

**Title: Bio enhancing processes in pharmaceuticals of  
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**\*Corresponding Author: [Email: vd.sushmadongre@rediffmail.com](mailto:vd.sushmadongre@rediffmail.com) Mb 9970648450****Abstract:**

Rasashastra is always been a treasure for Ayurveda due its formulations called *Rasaushadhies* which assures fast recovery of patients as compare to plant based medicine. These Herbo-mineral formulations have exclusive drug delivery system due its ingredients and distinctive pharmaceutical processing which increases its bioavailability in substantial way. Pharmaceutical processing of Ayurvedic formulations needs to be observed in very critical way as assigned in classical text of Ayurveda. However due to increasing competition and commercialization among pharmaceutical companies very short cut processing techniques are followed which ultimately hamper the quality of medicine. There are various bio enhancing process followed in *Rasashastra* such as *Shodhana* (Purification), *Marana* (Incineration), *Bhavana* (Trituration), *Amrutikarana* (Nectarization) etc. which eventually change the drug into micro fine form so that it is easily bioavailable in blood.. Hence present review is intended to

discuss bio enhancing aspects of these processes.

The traditional wisdom of Ayurveda could have immense utility in enhancing the bioavailability of allopathic drugs. The bio-enhancement leads to reduction in therapeutic dose of principal drug, thus reducing the possibilities of toxicity and side effects of drug, potentiating the efficacy, reducing the resistance, decreasing the requirement of raw material for drug manufacture and ultimately benefitting to the world economy by reducing the treatment cost. The standard operations of the pharmaceutical process such as *Shodhana*, *Bhavana*, *Marana*, *Amrutikarana* etc. need to observe keenly so that optimum quality of medicine is achieved. So the people involved in pharmaceutical sector should not shortcut these authentic techniques of medicine preparations.

**Keywords:** Bioavailability, *Shodhana*, *Marana*, *Bhavana*, *Amrutikarana*, Drug potency, Bioavailability

**Introduction:**

*Rasashastra* is always been a treasure for Ayurveda due its formulations which assures fast recovery of patients as compare to plant based medicine. These Herbo-mineral formulations have exclusive drug delivery system due its ingredients and distinctive pharmaceutical processing which increases its bioavailability in substantial way. Although pharmaceutical processing of Ayurvedic formulations needs to be observed in very critical way as assigned in classical text of Ayurveda but due to increasing competition and commercialization among pharmaceutical companies very short cut processing techniques are followed which ultimately hamper the quality of medicine. Also various machinery used in preparation of medicine affect its medicinal properties due to thermo sensitivity of drugs. Ancient process are planned in such a way that there is heat regulatory system which sustains the drug potency so that its bio enhancing ability become intact. There are various bioenhancing process followed in *Rasashastra* such as *Shodhana*, *Marana*, *Bhavana*, *Kuttana*, *Amrutikarana* etc. which eventually change the drug into micro fine form so that it which easily bio-available in Blood. Nanotechnology is the term used now a days which ensure sole aim of *Rasaushadhi* to become easily absorb, assimilate and excrete in proper way. The traditional wisdom of Ayurveda could have immense utility in enhancing the bioavailability of allopathic drugs. The bio-enhancement leads to reduction in therapeutic dose of principal drug, thus reducing the possibilities of toxicity and side effects of drug, potentiating the efficacy, reducing the resistance, decreasing the requirement of raw material for drug manufacture and

ultimately benefitting to the world economy by reducing the treatment cost.<sup>1</sup>

As *Rasashastra* deals with pharmaceuticals of Metals and minerals and sole aim is to provide effective, safe and nontoxic medicines, it is very important to study its processing techniques which enhance medicinal properties critically to every pharmacist in order to achieve quality medicine. The standard of the pharmaceutical process such as *Shodhana*, *Bhavana*, *Marana*, *Amrutikarana* etc. need to observe keenly so that optimum quality of medicine is achieved. So the people involved in pharmaceutical sector should not shortcut these authentic techniques of medicine preparations. Hence present paper is intended to discover bio enhancing aspect of these process.

**BIOAVAILABILITY ASPECTS OF PHARMACEUTICAL PROCEDURE****Shodhana(Purification)**

In Ayurveda *Shodhana* is comprehensive term which involve purification of drugs for medicinal purpose. It is a process in which *Kshalana* (Washing), *Mardana* (Pounding), *Bhavana* (Levigation), *Swedana* (Boiling), *Bharjana* (Frying), *Nirvapa* (Heating & Dipping in specified liquids) etc. are carried out on mineral drugs with a view to eliminate impurities.<sup>2</sup> *Shodhana* process is aimed to relieve external and internal impurities beside enhancement of its original medicinal properties.<sup>3</sup> It is the first step for making any metal or mineral into its bio available form. It change physicochemical structure of purified drug up to some extent. The ultimate objective of these physic chemical changes of the material is to increase its biological availability means to potentiate its biological efficacy. Reduction in particle size helps in absorption,

smoothness leads to non-irritability and all chemical changes make the material body friendly.<sup>4</sup>

The selection of certain media for purification by Ayurvedic seers shows scientific confirmation as various organic media is used such as juices, decoctions, cow's milk, cows urine which helps to detoxify all the unwanted impurities in that inorganic metals and minerals for making it biocompatible. The analysis of media before and after *Shodhana* (purification /processing) will give clear rationale behind the selection of the particular media for the particular drug. The change that takes place during the *Shodhana* process can be explored by modern analytical methods.<sup>5</sup>The specific treatments of *Shodhana* claim to enhance the efficacy and reduce the toxicity of crude drugs by alteration of their pharmacodynamics properties.<sup>6</sup>During purification process herbal drugs not only nullify the toxicity & modifies the active principles, but also brings organic qualities, which is highly necessary for administration.<sup>7</sup>

### **Bhavana(Trituration)**

*Bhavana* is the process in which powdered drug is impregnated with liquid media such as decoctions, juices etc. by triturating till it become dry. Liquid media should be added in such a quantity so that powdered drug is quenched enough for pestle movements.<sup>8</sup>Impregnation of properties of media to the drug material which lead to unique and suitable physicochemical changes helping in incorporation of organic properties to inorganic substances. It is a systematic procedure of enhancing therapeutic qualities in individual drug as well as formulations.<sup>9</sup>

It possibly suggesting augmenting property of ingredients generated with

*Bhavana*, and also more possibility of generation of potent synergistic action in between constituents, as a result of *Bhavana* since there are only few *Kharaliya Rasa Kalpa* where *Bhavana* is not mentioned or is mentioned with water. The interaction of liquids of same drug or different drug in *Bhavana* process may give leads for development of newer pharmacokinetic-dynamic potent molecules.<sup>10</sup>*Bhavana* plays a vital role in enhancing the efficacy of drug by making desirable changes while processing through various types of *Bhavanadravyas* which act as catalyst.<sup>11</sup>

The *Bhavana* with specific organic liquid helps to induce trace elements in the *Bhasma* (incinerated metals and minerals) and to target it on a particular site of action.<sup>12</sup>

Patil Usha (2016) concluded in the study on "*Bhavana Samskara* Improves the Pharmacognostic Values of Anti-diabetic Ayurvedic Formulation, *Nishamalaki Curma*" that there is significant improvement in physicochemical parameters and the active constituents of the drug following the *Bhavanash* shows that the *Bhavanasamskara* helps in expressing the hidden constituents of the drug ultimately improving its potency.<sup>13</sup>

Suchi Mitra et al (2010) in the study on "Impact of *Bhavana Samskara* on physico-chemical parameters with special reference to *Gandhaka Rasayana* prepared by different media and methods" revealed remarkable difference in structure (surface anatomy) of the drug with *Bhavana* and without *Bhavana* by using a very sophisticated x-ray photoelectron spectrometer (XPS) study hence concluded that *Bhavana* is an important and mandatory process during drug processing, affecting the physicochemical

and biological properties of a dosage form.<sup>14</sup>

### Marana (Incineration)

The metals and minerals are not bio-assimilable in their natural forms. They needed to be converted into such fine form which can be easily assimilable in human body, able to cure various illnesses and did not cause any harmful effect. The process of making the metals/minerals into a fine powder by applying required quantum of heat is known as *Marana*. It is the conversion of metal/mineral into fine nano particles which herbo-mineral, organo-metallic nature and therapeutic potency.<sup>15</sup>

The objective of *Marana* is to bring physico-chemical changes of material to increase its biological availability, i.e. to potentiate its biological efficacy. Reduction in particle size helps in absorption, smoothness leads to non-irritability and all chemical changes make the material cell friendly.<sup>16</sup>The *Marana* process includes *Bhavana* with specific media, making of cakes of proposed drug for *Marana* in definite proportion, drying of cakes, *Saravsamputa* (packing of cakes in earthen vessels in certain order) and incineration in recommended *Putra*(Classical furnace).The vegetable drugs which are used in the form of decoction or juice have their own therapeutic properties, imported with *marana*, the drug become non-toxic, easily digestible and absorbable, suitable for metabolic changes, assimilable by tissue cells and become therapeutic potent.<sup>17</sup>In addition to major constituent element found at percentage level, several other essential elements like sodium, potassium, calcium, magnesium, molybdenum, iron, copper and zinc have also been found in micrograms per grams amount. These seem to remain chelated

with organic ligands derived from organic medicinal herbs.<sup>18</sup>

Thus Mercury can be treated as a bio-enhancer agent in Ayurvedic pharmaceutical science. '*Rasavaidyaas*' use characteristics of Mercury, as a standard of pharmaceutical actions of mineral and metallic drug preparation particularly in case of metal '*Bhasma*' it is said that the metals when converted into '*Bhasma*' acquire the characteristics of Mercury and become capable of strengthening the body and curing the disease. '*Rasibhavana*' also refers to the ability of *Bhasma* to assimilate in the *Rasa* i.e. nutrient fluid circulating inside the body after administration<sup>19</sup>

### Amritikarana (Nectarization)

The method by which the left over *Doshas* of the *MrutaLohas*(Incinerated metals and minerals) are eliminated is called *Amrutikarana*.<sup>20</sup> Due to *Marana* process *Bhasma* become *Ruksha*, *Tikshna* and *Agneya* (extremely dry and hot in properties) which can hamper its original properties hence it need *Amritikarana* process in some *Bhasma* such as *Tambra*, *Abhrakand LohaBhasma*. This excess *Agnisamskara* (Heat treatment) might hamper its *Rasayana* (Immunomodulation) properties. Perhaps to retain the *Rasayana* properties, it is treated with *Triphala* (three myrobalans) and *Goghruata* (cow's ghee) which are having antioxidant and immune-modulatory properties. *Triphalakvatha* and *Goghruata* are mentioned in the *Amrutikarana* of *Abhraka* and *Loha*. It might assist to remove the remnant impurities and enhance the quality of *Bhasma*. *Triphala* is included under *Lohamarakagana* and also it is used as media for *Shodhana* and *Marana* of both *Abhraka* and *Loha*. *Kumarisvarasa* along with *Goghruata* is used in the *Amrutikarana* of *Abhraka* as per *Rasatarangini*.<sup>21</sup>

Janakiram Anupama et al (2017) mentioned *Amrutikaruta Loha* has increased percentage of Iron and the Particle size has also reduced significantly. Ferrous sulphide is absent in the *Amrutikruta Loha* and Iron is present more in the ferroso-ferric form. To attain these changes probably the process of *Amrutikarana* was told for Loha.<sup>22</sup>

### Discussion:

Ancient Ayurvedic physicians always stressed on dispensing of medicines to give authentic treatment to the patients and to maintain the quality of medicines. Hence pharmaceutical science (*Rasshastra and Bhaishjya Kalpana*) of Ayurveda has great importance and bound to give quality medicine due to its scientific processing techniques. It remain quest for modern medical science how inorganic metal and mineral drugs not only turn bio compatible form by these simple processing techniques but also become bio-available easily with various herbal drugs in various forms. Processes like *Shodhana, Bhavna, Marana* etc. are planned with scientific therapeutic basis and have numerous theories to explain its efficacy according to *Desha* (Habitat) *Kala* (Season), *Bala* (Mental and Physical strength), *Prakrutietc.*

In *Shodhana* process media is selected as per drug's chemical and physical nature, its toxicity and therapeutic uses. It is the first step to change physicochemical structure of drug, making it more fragile to ease *Marana* process. Different Procedure involve in *Shodhana* help to reduce particle size and exposure to direct and indirect heat (by means of *Bhavana*) leads to bring refinement in *Parthiva* (Mineral originated) drug which is important for digestion of drug.

*Bhavana* process is the imbibitions of organic properties to inorganic drugs at molecular level. The repeated movement of pestle in mortar generate optimum heat which is enough for chemical reaction among *Bhavana* and *Bhavya Dravya*. There must be logic behind the number of *Bhavna* usually seven or three which are enough to change its chemical structure. This process help to advancement of various trace elements with organic media required for different enzymatic activities. Development of newer pharmaco-kinetic-dynamic potent molecules changes occurred are in hidden form but ultimately helping the formulation to improve its bioavailability.

After scientific *Shodhana* and *Bhavana* process, *Marana* process helps the drug to change into bio assessable nanoparticles form. Hence *Bhasma Pariksha* in *Rasashastra* are adequate to decide the quality of formulations. The term *Rasibhavantilohani* is used in *Rasshastra* which means targeted drug delivery at cellular level. Hence number of incineration cycles directly responsible for the *Bhasmato* become micro fine, increase potency and reduce the therapeutic dose.

*Amrutikarana* Process help to relieve the antagonistic properties of *Bhasma* which require more number of *Putra* such as *Loha* and *Abhraka Bhasma* in order to retain its Immunomodulatory and rejuvenation properties making it more bioavailable. *Goghruta* used in *Amrutikarana* process is natural bio enhancer.

Concept of bioavailability enhancer is rather new to western medicine but an integral part of drug design and development in Ayurveda. *Yogavahi, Deepana, Paacana Dravya* and *Rasayana Dravya* are useful to improve bioavailability.<sup>23</sup> Various pharmaceutical

processing in *Rasshastra* are aimed to improve above properties in *Rassaushadhies*. In short we cannot deny the role of every procedure for bio enhancing of *Rasaushadhies*. Shortcutting of these procedure definitely hamper its therapeutic efficacy in long term although it might not detected at preclinical level.

### Conclusions:

In the view of increasing cost of medicines, rising resistance cases of promising antibiotics and controversies over heavy metal content in Herbo-mineral drugs, bio enhancer drugs and procedures makes a choice, so it is important to concentrate on authentic pharmaceutical procedure in order to achieve potent medicines for good therapeutic efficacy. Hence Scientific Pharmaceutical techniques of *Rasshastra* need to follow as per classics for guanine formulations.

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