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CONCEPT OF NANO PARTICLE FORMULATION IN AYURVEDA – BHASMA: A CRITICAL REVIEW

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ABSTRACT

The ancient treatises of Indian System of Medicine, Ayurveda books, are rich with various drug delivery methods. Since the dawn of time, patients have had access to a vast choice of pharmaceutical preparations. The initial specifics of various medicinal presentations can be found in the *Caraka Samhita*[1], however the majority of them are drawn from herbal materials. With the invention of *Rasa Shastra* in mediaeval times, a fresh drug delivery technique emerged. *Rasashastra* is an Ayurvedic branch in which metals and minerals are transformed into usable forms, known as *Rasaushadhis* (which include *Bhasma*, *Kupakva rasayana*, *Parpati kalpana*, and others) for internal use. *Bhasmas* are one of the earliest examples of nanoparticles being used to treat disease. *Bhasmas* are claimed to be biologically produced nanoparticles, as *Bhasma* preparations are the concept of reducing the particle size of metal and mineral particles by treating them with herbal juices or decoctions and exposing them to a certain amount of heat as per puta mentioned in Ayurvedic classical text. Because of their small doses, tastelessness, quick action, and easy absorption, as well as their prolonged shelf life, wide spectrum of therapeutic efficacy, and greater *Rasayana*[2] (Rejuvenating activity) benefits, *Bhasmas* receive the most attention and hold a special place. This review article included process of *bhasma* prepration as per ayurveda literature and its *pariksha* or examination in terms of modern and Ayurvedic parameters.

KEYWORDS: *Rasashastra*, *Bhasma*, Nano particles, Ayurveda.

INTRODUCTION

Ayurveda, is as old as living creatures themselves, therefore finding a means of survival has always been and will continue to be a quest for them. Ayurveda is one of the oldest systems of medicine, health, and healing. It predates the *Vedas* in terms of age. This body of knowledge has existed for over 3000 years, with an uninterrupted legacy of practise down the ages. It is a highly developed and codified system of life and health science founded on its own original concepts and core principles. Ayurveda's fundamental and practical knowledge has survived to the present day through numerous disciplines such as *Kayachikitsa, DravyaGuna, and Rasashastra* etc.

Rasashastra is an Ayurvedic branch that deals with the pharmaceutical processes of *Shodhana, Marana, Jarana, Murchana,* and other detailed descriptions of metals, minerals, poisonous plant medications, and animal products utilized therapeutically in Ayurvedic treatment. By their very nature, certain metals and minerals, as well as plant and animal products, are toxic. They are subjected to the *Shodhana* and *Marana* processes to remove toxicity and make them easily digestive, absorbable, and assimilable.[3] As a result, these items are covered by *Rasashastra*.

Metals, minerals, stones, jewels, and animal as well as vegetable products are frequently used by Ayurvedic practitioners in current scientific era. The wisdom of utilizing such hazardous medications for medicinal reasons is understandably questioned by intellectuals and scientists in India and abroad. This is largely due to their lack of understanding of the rationale of the processes employed to process these deadly substances before they are utilized in treatments. As pharmacokinetics and pharmacodynamics explain the rationality of various pharmaceuticals used in modern medicine, acharyas describe the suitability of the processing employed by Ayurvedic physicians to make metals, etc., free of toxicity and potentize them to reach therapeutic perfection.

Rasaushadhies have given *Ayurveda* a completely new health-care look in the contemporary dynamic era. *Rasausadhies'* inherent properties, such as fast action, low dose, tastelessness, long shelf life, and superior palatability, have helped them to meet the demands of both patients and pharmaceutical companies. *Bhasmas* are the most commonly utilized *Rasaushadhi* and receive the greatest attention.

The process of *Bhasmikaran* includes the following basic steps[4]

- *Shodhana*
- *Bhavana*
- *Marana*

CONCEPT OF SHODHANA[5]

Shodhana is a method of removing impurities from material using pharmaceutical procedures such as *Swedana, Mardana, Nirvapana*, and other medications. It is a method of separating imperfections from a substance using various methods such as grinding and particular medications.

TYPES OF *SHODANA* PROCEDURES

- *Abhisheka* (sprinkling): The material is heated to a high temperature and then sprayed with liquid media. *Mandura Shodhana*, for example.
- *Achushana* (absorption) : Different absorption methods, such as *Bhallataka Shodhana*, are used to reduce the oily content of some harmful compounds.
- *Atapa / Agni Shoshana* (drying): The material is maintained on fire or exposed to the sun until it is completely dry, for example, *Shilajatu Shodhana.*
- *Bharjana* (frying or roasting): The substance is fried in a specified liquid medium on *Mandagni* (low heat), for example, *Gairika Shodhana.*
- *Bhavana* (levigation): The material is triturated for a particular time period using prescribed liquid media. *Hingula Shodhana*, for example.
- *Dhalana* (melting and quenching): The substance is heated to a high temperature and then poured into a liquid medium. *Naga Shodhana*, for example.
- *Galana* (melting and straining): The solid material is heated and then strained through a fabric, such as *Gandhaka Shodhana.*
- *Mardana* (trituration): The material is correctly ground with the prescribed medicine for a set amount of time. *Parada Shodhana*, for example.
- *Nimajjana* (dipping): The material is dipped in the required liquid for a certain amount of time. Vatsanabha Shodhana, for example.
- *Nirjalikarana* (water evaporation): The material's whole water content is evaporated by heating. *Sphatika Shodhana*, for example.
- *Nirvapa* (heating and cooling): The red hot material is dipped in the prescribed liquid. *Lauha Shodhana*, for example.

- *Parishravana* (straining): The solid material is dissolved in appropriate liquid media and then strained to remove insoluble contaminants. *Navasadara Shodhana,* for example.
- *Patana* (sublimation): The material is heated in the *Patana Yantra* to convert it to vapour, which is then condensed back into the substance. e.g.
- *Prakshalana* (washing): To remove physical impurities, the item is cleaned with a prescribed liquid. *Godanti Shodhana*, for example.
- Physical pollutants are removed in *Prithakikarana* (separation). *Guggula Shodhana*, for example.
- *Swedana* (boiling in a liquid bath): Using the *Dola Yantra* method, the material is boiled in the appropriate liquid media. *Sankha Shodhana*, for example.
- *Vilayana* (elutriation): The material is first dissolved in a specified liquid medium and then left there for a period of time. Then, for example, *Shilajatu Shodhana*, the upper half of the liquid containing the soluble drug material is decanted into another pot, leaving the contaminants at the bottom of the first pot.

***SHODHANA* PROCESS TYPES**: The *Shodhana* process is separated into two basic categories.[6]

1. *Samanya Shodhana:* When all the raw materials of a certain class [i.e. *Maha rasa, Uprasa, Sahdarana rasa, Ratnas,* and so on] are treated with a single specific *Shodhana* technique, that procedure is called as *Samanya Shodhana* for that class. *Dhatus' Samanya Shodhana*, for example.

2. *Vishesha Shodhana*: This is a one-time operation for a single medication substance rather than a group. After *Samanya Shodhana,* for example, *Lauha* in *Triphala Kwatha*, it should be used.

CONCEPT OF BHAVANA[7]

It is the process of thoroughly immersing a material in a prescribed liquid and allowing it to dry. When making *Kwatha* as *Bhavna Drava*, the amount of dry herb should be equal to the amount of material, then eight times water should be added and reduced to one eighth by boiling.

BHAVANA'S PROCEDURE

- The decoction is then applied to the material in such a way that it remains wet for the entire day.
- This procedure can be repeated for seven days, twenty-one days, or as needed.

- The substance is combined with liquid material and crushed until the mixture resembles dough.
- The material is mixed with a predetermined liquid medium and ground continuously for a set amount of time.

CHIEF DESIRED CHARACTERS

- After levigation, the material can be given the desired shape.
- If you squeeze it between your fingers, it will flatten out.
- It will be gentle to the touch.

CONCEPT OF *MARANA*[8]

Marana is the process of converting refined metals and minerals into *Bhasma* after they have been subjected to levigation and incineration.

STEPS OF *MARANA*: The *Marana* Process consists of three basic steps.[9]

1. *Purva Karma* is the first step.
2. *Pradhana Karma* is the second type of karma.
3. Last one is *Paschat Karma.*

PURVA KARMA

This technique can be further broken down into three sub-processes, which are as follows:

- *Mardana & Bhavana* [Trituration]
- *Chakrikakarana* [Pellets formation]
- *Sharava samputa* [Sealing in an earthen vessel]

Mardana & Bhavana [Trituration]

After the *Shodhana* process, *Mardana* and *Bhavana* are the first processes used to raw materials. The *Shodhita* ingredients are triturated for the specified time period using the given liquids [i.e. *Swarasa, Kwatha, Dugdha*, etc.]. *Shodhita* materials undergo the following changes as a result of this procedure.

1. After each *Bhavana*, the particle size became smaller and smaller.

2. During levigation, *Shodhita* materials and *Bhavana Dravyas* remain in close proximity in order to create a homogeneous mixture.

3. *Bhavana Dravyas* aids in the development of pellets.

4. The necessary therapeutic efficacy can be induced in end products by applying specific *Bhavana Dravya*.

***Chakrikakarana*[10] [Pellets formation]**

This is a *Marana* intermediate process in which *Bhavita* and *Mardita Dravyas* are pelletized in order to achieve the following goals.

1. It facilitates the drying of materials in a shorter amount of time.
2. By producing pellets, one may fit a larger number of materials into a smaller *Sharavas* space.
3. It aids in the even distribution of heat throughout the material's particles.
4. It increases the material's surface area to allow for maximal heat transfer during the Puta process.
5. It helps to prevent the loss of prepared medications following a series of *Putas*, with the added benefit of being simple to use.

***Sharava samputa* [Sealing in an earthen vessel]**

This method is the last phase in the *Purva Karma* process, following which the materials are incinerated using the puta process. In this procedure, dried pellets are placed in a *Sharava*, then *Sandhi Bandhana* is formed using another *Sharava* and mud smeared with cotton fabric strips to prepare *Sharava Samputa*.

Procedure

Pellets are maintained in a single earthen saucer and allowed to dry completely. Then it's covered with another earthen saucer, and the junction is sealed with mud-smeared fabric before being allowed to dry completely.

***PRADHANA KARMA* (*PUTAPAKA*)[10,11]**

"It is a procedure of heating a substance to a defined heating grade (*Puta*) in a specific atmosphere for a set period of time, resulting in proper incineration. so that it can be absorbed by the body.

PASCHAT KARMA

This is the final step of *Marana* process and divided in to 2 sub-steps.

1. Trituration of pellets
2. *Bhasma pariksha*

1. **Trituration of pellets[12]:** This process is performed to justify following objectives.

- To bring the end product at a micro fine particle size level.
- To enable the end product to perform *bhasma pariksha*.
- To convert it in to the easily storage able and dispensable form.

2. ***Bhasma Pariksha.***

- **According to classical parameters**
- **According to modern parameters**

BHASMA PARIKSHA[13]

01. According to classical parameters: In ancient classical text of *Rasa Shashtra* some parameters are there to analysis the *Bhasma* these are.

Physical Parameters[14]: *Varitara, Unam test, Rekhapurnata, Slakshnatvam, Mrudutva, Nishchandratva, Nirdhoomatva.*

Chemical Parameters: *Varna, Gatarasatvam, Apunarbhavata[15], Niruttha[16] etc.*

02. According to modern parameters[17]

1. **Macroscopic and Microscopic test-** to know Appearance, Colour, Odor, Taste, pH of *Bhasma.*
2. **Physico-chemical tests include-** determination of loss on drying (L.O.D.), Total Ash Value, Acid Insoluble Ash Value, Water Soluble Extractive, Alcohol soluble extractive.
3. **Qualitative/Quantitative tests includes-** SEM(Scanning Electron Microscope), ICP-AES (Inductively Coupled Plasma – Atomic Emission Spectroscopy), XRD (X-ray Diffraction), FT- IR (Fourier Transform Infrared Spectrometry), PSA (Particle Size Analysis), EDX (Energy-Dispersive X-ray spectroscopy) to determine the nature of compound formed, identification of elements and organic groups in the compound and particle size of *Bhasma*.

CONCLUSION

The preparation of *Bhasma* has a unique and complex combination of many procedures which convert the raw material in the form of metals, minerals, and animal products into the final product called as *Bhasma.* The chemicals used during the process play a key role in the prepration of *Bhasma* made in a specific way. The particle size of the drug is reduced significantly as a result of different stages of processing techniques like *shodhana* (which

involves roasting with the addition of herbal juices and continuous stirring) and *marana* (which involves *bhavana* (wet trituration) and the *puta* system of heating), which may help with absorption and assimilation. The knowledge of bhasma prepration and its examination help in building the confidence in the use of such products for medication by modern medical sciences too.

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