Research Article

J. Ayu. Herb. Med.
2016; 2(3): 82-85
May- June

www. ayurvedjournal.com

Toxicological study of arsenic containing Ayurvedic drug *Haratal Bhasma*

Sucheta Mondal[1], Satadru Palbag[2], D.N.S.Gautam[3]

1 *PG Scholar, Department of Ayurvedic Pharmacy, Institute of Medical Sciences, Banaras Hindu University (IMS, BHU), Varanasi, Uttar Pradesh-221005, India*

2 *Assistant Professor, Rasa-Shastra, B.I.P.S, S.P.L.P.I.M. Campus, Nadia, West Bengal-741235, India*

3 *Associate Professor, Department of Rasa-Shastra, Institute of Medical Sciences, Banaras Hindu University (IMS, BHU), Varanasi, Uttar Pradesh-221005, India*

ABSTRACT

Background: Drug standardization is the need of the era for proper validation of Ayurvedic medicines, specially the Ayurvedic bhasmas due to their herbo-mineral nature. There are several poisonous drugs used in Ayurveda which are used in practice without proper documentation. *Haratal Bhasma* is an important arsenic containing Ayurvedic drug used in Ayurveda for the treatment of several ailments. They are prepared from raw *Haratal* by the distinct Ayurvedic procedure. **Objective:** The raw *Haratal* is purified and converted to its bhasma form and was subjected to histopathological and toxicological study to evaluate the safety of this arsenic containing Ayurvedic medicine. **Materials and Methods:** 40 Adult Charles Foster Albino Rats of either sex, among them are grouped (*Haratal*, *Haratal Bhasma*) for the whole study. Toxicological and histo-pathological study of brain, liver, kidney etc were performed after 28 days in a maintained dose. **Results:** *Haratal Bhasma* and Raw *Haratal* exhibited nearly non toxicological profile, when administered in the dose of 60-65 mg of the drug/kg body wt. of the rats except minute inflammation and tubular dilatation in the vital organs. **Conclusion:** *Haratal Bhasma* is non toxic and safe, which may be attributed to compound form of arsenic in Haratal which is insoluble in nature in human body.

Keywords: *Haratal Shodhana, Haratal Bhasma*.

INTRODUCTION

Ayurveda makes use of several poisonous plants and minerals in the treatment and management of diseases. *Rasa Shastra* is a well established branch of Ayurveda serving humanity with its unique heritage of drugs derived from metal, mineral and animal origin combined with certain herbs. Different alternative systems of medicines, including Ayurveda makes use of herbal preparations for their curative effects. *Shodhan*(~purification) is an Ayurvedic technique necessary for almost all kinds of drugs to remove their impurities or toxic contents and improve its efficacy. *Bhasmikarana* (calcinations) process is a very popular technique in Ayurvedic system of medicine which converts the metal into its specially desired chemical compound known as *Bhasmas* by at first triturating the purified metal with desired herbs and then subjected to heat through the process of repeated heating in an enclosed container. It eliminates the toxicity of the metal as well as has the significant medicinal benefits. Thus minerals or metals in the form of its ash become a lot easier to get absorbed into the systemic circulation. According to Ayurveda,for proper use it is essential that raw *Haratal* is subjected for *shodhan* (purification) process and *marana*(calcinations) process. Ayurvedic techniques like *shodhan* and *marana* necessary for almost all kinds of drugs to remove their impurities or toxic contents and improve its efficacy. Among several types of minerals used in Ayurveda, several minerals are toxic in nature. Among them *Haratal, Manhasila* and *Sankhiya* are arsenic containing minerals. The *Rasamanikya* and *Malla Sindoor* are very popular Ayurvedic, arsenic containing formulations produced from them. They have substantial physico-chemical and toxicological reports to support their safety and efficacy[1,2]. But *Haratal* in its *bhasma* form, i.e, *Haratal bhasma* is not so common in practice due to its scarce scientific database. Only few scientific database is available in support of their safety profile. [3]

The toxicity study is very important to establish the safe use of the *bhasma* form but almost no report is obtained regarding toxicity studies of *Haratal bhasma.* The main objective of the study is to validate *Haratal bhasma* in the context of toxicological study. Hence to confirm the safety issues of *Haratal bhasma,* the toxicological study and histopathological study of *Adult Charles Foster Albino Rats* of either sex (150-210 g) were carried out, before and after administration of *Haratal* and *Haratal bhasma.*

***Corresponding author:**
Dr. Dev Nath Singh Gautam
Associate Professor, Department of Rasa-Shastra, Institute of Medical Sciences, Banaras Hindu University (IMS, BHU), Varanasi, Uttar Pradesh-221005, India
Email: drdnsgautam[at]gmail.com

MATERIALS AND METHODS

Shodhan of *Haratal*

Raw *Haratal* (700gm) was procured from Ayurvedic Pharmacy, Institute of Medical Sciences, B.H.U. Varanasi. *Shodhana* of *Haratal* was done by *swedana*(boiling) in *Kushmanda swarasa* (*Benincasa hispida* juice) for three hours in constant heating. After that it washed with warm water and dried well. It was light yellow in colour, solid in consistency, slight acidic smell. 700 gm of Raw *Haratal* was taken for study and after *Sodhana* process 690 gm of *Shodhita Haratal* was obtained yielding a loss of 10% in *Haratal.*

Marana of *Haratal*

The accurately weighed purified *Haratal* was taken in mortar and pestle. Then the purified *Haratal* was triturated with the decoction of *Palash* roots (*Butea monosperma*) decoction for 3 days continuously for duration of 8 hours per day until the preparation get dried up. Then trituration was done with buffalo's urine. Finally pellets were prepared and made dried and kept in *Sharava samputa* (earthen casserole) and heated with 10 cow dung cakes. The whole process was repeated for 12 times. Finally grey coloured *Haratal bhasma* was obtained. [4, 5]

Histo-pathological studies

Adult Charles Foster Albino Rats of either sex (150-210 g) were used for the study. Animals were procured from Central Animal House, Institute of Medical Sciences, Banaras Hindu University, Varanasi. Ethical clearance was obtained prior to conduction of animal study from Central Animal Ethical Committee of the University *(No. Dean/13-14/CAEC/316)*, BHU. Total 40 rats were procured, 24 *Adult Charles Foster Albino Rats* of either sex weighing (150-210 g) were taken for sub acute toxicity study and remaining for acute toxicity study. They were divided into four groups depending upon the drug, each group containing six rats (4 male, 2 female) in one cage. The grouping was done based on the samples of the therapeutic dose given to the rats for the entire study period. The rats were maintained the same concentration of the drug i.e Control (2% gum acacia suspension), 60-65 mg of the drug/kg body wt. which was mentioned in Ayurvedic classical dose given twice daily from the start of the experiment to the end.[6] The dose was extrapolated and selected for rats according to the U.S. Food and Drug Administration*, Centre for Drug Evaluation and Research (CDER)* guidelines. Both the drugs *(Haratal* and *Haratal Bhasma)* were prepared in 2% gum acacia solution and were administered through oral route. The subchronic toxicity study was continued for 28 days at par with pharmacological observations according to the OECD_407 guidelines. On 29th day, the animals were sacrificed after overnight fasting. Organs namely brain, liver, kidney and spleen were isolated and preserved in 10% neutral buffered formaldehyde solution. The toxicity study was performed and the findings like histopathological changes in the body, chronic toxicity to specific organs were noted down.[7,8]

OBSERVATION AND RESULTS

After completion of 28 days the effect of *Haratal and haratal bhasma* on the weight of vital organs were measured following daily oral administration of doses [Table 1]. In case of acute toxicity study two mortalities were found in rats given *in Haratal bhasma* at higher dose. Both were male rats. One of them died at 2nd week of the study when given a dose of 16mg/200gm body wt. and other died on the third week of the study when given a dose of 32mg/200gm body wt. *Histopathological changes* were studied in the following organs viz. *Brain, Liver, Kidney,* and *spleen* of the rats after they were exposed to the test drug given in various for 28 days. [Table:2, Figure:1]

Table 1: Food and Water intake & Weight variation in Sub acute Toxicity study measured weekly following daily oral administration for 28 days

Group and Dose (mg/kg)		Weight (g)				Food (g) Weekly		Water (ml) Weekly	
		Before Administration		After Administration					
		A	B	A	B	A	B	A	B
Control Group	Ist wk.	150	155	150	155	122	107133	101143.5	8275
	2nd wk	155	170	160	172	133	118	107	92
	3rd wk	160	165	160	170	143.5	129.5	122	97
	4th wk	160	150	165	160	175	155	135	124
Raw Haratal	Ist wk.	177	155	180	155	101	117	107	75
	2nd wk	165	160	170	163	112	132	119	82
	3rd wk	155	150	160	155	119	125	119	60
	4th wk	140	155	150	160	126	139	128	103
Haratal Bhasma	Ist wk.	140	150	140	150	105	105	105	101
	2nd wk	150	165	153	165	114	129	98	119
	3rd wk	155	170	157	170	109.5	146	111	128
	4th wk	170	155	172	160	134	128	122	144

Table 2: Histopathological changes for *Haratal* and its bhasma

Drugs	Brain	Liver	Kidney	Spleen
Control	No significant changes observed in morphology of the brain cells.	No significant changes in the morphology of the parenchymal cells (hepatocytes). Non parenchymal cells like sinusoidal, endothelial, kuffer cells, pit cells all were found normal	The nephron were found normal. Tubular necrosis are not observed. Glomeruli and renal tubules were also normal.	In spleen the white pulp and the red pulp were found normal.
Raw Haratal	No significant changes observed.	No significant changes observed.	Minimal inflammation seen.	Preserved architecture & mild acute ductular dilatation, sloughing of epithelium seen.
Haratal bhasma	Brain unremarkable.	No significant changes Observed	Preserved architecture, mild inflammation seen.	Tubules dilated & show sloughing of epithelium.

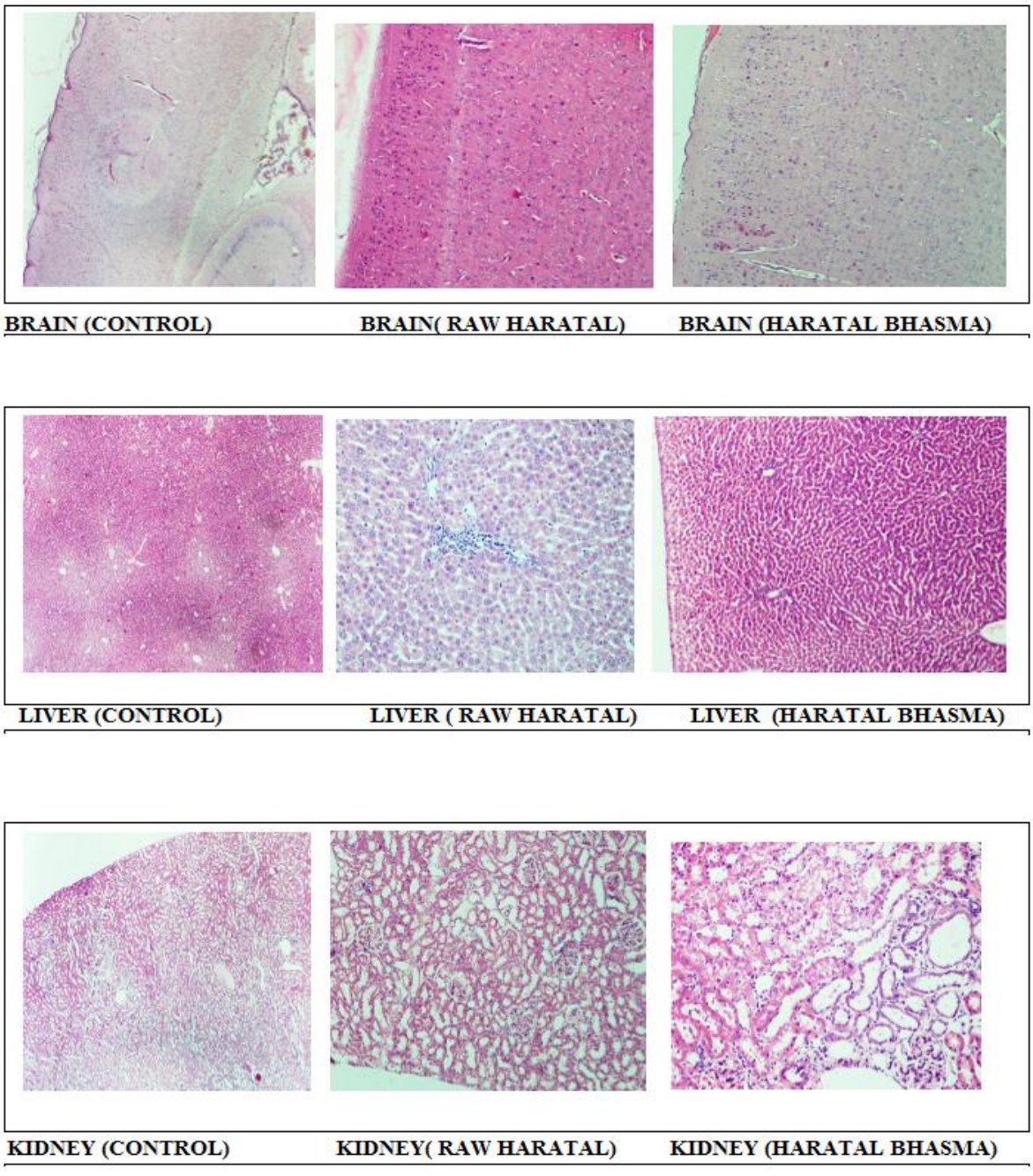

Figure 1: Histopathological changes in vital organs

DISCUSSION

Haratal Bhasma is non-toxic and safer in classical dose and did not show any significant change in normal behaviour of animals. The death of four male rats by the higher dose of raw *Haratal* was exhibited and in case of *haratal bhasma,* death of two rats is exhibited. The higher safety profile of the *Haratal bhasma* could be understand from this report. The histopathological study at 60-65 mg of the drug/kg body wt for both the *Raw Haratal* and its *bhasma* revealed more or less equivalent safety profile for both of the drugs. Raw *Haratal* and *Haratal bhasma* both exhibited no significant changes in liver morphology .In case of brain too; there is no significant changes in the toxicological profile when compared with the control. In the case of kidney mild inflammation were noticed for both the *Haratal bhasma* and raw *Haratal*. In the case of spleen tubular dilatation and sloughing of epithelium was noticed for both the drugs. The probable reason for the safety profile of *Haratal* may be hidden in the fact that arsenic in the *Haratal* is not in elemental form but in the compound form with the formula of As_2O_3. A case report where a 57 year old patient had survived after ingestion of 84 gram of arsenic specimen of orpiment (As_2O_3) was reported proving the safety of arsenic in compound form.[9] Non absorbing nature of arsenic in its compound form due to the poor solubility of *Haratal*, is responsible for the peculiar safety profile.

CONCLUSION

Ayurveda is a treasure of minerals and herbs. Among several minerals, some are toxic like *Haratal*. *Haratal* is most popular as medicine in its *Rasamanikya* processed form. Its *bhasma* i.e., *Haratal bhasma* is mentioned in classical texts but its use is limited due to scarce scientific reports as it is available in the case of *Rasamanikya*. Strategy should be developed to incorporate such drugs with proper validation. During animal experimentation considering acute and sub-acute toxicity it showed that no immediate and evident toxic signs in case of classical dose of *Haratal bhasma*. The above study is a preliminary approach to validate the *Haratal bhasmsa's* safety. Further extensive research is welcomed in this arena.

Source of Support: Nil.

Conflict of Interest: None Declared.

REFERENCES

1. Srimannarayana K, Patgiri BJ, Prajapati PK. Process standardization of Rasamanikya. AYU. 2010;31(1): 7-11.
2. Sud S, Reddy PS, Sujatha K, Honwad S. A comparative toxicological study of *Rasamanikya* prepared with three different methods. Ayu. 2013;34(3): 309-315.
3. Palbag S, Mondal S, Bardhan T, Gautam D.N.S. Comparative physico-chemical validation between Arsenic-based Indian traditional drugs Haratal Bhasma and Rasamanikya. J Ayu Herb Med 2016;2(2): 43-48.
4. Sharma S, Rasa Tarangini, Haridatta Shastri, 11th Edition, New Delhi, Motilal Banarasidas publication, 2004, 11th chapter, 92-93 shloka, 772.
5. Sri Vagbhatacharya, Rasa Ratna Samucchaya, Rasaprabha hindi vyakhya by Indradev Tripati, Chaukamba Publishers, reprinted on 2009. 3rd chapter, shloka no.74.
6. Sadananda Sharma, Rasa Tarangini, Haridatta Shastri, 11th Edition, New Delhi, Motilal Banarasidas publication, 2012, 11th chapter, 56 shloka, 253.
7. Ghosh MN. Fundamental of Experimental Pharmacology. 2nd Edition Chapter 26.Toxicity Studies. Scientific Book Agency. Calcutta. 1984.161.
8. Lewis SM, Bain BJ, Bates Dacie and Lewis. Practical Haaematology; Basic Haematological Techniques. 9th Edition, Editors. Bain J.B. and Bates I. Churchill Livingstone (Harcout Publishers Ltd. London), NY.2002. 19-46.
9. Buchanan, J. A., Eberhardt, A., Tebb, Z. D., Heard, K., Wendlandt, R. F., & Kosnett M J. Massive human ingestion of orpiment (*Arsenic trisulfide*). The Journal of emergency medicine 2013;44(2): 367-372.

HOW TO CITE THIS ARTICLE
Mondal S, Palbag S, Gautam DNS. Toxicological study of arsenic containing Ayurvedic drug *Haratal Bhasma*. J Ayu Herb Med 2016;2(3):82-85.