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CONCEPT OF NANOTECHNOLOGY IN AYURVEDA W.S.R. TO RASA AUSHADHIES

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ABSTRACT

Nanotechnology is an emerging new branch of science in present era, with many possible applications in medicine and other field. In *Ayurveda*, Medicine prepared from metals in the form of fine powder known as *Ayaskriti*. The metals and minerals are heavy, non-absorbable and toxic substances. The metals and when there are converted into fine form substances known as *Bhasma*, are absorbable and therapeutically most effective. The examination of these *Bhasmas* is quit comprehensive by various ways and means to avoid their adverse and toxic effect. Assimilation of *Ayurveda* and nanotechnology may provide the best medicines to treat various lethal diseases. The combination of nanotechnology with *Ayurvedic* medicine will provide a very useful tool in designing future medicine with improvised bioavailability profile and less toxicity and Adverse reaction. Through this technology is already in practice in *Ayurveda* in traditional way and the application of recent developments in nanotechnology may be helpful in *Ayurvedic* drugs formulations.

KEYWORDS:- Nanotechnology, *Ayaskriti*, *Parmanu*.

INTRODUCTION

Nanotechnology is the advanced scientific technology of the 21st century. The term nanotechnology is derived from a Greek word ‘nanos’ which means dwarf. It is a new technology in drug delivery system. It aims to develop devices and dosage in the range of 1 to100 nm which can be increased up to 1000 nm. Nanotechnology makes use of nanoparticles

that have a high surface area and can reach the targeted site because of its extremely small size. Nanotechnology and Herbal science is combined to overcome the limitations of using herbal drugs. The development of novel drug delivery system for herbal medicines includes nano dose which helps in enhancing the bio-solubility and bioavailability, protection from toxicity, sustained delivery etc. Such novel drug delivery systems have site specific action and predetermined rate.

One of the discipline or branch of *Ayurveda* which deals with herbo-mineral preparations called *Bhasma* (Ash) is known as *Rasa Shastra*. *Rasa Shastra*, an integral part of *Ayurveda*, deals with numerous formulations based on metal-herb combinations. The major therapeutic actions of *Bhasma* are their ability for Immunomodulation, anti-aging property also known as *Rasayana* in *Ayurveda* and ability to target drugs to the site (*Yogavahi*). Such *Ayurvedic* preparations are claimed to be nontoxic, absorbed readily, and biocompatible.[1]

Metal-based *Bhasma* includes *Swarna Bhasma* (Gold), *Rajata Bhasma* (Silver), *Tamra Bhasma* (Copper), *Lauha Bhasma* (Iron), *Yasada Bhasma* (Zinc), Alloy of Gold, Sulphur and Mercury (*Makardhwaja Bhasma*), Iron Oxide (*Mandura Bhasma*), etc.

Nanotechnology deals with materials in the size of 0.1 to 100 nm; although it is also inherent that these materials should display different properties such as optical effects, magnetism, electrical conductance chemical reactivity, and physical strength, from bulk materials as a result of their small size. Nanotechnology works on matter at dimensions in the nano meter scale length (1-100 nm), and thus can be used for a wide range of applications and the creation of different types of nano materials and nano devices.

Bhasma used in *Ayurveda* for treatment of various diseases for past several centuries (7^{th}century on world). It is the oldest form of nanotechnology applied in *Ayurveda*. *Bhasma* is prepared by repeated *Maran* (incineration) and *Mardan* (grinding) the metal with some herbal juice and other specific drug in *Ayurveda*. This concept is known as '*Samsakar'* (processing) done through *Shodhana, Bhavana, and Putpaka* procedures which reduces particle size of metals and minerals extremely finer. Due to its small size basic characters of material get changed. *Swarna Bhasma* is a therapeutic form of gold metal of nano size particle. When evaluated by various tool and technique like AFM (atomic force microscope), SEM (scanning electron microscope), it was found that the size of particle was 56 nm. Analysis by FT-IR and

XRD shows that pure Au in zero valency state. That it reaches desired site of action and execrated from different route of body.

MATERIAL AND METHODS

Collection, exploration and interpretation of subjective matter from different sources.

Nanotechnology science:- Nanotechnology is manipulation of matter on an atomic, molecular, and supramolecular scale. It is therefore common to see the plural form "nanotechnologies" as well as "nano scale technologies" to refer to the broad range of research and application whose common trait is size.

Applications of nanotechnology

The different fields that find potential applications of nanotechnology are as follows:[2]

a) Health and Medicine
b) Electronics
c) Transportation
d) Energy and Environment
e) Space exploration etc.

Applications of Nano-materials in medicine

These applications include gene delivery, fluorescent biological labels, drug and bio-detection of pathogens, probing of DNA structure, tissue engineering, tumor detection, separation and purification of biological molecules and cells, detection of protein, MRI contrast enhancement and phagokinetic studies.[3,4]

Nanocarriers used in drug delivery system (DDS)

In nanotechnology nano particles are used for site specific drug delivery. In this technique the required drug dose is used and side-effects are lowered significantly as the active agent is deposited in the morbid region only. This highly selective approach can reduce costs and pain to the patients. Nano medicines used for drug delivery, are made up of nano scale particles or molecules which can improve drug bioavailability. For maximizing bioavailability both at specific places in the body and over a period of time, molecular targeting is done by nano engineered devices such as nano robots.[5]

Nanocarriers are used as a transport module for another substance such as drugs. They are used as DDS. Commonly used nanocarriers include liposomes, solid lipids nanoparticles,

dendrimers, polymeric nanoparticles, silicon or carbon materials, and magnetic nanoparticles and nano-emulsions. Nanocarriers can be made slowly degradable, stimuli reactive (e.g. pH- or temperature-sensitive), and even targeted (e.g. by conjugating them with specific antibodies against certain characteristic components of the area of interest).[6]

Advantages of the nano DDS[7,8]

- Convey most extreme measure of medication to the site of activity by passing all barriers.
- For example, acidic pH of stomach increment draws out dissemination of medication into blood because of their little molecule size.
- Reduce repeated dose administration.
- Increased bioavailability.
- Solubility enhancement.
- Increased bioavailability.
- Protection from toxicity.
- Enhancement of pharmacological activity.

Classification of nanoparticles

- **Labile nanoparticles:** Liposomes, micelles, polymers, nano-emulsions etc.
- **Insoluble nanoparticles:** TiO_2, SiO_2, fullerens, quantum dots, carbon lattices, etc.
- **One dimensional nanomaterial:** Nanowire and nanotube.
- **Two dimensional nanomaterial:** Self assembled monolayer film.

Nanotechnology in *ayurveda* in relation to *rasa shastra*

Ayurvedic system of medicine is one of the oldest system of Indian traditional medicine. In this system, various medicines are based on metal- mineral formulation popularly known as *Bhasma.* There are different type of *Bhasma* which are fabricated using traditional methods of *Ayurveda*, called *Bhasmikara.* In the Herbo - metallic preparations, the particle used have a diameter of about 10-15 nm. *Bhasma* is now been considered *Ayurvedic* nanomedicine and provide opportunity for drug designing employing modern concept of nanomedicine.

Some common metals used to prepare *bhasma* and its application

1. ***Rajata* (Silver) *Bhasma:-*** Silver is a noble metal that was used by ancient *Acharyas* for therapeutic purposes since the period of *Charaka* and his contemporize.[9] As described, *Rajata* or Silver is a clear, heavy, and lustrous with metallic sheen, which becomes bright

white on cutting or heating. *Rajata*, not having any furrows or ridges, can be accepted for the therapeutic applications. In terms of composition, *Rajata Bhasma* is composed of pure silver metal (52%59%), ferric oxide (14.33%), free sulphur (0.675%), calcium (10.769%), and silver chloride (0.479%) as well as traces of other metals including potassium, sodium, and aluminium. Silver *Bhasma* has been prescribed for respiratory disorders. The standard prescribed dose range of *Rajata Bhasma* is 30-120 mg.[1]

2. ***Swarna* (Gold) *Bhasma*:-** The therapeutic applicability of *Sara Lauha* or *Swarna* is known to Indians since ancient times. The references of application of this *Bhasma* are found in *Charaka Samhita*. The *Swarna Bhasma* comprises metallic gold (96.76%), ferric oxide (0.14%), silica (1.14%), phosphates (0.78%), salt (0.078%), potash (0.16%), and traces of magnesium and copper.[10] The elemental form of gold has been used traditionally as an antipruritic agent to relieve itching palms. Some useful formulations of Swarna are used to treat chronic diseases such as *Yakshma* (Tuberculosis), *Kasa* (Cough), *Swasa* (Respiratory Disorders), and *Pandu* (Anaemia). The dosage range of *Swarna Bhasma* is 15-30 mg.

3. ***Parada* (Mercury) *bhasma:-*** There are only few formulations mentioned in *Charaka Samhita* that contains mercury. There is controversy in the reference of therapeutic utility of *Parada* where only a few scholars interpret the term Rasa in the verse *Chikitsa Sthana* 7/71 as *Parada*. In *Dwivraniya Chikitsa*, the term *Rasa* is interpreted as *Parada* by the commentator *Chakrapani*. Above two mentioned formulations are only recommended for external applications.[9]

4. ***Aayasa* or *loha* (Iron) *bhasma*:-** *Ayasa* or *Loha* is also known since ancient civilizations, which was used in different dosage during the period of Charaka, both for internal and external administrations for many pathological manifestations. Compounds of iron were prescribed in anaemia and other related conditions, mainly when blood becomes deficient in iron, or functions of hemopoietic systems are disturbed. It is claimed in *Rasashastra* that *Loha* stimulates functional activity of almost all the organs, destroys a number of diseases, promotes life and strength, and also acts as a restorative. According to *Rasa Vagbhata*, among all varieties of *Loha* (Iron), namely- *Munda* (Cast Iron), *Kanta* (Wrought Iron), and *Teekshna* (Carbon Steel), the *Kanta* is the best variety to use. *Chakrapani* has emphasized that there is need of critical care while administration of *Loha*. *Lauha Bhasma* is composed of ferric oxide (96.5%), ferrous oxide (2.5%), calcium

oxide (0.3%), and magnesium oxide (0.8%) along with traces of potassium and phosphorus. Formulations of *Loha* were used for the treatment of diseases like *Urah Shula* (Chest Pain), *Gulma* (Abdominal Lump) *Arsha* (Piles), *Yakrit Roga* (Liver Diseases), Pliha Roga (spleen disease), *Ksaya* (Phthisis), *Pandu* (Anemia), *Kamala* (Jaundice), etc. The normal dose limit for *Lauha Bhasma* is 30-240 mg.[11]

5. ***Tamra* (Copper) *bhasma*:-** Copper or *Tamra*, an ancient metal, is also known to human civilization since pre-Vedic times that was part of daily livelihood uses. The metals were used in preparation of the alloys mainly brass and bronze. The desired properties of *Tamra* for medicinal uses were metallic sheen, bright reddish in colour, heavy, soft with having high tensile strength, and lacking impurities. Apart from the use of *Tamra* in management of diseases like *Krimi* (Worms), *Arsha* (Piles), *Sthaulya* (Obesity), *Ksaya* (Phthisis), *Pandu*(Anemia), *Swasa* (Respiratory Disorder), *Kustha* (Skin Disease), *Kasa* (Cough), *Shotha*(Oedema), *Amlapitta* (Hyperacidity), Sula (chest pain), *Grahani Dosha* (Intestinal Disorder), *Yakrit Roga* (Liver Disease), etc., the use of *Tamra Patra* (copper vessels) has also been advised in several pharmaceutical procedures. The normal prescription dose for *Tamra Bhasma* is 15-60 mg.[12]

6. ***Sisaka*/*naga* (Lead) *bhasma*:-** *Naga* is also an important *Puti Loha* (easy fusing metals) which has been known since ancient times and mentioned as *Sisaka* or *Sisa* in ancient texts. As described by Charaka, this metal should be externally used for medicinal purposes especially in the cases of *Mandala Kushta* (Dermatological Disorders). The desired characteristics for therapeutic purposes in Naga are externally black in colour and heavy that melt easily and shine with bright black lustre when incised. Quantitatively, *Naga Bhasma* contains lead oxide (75.6%) and ferric oxide (7.5%) as major components along with traces of chlorides and carbonates of magnesium and calcium. The normal therapeutic dose of *Naga Bhasma* is 30-120 mg and beneficial for diseases like *Prameha* (Urinary Disorder), *Arsha* (Piles), *Gulma* (Abdominal Lump), *Sweta Pradara* (Leucorrhoea), *Antrashotha* (Gastroenteritis), *Grahani Roga* (Intestinal Disorder), etc. [9,12]

7. ***Mandura bhasma*:-** It is another form of iron that has been used for therapeutic purposes since antiquity in classical Ayurveda. As described in the *Ayurveda Prakasha*, it is the debris or residue collected after heating and beating processes of iron around a blacksmith's anvil. The qualities in *Mandura* for therapeutic purposes as mentioned in

ancient literature are smooth to touch, strong, heavy, lack furrows, or fissures. Administration of purified *Mandura* is beneficial in Inflammations, Jaundice, Oedematous conditions, etc. It is also a drug for the treatment of *Pandu* (Anemia).[13]

Chemical compositions of *Mandura* are ferric oxide (59.14%), chlorides (4.4%), ferrous oxide (26.7%), magnesium (3.9%), sodium (1.7%), and some other elements in trace amounts. There are approximately 30 formulations of *Mandura* mentioned in *Charaka Samhita* having dose range of 30-240 mg.[14]

8. ***Vanga*/*Trapu* (Tin) *bhasma*:-** *Vanga*, a type of the *PutiLoha* (easy fusing metals) was known to ancient Indian physicians by term *Trapu* (Tin). The preferable characteristics for therapeutic applications in *Vanga* are bright white in colour, smooth, soft, easily melts, shiny, and heavy which are termed as *Khura Vanga*. Chemically, *Vanga Bhasma* is a mixture of stannic oxide (91.4%), potassium (2.9%), ferric oxide (2.9%), calcium oxide (2%), aluminum (2%), and magnesium (0.6%) oxides. *Vanga Bhasma* alone is a drug of choice for *Prameha* (Urinary Disorder) and in combination with other *Puti Loha*, it is beneficial for genitourinary tract. Various formulations of *Vanga Bhasma* are beneficial in the management of *Prameha* (Urinary Disorder), *Swasa* (Respiratory Disorder), *Kasa* (Cough), *Krimi* (Worms), *Pandu* (Anemia), *Ksaya* (phthisis), *Pradara* (leucorrhea), *Garbhashaya Chyuti* (Uterus Displacement), etc. in the dose range of 120-240 mg. [9]

9. ***Kamsya* (Bronze) *bhasma:-*** *Kamsya* is an alloy of Tin and Copper. *Pushpa* variety of Kamsya is only acceptable for therapeutic applications which produce sharp sound, are smooth to touch, soft, slightly grayish, turn red on heating, and devoid of impurities. Therapeutic doses of 60 - 120 mg of *Kamsya Bhasma* are beneficial for diseases like *Kusta* (Skin Disorder), *Krimi* (Worms), etc.[11]

10. ***Pittala* (Brass) *Bhasma:-*** *Pittala* is another vital *Misra Loha*, known since the period of *Samhita Kala*(period), which an alloy of zinc and copper is. Several formulations of *Pittala Bhasma* are beneficial in diseases like *Krimi* (Worms), *Pandu* (Anemia), *Kusta* (Skin Disorder), etc.[9]

Bhasma are nearer to nano crystallite materials which are solid composed of crystallite with sizes less than 100 nm, at least in one dimension.[15] Nanoparticle size of *Lauha Bhasma* was confirmed by surface morphological analysis by scanning electron microscopy (SEM).

Spherical nanoparticles with a diameter of about 17 nm were observed.[16] A scientific analysis of *Swarna Bhasma* by TEM and atomic force microscopy have demonstrated that the principle ingredient of *Swarna Bhasma* is globular gold nanoparticles of 5657 nm. Atomic absorption spectroscopy and infra-red (IR) spectroscopy studies reveal that *Swarna Bhasma* is devoid of any other heavy metal or organic material.[17] However, Mohapatra and Jha (2013) showed the presence of Iron, Copper, and Sulphur in *Swarna Bhasma*.[18] In addition to these elements, the *Bhasma* found to contain Potassium, Magnesium, Aluminium, and silicon in trace amount. *Tarkeshwar Ras*, an amalgamation of different *Bhasma* (such as *Lauha*, *Vanga*, *Abhraka*, and *Rasasindoora*) revealed the presence of different elements such as iron, tin, Aluminium, etc. The agglomerated particle size was found to be in the range of 0.52 µm in diameter.[19] The TEM study reveals that grain size was significantly reduced in *Swarna Bhasma* to 50200 nm. Likewise, *Ras Sindoor* (sublimed Mercury compound) contains mercury Sulphide (crystalline; size, 2550 nm). This is an organic macromolecule derived from plant extract. Several macro-/trace elements may be present in different amounts, which are bioavailable and accountable for adding to medicinal value of Ras *Sindoor*.[20]Analysis of *Rajata* (Silver) *Bhasma* by SEM revealed particles in the range from 10 to 60 nm and content of Silver in *Rajata Bhasma* measured with ICP-AES was found to be 70.56%.[21]Physiochemical characterization including X-ray diffraction analysis and SEM results revealed that the crystallite size of *Tamra Bhasma* (copper) powder was less than 100 nm and nanocrystallites of agglomerated size in micrometre.[22] Some of the *Bhasma* detected with presence of nano-sized particles are described in Table.

Detection of nanoparticles/ nanocrystallites in different *bhasma*.

Bhasma	**Nanoparticle detected**	**Size**
Praval Bhasma[23]	Calcium oxide	1015 µm
Tamra Bhasma[24,22]	Copper oxide	110 µm
	Different oxides of copper	100 nm
Rajata Bhasma[25]	Silver sulphide	1.04 µm
Mandura Bhasma[26]	Iron oxide	-
Shankh Bhasma[27]	Calcium oxide	600 nm
Yashada Bhasma[28,29]	Zinc oxide	520 µm
	Zinc oxide	1025 nm
Vaikranta Bhasma[30]	Multi-mineral	520 µm
Swarna Bhasma[31,17]	Gold	9.9 µm
	Gold	5657 nm
Vanga Bhasma[32]	Tin dioxide	10100 nm
Muktashukti Bhasma[33]	Calcium carbonate	1050 µm
Naga Bhasma[34,35]	Lead sulphide	60 nm

	Lead oxide	-
Trivanga Bhasma[36]	Lead, zinc, and tin oxides	500 nm
Samagandhak Kajjali[37]	Mercuric sulphide	0.210 µm
Mukta Bhasma[38]	Calcite	156 nm

Bhasma pariksha

Like modern science nano particle size etc. are the criteria for proper *Bhasma* preparation. The prepared *Bhasma* should be subjected to certain tests Physical and chemical tests to assess the genuineness of the sample. The knowledge of various methods of examination of these *Bhasmas* is absolutely necessary because one single method may not be suitable to be applied for examining different group of *Bhasmas* on account of their natural structural composition.

So the *Bhasmas* are mainly examined in terms of:

1. Physical test 2. Chemical test

1. Physical tests

- ***Rekhapurnata*:-** This test is applied to study the micro fineness of *Bhasma*. The *Bhasma* particles should be of minimum size for the easy absorption and assimilation in the body. The large particle cannot be absorbed properly and retained in micro cellular level of soft organ. The Bhasma should be so micro fine that it can fill the furrows of finger tips.

- **Procedure:** A little amount of *Bhasma* is rubbed in between the index finger and thumb. It is to be observed whether the particle scan fill the furrows of finger tips. If the *Bhasma* attains the micro fine character so as to fill the furrows, it may be considered as genuine (properly incinerated).

- ***Slakshnatvam*:-** It is the tactile sensation produced by *Bhasma* by simple touch with finger tips. The properly incinerated *Bhasma* attain this quality. *Slakshna Bhasma* can be absorbed and assimilated in the body.

- ***Sukshma*:-** It indicates micro fineness of the *Bhasma* preparation. This character of *Bhasma* can be perceived by *Varitara* and *Rekhapurnata* tests. Properly prepared *Bhasma* must be *Sukshma*, so that it can be absorbed in the body easily.

- ***Anjana sannibha*:-** *Anjana* is smooth in character and it does not create any irritation whenever applied. Properly incinerated *Bhasma* should have the same characteristics

like *Anjana*. It must be smooth and should not create any irritation to the mucous membrane of gastrointestinal tract.

- ***Varitara*:-** This test is applied to study the lightness and fineness of *Bhasma*. *Varitara* is floating character of *Bhasma* on stagnant water surface. Here the particles of *Bhasma* attain so much fine and light character that they cannot break surface tension of stagnant water**.**

- **Procedure:** Take clear transparent water in a transparent glass. Now take a little amount of *Bhasma* in between index figure and thumb, sprinkle it slowly on stagnant water surface from a short distance. The properly incinerated *Bhasma* will float on the surface of water.

- ***Unama*:-** It is further reassessment of *Varitara* test.

- **Procedure:** A grain of rice is to be kept carefully on the layer of floated *Bhasma*. Observe whether the grain floats or sinks. If the grain remains as it is on the layer, then the *Bhasma* can be considered as excellent (properly prepared).

- **Chemical parameters:** To assess the chemical changes as compound formation etc. the below mentioned parameters are to be considered.

- ***Varna*:-** It indicates the colour of the *Bhasma*. A specific colour is mentioned for each *Bhasma*. And alteration in this specific colour suggests that the *Bhasma* is not prepared properly.

- ***Gatarasatvam*:-** Every metal has its specific metallic taste. The properly incinerated *Bhasma* of a metal should be tasteless on taste perception. It indicates transformation of the particular metallic taste to taste less compounds by unique pharmaceutical procedure.

- ***Nishchandratvam*:-** The *Bhasma* must be *Nischandra* (lustreless) before therapeutic application. *Chandratva* (lustre) is a character of metal. After proper Marana the lustre of metal should not remain same. This test is applicable to metallic and *Abhraka Bhasma*.

- **Procedure:** Observe the *Bhasma* preparation in bright sun light, whether the lustre is present or not, if the lustre is still present, it indicates the need of further *Marana*.

- ***Apunarbhavata*:–** This test indicates the *Bhasmas* irreversible state of becoming again the same metal or mineral. *Apunarbhava* means incapability to regain the original metallic form. It reflects the proper or improper *Marana* of *Bhasma*. The properly incinerated *Bhasma* should not return to its natural metallic form.

- **Procedure:** The *Bhasma* is mixed with equal quantity of *MitraPanchaka*.[26] (seeds of *Abrus precatorius* - *Gunja*, *Madhu*, *Ghrita*, Borax-*Tankana* and Jiggery-*Guda* or *Commifera Mukul* and it is sealed in *Sarava Samputa*(earthen pots),after that, the similar grade of heat used for the preparation of the particular *Bhasma* is applied and on self-cooling product is observed. Lustre particles in it shows presence of free metal which is indicative of improper *Marana*.

- ***Niruttha*:–** *Niruttha* test is to be considered as inability to regain the metallic form, because after proper *Marana* the metal is transformed to its compounds. So it cannot regain the original metallic form on the same grade of temperature for *Marana*. This test is applicable to metallic *Bhasmas* only.

Procedure: *Bhasma* is mixed with a fixed weight of silver leaf. It is kept in a *Sarava Samputa* (earthen pots) and similar grade of heat is applied as for preparation of *Bhasma* and after self-cooling, weight of silver is taken. Increase in weight of silver leaf indicates improperly prepared *Bhasma*.

Amrutikarana:- It is a special process advocated for specific *Bhasmas* of *Abhraka* and *Tamra*.

According to *Rasa Tarangini* the purification method, which is adopted to eliminate the remaining *Dosas* (blemishes) from the *Bhasmas* of metals and minerals, is termed as "*Amrutikarana"* (R.T.2/58).

The main aims of the *amrutikarana*

1. To remove the remaining impurities from the Bhasmas.
2. To reduce the *Ruksata* produced by *Agni Samskara*.
3. To increase the potency of *Bhasma*.

It is the process to be done after *Marana* process to nullify the remaining *Doshas* or *Tikshnata* thus making it free from toxic or bad effects. This procedure is recommended for all the *Bhasmas* like *Abhraka Bhasma* and *Tamra Bhasma* but in case of *Tamra Bhasma* it has been recommended mandatory essential to make the *Bhasma* free from its *Utklesha*, *Vanti* and *Bhranti Doshas*. It should be done after confirmation of *Bhasma Siddha Lakshanas* (Proper preparation and examination of *Bhasma*).

DISCUSSION

Bhasma used in *Ayurveda* for treatment of various diseases for past several centuries. Now a days it is proved that the *Bhasmas* are composition of nanoparticles of metals and minerals with coal powder and also proved that they have characteristics feature in medicinal point of view. Using nanotechnology principles, various dose-related adverse effects can be prevented as it has been able to reduce the amount of drug that needs to be loaded. This will also help to increase the potency and safety issues related to *Ayurvedic* drugs and formulations. Various *Bhasma Pariksha* is also used including physical and chemical to assess the genuineness of the sample.

CONCLUSION

The combination of nanotechnology with *Ayurvedic* medicine will provide a very useful tool in designing future medicine with improvised bioavailability profile and less toxicity. *Ayurvedic* herbo-metallic formulation consisting of *Bhasma* is ancient nano medicine for treatment of various illness. Using nanotechnology principles, various dose-related adverse effects can be prevented as it has been able to reduce the amount of drug that needs to be loaded. This will also help to increase the potency and safety issues related to *Ayurvedic* drugs and formulations.On the basis of this review, we can conclude that the use of Ayurvedic drugs and formulations in the nanocarriers will increase its potential to treat various chronic diseases. They will effectively increase the bioavailability and stability and will also reduce the dose of various potent drugs.

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