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Review Article

METAL *BHASMAS*: A POSSIBLE SOURCE OF TRACE ELEMENTS

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ABSTRACT

Trace elements are important constituents required for normal physiological functioning. Iron, Zinc, Manganese, copper; Fluoride, Molybdenum, Chromium and selenium and Iodine are some of the trace elements required for body in very minute quantity and generally its need is fulfilled from intake of balanced diet. However the increased tendency in recent times towards unbalanced food intake, excessive purification of crops, and dieting practiced widely to reduce body weight, deficiencies of a trace elements are relatively frequent. To encounter this deficiency generally supplementation of multi mineral drugs are given. *Rasaushadhies* (Herbomineral preparations) could be the answer to this especially metallic *Bhasmas* (Incinerated minerals) as it contains various trace elements along with basic elements. Hence present paper aimed to review analytical studies conducted on *Dhatu bhasma* (metallic incinerated powders prepared by Ayurvedic methods) to find out important trace elements in them. For this purpose analytical studies on *Saptadhatu bhasmas* (Seven metallic *Bhasmas*) namely *Suwarna* (Gold), *Rajat* (Silver), *Tambra* (Copper), *Louha* (Iron), *Vanga* (Tin), *Naga* (Lead) and *Yashada* (Zinc) bhasma was reviewed. It is observed that these *Bhasma* preparation contain significant number important trace elements such as Iron, Manganese, Copper, Calcium etc. Also due to immune modulator and rejuvenating properties of these *Bhasma* preparations, *Bhasma* can be a possible source of trace elements. However there is need of further research on both experimental and clinical ground to find out role of administration of trace elements in the form of *Bhasma* in treating deficiency disorders of trace elements.

KEYWORDS: Trace elements, *Rasaushadhies, Saptadhatu bhasma*.

INTRODUCTION

Trace elements are the micronutrients required by the body in very minute quantity. These elements have preventive and curative role in human body for various diseases. Iron, Zinc, Manganese, copper; Fluoride, Molybdenum Chromium and selenium, Iodine, are some of the trace elements required for proper growth and development. Although need of these trace elements is fulfilled by diet. Now a day the stress has been given for its supplement as its deficiency lead to various disorders. Because of the tendency in recent times towards unbalanced food intake, excessive purification of crops, and dieting practiced widely to reduce body weight, deficiencies of a trace element are encountered relatively frequently.[1]

Even though biological effect of metals are well known, very little is known about their biological activity in terms of elemental properties. Metals and their actions play a critical role of acting as Catalysts or a structural components of large molecule with specific function and thereby indispensable for life. Biological active elements are required for maintenance of biological fluids, structure and function of cell membranes, synthesis of protein, conduction of nerve impulses and construction of muscles. Trace elements are selected for specific tasks in biological systems such as several enzymatic activities. [2]

Rasaushadhies (Herbomineral Preparations) especially metallic *Bhasma* (Incinerated metal) are known to improve immunity and stability in the body. [3] As these *Bhasma* acts as *Rasayana* (Rejuvenation) and *Yogvahi* (Targeted drug delivery). Use of these *Bhasma* for therapeutic purpose is not merely to cure the respective ailment but also can complete the need of trace elements required for various enzymatic activities in the body. Pharmaceutical processing of *Bhasma* preparation by classical *Ayurvedic* methods, herbal drugs are use for *Bhavna* (trituration), *Shodhan* (purification) and *Maran* (Incineration) purpose. They act as chelating agents and form multiple bonds with single metallic ions. [4] As plants are good source of trace elements, processing with these plants material may be the origin of trace elements in metallic *Bhasma.*

It is important to understand the structure and composition of various constituents present in the *Bhasma* which suppresses its toxic effects and inserting therapeutic effects to the metal. It has been hypothesized that repeated incineration of metal with suitable raw material change the inherent quality of the metal, which render them non-toxic and suitable for the treatment of chronic ailments.[5] Analytical study of various metallic preparation shows remarkable numbers of trace elements which ultimately proves that *Dhatu Bhasma* (Incinerated metals) are good source of trace elements. Now various technologies are available which are helpful in finding total elemental content of *Bhasma* sample. The most widely techniques to analyze trace and heavy metals are atomic absorption spectrometry (AAS), inductively coupled plasma mass

spectrometry (ICP-MS), inductively coupled plasma atomic emission spectrometry (ICP-AES), and X-ray fluorescence spectroscopy (XFS).[6] With the help of these technologies various analytical studies are carried out which gives complete profile of trace element present in various metallic *Bhasma.* Present paper has taken brief review of these papers to point out trace elements in various *Bhasma* preparations.

TRACE ELEMENTS IN *BHASMA*

Swarna bhasma

Swarna bhasma (Incinerated gold) *is Madhur* (Sweet), *Hrudya* (Heart tonic), improves intellectual power, *Rasayana* (rejuvenator), alleviates increased *Doshas* and Anti Toxic effect. [7] *Brown et al* (2007) in their study evaluated the physico-chemical characterization of *Swarna Bhasma* by using atomic absorption spectrometer, FT infrared spectroscopy, transmission electron microscopy, Atomic force microscopy and x-ray diffraction analysis. Atomic absorption spectroscopy revealed that *Swarna Bhasma* contain 92 % gold. Pharmacological review of *Swarna Bhasma* reveals that it possesses immune modulator, free radical scavenging activity, analgesic activity and anti stress activity.[8] In elemental analysis of *Swarna Bhasma* by EDAX it is observed that As and Nb in trace amount.[9] However presence of other trace element is not observed.

Rajat bhasma

Rajat Bhasma (incinerated silver) is *Kashaya* (Pungent) *Ruchikarak* (Improve taste) and *Uttam medhavardhak* (Good brain tonic). It is *Vayasthapana* (Anti aging). [10] In elemental analysis of *Rajat Bhasma* various trace elements found were iron, copper, lead, cadmium apart from silver (73.59%w/w) and sulphur (17.24%w/w) with the help of Atomic Emission Spectroscopy with Inductively Coupled Plasma (AESICP).[11]

Tambra Bhasma

Tambra Bhasma (Incinerated Copper) is *Deepan* (Appetizer), *Udarkriminashak* (Anti-helmenthic) and *Kushtaroganashak* (Relives skin diseases). It is *Ayuvardhak* (Decrease Aging process).[12] Sudheendra Honwad et.al (2014) noted in Elemental analysis by ICP-AES of *Somnathi Tambra Bhasma* shows elements such as Cu, Fe, Al, S, As and Hg in trace forms. [13]

Louha bhasma

Lauha Bhasma (Incinerated iron) is *Deepan* (Appetizer), *Kshayaroganashak* (Anti-tuberculosis), *Udarkriminashak* and *Uttam panduroganashak* (Anaemia). [14] In the body, Iron has major role in carrying oxygen in the body hence must required elements by all living being. *Louha Bhasma* in the form of iron oxide completes the need of iron. *Louha bhasma* contains iron as major element along with potassium (K), Copper (cu), Zinc (Zn), Manganese (Mn) and Magnesium (Mg) as a trace element estimated by ASS and EDAX study. [15] *Sekar et al.* reported the presence in elemental analysis of *Lauha Bhasma* indicates the major elements to be iron (>60%) and oxygen (>30%). Other elements like Ca, K, Na, Cl from the herbal ingredients are present at >0.1% may be involved in pharmacological activities of the *Bhasma*. [16]

Vanga bhasma

Vanga Bhasma (Incinerated Tin) acts on *Bahumutrata* (Excessive Urination), *Shukrameha* (Excessive semen discharge), *Swetpradara* (white discharge in females) etc. It also acts as nervine tonic for urogenital system. [17] Saraswathy A et.al noted in study on chemical analysis of *Vanga Bhasma* that along with presence of tin oxide, trace elements such as calcium, arsenic, iron, silicone, phosphorus, aluminum and chloride.[18]

Naga Bhasma

Naga Bhasma (Incinerated *Naga*) *Deepan*, *Antragativardhak* (Increases peristaltic movements) and *Pramehanashak* (Diabetes). [19] Manoj Dash et al identified elements such as calcium, tin, molybdenum and potassium in pharmaceutical and Identification study of Naga Bhasma. [20] Lagad C.E et al noted percentage of the elements like Ca, Fe, Mg, K, Mn, n etc was increased with the process of *Marana*. [21]

Yashad bhasma

Yashad Bhasma (Incinerated Zinc) act on *Netraroga* (Eye disorders), *Panduroga* (Anaemia), *Rajyakshma* (Tuberculosis) and *Ratriswed* (Excessive Sweating at Night).[22] Santhosh et al. noted in Analytical study of *Yashad Bhasma* ICPAES (Inductively coupled plasma atomic emission spectroscopy) showed the presence of Zinc in major portion (95.08ppm) and other elements like Sn (0.27), Pb (0.14), Fe (1.69), Ca (1.82), Mg (1.00), Cu, Co and Mn < 0.5 ppm in the final product. [23]

Table 1: Trace elements in *Sapta Dhatu Bhasmas*

S.No.	***Bhasmas***	Trace elements
1	*Suwarna Bhasma*	As, Nb
2	*Rajat Bhasma*	Fe, Cu, Pb,Cd,S
3	*Tambra Bhasma*	Cu, Fe, Al, S, As,Hg
4	*Louha Bhasma*	K, Cu, Zn, Mn, Mg, Ca,Na,Cl
5	*Vanga Bhasma*	Ca, As, Fe, Si, P, Al, Cl
6	*Naga Bhasma*	Ca, Sn, Mo, K, Mn, Fe,Mg
7	*Yashad Bhasma*	Sn, Pb, Fe, Ca, Mg,Cu,Co,Mn

Discussion

With the principles of *Ras shashtra, Lohasidhhi* (conversion of low quality metals into precious metals) and *Dehasiddhi* (To achieve healthy body and long life by using *Rasoushadhi*) metallic *Bhasmas* has own importance due to its curative and preventive role. In *Rasashastra*, pharmacology of *Bhasma* is followed properly which gives ultimate therapeutic benefit of these *Bhasma* and the authenticity of these *Bhasma* was judged by its therapeutic value only. Now with the development of newer technology such as atomic absorption spectrometry (AAS), inductively coupled plasma mass spectrometry (ICP-MS), inductively coupled plasma atomic emission spectrometry (ICP-AES), and X-ray fluorescence spectroscopy (XFS), it is possible to estimate purity of metallic *Bhasma* along with its elemental analysis and particle size. From the above review it is observed that most of the *Bhasma* contain very essential trace elements such as Ca, Cu, Fe, Mg which are very important in physiology (table1). Metals and trace Elements are essential components of metabolism however due to complicated metabolism process of trace

elements it is quite difficult to access exact deficiency of single trace element. Modern medicine is using these trace elements in supplementation in respective deficiency of that elements. Unfortunately, in recent years the avalanche of uncontrolled supplementation with TE (Trace elements) has put some TE on the border of toxicity in several populations. Thus, it is a crucial priority to define the requirements for TE, based on essentiality and health promotion, and the limits for toxicity. [24] Due to complex metabolism process and interdependent metabolism it is quite difficult to decide toxic level of these elements.

Although concept of trace element deficiency is not mentioned in Ayurveda but it is interesting to study the role of these *Bhasma* preparation in trace elements deficiency disorder by animal study or clinical trials.

Since Ayurvedic *Bhasma* preparations are ultimate *Rasayana* drugs, as metallic *Bhasma* rejuvenate body, increases intellectual capacity, anti aging capacity, improves appetite, restores reproductive functions, use of these *Bhasma* as *Rasayana* can not only fulfill the need of essential elements such as Iron, copper, Zinc etc but also can able to complete need of trace elements such as manganese, phosphorus, Aluminum etc required by the body in trace amount. Presence of trace elements in *Bhasma* preparations may improve its assimilation by taking parts in various enzymatic processes at micro level.

CONCLUSION

Bhasma preparation contains significant number of trace elements in bio accessible form, but exact physiological and clinical basis is yet to prove. If it is studied in deficiency disorders by various clinical trials for its therapeutics value for trace elements. Then it could be a good option for deficiency disorders of trace elements.

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