	R.C.-7/77

Toxic Effect

If the *Haratala* is used without proper purification the toxic effects are *Daha* (burning sensation), *Kampaka* (tremors), *Toda* (pricking pain), *Kshobha*, *Pida*, *Raktadusti* (vitiates blood), *Kushta* (skin disease), *Malinikaroti Gatram*, *Vata Kapha Prakopatamaka Roga*, *Mrtyusankakara*.[14] The other opinion is, if used without proper purification it shortens the life span, causes diseases of *Kapha* and *Vata*, *Prameha* (diabetes). It is responsible for *Santapa* (burning sensation) in the body, *Sphota* (boils) and *Snayusankucha*.[15] According to *Ayurveda Prakasha*, the toxic effects of improper incinerated *Haratala Bhasma* are *Dehanashaka*, *Daha* (burning sensation), *Angasankhochaka*, *Pida*, *Kapha Roga*, *Vata Roga* and *Kushtaroga*.[16]

Management of poisonous effect of *Haratala*

The management of the poisoning of in taking impure orpiment (*Asuddha Haratala Sevana*) *Jeeraka* (seed of the powder of carrumcarvi) with sugar should be given for three times a day.[17] *Kusmanda Svarasa* can also be applied. *Hansaraja Swarasa* is a one more remedy for this purpose according to *Rasendra Cudamani*. In *Rasayanasara* six times exhausted mercury with sulphur is advised for seven days to manage the complications of impure orpiment.

Chemical form of Arsenic[18]

The arsenic atoms exist in the elemental form and in trivalent and pentavalent oxidation states. The toxicity of a given arsenical is released to the rate of its clearance to the body and therefore to its degree of accumulation in tissues. In general, toxicity increases in the sequence of organic arsenicals (organic arsenicals AS+5 arsenic). The organic arsenicals are usually excreted more rapidly than are in the inorganic forms. The pentavalent arsenicals have very low affinity for triode groups in control to the trivalent compounds and are much less toxic.

Mechanism of Action [18]

Arsenate is a well-known up-coupler of mitochondrial oxidative phosphorylation. The mechanism is thought to be related to competitive substitution of arsenide. For inorganic phosphate with subsequent formation of an unstable arsenide ester that is rapidly hydrolyzed. This process is termed arsenolysis. Trivalent arsenicals including inorganic arsenide are regarded primarily as sulfhydryl reagents. As such, trivalent arsenicals inhibit many enzymes by reacting with biological ligands containing available – SH groups.

Absorption, Distribution and Excreation [18]

The absorption of poorly water soluble arsenicals such as AS_2O_3 greatly depends upon the physical state of the compound. Coarse powdered material is less toxic because it can be eliminated in faeces before it dissolves, experimental evidence has shown a high degree of gastro-intestinal absorption of both trivalent and pentavalent forms of arsenic. Medicinal organic arsenicals vary in their extent of gastrointestinal absorption. Some are well absorbed and are given orally in the treatment of systemic infections. Others, those are poorly absorbed are used effectively against intra-intestinal parasites. The distribution of arsenic depends upon the duration of administration and the particular arsenicals involved. Arsenic is stored mainly in liver, kidney, heart and lungs. Much smaller amounts are found in muscles and neural tissues. Because of the high sulphydryl content of keratin high concentration of arsenic are found in hairs and nails. Deposition in hairs and starts within two weeks after administration and arsenic stays fixed at this site for years. It is also deposited in bones and teeth and is retained there for long period. The low toxicity and high recovery of pentavalent arsenicals in urine and excreta indicate that very little reduction takes place. It appears that both trivalent and pentavalent forms are methylated in man. Because of dimethyl Arsenic acid is a major form of

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arsenic excreted in urine. Arsenic is eliminated by many routes (faeces, urine, sweat, hair, skin, lungs) although most is excreted in urine of man. The half life for the urinary excretion of arsenic is 3 to 5 days.

Pharmacological and Toxicological effects of Arsenic[18]

Arsenicals have carried effects on many organs and systems. The effect on skin is as under, Actually many arsenicals have vesicant effect on the skin that results in necrosis and sloughing. Chronic ingestion of low doses of inorganic arsenicals causes coetaneous. Vasodilatation prolonged use of arsenic however also chronic.

Chronic Arsenic Poisoning[18]

The most common early sign of common arsenic poisoning is muscle of the neck, eyelids, nipples and axillae. Hyperkeratosis weaknesses and aching, skin pigmentation specially. Gastro-intestinal involvement is less prominent in chronic exposures. Other signs and symptoms that should a rose suspicion of arsenic poisoning include garlic odour of the breath and perspiration, Excessive salivation, sweating, stomatitis, Generalized itching, sore throat, lacrimation, numbness, burning or tingling of the extremities, Dermatitis, vitiligo and alopecia, poisoning may begin insidiously within symptoms of weakness, longer anorexia, occasional nausea and vomiting, diarrhoea or constipation. Subsequent symptoms may stimulate acute coryza. Peripheral neuritis results in motor and sensory paralysis of the extremities usually the legs are more severely affected than the arms. The bone marrow is seriously injured by arsenic by which severe explosion of all haematological pathways may be affected and causes of hyperkeratosis. Particularly of the palms and soles are effected and hyper pigmentation over the trunk and extremities also can occur. Eventually those actions proceed to atrophy and degeneration and possibly to cancer. Skin eruptions are common in patients who received inorganic arsenic medication.

Acute Arsenic Poisoning[18]

Arsenic, in the form of AS_2O_3 used to be a common cause of poisoning because it is readily available. Particular it is taste less and has the appearance of sugar. Fatal dose of Arsenic is 100 to 200mg. gastrointestinal discomfort is usually experienced within an hour after intake of the arsenicals although it may be delayed as much as 12 hours, after oral ingestion, if food is in stomach. Burning lips, constriction of the throat and difficulty in swallowing may be the first symptoms followed by excruciating gastric pain projectile vomiting and severe diarrhoea. Oligouria with proteinuria and haematuria is usually present. Eventually anuria may occur. The patient often complains marked skeletal muscle cramps and severe thirst. As the loss of fluids proceeds symptoms of shock appear. Hypoxic convulsion may occur terminally and coma, after death can occur within an hour. But usual interval is 24 hours.

CONCLUSION

Every mineral used in *Rasa Sastra* is to be purified before it goes for further processes or therapeutic uses, this is termed as *Shodhana*. However *Dravya* is poisonous, the importance of *Shodhana* process is considered a very initiative process before its application on human body. Purified *Haratala* is applied therapeutically, if the purification is not conducted properly or accidentally the *Haratala* is taken orally in impure form it is harmful.

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