Metals and Ayurveda

(Dhatu varga)

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PREFACE

The Purpose of this book is to provide concise, essential, complete & readable information on Basic and applied aspects of **Metals specially Sapta dhatu**. Selection of subject matter and its presentation is based on the experience gained during the Post-graduation and teaching of the students. Stress is also given on all aspects, which are clinically important, and an effort has been made to correlate it with Modern.

Information is arranged according to sequence. It is hoped that the students & Practitioners will find the book useful for understanding the **Metals specially Sapta dhatu** as well as clinical and theoretical point of view.

Dr. Vivek Awasthi
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Dr. Nitin Urmaliya

INTRODUCTION

Charaka Samhita reveals that Ayurveda utilized metals for various therapeutic and non-therapeutic purposes. The text emphasizes the need to observe great caution while using metals, and directs that they should be reduced to micro-fine powders through the specially designed process 'Ayaskriti'. The reduced metals may contain associated compounds together with major elements, which have their own significance in the process of disease pacification. In addition, a few of the metallic powders also may provide nourishment, as they are a combination of many trace elements and electrolytes.

Ayurveda is the science of life. It shows the way to remove diseases, to keep up sound health and attain longevity. The lord Brahma himself propounded the life of science first. He composed the first book of Ayurveda consisting of one hundred chapters of one hundred slokas each, which is also the oldest medical book of Hindus. It has eight parts:

(1)Shalya: Surgery (2) Shalakya: diseases of eye, nose, mouth, ears etc. and their treatment (3) Kaya Chikitsa: general diseases of body and their treatment (4) Bhoot vidya: treatment of diseases caused by evil spirits/souls (5) Kumara Bhritya: it treats the diseases of children (6) Agada tantra: description and treatment of poisonous drugs (7) Rasayana: science of Rejuvenating the body (8) Bajikarana: aphrodisiac or science of acquiring virile strength.

According to Ayurveda, the definition of healthy body is, "a person should not only be free from physical ailments but also should be mentally happy and spiritually elevated". To achieve the above, Ayurveda enforces to follow the principles of Ahar (diet), Vihar (activity) & Aushadhi (medicines).

The last part i.e. Aushadhi comprises of three categories:

1).Herbal Product

2).Animal Product

3).Metals & Minerals

To attain the happy & healthy life herbal products were extensively used in the classic age in all branches of Ayurveda. Metals & minerals were also used as a part of therapeutic agent

but less frequently as compared to herbal drugs. As these metals, minerals & costly stones etc. has proved efficacy in attaining all three requirement viz. physical, mental & spiritual health, it became very popular among the physicians & this uninterrupted popularity of these magic metals gave birth to a new specialized branch in Ayurveda i.e. "Rasashastra".

Rasashastra is an Ayurvedic pharmaceutics, which deals with chiefly the drugs of metals & minerals origin, their varieties, characteristics, processing techniques, properties & their therapeutic doses. However, it also includes the drugs of plant and animal origin.

The ancient chemist after classifying mercury as the 'rasa' after which, this branch has been named, classified the other metals, minerals & gems into dhatu, upadhatu, ratna, uparatna, maharasa, uparasa, sadharanarasas & sudha and sikta varga and also visha and upavisha varga later on.

Aim of Rasashastra:

There are many basic principles of Ayurveda. One of them is "Purushartha". There are four Purusharthas considered in Ayurveda: 1) Dharma 2) Artha 3) Kama 4) Moksha. Rasa Shastra is a branch of Ayurveda, deals with Herbal, mineral and metallic drugs, is a resultant of these four Purusharthas.

धर्मार्थमुपभोगानां नष्टराज्यविवृद्धये।
आयुर्यौवनलाभाथ मुक्त्यर्थं च मुमुक्षुनाम्।।(रसोपनिषद्)

To regain the Empire, to consume Dharma and Artha, to achieve youth and longevity and at the end to get Moksha, is the aim of Rasa Shastra.

The invention of Rasa Shastra is based upon two vadas; Dehavada and Dhatuvada or also called as Deha Siddhi and Lauha Siddhi. Meaning of Lauhavada is transformation of lower metals (copper, tin) to the higher one (gold, silver) and Dehavada is to make body free from all ailments, ageing and attaining of perfect health. According to some people, the aim of origin of Rasa Shastra was 'Lauhavada', but it is written in Rasa Hridaya Tantra;

इति धनशरीरभोगान् मत्वा अनित्यान् सदैव यतनीयम्।
मुक्तौ, सा च ज्ञानात्, तच्चाभ्यासात् स च स्थिरे देहे।(रस.हृ.त.1/10)

Metallic transformation from lower metals like copper, tin into gold or silver, was not the aim of the Pioneers of Rasa Shastra. Wealth and Physical comforts were useless in their view. Their main aim was; to achieve 'Moksha', that's why it is written in Sarvadarshan Sangraha;

न च रसशास्त्रं धातुवादार्थमेवेति मन्तव्यं।
देहवेधद्वारा मुक्तिरेव परमप्रयोजनत्वात् ।। (सर्वदर्शनसंग्रह)

Importance of Rasaushdhis:

Most important drug of Rasa Shastra described in different texts is 'Mercury' (Parada).we can even attain Deha Siddhi and Lauha Siddhi by virtue of miraculous properties of the mercury. It has a quality to assimilate all the matters of Earth in it. In this context a sloka is described in Rasaratna Samuchaya;

काष्ठौषध्यो नागे नागो वङ्गेऽथ वङ्मपि शुल्वे ।
शुल्वं तारे तारं कनके कनकं च लीयते सूते ।। (र.र.समु.1/41)

Mercury has a specific quality to dissolve all the matters in it just like; atma (soul) merges in Parmatma (god). In this connection all the plant drugs merges into Lead, Lead merges in Tin, Tin in Copper, Copper in Silver, Silver in Gold and finally Gold merges in Mercury. This is the serial of merging matters into the Mercury.

न रोगाना (दोषानां) न दूष्यानां न च पुंसां परीक्षणम्।
न देशस्य न कालस्य कार्ये रस चिकित्सते।। (र.जलनिधि 4/29)

Rasaushadhis and their bhasmas are not dependent on doshas, dushyas, desh, kala and rogi. So rasaushadhis can be used without examining the above factors. Again founder of rasa shastra have described the importance and greatness of Rasaushadhis as;

स्वल्पा हि मात्रा विपुला गुणाश्च सद्यो हि तद्दीपनपाचनं च।।
(र.चूड़ामणि 1/33)

Lower therapeutic dose, instantaneous effect, easily palatable and easily digestive: these are the properties of rasaushadhis described in Rasendra chudamani.

अल्पमात्रोप्रयोगित्वादरुचेरप्रसंगतः।
क्षिप्रमारोग्यदायित्वादौषधेभ्योऽधिको रसः ।। (र.सा.सं. 1/4)

Rasaushadhis are therapeutically effective even when, we use it in smaller dose (not like plant based medicines which we use in much larger dose), they are easily palatable (unlike some plant drugs which are not easily palatable due to their bitter or pungent tastes), and gives result instantly. In comparison of vegetable drugs and surgical therapies these metallic and mineral preparations (rasaaushadhis) are recognized superior for the treatment of different ailments.

उत्तमो रसवैद्यस्ते मध्यमो मूलिकादिभिः।
अधमः शस्त्रदाहाभ्यामित्थं वैद्यास्त्रिधा मताः।।

Rasa Vaidya is considered as superior among the physicians of all therapies, the physicians who use the remedies of herbal product is inferior to Rasa vaidya and the physician who treats with surgical instruments, cautery etc. is considered as Adhama(having less importance).

Metals:

A word metal is derived from the Greek word *métallon*, which means "mine, quarry. metal is a material which may be an element, compound or alloy and that is typically hard, shiny, lustrous, opaque, and having good electrical and thermal conductivity. Metals are generally malleable , they can be permanently pressed or hammered, changing its shape without breaking or cracking as well as having quality of fusibility (able to be fused or melted) and ductility (able to be drawn out into a thin wire).

Physical properties of Metals:

Metals in general have:

1) High electrical conductivity
2) High thermal conductivity.
3) Having high density.
4) They are malleable and ductile, deforming under stress without cleaving.
5) Metals are shiny and lustrous.
6) Sheets of metal beyond a few micrometers in thickness appear opaque.
7) Metals are sonorous i.e. they produce sound.Although most metals have higher densities than most nonmetals, there is wide variation in their densities, Lithium being the least dense solid

element and osmium the densest. The alkali and alkaline earth metals in groups I A and II A are referred to as the light metals because they have low density, low hardness, and low melting points. The high density of most metals is due to the tightly packed crystal lattice of the metallic structure. The strength of metallic bonds for different metals reaches a maximum around the center of the transition metal series, as those elements have large amounts of delocalized electrons in tight binding type metallic bonds. However, other factors (such as atomic radius, nuclear charge, number of bonds orbital, overlap of orbital energies and crystal form) are involved as well. There are 118 elements are mentioned in the periodic table, out of which about 90 elements are metal (some elements appear in both metallic and non-metallic forms).

Ayurvedic view:

धातुर्लोहे लुह इति मतः सोऽपिकर्षार्थवाची। र.र.समु. 5/1)

The word 'Loha' is derived from 'Luh Dhatu', which means-'to pull out' or 'to extract'. In ancient time people used this word Loha for the ores which is having any metal in it. Metals are extracted or pulled out from these ores, so it is named as Loha, but now a days we use the word Dhatu for metals as well as Loha for Iron.

म्जलउवसवहल वर्किंजनरू
वलीपलितखालित्य काश्र्यबल्यजरामयान्।
निवार्य दधते देहं नृणां तद्धातवो मताः ।। (आयु.प्र. 3/2)

Dhatu is a substance which prevents Vali, Palitya, Khalitya, Krashta, Daurbalyta, Jara, and other ailments and restores potency and strength of the body.

From historical point of view it is evident that the science of metallurgy of the modern age has developed much later but this does not mean that metals & minerals were not in use in old age. As per historic text like Rigveda & Atharvaveda have mentioned about the medicinal values of certain metals like gold & silver. That's why it is also considered that the Hindus (Indians) were the pioneers to use metals for medicinal purposes.

The actual development of Rasa shastra took place in the period of Koutilya, where extensive use of metals & minerals is found. Many methods for shodhana (Purification), marana (Incineration) of metals & minerals indicate the importance given to avoid toxic effects of these medicines during the above period.

From thousands of years these metallic preparations are manufactured with the help of various methods explained in the classical text to avoid its toxicity but sometimes these medicines prepared from metals & minerals may produce toxicity when used for long period, without proper dose or without the use of proper purification methods at the time of medicine manufacturing.

To avoid any further rumor regarding the toxicity of medicines prepared from the metals & minerals, it is the duty of people of Ayurveda to provide proper guideline for quality

control of raw material & processes so that only non-toxic medicines could be made.

Though metals can be used to make everyday objects like kitchen or household appliances, they also play an important role in our bodies. They have been known to cure various diseases, heal wounds and add supplemental value to our diets. From creating new blood cells to activating enzymes, we need metals to survive and function.

The use of metal complexes In medicine to diagnose or treat patients with different medical conditions is well established. However, the field is currently undergoing a paradigm shift; formerly, after the discovery of a useful compound, the primary mechanism of action was subsequently investigated, whereas today, the mechanism of action is increasingly used to drive the discovery process. This approach benefits from the specific properties of metal complexes that can be tuned to optimize the drug-like properties of the metal compound.

Whether we use it to treat a headache or back pain, metal complexes in both conventional and alternative medicines present a wide range of benefits for our bodies. Metal ions are required for many critical functions in humans. Scarcity of some metal ions can lead to disease. Well-known examples include pernicious anaemia resulting from iron deficiency, growth retardation arising from insufficient dietary zinc, and heart disease in infants owing to copper deficiency. The ability to recognize, to understand at the molecular level, and to treat diseases caused by inadequate metal-ion function constitutes an important aspect of medicinal bioinorganic chemistry.

Metal ions can also induce toxicity in humans, classic examples being heavy-metal poisons such as mercury and lead. Even essential metal ions can be toxic when present in excess; iron is a common household poison in the United States as a result of accidental ingestion, usually by children, of the dietary supplement ferrous sulphate. Understanding the biochemistry and molecular biology of natural detoxification mechanisms, and designing and applying ion-specific chelating agents to treat metal overloads, are two components of a second major aspect of the new science that is evolving at the interface of bioinorganic chemistry and medicine.

Less well known than the fact that metal ions are required in biology is their role as pharmaceuticals. Two major drugs based on metals that have no known natural biological function, Pt (cisplatin) and Au (auranofin), are widely used for the treatment of genitourinary and head and neck tumours and of rheumatoid arthritis, respectively. In addition, compounds of radioactive metal ions such as Tc and complexes of paramagnetic metals such as Gd(III) are now in widespread use as imaging agents for the diagnosis of disease. Many patients admitted overnight to a hospital in the U.S. will receive an injection of a Tc compound for radio diagnostic purposes. Yet, despite the obvious success of metal complexes as diagnostic and chemotherapeutic agents, few pharmaceutical or chemical companies have serious in-house research programs that address these important bioinorganic aspects of medicine.

Here's a list of metals used in over the counter (OTC) drugs, such as aspirin and ibuprofen:

1.Copper : Copper is an easily moulded base metal that is often added to precious metals to improve their elasticity, flexibility, hardness, colour, and resistance to corrosion.

As the Egyptians documented, copper is known to kill many germs on contact. Dr. Bill Keevil at the University of Southampton found that MRSA (an antibiotic-resistant strain of bacterial staph) cannot survive on copper surfaces the way it can on the platinum metals often used in hospital building railings, doorknobs, and beds. With the help of his research, hospitals are installing copper touch surfaces around the world to halt the spread of bacterial infections in hospital settings.

For thousands of years, copper has been so widespread that most people encounter it without even noticing. Ancient Egyptians used copper to disinfect wounds and surgical tools, and the earliest copper alloy weaponry dates back to the mid-.th millennium B.C. From building tools to biology, copper is an essential part of human life. We even need 1.2 milligrams of copper daily to help enzymes transfer energy inside our cells. Here are some facts about common uses for copper today:

- Sodium
- Calcium
- Potassium

- Chromium
- Magnesium
- Molybdenum

COMMON FEATURES AND PROCEDURES OF METALS

Natural colours of Metals:

स्वभावो रक्तता ताम्रे शौक्ल्यं तारे व्यवस्थितम् ।
शौक्ल्यं काष्ण्यसहितं वंङ्नागे प्रपठयते।। (रसोपनिषद् 7/2)

Rasopnishat stated that there is swabhawika raktata (natural redness) in Tamra and swabhawika shuklata (natural whiteness) in Rajat, likewise Vanga and Naga has Shyamtasahashuklata (whitish and blackish mix).

Natural Colors of metals have been illustrated as:

Swarna & Peetal-		Peetavarna(yellow)
Rajat & Vanga	-	Shuklavarna(white)
Tamra	-	Raktavarna(red)
Iron &Naga	-	Krishnavarna(black)
Kansya	-	Shweta(white)

Flame Test of Metals:

आवर्त्तमाने कनके पीता तारे सिताप्रमा।
शुल्वे नीलनिभा तीक्ष्णे कृष्णवर्णा सुरेश्वरि।।49।।
वङ्गे ज्वाला कपोताभा नागे मलिनधूमका।
शैले तु धुसरा देवि। आयसे कपिलपभा।।50।।
अयस्कान्ते धूम्रवर्णा सस्यके लोहिता भवेत्।
वज्रे नानाविधा ज्वाला खसत्वे पाण्डुरप्रभा।। (रसार्वव 4/51)

According to Rasarnava If we burn or put the metals on fire, specific types of flames appears in each metal, due to color of this flame we can recognize the metal.

1) Swarna	-	Peetvarna jwala
2) Rajat	-	Shwetavarna jwala
3)Tamra	-	Neelvarna jwala
4)Tiksnaloha	-	Krishnavarna jwala
5)Vanga	-	Kapotavarna jwala
6) Naga	-	Malindhumravarna jwala
7)Lauha	-	Kapilavarna jwala
8)Ayaskanta	-	Dhumravarna jwala
9)Tutha	-	Lohitavarna jwala
10)Vajra	-	Nanavidha jwala(mixed coloured)

11)Abhrraksatva	-	Panduravarna jwala
12)Shilajatu	-	Dhusaravarna jwala

अग्ना सुवर्णमक्षीणं रजते द्विपलं शते।
अष्टौ त्रपुणि सीसे च ताम्रे पहच दशायसि।।
(याज्ञ. स्मृ. व्यव. 178)

In Yagvalkya Smriti six metals and their loss after melting them in fire are described as follows:

1. Swarna	-	no loss
2. Rajat	-	2pala/100pala(2%)
3. Vanga	-	8pala/100pala(8%)
4. Naga	-	8pala/100pala(8%)
5. Tamra	-	5pala/100pala(5%)
6. Lauha	-	10pala/100pala(10%)

Common Purification of Metals:

तैल तक्रे गवां मूत्रे ह्मारनाल कुलत्थजे।
क्रमान्निषेचयेतप्तं द्रावे द्रावे तु सप्तधा।।
स्वर्णादिलोहपत्राणां शुद्धिरेषा प्रशस्यते।। (र.र. समु. 5/13)
निषिहचत् तप्ततप्तानि तैले तक्रे गवां जले।
कांहिजकेऽथ कुलत्थानां कषाये सप्तधापृथक्।। (आ.प्र. 3/50)
सूचिवेध्यानि पत्राणि धातूनान्तु समाहरेत्।
यावद्वहिप्रभाणि स्युस्तावद्धह्मौ प्रतापयेत्।।
स्नपयेतप्ततप्तानि काहिजके तु त्रिधा त्रिधा।
तक्रे कुलत्थक्वथिते गोमूत्रतिलतैलयोः।।
एवं विशुद्धिमायान्ति स्वर्णाद्याः सप्तधातवः।
समासतः समाख्यातमिदं सामान्य शोधनम्।।(र.त. 15/4–6)

Samanya shodhan(common purification) for all the metals is cited in Rasa Ratna Samuchaya. Thin patra(leaflets) of metals should be made first, and then after getting it red hot on fire, it should be dipped seven times in Taila (Tila oil), Takra (butter milk), Cow Urine, Aranala (type of vinegar) and Kulattha Kwata (Dolichosbiflorus Linn.) subsequently. Applying this method all the metals becomes purified.

सर्वलोहानि तप्तानि कदलीमूलवारिणी।
सप्तधाऽभिनिषिक्तानि शुद्धिमायान्त्यथोत्तमाम्।। (आ.प्र.3/54)
प्रतप्तानि तु लोहानि रम्भामूलजले भिषक्।
निषेचयत्सप्तवारं विशुद्धयति न संशयः।। (र.त.15/7)

After heating or melting the metals, it should be dipped into kadlikand swarasa seven times. In this way all the metals get purified. This method of purification is described in Ayurveda Prakash and Rasa Tarangini.

शशक्षतजसंलिप्तं त्रिवारं परितापितम्।
मुण्डादिसकलं लोहं सर्वदोषान्विमुहचति।। (र.र.स. 5/101)

First Trituration of the metals should be done with rabbit blood. After that, metals should be made red hot. Applying this method three times metals gets purified.

Incineration of Metals:

तालेन वंङ्गं दरदेन तोक्ष्णं नागेन हेमं शिलया च नागम्।
गन्धाश्मना चैव निहन्ति शुल्बं तारंहच माक्षीकरसेन हन्यात्।।
(रसेन्द्र मंगल 2/54)

For the Incineration of metals very beautiful lines are written in Rasendra mangal by Acharya Nagarjuna that, Vanga can be easily incinerated by Hartala, Iron by Hingula, Swarna by Naga, Naga by Manahshila, Tamra by Gandhaka and Rajat by Makshika.

न सोऽस्ति लोहमातांङ्गेऽयं न गन्धककेसरी।
निहन्याद्गन्धमात्रेण यद्वा माक्षिककेसरी।।(रसार्णव 7/150)

According to Rasarnava, None of the metal is so much strong (as Elephant) which can not be Incinerated by Gandhaka (like lion) and Makshika(like lion), That means Makshika or Gandhak solely have a power to Incinerate all the Metals.

मनःशिलागन्धकसूर्यदुग्धैः सम्मर्द्य खल्वे खलुसप्तलोहम्।
वन्योत्पलाग्नौ पुटितं प्रयत्नादनुत्तमां याति मृति ह्यवश्यम्।।
(र.त.15/8)

One of the seven metals should be taken and rubbed with Manahshila, Gandhak, and Arka milk. Then make small round flat cakes of it. After Sharava samputikarana, give it appropriate required putas, untill the bhasma is prepared.

नागेन स्वर्ण रजतं च ताप्यैः गन्धेन ताम्रं शिलया च नागम्।
तालेन वंङ्ग त्रिविधं तु लोहं नारीपयो ध्नन्ति च हिंङ्गुलेन ।।27।।
तथाऽभ्रसत्त्वं वलिनोपलोहं वज्रेण सूतं विनिहन्ति सद्यः।(आन.क.क्रि. 7/28)

According to Anandkand, Naga is used for the incineration of Swarna, Makshika for Rajat, Gandhak for Tamra, Manahshila for Naga, Haratala for Vanga, Hingula and human milk for Lauha and Abhraka Satva, Gandhaka for Upaloha and Vajra(diamond) should be used for the incineration of Parada.

वंश पलाशेन च तालकेन नागं रवेर्दुग्धमनः शिलाभिः।
हेमं तथा वज्रिरसेन नागे तारं स्नुहीक्षीरसुमाक्षिकेण।।
शुल्बं अजाक्षीरसुगन्धकेन तीक्ष्णं सुनारीपयहिंगुलेन।
मृतानि लोहानि रसीभवन्ति रसेन युक्तत्यामयनाशनानि।।
(रसेन्द्रमंगल 2/55.56)
रूक्मं शिलानागसुधादकेण तारं स्नुहीक्षीरसमाक्षिकेण।
शुल्बं त्वजाक्षीरसगन्धकेन वंङ्ग पलाशद्रवतालकाभ्याम्।।
शिलार्कदुग्धेन निहन्ति नागं सूतेन तीक्ष्णं दरदेन युक्तम्।
(रसकामधेनु 2/1/20)
रसीभवन्ति लोहानि मृतानि सुरवन्दिते।
हरिन्त सकलान् रोगान् रसयुक्तानि किं पुनः।।(रसार्णव 7/151)

In Rasarnava it is described that all the metal Bhasmas becomes Rasamaya (easily dissolves into Rasa, Rakta dhatu) after intaking it. They show the quality of rejuvenators and if metal bhasmas incinerated by Parada is administered, it shows great result and destroys all the ailments of the body.

लेहानां मारणं श्रेष्ठं सर्वेषां रसभस्मना।
मूलिभिर्मध्यमं प्राहुः कनिष्ठं गन्धकादिभिः।।
अरिलाहेन लोहस्य मारणं दुर्गुणप्रदम्। (र.र.समु 5/14)

Here qualities of metallic bhasmas, incinerated with various matters are differentiated. Metals incinerated with mercury are considered to be the best one, metals incinerated with Kashthaushadhis are of medium quality, metals incinerated with Gandhaka etc. are supposed to be lower quality and lastly metals incinerated by their enemy metals (ariloha) are considered as lowest one.

लोहं सूतयुतं दोषांस्त्यतेत्सूतस्तु लोहयुक्।
अतः स्वर्णादिलोहानि विना सूतं न मारयेत्।। (पारद संहिता)

Again it is said in Parada samhita that none of the metal should be incinerated without the help of Parada. By incinerating with

Parada, metals leave their demerits and toxicity as well as Parada also becomes defectless. So it is recommended that all metals should be preferably incinerated with the help of Parada.

न रसेन विना लोहं न रसं चाभ्रकं विना।
एकत्वेन शरीरस्य बन्धो भवति देहिनः।।38।।
चपलन विना लौहं यः करोति पुमानिह।
उदरे तस्य किट्टानि जायते नात्र संशयः।। (रसेन्द्रचिन्ता. 6/39)
स्वर्णरूप्यवधे ज्ञेयं पुटं कुक्कुटकादिकम् ।
ताम्रे काष्ठादिजो वह्निर्लोहे गजपुटानि च।। (आयु. प्र. 3/47)

For the Incineration of Swarna and Rajat always Kukkuta Puta should be applied, Kashthagni (woodfire) for Tamra bhasma and for Lauha marana, Gajaputa should be used.

Amratikarana:
लोहादीनां मृतानां वैशिष्ट दोषापनुत्तये।
क्रियते यस्तु संस्कार अमृतीकरणं मतम्।। (रसतरं. 2/58)

After the incineration process some specific impurities still remains in metals, beside this, applying incineration process again and again, bhasmas aquire Ushnata, Tikshanata and Rukshta. To remove all this factors and to obtain improved and safer remedy, the process of Amratikaran is used.

ज्मेज वि ठींउेंरू
मृतं तरति यत्तोये लोहं वारितरं हि तत् ।।26।।
अंगुष्ठतर्जनीस्पृष्टं तत्तद्रेखान्तरे विशेत् ।
मृतं लोहं तदुद्दिष्टं रेखापूर्णाभिधानतः ।।27।।
गुडगुञ्जासुखस्पर्शमध्वाज्यैः सह योजितम् ।
नायातिं प्रकृतिं ध्मानादपुनर्भवमुच्यते ।।28।।
तस्योपरि गुरू द्रव्यं धान्यं चोपनयेदध्रुवम् ।
हंसवत्तीर्यते वारिण्युत्तमं परिकीर्तितम् ।।29।।
रौप्येण सह संयुक्तं ध्मातं रौप्येण नो लगेत् ।
तदा निरुत्यमित्युक्तं लोहं तदपुनर्भवम् ।। (र.र.स. 8/30)

So tests are as follows -
1)Varitara:
Take water in a pot and sprinkle some bhasma on the water. If bhasma remains floating and none of its particle goes down the water, then it is considered as Varitara.

2)Rekhapurna:
A pinch of bhasma should be holded in between the thumb and index finger. If the bhasma is microfined then, its particle will enter the lines of the finger. This is called Rekhapurnatwa.

3)Apunarbhava:
This is called irreversible condition of Bhasma. Mitrapanchak i.e. Ghrita, Gunja, Honey, Borax, and Guggula should be added in Bhasma and heated. These drugs reduce the melting point of any metal and metal reverts to its original form after heating. But if the bhasma is cooked properly then the metal will not come to its original form and bhasma is called as Apunarbhava.

4)Uttama:
This is the next step of varitara test. If we put a rice seed on floating bhasma in a water pot, the rice seed will not drown and the bhasma is called as Uttama.

5)Niruttha;
Some Rajat should be added with bhasma and heated. If some part of the bhasma mixes with Rajat, then the bhasma is not incinerated properly and if it doesn't react with Rajat then it is called as Niruthha.

6)Avami:
If intaking of bhasma doesn't produce vomiting, then the bhasma is considered as Avami.

7)Nishchandra:
Luster should not be seen in bhasma. Bhasma should be taken on palm in sunlight, if it doesn't show any luster then, the bhasma is considered as Nishchandra.

8)Nirdhuma:
Sprinkling the bhasma on fire, if smoke doesn't arises then, the bhasma is Nirdhuma

9)laghu:
Bhasma should be very light in weight.

10)sukshma:
Particles of bhasma should be very fine.

11)Shlakshna:
Bhasma should be very smooth in touch.

12)Niswadu:
Bhasma should be tasteless just like ash.

13)Mridu:
Bhasma should be very soft in touch.
14) Varna:
Bhasma should have their original colours which are defined in Ancient texts. Like Abhraka bhasma is Ishtika churnavata(brick red), Swarna bhasma is Gairika varnavata.
15)Dantagre-kachkachabhava:
Putinng bhasma in between the teeth doesn't produce any sound. This is called Dantagre- kachkachabhava.
16)Amla Pariksha:
This is specially done for Tamra bhasma. Tamra bhasma should be sprinkled over any acidic media like curd, lemon juice etc., if the color changes then, it is not properly incinerated.
In these tests Apunarbhava, Niruttha, Nishchandra, Varitara, Amlapariksha are specially used for Metallic bhasmas.

Colours of Different Bhasmas:
स्वर्णचम्पकवर्णाभं कृष्णत्वं तारताम्रयोः ।
कांस्यं धूसरवर्ण स्यान्नागः पारावतप्रभः ।।
वङ्गं शुभ्रत्वमायाति तीक्ष्णं जम्बूफलोपमम् ।
अभ्रकं चेष्टिकाभं स्याद्धातूनां वर्णनिर्णयः ।। (योगरत्ना. पूर्वा. धातु.)
अपि च जाम्बवार्भ सुवर्णस्य भस्म प्राहुभिषग्वराः ।। (आ.प्र. 3/76)

In Yogaratnakar colours of different bhasmas are given:

1)	Swarna bhasma	- Gairika and Champaka varna
2)	Rajat and Tamra bhasma	- Krishna varna
3)	Kansya bhasma	- Dhusar varna
4)	Naga bhasma	- Kapota varna
5)	Vanga bhasma	- shweta varna
6)	Tikshnaloha bhasma	- Jambuphala varna
7)	Abhrak bhasma	- Ishtikachurna varna

As per literature given above we should follow these procedures to obtain good quality of medicaments.
So Now details of metals are as follows -
GOLD :
Gold is one of the most common alloyed metals with copper. In most jewellery stores, you'll spot:
- 18K yellow gold
- 18K palladium white gold
- 18K rose gold

- 18k pink gold
- 18K light green gold

In fact, 18K yellow gold is the most commonly used gold alloy in jewellery-making.

SILVER : Sterling silver

Sterling silver is also a copper alloy used to make utensils, tableware, and jewellery. It's a harder alloy than gold, making it an obvious choice for:

- Body jewellery
- Belt buckles
- Cufflinks
- Bracelets
- Rings
- Necklaces

Much sterling silver jewellery is also non-irritating thanks to copper's hypoallergenic properties.

Transition metals are a group of chemical elements found between columns three through twelve on the periodic table. Together, they make up the largest section of the periodic table as it includes metals like copper, gold, and titanium.

Transition group metals also have been used to treat several diseases for thousands of years. In fact, Egyptians were one of the first known civilizations to use iron to cure malaria during mid 1.th century BC. However, today's developments in medicine have allowed us to support life-threatening conditions, improve cancer medications and control red blood cell production.

These three metals are used in modern medicine:

1. Iron

Iron is one of the most vital minerals in our bodies, and medical applications are mined from iron ore. Although the average person consumes between 8-18 milligrams of iron per day, there are certain cases where it may be necessary to add in more iron to your diet. For example, iron supplements are used to treat low blood levels–which is caused by pregnancy, poor diet, blood loss or the inability to absorb iron.

2. Zinc

Zinc is a metal found in every tissue of the body. It is often called a "trace element," because very small amounts of zinc are

needed to support a healthy lifestyle. Zinc can be used to treat a number of severe medical conditions, such as:

- Crohn's disease
- Down syndrome
- Hansen's disease
- Alzheimer's disease
- Ulcerative colitis or inflammatory bowel disease
- Attention deficit-hyperactivity disorder (ADHD)
- Hypogeusia (or a reduced ability to taste things like sweet, sour, bitter, or salty substances) Research also suggests that zinc stimulates the activity of at least 100 different enzymes in the human body, which can prevent further risks related to these diseases.

3. Platinum

Platinum is a precious metal that has been used in a variety of medications and tools since the early 1970s. Its dense, malleable properties are essential to the production of pacemakers, catheters, stents and even cancer therapies.

According to the International Journal of Cancer Research and Treatment, platinum-based agents are used in more than .0 percent of the world's anticancer drugs. Cisplatin–along with its successor drug, carboplatin–also use platinum complexes in the treatment of common tumors, such as breast, ovarian and lung cancer. Although these healthy metals made remarkable improvements in the field of medicine, there's still a greater demand for its applications in other industries.

Formation of ayurvedic medicines : compound formulations are mainly originated from plants (Kasthausadhi) and metals and minerals (Rasausadhi). In Ayurveda, impurified states of mercury, gold, silver, copper, iron, and sulfur are used to convert to Bhasma form. However, the use of metals is regarded as toxic in modern medicine. Interestingly, an ancient knowledge system has utilized the herbal qualities of metals by developing various formulations via chemical and physical modifications. Different manufacturing processes have been employed to ascertain different herbal constituents. In Ayurveda, to assess the quality of the final drugs, subjective parameters are used, while in modern medicine, multiple analytical and advanced biotechniques are employed. The Ayurveda system poses different scales and

parameters and can compare those with present scientific scales rapidly. In-depth scientific studies may be required to ascertain the essence of Ayurveda concepts to make them more applicable to modern medicine.

The system of Ayurveda has a long h”stor’ and is approximately as old as the Vedic age. At present, most people prefer Ayurveda as an alternative to allopathic medicines because it is significantly cheaper and has fewer side effects. The products obtained from natural resources have been essential for maintaining and healing life for millennia. They are used following the processing or formation of raw materials from which robust chemical structures with promising biological activity are isolated. Nowadays, products from natural resources are becoming increasingly essential as complementary and alternative medicines and sources of pharmaco-therapeutics. Almost half of the population of the United States has tried natural medicines to prevent and/or treat diseases. Chemicals posing medicinal values are considered as active ingredients of natural therapies. For new drug development, natural products have been used as a primary resource. Nearly half of the Food and Drug Administration (FDA)-approved drugs from the 1940s to the end of 2020 were developed from natural products. In natural medicine, the active ingredients are relatively low in quantity, and cumbersome extraction and isolation processes have been the limiting factor in applying natural drug development products. Therefore, the development of efficient methods for extracting and isolating natural bioactive products is appealing.

The minerals and metallic preparations with healing properties occupy a significant area in the Ayurvedic pharmacopeia, which has been practiced in different parts of India for many centuries. Interestingly, those preparations are safe and, even in minute doses, are effective, provided that they are manufactured and used following the specified classical guidelines. However, over the past decade, several concerns have been expressed by the scientific community in the West regarding the safety of Ayurvedic preparations, including various minerals and metallic medical products. Ayurvedic medicines are based on plants, extracts of animals, and by-products of

minerals as single drugs and/or compound formulations. Moreover, in Ayurveda, all substances are regarded as a potential source of medicine.8 With the aid of different manufacturing processes, Ayurvedic herbal dosage forms are formulated. Ayurvedic compound formulations mainly originate from plants (Kasthausadhi) and metals and minerals (Rasausadhi). Plant formulations such as Asavaristra, Avleha, Grafa Churena, and Taila, and metal and mineral formulations such as Bhasma, Lauha Kapibadkva, and Rasayana are described in Ayurveda.

Rasa Rasayana : Word Rasayana is derived from "Rasasya Ayanam Rasayanam" which means the way of obtaining a good Rasa is Rasayana. Acharya Dalhana has explained that the methods which improve youth and enhance longevity by attaining best quality body tissues are termed as Rasayana. The word Rasayana is comprised of two terms i.e., "**Rasa**" and "**Ayana**". Term Rasa has many connotations. It is used for juice, alchemy, taste, first Rasa Dhatu etc. Word Rasa, in relation to Rasayana therapy means the Rasa Dhatu and Ayana means the path of circulation. Thus, it can be said that Rasayana is related to the nutrition and its transportation in the body. In this fast moving world our life style has become very hectic. Stress is an in escapable part of personal and professional life. In order to achieve the things for better and pleasurable living there is hardly any time for exercise. Dietary habits have become faulty as many people are into the habit of fast food.[6] Timings of eating have become irregular due to change in the duties and more and more persons are using stale foods with preservatives. More and more people are becoming addicted to alcohol, smoking and drugs.[7] All these factors are responsible for vitiation of Doshas and Agni, thus causing improper nutrition to the tissues, low immunity, fatigue, debility, inability to adapt to stress and premature aging. Rasayana foods, herbs and regimens help to re-establish this balance.

1. Classification of Rasayana

Dravyabhuta-Rasayana: When Rasayana effect isobtained using Dravyas like herbs,

Minerals, herbo-mineral drugs, food, milk etc. it is known as Dravyabhuta-Rasayana.

Adravyabhuta-Rasayana: Where no substance is used and Rasayana effect is obtained by good moral conduct, meditation etc. then it is called as Adravyabhuta-Rasayana. E.g., Achara-Rasayana.

2. According to scope of use

Kamya-Rasayana: These are used in healthy persons for further promotion of health. It is further sub-divided into;

A. Pranakamya – one which promotes longevity.
B. Srikamya – promotes body lusture.
C. Medhakamya – promotes memory & intellect

Naimittika-Rasavana: The Rasavanas which are used specifically in the prevention or treatment of specific diseases are termed as Naimittika-Rasayana. This is the prime area where Rasayana drugs are mainly studied and tested in present times.

Some of the examples are

Pandu – Loha, Mandura, Swarnmakshika
Prameha – Haridra, Shilajatu, Amalaki
Kushtha- Khadira, Tuvaraka, Triphala, Bhallatak
Mutravahasrotas Vyadhis – Gokshuru, Punarnava, Shilajatu
Vata Vyadhi – Shilajit, Guggulu, Rasna, Bala
Eye diseases – Triphala, Madhuyashti
Respiratory diseases- Pippali, Sirisha, Chyawanprasha
Psychiatric disorders- Ashwagandha, Shankhpushpi, Brahmi

Ajasrika Rasavana: Food substances which we consume in our daily life on regular basis in moderation for nourishment of body tissues. Examples are daily usage of milk & ghee.

3. According to method of administration

Kuti Praveshika Rasayana: This is basically the indoor method of Rasayana administration. As per the textual reference person was made to stay in a specially designed Trigarbha chamber for a particular period and Rasayana drug was administrated after bio purification with Panch-Karma.

Along with Rasayana drug patient is also advised to follow strict diet schedule and specific code and conduct of life. Thus, it is administration of Rasayana under strict controlled conditions. This is superior method of administering the Rasayana as maximum benefits can be obtained from this.

In Ayurveda, use of mineral drugs is called Rasa Rasayana or Ras-yoga. Rasibhavana relate to the ability of Bhasma to act

on the body, which mimics fluid containing nutrients that are circulating inside the body. The impurified states of mercury, gold, silver, copper, iron, and sulfur are used to convert to Bhasma form; subsequently, other herbs are added in aliquots and grounded to form a fine powder. Drugs such as Gandhaka and Manaḥaśila are used in purified form. Rasa and Gandhakaare, the components of a formulation of Kajjalī, are prepared, and fine powders of other specified drugs are added in specified quantities. The color and smell of the formula depend on the type of metal.

The ”aura Kalpa is formed following mixing powders of active drugs with Loha Bhasma. The powder mixture (churnas) is prepared by sieving the dry drugs through a fine cloth. Laura Kalpa in Churna form is prepared following the addition of finely powdered herbal medicines to the Lauha Bhasma. Until a homogeneous mixture is formulated it is triturated. Physicians mastered the art of Bhasma preparation relatively safely and effectively. The processing of Bhasma was remarkable, with the whole idea being to remove the toxicity of the minerals and metals in the therapeutic doses. To assess the safety of these formulations, physical and chemical tests have been developed, and the ancient texts discuss such tests. Interestingly, they considered the size of the particle, its density, and its chemical and physical stability under high temperature. The characteristics of properly processed Bhasma should include: once rubbed between the thumb and the index finger Bhasma particles are powdered to settle in the ridges of fingers; it should float on the surface of water; once mixed with the jaggery, fruits of Abrus precatorious Linn., ghee, honey, and borax and subjected to intense heating it should never re-appear as the original mineral or metal used to prepare the Bhasma. Special attention is required to keep the temperature below the temperature used to test the quality of Bhasma.

Moreover, the Bhasma is placed in a crucible with an equally weighted piece of silver metal, and the crucible is heated for 3 hours, at the exact temperature used for the preparation of Bhasma. Thus, heating should not change the weight of the silver metal pieces, with any change indicating that the Bhasma has not been correctly prepared. Bhasma that fails to

retain the described physical and chemical parameters is considered to be toxic. It is worth noting the harmful and poisonous effects of mercury and other minerals and metals for the therapeutics following improper or inadequate processing.

Steps of bhasmikaran

1. Shodhan: The principle objective of shodhan is to remove unwanted part from the raw material and separate out impurities(Vaiday and Dole 1996b). Metals obtained from ores may contain several impurities, which are removed by subjecting them to Shodhan process. In context of bhasma, shodhan means purifying and making the product suitable for the next step i.e. Maran. Ayurveda classifies shodhan into a) General process and b) Specific process.

General process for shodhan:

a."The sheets of metals are heated till red hot and are successively dipped into liquids like oil, buttermilk, cow's urine etc. The procedure is repeated seven times".

b. Specific process for shodhan For some metals a specific process is described for shodhan e.g. for purification of Jasad, the molten mass is poured in cow's milk 21 times (Shastri K,1979b).

2. Maran : Maran literally means killing. As the name suggests in maran process, a change is brought about in the chemical form or state of the metal. This makes it to lose its metallic characteristics and physical nature. In short, after maran, metal can be converted into powder or other form suitable for administration. To convert various metals into a form appropriate for human consumption, several techniques have been employed which ultimately gave birth to concept: "Bhasma prepared by using Rasa i.e. mercury is the best, where as the one prepared using herbs are of better quality and those prepared using Gandhak (sulfur) are of inferior quality. Thus there are 3 methods given for maran. It is carried out by heating the metal in presence of

1) mercury 2) plants and 3) sulfur.

When various maran procedures for different metals were reviewed, it was found that mercury is mainly used. The unique property of mercury to amalgamate with many metals must have been the reason behind its maximum use in the process of

Bhasmikaran. Ancient practitioners might have found it as the most suitable chemical and therefore probably have mentioned that bhasmas using mercury are superior. Plants used in maran process may be serving as catalyst in the process or the minerals in the plants may be forming complexes with the metals. However, no such explanation can be obtained for the use of sulfur. 3. Chalan: Process of stirring during heating the metal is chalan. Stirring is carried out either with iron rod or stick made from a specific plant. As we know today, iron serves as catalyst in many chemical reactions. The phytoconstituents of plant stick may be enhancing the therapeutic effect. For example, stick of Neem is used for chalan process of Jasad bhasma, which is used topically for ophthalmic diseases. We can interpret the significance of this process now. Neem is an antiseptic (Puranik and Dhamankar, 1964h). Zinc is antiseptic , astringent and has ulcer healing property (Block et al, 1982b). These effects of both the constituents may impart the final product better therapeutic activity.

4. Dhavan: In this process, several water washes are given to the product obtained in the previous stage. Perhaps this is to remove the excess amounts of agents used in shodhan or maran stage. Such agents may adversely affect the quality of final product. Hence intermediates are washed with water, thereby water soluble constituents are removed (Puranik and Dhamankar, 1964h).

5. Galan: The product is then sifted either through a fine cloth or through sieves of suitable mesh so as to separate residual material larger in size (Puranik and Dhamankar, 1964h).

6. Puttan: The term puttan means ignition. The general term used for heating in the process of Bhasmikaran is Puta. A special earthen pot, Sharav is generally used for the process. It has two parts, each having a shape of soccer. Sharav is used for direct heating of the material. Its shallowness is useful in heating the material faster and uniformly. After keeping the material on the shallow surface, other part is used as a lid, by placing it in an inverted position. This Puttan process can be looked upon as the key step in manufacturing of bhasma. The classification of putta is primarily done on the basic nature of the process and is as under :- (Puranik and Dhamankar, 1964f)

1)Chandraputta
2) Dhanyarashiputta
3) Suryaputta
4)Bhugarbhaputta
5) Agniptuta.

Method of Preparation of Bhasma : In the Ayurvedic description, several metallic preparations called Bhasma are in clinical use since 8th century AD. The Puta system of Ayurveda describes that metals or minerals should be heated at high temperature for melting and then it quench in suitable media like herbal juices or decoction for specified times. The Bhasma (incinerated metals) is obtained by repeating these methods several times. In this process the toxic effects of the metals are not only nullified but are transformed into biologically active nanoparticles. When various Bhasmas viz. Swarna bhasma, Makshika bhasma, Abhrak bhasma, Tamra bhasma and Louha bhasma were subjected to analysis under electron microscope it was found that they were similar to nanocrystalline materials possessing similar physico-chemical properties. The therapeutic effect of Bhasma may be attributed to large surface area of materials and small particle size by which they can easily transported into cell nucleus and to specific target sites as desired.

The ash that is obtained by calcinations of metals is known as Bhasma. It is prepared with the extracts of metals and herbs in the right combination that functions the best when it is converted from their original metals to the oxide forms. An ash that is obtained through the process of burning completely, the starter material undergoes a brief process of purification and this process is followed by a reaction phase that includes incorporation of some other herbal and/or mineral extract.

The preparation of Bhasma includeincludees the calcinations of metals in a container with the cakes that are made of cow dung. As Bhasmas are produced nano-particles biologically and are taken with honey, butter, milk or ghee that makes these elements easily available, enhancing their biocompatibility and eliminating their toxic effects.

Depending on their appearance and colour, Bhasmas are classified accordingly. Scientifically, bhasmas are classified as

herbal bhasma, mineral and metal. General examples of bhasma include

- Loha Bhasma
- Swarna Bhasma
- Rajata Bhasma
- Pravala Bhasma
- Godanti Bhasma
- Heerak Bhasma
- Trivang Bhasma
- Varatika Bhasma
- Shankh Bhasma
- Vanga Bhasma
- Mandoor Bhasma
- Tamra Bhasma
- Jasad Bhasma
- Shuddha Parada
- Tankan Bhasma
- Mukta Bhasma
- Shukti Bhasma
- Manikya Bhasma
- Kapardika Bhasma
- Abhrak Bhasma

Depending on the main drug and other drugs that are used in the process of marara, bhasmas are generally white, black, grey, dark black and reddish. Generally they are stored in the air tight containers. Ayurvedic Bhasmas reflect an ancient form of nanotechnology, that showcases the reduction of particles to nanosize in the production of the final product.

From ancient times, Bhasma has been used for many purposes of immunomodulatory action, anemia, antioxidant action, anti-inflammatory, analgesic, free radical scavenging activity, brain related degenerative disorders and other chronic disorders. By the use of nanotechnology in Bhasmas it can be used as a purpose with less toxicity and high efficacy. Bhasma is an ayurvedic mineral/metallic preparation that is treated with decoction or herbal juices and exposed for a certain degree of heat.

Merits of Bhasma :-

- Bhasmas can act swiftly
- They are available in nanosized particle
- They will not have any specific taste
- Bhasmas helps to maintain optimum alkalinity for the purpose of optimum health
- It helps in providing easily absorbed and usable calcium.
- It helps in cleansing intestines, liver and kidneys
- It helps in healthier teeth and stronger bones
- It reduces depression and insomnia
- It helps to maintain minerals and arrhythmias balance
- It helps in breaking down drug residues and heavy metals in the body
- Contributes in neutralizing harmful acids that leads to illness
- Protects the body from any type of free radical damage.

Shodhana (purification) and Maarana are regarded as the two main steps in Bhasma preparation. Some minerals and metals, such as Biotite mica and copper, may undergo additional steps such as Amrutikarna and Lohitikarna.

Ayurvedic bhasma, a unique form of medicine created through an intricate alchemical process, has been revered for its potential healing properties in the context of cancer treatment. According to Ayurvedic principles, bhasma is believed to undergo a transformative process that enhances its therapeutic efficacy. When used in Cancer Treatment, specific bhasma preparations are thought to possess anti-tumor and immune-modulating properties that aid in combating cancer cells and promoting overall well-being. These bhasma formulations are often tailored to target the specific dosha imbalances associated with cancer, aiming to restore balance and harmony in the body.

Bhasma holds a revered position in Ayurveda, serving as a vital component of this ancient healing system. Through its unique preparation methods and therapeutic attributes, Bhasma plays a pivotal role in promoting wellness and equilibrium. By harnessing the transformative power of fire and employing specialized techniques, Ayurvedic Experts In India convert medicinal substances into potent remedies. With a diverse range of Swarna Bhasmas, each offering specific qualities and

applications, a holistic approach is provided for addressing various health conditions. As we delve further into the realm of Ayurveda, recognizing and valuing the significance of Bhasma opens doors to explore the profound wisdom of this time-honored tradition, unlocking its potential for optimal well-being.

Shodhana : Śodhana process involves the purification as well as reduction in the levels of toxic principles which sometimes results in an enhanced therapeutic efficacy. Śodhana process is specially designed for the drugs from mineral origin; however, it is recommended for all kinds of drugs to remove their doṣās (impurities or toxic content). It is cited in the treatises of Ayurveda that by the used of proper method of processing, viṣa can be converted into amṛta (nectar) and on other hand on adoption of inappropriate methods, nontoxic materials become a toxic. The concept of Śodhana in Ayurveda not only covers the process of purification/detoxifcation of physical as well as chemical impurities but also covers the minimization of side effects and improving the potency/therapeutic efficacy of the purified drugs.

Shodhana is regarded as the process of purification. The aspects of Shodhana are broad and are not restricted to physical or chemical purification and are mainly focused on the therapeutic utility. Sometimes the processed material may contain foreign molecules. The concept of Shodhana treatment was in practice since the times of Vedic period and it also included the measures claimed to be responsible for the alteration or addition of the properties of the drugs while subjected to various pharmaceutical operations and treatments. Though references regarding the Shodhana treatment are available since the time of Ayurvedic classics but the details about procedure could be traced only after the development of Rasashastra / Rasachikitsa (Mineral therapy) in Ayurvedic medicine during medieval period in which mineral / poisonous and sub poisonous drugs acquired prominence over other types of drugs in the therapy. Charaka Samhita has mentioned Shodhana as Shuddhikarana meaning the process through which unwanted or toxic properties are removed.[2] The same concept has been adopted by Acharyas of Rasashastra from 8th century A.D., onwards for drugs of herbal, animal, metal or mineral origin. Shodhana is the process which is done to remove

the impurities from a Dravya by doing the process like grinding etc. and using specific herbs for this process.The Shodhana process described In classics of Ayurveda is not merely a process of separation, purification or detoxification. Rather it increases the therapeutic potency of the drug also.

The main objective of Shodhana process is to increase the biological efficacy of the drug. To provide its finer particles so that the drug may be made suitable for further procedures of other special techniques viz Jarana, Marana and Satwapatana etc. to obtain product suitable for internal use.

Types: Shodhana process can be of two types-

A. **Samanya Shodhana:** It is a common procedure used for drugs of a particular group where the drugs of a particular group are subjected to the similar procedure though individually.
B. **Vishesha Shodhana:** When Shodhana process is done for a particular Dravya then it is known as Vishesa

Both the above procedures are further classified into Saagni and Niragni.

1. **Saagni:** Nirvapa, Dhalana, Bharjana, Puta, Swedana, Patana
2. **Niragni:** Bhavana, Prakshalana, Shoshana, Sinchana, Nimajjana, Gharshana

A summary of the objectives of shodhana is as follows: macroscopically remove foreign matter like dust and gravel; biologically eliminate the harmful activities of the drug; the physical and chemical modifications lead to improvement of its therapeutic action; and finally, preparation for further processing. At the end of shodhana, sulfur, hematite, and alum are suitable for use as a mono-drug or material for a herbal mixture. Other minerals and metals require further processing to be suitable as a drug, and this further processing is termed Maarana.

Maarana

Mica, pyrite ores, and metals are hard in consistency and following shodhana their consistency is decreased to a reasonable extent; however to make them edible further processing is required. In addition to making the materials soft and palatable, this augments the intended therapeutic efficacy.

The objective of maarana is to obtain the material in powder form and as Bhasma that is as fine and as soft as collyrium. Collyrium is applied in the eye, is fine and soft in consistency, and does not cause chemical or physical injury to the cornea. To minimize toxic effects, the material is required to be further processed. The prescribed procedure is maarana, which is an outcome following the processes of incineration and calcination. It is carried out following wet grinding (Bhaavana) and incineration (Putapaaka).

The end product of the shodhana process is termed shuddha dravya (cleaned products), which is used as the raw material for the process of maarana. Those raw materials are subjected to wet grinding, and initially, using the prescribed liquid media, the material is wholly soaked until the liquid is evaporated. When the grinder contents became doughy, the process of wet grinding is stopped, and pellets of the required size are cut from the dough. These pellets are dried in air, and further processing, called Putapaaka, is carried out. The incineration must be carried out appropriately using pellets. A specific device called a puta is used for incineration, and as fuel, cow dung cakes are used. Once dried pellets are obtained, they are sealed in two shallow earthenware plates using an appropriate sealing material. Then, the surrounding cow dung cakes are ignited, left to burn to ashes, and left to cool on their own. The sealed pot is later opened, and the contents are ground using a mortar to prepare fine powder. One puta describes the process from wet grinding to incineration. The process must be repeated until Bhasma in the required quality is obtained. However, following the prescribed number of puta, if the Bhasma fails in the prescribed tests, the puta process must be continued until Bhasma has been reached.

In regards to the therapeutic activity of metal Bhasma, metal with mercury contains the highest activity. In contrast, medium activity is ascertained following metal with plant material, and the lowest following metal with sulfur. Metal Bhasma prepared by blending metals with opposing characters are thought to be toxic. In contrast, modern medicine strongly prohibits the internal use of mercury and its derivatives. Also, to avoid physical contact with mercury and its compounds, extra caution is recommended. Mercuric sulfide, an inorganic form, is the

form that is primarily used in Ayurveda. Occasionally, mercuric chloride is used, and such use is limited and always advised with caution due to its toxicity. A negligible amount of mercuric sulfide is absorbed through the gastric mucosa and hence is nontoxic. In contrast, mercury in organic form has been often highly toxic and known to damage the brain and liver.
The Metals Used to Develop Various Herbal Formulas Under Rasa Rasayana

PROCEDURE OF MARANA IS CARRIED OUT IN SEVEN UNIQUE STEPS.

Step 1: Shodhana of Metal and Minerals This is the first and very important step in the process of Marana. Shodhana is a technique which involves many procedures with an aim to remove impure and toxic material from drugs or to potentiate the qualities of the drug or to bring physicochemical changes to make the drug suitable for the further processing. Shodhana contain different procedures like Shoshana (Drying), Bharjana (Roasting/Frying), Bhavana (Wet Trituration), Nirvapa (Quenching) etc. with different aims. For example, intake of improperly Shodhita iron produces seven defects in the body like heaviness (Jadyata), nausea (Hrulasa) etc. . But during process of shodhan quenching of the iron in the different media like Sesame oil leads to reduction in the particle size of iron and may converted into the martensite form which is hard and brittle . Repeated heating of iron in Samanya and Vishesh Shodhana leads to microcracks on the surface of iron. These microcracks not only helpful to incorporate nanostructure feature but also to improve reactivity with herbal constitutes. Shodhana of iron removes oxides of Fe+3 by forming complexation with the herbal and animal products. Thus Shodhana of iron leads to removing of the ill effects of iron and to bring the physiochemical changes useful for the further processing .

Step 2: Bhavana (Trituration of Metal and Minerals with herbal juices) Shodhita material is triturated with specific herbal juices till doughy mass is obtained, which is soft and easily converted into Varti (Roll) form without breaking and cracking even after drying. It is the wastage of energy to do the excessive Mardana (trituration) for longer duration. Acharyas

also warned not to use only water instead of Marana Dravya or specific herbal juice just to form doughy mass to convert it into Chakrika (pellets). Hence it seems that use of herbal juice in specific quantity and trituration for specific duration has direct role in the Bhasma formation. Sometimes Bhavana procedures are done as part of Shodhana with an aim to remove the toxic material from drug. Still we have to repeat the Bhavana procedure as part of Marana process. But during the bhavana as a part of Marana procedure we have to use Maraka dravya. Sometimes herbal drug used in the Shodhana and Marana Process may be same as in the case of Kasis.

Step 3: Chakrika Nirmana (Pellatisation) The doughy mass is converted into Chakrika (Pellets) and kept for drying. The prepared pellets must be flat in shape and weighs not more than 10 to 20 grams [16]. Moist Pellets
subjected to puta results into abnormal color of Bhasma and become hard. Flat shape of Pellets facilitates the uniform and homogenous heating as pellets gets more surface area and lesser thickness.

Step 4: Sharava Samputikarana Dry flat pellets were kept on the flat surface of earthen saucers and covered with another earthen saucer. The joint of both earthen saucers is closed with mud smeared cloth and allowed to dry. This specific arrangement was denoted as Puta Yantra by ancient scholars . Some ancient scholar mentioned not to close the joint of two earthen saucers only for those puta which contains gaseous material like sulphar, arsenic.

Step 5: Puta (Application of specific heat Pattern)
Puta Yantra is subjected to Puta (A specific heating pattern for specific duration). Application of the Puta is the important procedure in the process of Marana. Puta are divided into different types depending upon the source of heat, direct and indirect application of heat, source of fuel and of course its own dimension. Variation in the temperature pattern due to different size of pits and number of cow dung cakes further divides Agniputa in the different types.

Ancient scholars recommended different Puta for the different Material like Gaja Puta for iron . Some scholar recommended first Puta of maximum temperature followed by Puta of lower

temperature for the preparation of quality bhasma of Abhrak, Tamra and Lauha. Reverse method of applying puta was told in Swarana, Rajat and Naga bhasma preparation.

Step 6: Trituration: Collected pellets were examined for its consistency and all pellets are converted in to fine powder by trituration. **Step 7:** Repetition of above procedure till desired physico-chemico-biological changes takes place in the material whose Marana is done.

Mercury (Parada)

The first reference to mercury and its utility in the classics is controversial, and its use is rarely mentioned in Charaka. Only a few scholars interpret Rasa in the verse chikitsasthana as mercury. In Dwivraniya Chikitsa, Rasa is interpreted as mercury by Chakrapani, the commentator. Interestingly, both these formulations are recommended only for external application. Rasausadhies, which were named after mercury, were classified into two separate classes: mercurials and nonmercurials. The use of mercury has changed the direction of the management of disease. Mercury was regarded as a bio-enhancer and not as a drug. When any medication is combined with mercury, it is supposed to increase its efficacy and reduce its dose manyfold. Initially, mercury is purified and converted into an effective, stable, and nontoxic compound. The primary material used to prepare most mercury-based drugs is a combination of mercury and sulfur, which are ground together. This fine powder is black and termed kajjali which mimics collyrium due to its color and softness. Depending on the preparation methods, mercury-based herbals are categorized as Khalvi Rasa, Parpati Rasa, Kupipakwa Rasa, and Pottali Rasa.

Khalvi Rasa : A finely powdered formula is formed using a mortar by grinding mercury and sulfur with other herbal, mineral, and metal ingredients. After being ground in a mortar, termed Khalva, in Ayurveda the formulation is classified as Khalvi Rasa.

Parpati Rasa

A homogeneous black-colored fine powder termed Kajjali is formed using a ground mixture of mercury and sulfur mixed with or without a specified metal Bhasma. Then a molten mass is obtained using an iron spatula following the application of heat in a controlled manner. The molten mass then is poured immediately onto a flat soft surface, with a banana leaf placed on a smooth-surfaced platform made using fresh wet cow dung or mud and spread evenly. Then, the poured mass is covered immediately with a banana leaf and hand-pressed to create an even and thin flat sheet of the material termed parpati.

Kupipakva Rasa

Kupipakva Rasa is formed using mercurial drugs prepared by kajjali and is heated using a long narrow-necked glass flask (kupi). The drug is designed in the following stages: the kajjali, mercury, sulfur, and other required raw materials are subjected to the purification procedure; using a suitable mortar the purified metal is grounded with pure mercury to obtain a homogeneous mass.

Kajjali appropriately mixed with other metals or herbs can alleviate most symptoms and cure diseases. Following administration, the herbs spread rapidly through the body, which in turn clears the obstructed vessels in diseased organs and enhances the properties of other metallic or herbal medications. In Ayurveda the toxicity of mercury is immensely reduced following its combination with sulfur therefore reducing its bioavailability. The preparation of Kajjali by mixing purified mercury and sulfur is the initial step in preparing any herb mineral formulations. The gradual and homogeneous application of heat for the preparation of Kajjali has been described. A layer of clayed fabric is wrapped around a flask or bottle, assuring that there is no air gap between the clayed fabric and the outer surface of the flask or bottle, and then it is left to dry. Soon after the first layer dries, the second layer of clayed fabric is wrapped around the flask. Successively, the flask is covered with seven layers of clayed fabrics, and once all the wrappings are entirely dried it is ready to use. Heating starts with a low flame at between 100–200 °C, and the apparatus is left to cool on its own. Therefore, the heating must be continued for a number of hours. Safe drug storage is mentioned in an ancient text as being in the form of a fine powder in an airtight container.

Pottali Rasa

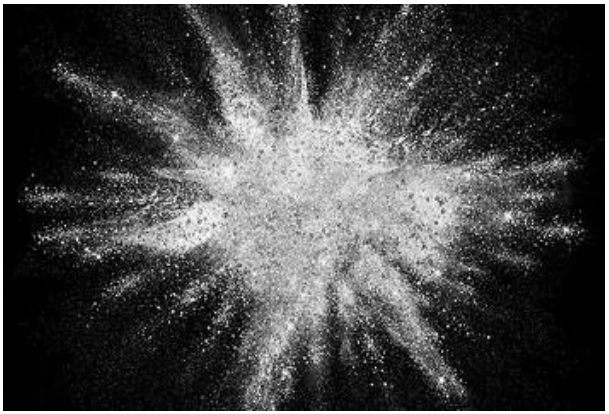
Kajjali is wrapped in a silk cloth to prepare a tight bundle (pottali). Sulfur powder in the prescribed quantity is placed in a stainless steel or wide-mouthed earthenware pan, kept on a fire, and allowed to melt. Then the bundle of kajjali is immersed in the melted sulfur while an adequate temperature is maintained to keep the sulfur in a molten state for a reasonable period of time. The wrapped silk cloth is burnt and wrapped around the hardened ball. In a circular motion, the hardball is rubbed on a

moist stone slab, and the accumulated paste is prescribed for licking. The drug's prescribed dose is decided following several rounds of rubbing.

The Pottali Rasa Is prescribed in medical emergencies and is regarded as an instantly acting drug formulation. Caution has also been issued for Rasa rasayana regarding the toxic effects of mercury and mercury toxicity treatment and its usability in Ayurveda texts has been intensely argued about. In Rasa therapy, mercury is regarded as the most unstable and chemically reactive substance. Mercury absorbs atmospheric impurities passively and tends to react with other metals and form amalgams quickly. Due to reactions, purified mercury is challenging to obtain.

Gold (Swarna) :

In general, the medicinal indications of swarna/gold can be found in almost all ancient medical classics, such as the Charak Samhita (1500 BC), Sushruta Samhita (1000 BC), and Astang Hridaya (400 AD). Around the fourth century, the creation of Rasa Shastra began, and from then on, Swarna has been dealt with comprehensively in Rasa Shastra texts, with masterstrokes of its pharmaceutics and therapeutics. Swarna is the most outstanding of all metals, and it is classified as part of the Sara loha group, which means ”essence” or a noble metal. Tuberculosis, anemia, cough, debility, sterility, and muscular dystrophy have all been treated with the calcined form (Swarna Bhasma). Moreover, it is thought to be the best rejuvenator because it promotes longevity and prevents aging.



Since antiquity, gold has been described as a noble metal. It can be referred to as Charaka and Sushruta Samhita.

The Bhasma form of gold is a mixture of metallic gold (96.76%), silica (1.14%), ferric oxide (0.14%), phosphates (0.78%), potash (0.16%), salt (0.078%), and traces of copper and magnesium. Various formulations of gold are helpful as disease alleviators, particularly in chronic debilitating diseases. The Swarna Bhasma dose is between 1.–30 mg.

Swarna Bhasma :-

It is a free radical scavenger, which means it consumes and removes free radicals from the body Several proteins and

enzymes in our body help to minimize the production of reactive oxygen species (O2, OH, H2 O2, and so on). After oxidative assault with acetic acid, two essential enzymes, superoxide dismutase (SOD) and catalase were assessed in two groups, Swarna Bhasma treated and control animals', blood and/or liver homogenate. Swarna Bhasma increased SOD activity (267 percent in serum SOD and 75.8percent in liver homogenate, compared to the corresponding controls) and catalase activity (80 percent compared to control hemolysate). This could be linked to the patients' improved pathophysiological status as well. [2] Via this free radical scavenging activity, it acts as an anti-oxidant and reduces inflammation.

Merits of Swarna Bhasma

For Nervous system :- Traditional gold preparations used in Ayurveda and Unani medicine had anxiolytic, anti-depressive, and anticataleptic properties with a large margin of safety. In a study, treated animals showed a decrease in immobility time in the forced swimming test. They demonstrated a reduction in haloperidol-induced seizure scores.

As pain killer :- The analgesic effects of Ayurvedic Swarna Bhasma, a calcined gold preparation, have been examined in various animal studies. Swarna bhasma was found to have analgesic efficacy in mice when tested using chemical, thermal, electrical, , and mechanical methods. Swarna bhasma is thought to have opioid-like action which reduces pain.

For brain : To assess brain damage due to poor bloody supply and its alterations, various enzyme parameters were used. Ayurvedic Swarna Bhasma significantly restored altered values to near-normal levels. This implies that gold preparations may have potential in cerebrovascular disorders.

Weak immunity : Our immune system is the first line of defense against various infections. Reduced immunity can make you fall sick very easily. The concept of immunity has been described in detail in Ayurvedic texts as Vyadhikshamatva, and one such important Ayurvedic medicine that helps boost immunity is Swarna Bhasma. It helps fight against infections in the body and prevent recurrent seasonal infections. This is due to its Rasayana (rejuvenating) property.

Loss of appetite : Poor appetite or decreased appetite occurs when you have a reduced desire to eat. In Ayurveda, loss of appetite is linked with Agnimandya (weak digestion). Loss of appetite is caused by an aggravation of Vata, Pitta, and Kapha doshas. It could also result due to psychological factors, leading to incomplete digestion of food and causing insufficient secretion of gastric juice in the stomach. All these factors play a characteristic role in the reduction of appetite. Swarna Bhasma helps to manage the loss of appetite, thirst, bloating, and flatulence. This is due to its Pachak Agni (digestive fire) boosting property which helps in digesting the food easily. These factors work in line to increase the food intake.

Rheumatoid arthritis : Rheumatoid arthritis (RA) is a chronic inflammatory disorder that can affect more than just your joints. It is known as Amavata in Ayurveda. Amavata is a disease caused due to the imbalance of Vata dosha in the body. Along with imbalanced Vata, there is an accumulation of Ama (toxic remains in the body due to improper digestion) in the joints. Amavata starts with a weak digestive fire and leads to the formation of Ama. It is carried to different parts of the body through Vata. This Ama, instead of getting absorbed in the body, gets accumulated in the joints. Swarna Bhasma helps to reduce excess Ama as it has Deepan (appetizer) property. This helps provide relief from the symptoms of rheumatoid arthritis-like joint pain and swelling.

Process to use swarna bhasam : Gold was employed in traditional medicine (mostly Indian and Chinese) as Swarna Bhasma, Swarna Parpati, Swarna Patra, or red colloidal solution. In addition, gold is employed in Ayurvedic bhasmas in refined metallic fine powder (perhaps as nanoparticles) or red colloidal solution, both of which are made through sophisticated processes that include herbal extracts and even other metals.

- The three stages of shodhana, dravana, and marana are used in the preparation of Swarna Bhasma. First, the gold leaves are heated and then dipped in sesame (Sesamum indicum) oil until red hot. This process is repeated seven times in total. [1]
- Next, buttermilk/urine, cow's kulattha (Dolichous biflorus) decoction, kanji (sour gruel made from rice [Oryza

sativa]), and radish decoction are used to prepare the tender leaves (Raphanus sativus). [1]

- Finally, heat is used to dry the leaves. The mixture is finely grinded, and the resulting paste is dried in the sun. The final product is created by repeating the grinding and drying under sunlight process 7 to 14 times with new aliquots of latex.

Swarna Origin:

A mythological origin of Swarna is described in Shatpatha Brahmana that, Swarna is supposed to be semen of Agni. Intercourse between Agni and Jala was taken place. At that time the semen of Agni turned to Swarna.

Types:

प्राकृतं सहजं वह्निसम्भूतं खनिसम्भवत्।
रसेन्द्रवधसंजातं स्वर्ण पहचविधं स्मृतम्।। (र.र. समु. 5/2)

Swarna are of five types as follows:

1. Prakrata or natural
2. Sahaja or in combination with other metals
3. Agnikrata or which is obtained from fire or volcanic activities. These three types of Swarna are miraculous and full of luster (full of all the sixteen parts). Wearing such Swarna in the form of ornaments removes sins and inauspiciousness.
4. Swarna prepared by the transmutation of mercury
5. Swarna obtained from the mines in mountains (this is called Full of fourteen parts)

Properties of acceptable Swarna:

The Swarna which becomes red on heating, Shiny and lustrous on cutting, Saffron coloured on rubbing with touch stone, Very smooth and soft in touch, Clean, leafless, having red- yellow colour and full of sixteen parts, is useful for Rasa-Rasayana and Deha siddhi and Loha siddhi. The Swarna having full of sixteen parts is considered the best among the all Swarnas.

Note: Pure Gold is called 24 Carat Gold. It is too much soft to use for making ornaments. Therefore, to make it harder for ornamental purposes, it is mixed with other metals like Silver, Copper etc. Carats also denote the purity of Gold like; 18 carat

Gold means that it consist 18 parts of pure Gold and remaining 6 parts of other metals.

Properties of unacceptable Swarna:

Characteristic of unacceptable Swarna are defined in Anandkand; Whiteness in colour, Hardness, Ununctousness or roughness, variegated colour, Association of impurities, Appearance of blackness or whiteness on heating, draws white line on rubbing with touch stone and lightness are the defects in Swarna. Such type of Swarna should not be used in Rasa-Rasayana.

Purpose of purification:

Swarna and its bhasma, which is not properly purified and incinerated, can create a group of diseases. It also loses the sukha (happiness), Potency, intellect and power. So, Swarna should be used after proper purification and proper Incineration.

Purification:

Swarna having full of sixteen colour is considered to be Shuddha(pure). We should not purify the pure Swarna. Metals other than Swarna should be purified without any doubt.

After making a thin leaflet of Swarna(Swarnapatra), it should be made red hot on fire and should be dipped seven times in Taila, Takra, Cow Urine, Aranala and Kulattha decoction subsequently. Applying this procedure for seven times, Swarna becomes purified.

Equal quantity of Valmika mrittika (soil of termite), Grahadhuma, Gairika, Ishtika churna (brick powder) and Saindhava lavana(taking all together is called Pancha mrittika) should be taken and should be turn to a paste with the help of lemon juice and Aarnaal (kanji). This paste should be applied over the kantakvedhi patra(thin leaflet of Swarna) and remain it for three days. After this, it should be introduced in laghu puta. After self cooling, these patra should be washed with clean water. Thus Swarna becomes purified.

In 200B.C. which is Manusmrati period, the author of manusmrati cited that Metals like Swarna, Rajat, Tamra, Kansya, Vanga, and Naga were purified with the help of Agni- Jala. That means, Metals first made red hot on fire and then by dipping them into the alkali water it got purified.

Incineration:

First Pure Swarna should be cut into fine pieces, then equal Parada should be added and rubbed hardly in Mortar and Pestle and After becoming the navneet (butter) like matter, trituration with lemon juice should be done for one day and wash it with fresh water. Now it should be rubbed with Hingula churna and again after mixing Manahshila and shuddha Gandhak and Navasadar, make Kajjali and triturate it with lemon juice and make chakrikas. Put these chakrikas in earthen vessels samputikarana and it should be placed in Kukkuta puta. By repeating this whole process for fifteen times red coloured bhasma of Swarna is obtained.

First Pure Swarna should be cut into pieces, and then equal Parada should be added and rubbed in Mortar and Pestle. After becoming the matter like navneet (butter), trituration with lemon juice should be done for one day and wash it with fresh water. Now it should be rubbed with Rasa sindura and again after mixing Manahshila and Swarnamakshika, trituration with lemon juice should be done and after making chakrikas of this matter, it should be kept in earthen vessels, which should be placed in Kukkuta puta after samputikarana. Applying this process for fifteen times the bhasma of Swarna is obtained.

Smooth paste of Rasa bhasma should be made with the help of lemon juice. This should be applied evenly on the surface of thin Swarna leaflets. These leaflets should be kept in Sharava samputa(two earthen plates)which is further introduced to Kukkuta puta. Applying this procedure ten times, bhasma of Swarna is obtained.

Swarna should be melted in moosha and added in equal quantity of Rasa bhasma (Rasa sindura).put this material in mortar and add equal amount of Hingula. Smooth paste should be made with the help of lemon juice. Small round cakes (chakrika) should be made and kept in sharava samputa (two earthen plates), which is further placed in Kukkuta puta. Applying this procedure for twelve times saffron coloured bhasma is prepared.

Rasa bhasma (Rasa sindura) ¼ part of Swarna, should be taken and make smooth paste with the help of Lemon juice. Apply this paste evenly on the surface of thin Swarna leaflets

and dry it. These leaflets should be kept in Sharava samputa and introduced to Kukkuta puta. This procedure should be applied eight times.

Leaflets of Pure Swarna should be cut into pieces, and then equal Parada should be added and rubbed in Mortar and Pestle. Now, trituration with Lemon juice should be done and washed with fresh water. It should be rubbed with equal quantity of Gandhak and after making chakrikas of this matter and earthen vessels samputikarana it should be placed in Kukkuta puta. This process should be repeated for fourteen times. After every Puta 1/16 part of Mercury should be reduced in each puta.

Harm of Improper incinerated Swarna bhasma:

Administration of improper incinerated or cooked, lustrous Swarna bhasma can cause loss of bala (power) and veerya (potency). It also causes different diseases in human being. Lastly Person dies due to vitiated doshas.

Properties of Purified Swarna:

Purified Swarna should be rubbed in mortar with water, honey or ghee. Licking this Swarna gives longevity, wealth and improves skin glow and memory. It destroys all ailments, ageing, poisons, evil spirits, and sins. It is an aphrodisiac, rejuvenator and cardiac tonic. It has a quality to treat the diseases like prameha, unmada and yakshma. It also gives potency, power, maintains youth and increases the semen.

Properties of Swarna Bhasma:

The bhasma of Swarna is madhur in Rasa and Vipaka. It is aphrodisiac, cardiac tonic, rejuvenator, improves power, potency, eye sight and skin complexion. By virtue of its sheeta and kashaya and tikta rasa, it is useful in the treatment of poisons. Again it is said by Acharya Charak that:

Swarna churna(Bhasma) is a great protector of Heart(as a cardiac tonic). Poison does not stay for a long time in the body of the person, who has taken Swarna preparation, just like the lotus leaf, on which the water doesn't stay inspite of contact with water.

Swarna bhasma in 2 ratti doses in anupana with black pepper and ghee cures the diseases like tuberculosis, anaemia, collitis, dyspepsia, asthma, cough, and anorexia. It increases

power and energy. It counteracts all type of toxic poisons included visha, upavisha and garavisha.

Incinerated Swarna or Swarna bhasma help in attain longevity, increases memory and grace, cures all types of fever, particularly chronic fever, affliction of voice and diseases related to chinta (worry), shoka (sorrow), bhaya (fear) and krodha (anger). It also increases the blood flow in shirodesh (Head and neck region).

Important formulations of Swarna:

- Kasturibhairav rasa
- Kanchnabhra rasa
- Trailokyachintamani rasa
- Makaradhwaj
- Chaturbhuj rasa
- Yogendra rasa
- Rasaraj rasa
- Vasantamalti rasa
- Vatachintamani rasa
- Swarna parpati

Silver (Rajata) :

Rajata (Silver), another noble metal like gold, also attracted the attention of the ancient Acharyas. The use of silver in therapeutics dates back to the period of Charaka and his contempories. Though, its therapeutic applications are not as extensive as other metals like Tamra or Loha, the ancient classics reveal that silver also enjoyed an important place in Ayurveda therapeutics. Rajata which are clear, lustrous (Swachha), heavy (Guru), and with metallic sheen (Snigdham), and which also become bright white on heating or cutting (Dahe Chede Samaprabham), without any ridges or furrows (Sphota rahitam), is genuine, and can be considered acceptable for therapeutic purposes. Silver is an element having high electrical and thermal conductivity. It is malleable and ductile. Care needs to be taken that only pure silver is used for medicinal preparations. Silver occurs naturally in its pure free form (native silver) as an alloy with gold and other metals, and in minerals such as argentite and chlorargyrite.

According to the classics, the therapeutic use of silver is limited. Classical alchemy describes silver as clear and heavy with a metallic sheen. Following heating or cutting, it becomes bright white. The Bhasma form of silver is a combination of metallic silver (.2–.9%), free sulfur (0.67.%), ferric oxide (14.33%), calcium (10.769%), silver chloride (0.479%), and traces of Na, K, and Al. The silver Bhasma dose is from 30 mg to 120 mg.

Purified silver is used in therapy in a powder form as rajata bhasma. Incineration or marana is an essential step in Rasa Sastra to convert a metal into a fine, ash form. The optimum temperature that the metal should be subjected to in the specific pit is specified in Ayurvedic texts, and this is expressed in terms of puta. This ensures that the final product is rich in the Required quality standards of the medicine. The conversion process is itself interesting where pure thin silver sheets are triturated, or ground into a fine powder, with other metals and herbs.The Ayurvedic formulations with silver as the ingredient are vast. Mahayogaraja Guggulu, the tablets used for the treatment of rheumatoid arthritis, Kasturibhairava rasa used in treating chronic fever, and Vasanta kusumakara rasa for treatment of diabetes and diseases relating to urinary tract, can be mentioned as examples.

Rajat Bhasma, which is a calcified formulation used largely in treating eye disorders, debility, cough with sputum, jaundice, anaemia, liver disorders, reproductive problems, and other neurological diseases. It is also known as Chandi Bhasma, Raupya Bhasma and Calcined Silver Ash.

Rajat bhasma is a reduced silver nanoparticle used in Ayurvedic medicine for a multitude of purposes. It is made using the method of extensive oxidation under very high temperatures. Calcined silver ash or fine bhasma remains when silver is burned with some herbs mainly with lime juice. When silver particles are heated it is converted into nanoparticles and calcined ash become light in weight.

Rajat bhasma is astringent, sweet, and sour in taste. While it also offers strength, Lekhana and sarak to the body and keep the mind calm. Being a natural coolant, it supports pacifying the system. As per the ayurvedic scriptures, Rajat bhasma is known to pacify the Vata humor and Pitta humor (dosha karma).

Merits of Rajat bhasma

Eye Health : Vision loss develops due to any injury to the optic nerve, excessive heat, overuse of gadgets, straining the eyes and these types of vision impairment can be managed effectively with Rajat bhasma. This classical ayurvedic formulation is known to strengthen the eye muscles and treat a host of eye problems. Rajat bhasma works well in combatting eye infection,

conjunctivitis, and cataract. However, you must consult an ayurvedic doctor to know about the right adjuvant to be taken along with Rajat bhasma to heal different types of eye diseases.

Treats Atherosclerosis : Atherosclerosis develops due to inflammation of the blood vessels and the build-up of plaque in the arterial walls. Potent anti-inflammatory effects of Rajat bhasma aids to reduce arterial inflammation and it is used as a drug of choice for treating atherosclerosis. Rajat bhasma is a highly valuable ayurvedic medicine that should be consumed along with adjuvants such as abhrak bhasma, guggul, pushkarmool, arjuna and shilajit to effectively treat atherosclerosis.

Remedies Liver Problems : Rajat bhasma is well-known to enhance liver functions by triggering metabolism and aids in eliminating the toxins from the liver. It works by stimulating normal functions of the liver and increasing the production of bile acids. The hepatoprotective traits of Rajat bhasma formulation are beneficial in curing fatty liver and improving the quality of life in people with liver problems.

Boost Stamina : A rich array of ayurvedic herbs is available that works well in boosting physical strength and endurance. Rajat Bhasma is one such potent ayurvedic medicine that helps immensely to fight weakness and fatigue, thereby improving stamina and energy levels to carry out daily activities.

Augments Mental Health : Vata dosha can be worsened in the system with excessive straining of the brain that may lead to loss of mental power and strength. Vertigo, mental tiredness, stress, strain, headache, and memory are some of the symptoms associated with loss of mental strength. Rajat bhasma is highly potent in treating all these problems owing to its natural strengthening action. Mukta pisti should be added along with Rajat bhasma to ease mental symptoms caused due to pitta humor. While shilajit should be combined with Rajat bhasma to control high blood pressure.

Remedies Cough : Chronic cough may lead to throat irritation, itching in the throat, dryness of the throat, and inflammation of the airways, Rajat bhasma works as a sure shot remedy in this condition. Blend Rajat bhasma along with liqorice powder, ghee for alleviating dry cough. If sputum is yellowish or greenish it

denotes chest infection, where Rajat bhasma works as a natural antibiotic and offer respite. It is taken along with parwal pisti, tankan bhasma, shring bhasma and Sameerpang ras.

Therapeutic Benefits

In traditional homes, silver is used in the form of utensils for offering naivedya at the puja room. Silver plates and tumblers are used at the dining table as a mark of purity. This ractice is supported by Acharya Sushruta, who lived around 600 BC and wrote the foundational text

Ayurveda says loss peya deyaiti rajate, meaning juices, food and drinks should be stored in silver vessels. Juices and drinks are considered to be coolants and storing them in silver vessels before serving will enhance this property.

Silver is widely used in topical gel impregnated into bandages because of its anti-microbial activity. The anti-microbial properties stem from the chemical properties of silver in its ionized form. This ion forms strong molecular bonds with other substances used by bacteria to respire, such as molecules containing sulphur, nitrogen and oxygen.

When the silver ion forms a complex bond with these molecules, they deprive the bacteria of necessary compounds, and thereby curtail its growth eventually leading to the bacteria's death. Silver gives strength, controls vata and pitta, and it is indicated in the treatment of bhrama (hallucination) and unmada (delusion).

Rajat Origin:

To kill the devil Tarkasura Lord Shiva has opened his third eye. The drops of tear from his third eye fall on Earth and turned to Rajat. Another type of artificial Rajat is made up of Parada and Vanga.

Types:

सहजं खनिसहजातंकृत्रिमं त्रिविधं मतम् ।
रजतं पूर्व पूर्वं हि स्वगुणैरुत्तरोत्तरम् ।। (र.र. समु. 5/22)

Rajat is of three types as follows:

1) Sahaja Rajat - Native Silver
2) Khanija Rajat - Ore Silver
3) Kritrima Rajat - Transmutated with the

help of parada

Sahaja Rajat is considered to be the best among the all variety, Khanija Rajat is considered as better than kritrima Rajat in qualities.

Properties of acceptable Rajat:

The Rajat which is dence, clean, heavy appears soft and white on cutting or heating, clean white coloured like moon, resembles like colour of conch shell, Shiny and smooth is considered as acceptable Rajat.

Properties of unacceptable Rajat:

The Rajat which is hard, artificial, rough, yellow or reddish, light weighted, which destroys on cutting, heating or hammering is considered as unacceptable Rajat.

Purpose of purification:

Impure or improper incinerated Rajat bhasma can cause fever, constipation, olegospermia, reduces vitality and metabolic process and chronic diseases. So Rajat should be purified and incinerated by the methods given in classical texts.

Acharya madhav specified that likewise gold, Tavak (leaflet) of Rajat should not be administered by rubbing or mixing with water or milk or without incineration. Even Rajat bhasma should not be used single as like other bhasmas. It is only useful in Leucoderma. Single use of Rajat bhasma is seen rarely in Rasa granthas. So it should be used only by going through the classical references.

Purification:

Rajat purifies by Nirvapa method. After making a thin leaf of Rajat, it should be made red hot on fire and should be dipped seven times in Taila, Takra, Cow Urine, Aranala and Kulattha decoction subsequently. Applying this method, Rajat becomes purified.

Incineration:

Pure Rajat should be turned to thin leaflet, and then equal part of Kajjali should be added and rubbed hardly in Mortar and Pestle with the help of Aloe vera juice. This paste should be applied on Rajat leaflets and should be placed in Sharava samputa and introduced to Puta of twenty cow dungs after its samputikarana. Applying the process twice, Rajat bhasma is obtained.

Properties of Rajat Bhasma:

Rajat bhasma is Kashaya and amla in taste, unctuous, slightly laxative and sweet in vipaka (the taste that emerges after digestion) and lekhana (scraping of tissue elements). It suppresses vayu and Kapha and improves power, potency and age. It cures all the diseases if taken as Rasayana.

Bhasma of Rajat improves longevity, vitality, glow, memory and power and cures prameha (obstinate urianry disorders including diabetes) anorexia, tympanitis, thirst. It cures vertigo, weakness and is a good uterine purifier.

Anupana or Vehicle:

Rajat bhasma can be administered with Honey, Ghee or milk cream.

Important formulations of Rajat:

1) Vrahad Kasturibhairav Rasa
2) Jayamangal Rasa
3) Mahamriganka Rasa
4) Trailokya Chintamani Rasa
5) Vishamjwarantaka Lauha
6) Grahanikapat Rasa
7) Indu Vati
8) Nityodaya Rasa
9) Varishoshana Rasa
10) Somanath Rasa

Copper (Tamra) :-

Tamra (Copper) is another ancient metal known to human civilization. During pre-Vedic times, the metal was part of day-today livelihood functions. Further, it is the earlier known metal for the preparation of the stronger alloy metals brass and bronze of which it is a component. Charaka uses the term Arka in a few places which Chakrapani clarifies as synonymous with Tamra. According to the descriptions of Rasa in Vagbhata Ref. there are two forms of Tamra viz. Nepaliya and Mlechha, only the former being acceptable. Samples with characteristic metallic sheen (Snigdham), soft (Mridulam), bright reddish in color (Shonam), having high tensile strength (Ghanaghata Ksamam), heavy (Guru), and devoid of impurities (Nirvikaram) are identified as best used for medicinal purposes. Tamra Bhasma, an extraordinary classical Ayurvedic formulation rooted in the inherent power of minerals, presents a realm of possibilities in addressing a wide spectrum of ailments. Its remarkable efficacy extends to diverse conditions such as asthma, heart diseases, skin disorders, gastrointestinal disorders, and even food poisoning. Notably, Tamra

Bhasma's speciality lies in its ability to bestow an anti-aging effect, illuminating the skin with a radiant glow.

The Ayurvedic properties of Tamra Bhasma are as follows:

Rasa (taste in the mouth): Kasaya (Astringent), Madhura (Sweet) Tikta (Bitter) Amal(Sour)

Guna (Action related to Pharmacology): Laghu (Light) Ruksha (Dry) Tikshna (Sharp)

Virya (Potency): Ushna (Hot)

Vipaka (Resultant): Katu (Pungent)

In Ayurveda, Tamra Bhasma has traditionally been prescribed to treat many health issues ranging from Asthma to Heart Disease and skin concerns. It is known as Ushna which means of hot potency, is Katu or pungent, and has Kashaya (Astringent), Amal (Sour), Madhura (Sweet) and Tikta (Bitter) properties.

Since pre-Vedic times, copper has been routinely used, and it is the best known metal for preparing the more robust brass and bronze alloy metals. A characteristic metallic sheen, smooth and bright reddish color with good tensile strength are observed in copper. Moreover, impurities are rarely identified and so it is

very suitable for medicinal purposes. Formulations of copper are used to cure a broad spectrum of diseases including worm infestation and hemorrhoids. The use of copper vessels for various pharmaceutical procedures has been described in Charaka. The copper Bhasma dose is between 1.–60 mg.

Formulations of 'Tamra' are useful in a wide range of diseases like Krimi, Sthaulya, Arsha, Ksaya, Pandu, Kusta, Swasa, Kasa, Amlapitta, Sotha, Sula, Yakrit Roga and Grahani dosha etc. In addition, Charaka advocates the use of Tamra Patra (copper vessels) in several pharmaceutical procedures.

METHOD OF PREPARATION

The purified copper rubbed with the juice of jambeera, purified parada and purified gandhaka. Then heated in the special equipment, called puta.

Detoxification of mercury– Ground with the juice of Aloe vera, Triphala(Terminalia chebula, Terminalia bellerica, Emblica officinalis), the root of chitraka (Plumbago zeylanica) each for 7 days.

Detoxification of Gandhaka – fried in ghee and dipped in cow's milk repeated for 7 times.

Purification of tamra- Heated and immersed in sesame oil, buttermilk, cow's urine, gruel and decoction of kulatha (Dolichos biflorus) in that order for seven days in each liquid.

Tamra Bhasma possesses a unique scraping quality, rendering it an ideal therapeutic choice for managing high cholesterol levels. Promising research reveals its potential in the realm of cancer treatment, adding to its acclaim. Traditional wisdom has long harnessed the power of Tamra Bhasma in addressing cases of poisoning, attesting to its versatile nature. By predominantly reducing Kapha Dosha, it facilitates the detoxification of Pitta Dosha, while concurrently enhancing the harmonious flow of this vital energetic force. This harmonization helps pacify the aggravated Pitta Dosha, fostering overall well-being.

The Illustrious reputation of Tamra Bhasma is further enriched by its extraordinary healing properties. Acting as an antacid, it proves invaluable in alleviating acidity, bringing relief to those afflicted. It also serves as an expectorant, aiding in the clearance of air passages and providing respite from persistent coughing.

Additionally, its gentle laxative properties ease bowel movements, offering solace to those grappling with constipation and related discomforts such as piles. Tamra Bhasma emerges as a formidable ally in fortifying the heart muscles and optimizing cardiac function, rendering it highly effective in the management of heart diseases. Furthermore, it contributes to the reduction of total lipid count in the body, playing a pivotal role in regulating cholesterol levels. Its classical indications span across a wide spectrum, encompassing tumors, cancer, liver disease, anemia, obesity, spleen and liver enlargement, hiccup, abdominal distention, and the intricate interplay of acidity. Tamra Bhasma is also used in case of gall bladder stone and the pain related to it. It also comes to use while treating patients suffering from indigestion and abdominal distension along with acidity. The Bhasma stimulates appetite, cures abdominal distension, and rectifies acid production.

Tamra bhasma has following healing properties -

- Antacid (only work if you have acidity with indigestion)
- Expectorant
- Mild laxative (action is based on stimulation of bile salts from the liver and then improving peristaltic movements)
- Digestive Stimulant
- Emmenagogue
- Hematogenic (helps in formation of red blood cells)
- Lowers bilirubin
- Fat Burner
- Zinc antagonist

Tamra Origin:

According to Rasa Kamadhenu Tamra is originated by Lord Surya.

Types:

म्लेच्छं नेपालकं चेति तयोर्नेपालकं वरम्।
नेपालादन्यखन्युत्थं म्लेच्छमित्यमिधियते।। (र.र. समु. 5/42)
ताम्रं तु द्विविध प्रोक्तं नेपालं म्लेच्छनामकम्। (आयु. प्र. 3/111)

Tamra is of two types:

1) Nepalak
2) Mlechha

Nepalak Tamra is considered to be the best and obtained from Nepal. Mlechha Tamra is adhama (lower in qualities) and obtained from Yavan country.

ताम्रतु द्विविधं प्रोक्तं रक्तं कृष्णं सुरेश्वरि ।। (रसार्णव 7/105)

According to the colour Tamra is of two types;

1) Rakta varna
2) Krishna varna

In these two varieties Rakta Tamra is considered to be the best one.

Properties of acceptable Tamra:

Nepala type of Tamra is exceedingly unctuous, ductile, red in colour, can tolerate hard hammering and don't turns to black colour after washing. It does not produce any adverse effect and bestows auspiciousness.

Properties of unacceptable Tamra:

The Tamra of Yavan(mleccha) or the Tamra which is white or blackish -red in colour, hard and causes vomiting, is of inferior quality. Again the Tamra having yellow or black colour, brittle, rough, having layers, should not be taken for Rasa karma.

Defects of Tamra:

Tamra is much more poisonous in comparison to any other poison. Poison has single defect but Tamra has eight defects as: Bhrama(delirium), Murchha(fainting), Vidaha(burning sensation), Sweda (sweating), Kleda(nausea), Vanti(vomiting), Aruchi(anorexia), Chittasantapa (anxiety).All defects of Tamra are removed after its proper purification and after that, it becomes like nectar in Rasa, Virya and Vipaka.

Tamra is considered as a toxic metal by all the ancient seers. Due to its toxicity it reduces longevity, vitality, power, graceness and also causes Unmada(mental disorder), Shula(pain) and Kushtha(leprosy).

Purpose of purification:

Impure Tamra can reduce potency, power, glow, skin complexion and vitality and causes vomiting, delirium, fainting and anxiety. Again impure Tamra causes fever, premature ejaculation and reduces metabolic functions. So Tamra should not be used without proper purification.

Purification:
After making a thin leaf of Tamra, it should be made red hot on fire and dipped seven times in Taila, Takra, Cow Urine, Aranala and Kulattha decoction subsequently. Applying this procedure for seven times, Tamra becomes purified.

Incineration:
Equal part of Parada and Gandhaka should be triturated by adding the juice of Jambira lemon. With this paste, Tamra sheets should be coated and placed in Kukkutaputa in a closed earthen pot (samputikarana). Applying this process three times Tamra becomes incinerated.

Tamra bhasma should be triturated in Lemon juice and make a ball of it. Keep this ball inside a rhizome (bulb) of Surana and wrapped it with mud. This should be cooked in strong fire of Gajaputa, after self cooling Tamra bhasma can be obtained from it. It cures all the disease and free from vanti (vomiting), bhrama (delirium) and vireka (purgations).

Amratikarana:
As we know that Tamra has eight defects. After the incineration of Tamra, some specific impurities still remain in the bhasma, except this, due to incineration Tamra aquires ushna, agneya and ruksha guna. To remove these factors, process of Amratikarana is used.

Tamra bhasma 1part and purified Gandhaka ½ part should be triturated with panchamrata (cow milk, ghee and curd, jaggery and honey in equal part) and small round flat cakes should be made and placed in between two earthen pots and after samputikarana it should be introduced to Gajaputa. This process should be applied for three times. This process is called Amratikarana of Tamra.

Test of Tamra Bhasma:
After the common tests of bhasmas like rekhapurnatva, varitara, nishchandra, Tamra bhasma should be sprinkled on curd. If the colour of curd turns to blue-green, then the bhasma should be considered as apakva (not properly incinerated).

Properties of Tamra Bhasma:
Tamra is tikta and kashaya in Rasa, madhur in Vipaka and ushna in Virya, it cures kapha, pitta, obstinate abdominal diseases, leprosy. It promotes vomiting and stool, counteracts the poisons,

it is a good appetizer and also cures obesity, hepatomegaly, piles, anaemia, and tuberculosis. It is tonic for eyes and lekhana (scraping of tissue elements) in property.

Complications and their cure:

Side effects Caused by intaking improper incinerated bhasma can be treated by Munibrihi and Mishri and Coriander seeds decoction with Mishri for three days.

Dose:

Dose of Tamra bhasma is specified as 1/8 to 1 ratti according to patient's condition.

Anupana or vehicle:

Honey and vegetable drug juices, powder etc. according to the diseases.

Important formulations of Tamra:

1) Arogyavardhini vati
2) Chandamrita rasa
3) Tamra parpati
4) Nityananda rasa
5) Lakshmivilas rasa
6) Sarveshwara rasa
7) Hridyarnava rasa
8) Kanchanabhra rasa
9) Trivikrama rasa
10) Gulmakalanala rasa

Iron (Aayasa or Loha)

Next to Swarna, Rajata and Tamra, Loha or Ayasa is another metal known to ancient civilizations. During the period of Charaka, it was used in different dosage forms named Curna, Vati, Avaleha, Varti, Asavarishta etc. either for external or internal administration in a number of pathological manifestations. Iron compounds were particularly employed in diseases suchas anaemia and other debilitating conditions, where functions of hemopoitic systems are disturbed and the blood has consequently become deficient in iron. Rasa Shastra classics explain that Loha is par excellence a rejuvenator as it stimulates functional activity of all the organs, promotes life, strength, destroys a number of diseases, and acts as a restorative.

After gold, silver, and copper, iron is another well-known metal that has been used for millennia. During Charaka, iron was used in various topical and oral formulations for many diseases. Compounds of iron were mainly used for anemia. Further classics describe iron as an excellent rejuvenator that stimulates all organ functions and promotes life, helping to regain mental and physical strength. Iron has a large number of therapeutic applications in Ayurveda, and during purification and incineration, proper care should be taken. A procedure to convert thin metal into a fine digestible form was described by Charaka. In addition, the use of iron vessels for various pharmaceutical procedures has been described. Iron in Bhasma form is a combination of ferric oxide (96..%), ferrous oxide (2..%), magnesium oxide (0.8%), copper oxide (0.3%), with trace amounts of phosphorus and potassium. Various iron formulations are used in a broad spectrum of diseases including hemorrhoids and different types of pain. The iron Bhasma dose is between 30–240 mg.

Preparation of Loha Bhasma involves purification, filtering, heating, coating, triturating, washing, and powdering. Kanta Loha is mostly used as the main iron source for the Loha Bhasma preparation process. While it is considered one of the best materials for the preparation of Loha Bhasma but due to lack of its availability, a metallic iron sample of teekshana laura is alternatively used. Iron sources in raw form contain minuscule

amounts of some other metals, and the presence of these metals can cause harmful effects on the human body.

Therefore, Ayurvedic medicine preparations follow shodhana or purification techniques to eliminate or decrease the number of disease-causing metals. The pharmaceutical processing of Lauha Bhasma is performed by following samanya shodhana, vishesha shodhana, and Marana. Under the process of Marana, three specific pharmaceutical techniques that are bhanupaka, sthalipaka, and putapaka are conducted.

According to Ayurveda, Loha Bhasma helps reduce anemia due to its pitta balancing property. It is high in iron which helps with anemia and improves general weakness. Loha Bhasma contains Vrishya (aphrodisiac) and Balya (strength provider) properties which may aid in improving libido, thereby helping improve male sexual dysfunction and stamina.

Loha Bhasma is available in powder form. Loha Bhasma is generally given in combination with other ayurvedic medicines in the form of a mixture. The mixture is usually advised to be taken with Ghee or Honey to rid of problems like anemia. Avoid self-medication or taking Loha Bhasma in excess.

Patients with gastritis or other digestion-related problems should consult a doctor before taking it. This is because Loha Bhasma is Guru (heavy) in nature and may cause symptoms like flatulence or constipation.

Loha Bhasma is generally well tolerated and does not have any side effects when taken in the recommended dose. However, it is advisable to consult the doctor before using Loha Bhasma.

The utility of this metal In therapeutics was only identified modern medicine in the first half of the 17th century, when its salts were recognized as the best haematenics. According to descriptions in Rasa Vagbhata, there are three varieties of Loha viz. Munda, Teekshna and Kanta, the latter being the best variety to use.

Merits of Loha bhasma

Anemia : Anemia is a condition which happens when the number of healthy red blood cells or hemoglobin in your blood gets too low. In this, the oxygen-carrying capacity of blood gets reduced. Anemia, known as Pandu in Ayurveda, is a condition that occurs due to an imbalanced Pitta dosha leading to weakness and fatigue. Loha Bhasma helps in reducing the symptoms of Anemia because it isca rich source of natural iron that helps to Restore hemoglobin levels.

General Weakness : General weakness is a feeling of body fatigue or tiredness. One may also feel a lack of energy. This usually happens when the body is deprived of a continuous flow of energy. Loha Bhasma is useful in managing general weakness or fatigue in day-to-day life. According to Ayurveda, fatigue is also known as klama. It is caused due to an imbalance of Kapha dosha and deficiency of essential minerals in the body like iron. Loha Bhasma helps provide the essential requirement of iron, thereby helping reduce the symptoms of fatigue or weakness.

Male Sexual Dysfunction : Sexual Dysfunction in men can be in the form of loss of libido (i.e., having no or very little inclination towards a sexual act). There can also be a low erection time or semen expelled soon after sexual activity. This is also referred to as ‘early discharge or premature ejaculation. Using Loha Bhasma along with other Ayurvedic formulations helps to correct male sexual dysfunction and also improve stamina. This is due to its Vrishya (aphrodisiac) and Balya (strength provider) properties.

Chronic fever : Chronic or persistent fevers are the type of fever that lasts more than 10 to 14 days. It could be caused due to mild infection or chronic condition. As per Ayurveda, there are two

factors that can lead to high fever, the first is Ama (toxic remains in the body due to improper digestion) and the second is any foreign particle or organisms that invade the body. Loha Bhasma helps in reducing fever due to its Javarghana (antipyretic) property.

Effect On Doshas : Loha Bhasma is tikta (bitter), kashaya (astringent), and madhura (sweet) in taste. The key qualities are sita (cool), Ruksha (dry), and Guru which implies that it is heavy to digest and undergoes a long metabolism process. Due to its Vatala effect, it increases the Vata dosha in the body but effectively pacifies Pitta dosha.

Prevents Liver Enlargement : Hepatomegaly is an enlarged liver, which means the liver gets swollen beyond its usual size. Often a sign of a serious health concern, it needs to be treated at the earliest. Loha Bhasma has a haematinic effect on the liver since it contains iron elements leading to better assimilation of food, aiding better liver functions, and promoting the overall health of the liver.

Heals Hiatus Hernia : This is a health condition when part of the stomach bulges up into the chest, through the large muscle separating the abdomen and chest. Possible causes are obesity, pregnancy, older age, and injury. Loha Bhasma contains elemental micro fine iron particles prepared by calcination that help fight this ailment effectively.

Charaka emphasizes a special Ayaskriti procedure, which converts thin leaves of metal into a fine absorbable form. In addition to these uses, iron vessels were specifically recommended to be used in certain pharmaceutical procedures (Chikitsa 1-3/43, 15/187, 16/83, 26/250, 26/274 etc.) Quantitatively, it is a combination of ferric oxide (96.5%), ferrous oxide (2.5%), magnesium oxide (0.8%), calcium oxide (0.3%), together with traces of phosphorus and potassium. Different formulations of 'Loha' are useful in a wide range of diseases: Sula, Arsha, Gulma, Pliha Roga, Yakrit
Roga, Ksaya, Pandu, Kamala etc.

Mandura : Mandura, the second form of Iron, has been used for a wide range of therapeutic procedures in classical Ayurveda since antiquity. It is defined by Madhava Upadhyaya in

the Ayurveda Prakasha as the debris collected after heating and beating processes of Iron around a blacksmith's anvil.

In Ayurveda the Mandura, another form of iron Bhasma, is well known for its use in a wide array of therapeutic procedures. Madhava Upadhyaya defines it as a collection of debris around a blacksmith's anvil, collected after heating and beating for many years. If anvils are 100 years old, they are regarded as the most useful, while those 60–80 years old are considered average and less efficacious. Mandura is smooth to touch, heavy, firm, devoid of fissures, and useful as a therapeutic.17,18 Following purification Mandura is useful for inflammations, edema, jaundice, and anemia. Mandura is a combination of ferric oxide (.9.14%), ferrous oxide (26.7%), chlorides (4.4%), magnesium (3.9%), sodium (1.7%), and a few other elements in small quantities. Its constituents play a major role in curing anemia. The Mandura Bhasma dose is between 30–240 mg.

Purified mandura, when administered with proper justification is beneficial in inflammations, edematous conditions, jaundice etc. It is the drug of choice in cases of anaemia (Pandu), and Charaka refers to a number of its preparations. Chemically, Mandura is a combination of ferric oxide (59.14%), ferrous oxide (26.7%), chlorides (4.4%), magnesium (3.9%), sodium (1.7%) and a few other elements in trace quantities. Its unique constitution plays a pivotal role in therapeutics of anaemia and other associated disorders.

Loha Origin:

Lauha is mythological originated from Lord Yama who is himself a 'Kalamurti'.

In another view, in the battle of Devta and Daitya, the body parts of Devil Lohasur were cut and scattered on the Earth and turned to Lauha.

Types:

मुण्डातीक्ष्णं ततः कान्तं ज्ञेयं तु गुणवत्तरम्।
औषधार्थे ततो याज्यं तीक्ष्णं वा कान्तमुत्तमम्।। (रसामृत 3/131)
मुण्डं तीक्ष्णंहच कान्तंहच त्रिप्रकारमयःस्मृतम् । (र.र. समु. 5/69)

Lauha is of three types:

1) Munda Lauha (Cast Iron or Pig Iron)
2) Tikshna Lauha (Wrought Iron)

3) Kanta Lauha (Magnetic Iron ore or magnetite)

Among these varieties kanta Lauha is the best. Tikshna Lauha is inferior than Kanta Lauha and Munda Lauha is inferior to Tikshna **Lauha in Quality.**

Munda Lauha (Cast Iron or Pig Iron)

Munda Lauha is of three types: Mridu Munda, Kunda Munda and Kadara Munda

Tikshna Lauha (Wrought Iron)

Tikshna Lauha is of six types: Kharatikshna, Saratikshna, Hannaltikshna, taravattatikshna, Vajirtikshna and Kalatikshna Lauha.

Kanta Lauha (Magnetic Iron)

Kanta Lauha is of five types: Bhramaka kantalauha, Chumbaka kantalauha, Karshaka kantalauha, Dravaka kantalauha, Romakanta kanta Lauha.

Properties of Munda Lauha:

The Lauha which melts easily on fire, doesn't break easily on hammering and smooth in nature is called Mridu mundalauha. This is best in quality. The Lauha which is not easily malleable is called Kunda mundalauha. This is inferior to Mridu munda and the Lauha which can be easily broken by hammering and broken part seems black, is called Kadara mundalauha. This is not useful for medicaments.

Properties of Tikshna Lauha:

Tikshna Lauha, which is hard, on breaking doesn't show Pogar(threads like structure), it's broken part shines like Parada and on bending it breaks easily is called Khara tikshna. Tikshna Lauha which loses its edges while throwing hardly and shows Pogar like structure is called Sara tikshna. Tikshna Lauha which is of Krishna Pandu varna shows Pogar like Chanchubeeja and very hard while breaking is called Hannala tikshna. Tikshna Lauha which is having diamond like hard lustrous and dense Pogar and having shyama varna(bluish-blackish) is called Vajir tikshna. Tikshna Lauha having neela-krishna varna, dense, smooth, heavy, lustrous is called Kalayas tikshna. The edges of Kalayas Lauha remains unbreakable even hammering it with hard Lauha. The explanation of Taravatta tikshna is not available in texts but we can take Tiksna lauha having dense thread like Pogar as Taravatta tikshna. Khara tikshna, Sara tikshna, Hannal

tikshna, taravatta tikshna, Vajir tikshna and kala tikshnalauha are respectively better in qualities than its previous one.

Pogar:

Pogar are the thread like lines which are visible on the breaking of Lauha. The synonyms of Pogar are 'Anga, chhaya and Vanga'. Anga means the structure of broken surface of Lauha, chhaya means reflex or shade of the broken surface of Lauha and Vanga means the thread like lines which are visible on the broken surface of Lauha.

Test for Tikshna Lauha:

Kasisa (green Vitriol) and Amla (Emblica officinalis) should make into paste and applied on the surface of Lauha and washed properly. If the Lauha reflexes the Image of viewer, like a mirror then the Lauha is considered as Tikshna Lauha. This Lauha is best for Incineration.

Properties of Kanta Lauha:

Kanta Lauha, which repels the small Lauha pieces or turns around them, is called Bhramaka kantalauha. On placing the small pieces of Lauha nearby the Kanta Lauha, if it sticks with small pieces then it is considered as Chumbaka kantalauha. Kanta Lauha, which can attract or pull small Lauha, is called Karshaka kantalauha. Kanta Lauha, which can repel or pull small pieces of Lauha, is considered as Dravaka kantalauha. Kanta Lauha, if broken, its particles sticks like hair follicles on its surface, so it is considered as Romakanta kantalauha.

Properties of utensil of Kanta Lauha:

The qualities of Kanta Lauha utensil are given in Rasa Ratna Samuchhaya that, if we take some water in Kanta Lauha utensil and put a drop of oil, it will not spread on water. Again, if we coat the utensil with Heenga(ferula northex), the smell of Heenga will go away. Pasting the Nimba Kalka on utensil, the Nimba loses its tiktata, boiling the milk in Kanta Lauha utensil will not allow the milk to be fallen out from the utensil.

Defects of Lauha:

Just like Copper, Lauha also have seven defects; Impure Lauha causes seven natural defects like heaviness, dridhta(stiffness), nausea, burning sensation in extremities, calculi and foul smell from body.

Purpose of purification:
Impure Lauha bhasma can decreases power, potency and skin complexion. It causes Cardiac pain and many other diseases, so Lauha bhasma should be made after proper purification.

Purification:
Triphala should be taken 64 Tola(16 Pala) and make its decoction with 8 times water and remain the decoction $1/4^{th}$ part. Then take 20 Tola(5 pala) of Lauha and make thin leaflet of it, which should be further dipped in Triphala decoction. Making the leaflet red hot and dipping them in Triphala decoction seven times, Lauha gets purified.
Dipping of Lauha leaflet in cow urine for seven times also purifies the Lauha.

Incineration:
Decoction of Triphala (1part) should be made in Cow urine (8part) and purified Lauha (Tikshna or Kanta Lauha) should be dipped repeatedly in that decoction after making it red hot on fire. Now this Lauha should be made to powder with the help of pounding apparatus. Now Triphala decoction should be used for the trituration of Lauha powder for 21 days. Small round cakes should be prepared with the paste and introduced to Gajaputa after samputikaran. Applying this procedure for twenty one times, Lauha bhasma is obtained.

Drugs used for Incineration:
The drugs used in the incineration of Lauha are considered as Lauha 'Maraka Gana'. They are Triphala, Shatavari, Brahati, Talamuli, Nilotpala, Sugandhabala, dashamula, punarnava, Vidhara, Bhringaraja, Shunthi, vidanga, Karanja, Shigrumulatwaka, Nirgundipatra, Tulsi, Erandamula, Hastikarna, Palasha, Parpata, Chandana and Bala. From this Gana any single drug can be taken for the incineration of Lauha according to the disease. But, Triphala by Virtue of its Tridoshaghna property can be use in all the diseases.

Number of putas for different purposes:
In medication we should always use properly incinerated Lauha. To cure different ailments 10 to 100 Putas are required for the incineration of Lauha. For rejuvenation purpose 100 to 1000 Putas are required and for aphrodisiac purposes 10 to 500 Putas are required. Lauha bhasma should be incinerated until it

becomes Varitara(floats on water), Laghu(Light weighted) and Sukshma(fine).

Trividha Lauha paka:

For the easy Incineration of Lauha, Authors of Rasa Tarangini and Rasendra Sara Sangraha have described three types of Pakas of Lauha.

1) Bhanupaka
2) Sthalipaka
3) Putapaka

Nirutthikarana:

Incinerated Lauha bhasma should be triturated with the help of equal quantity of purified Gandhaka, Cow's ghee and Aloe vera juice. This powder should be placed to Gajaputa after samputikarana. Applying this process once the bhasma becomes Niruttha.

Test for niruttha bhasma:

Lauha bhasma should be mix and rubbed with Mitra Panchak(Ghrita, Madhu, Giggula, Gunja, Tankana) and introduced to Gajaputa, if a part of bhasma turns to a big particle of Lauha then, the bhasma is not properly Incinerated and if the bhasma remains in same state after Gajaputa then it is considered as Niruttha.

Harm of Improper incinerated Lauha bhasma:

Bhasma of improperly or unpurified Lauha is not good for health. It decreases longevity, power and glows of skin and causes many diseases including cardiac pain.

Intaking of improper incinerated Lauha may cause even death. It also cause different types of pain, kustha (obstinate skin diseases including leprosy), malaise and cardiac pain. Therefore, Lauha should be properly purified before incineration and used.

Restrictions:

Kushmanda, Tilataila, Masha, Rai, Liquor, Amla and Masoor are restricted at the time of Lauha Bhasma administration.

Properties of KantaLauhaBhasma:

Bhasma of Kanta Lauha Improves the skin complexion and grace. It cures the diseases like anemia, tuberculosis, Leprosy, and Tridoshas. It prevents ageing process and cures wrinkling of the skin and graying of hair, baldness and all the diseases. It is a

best rejuvenator; none of the remedy is as miraculous as Lauha bhasma.

It cures anemia, Painful conditions, obesity, piles, colitis, fever, inflammation, prameha (obstinate urinary disorders including diabetes), tumors, vatarakta (gout), amavata (rheumatism), grahani (sprue syndrome) and spleenomegaly. The Lohakitta(Lauha rust) of Kanta Lauha is same in quality of Kanta Lauha.

Dose: Dose of Lauhabhasma is 1/4 to 2 Ratti.

Anupana or Vehicle:

Lauha bhasma with Triphala churna and honey can cure all the diseases. It gives appropriate result to a person, who takes it in proper manner.

Important formulations of Lauha:

- Arogyvardhini Vati
- Chndraprabha vati
- Dhatri Lauha
- Navayasa Lauha
- Saptamrita Lauha
- Pradarantaka Lauha
- Putapakwa Vishamjwarantaka Lauha
- Lauha Parpati
- Panchamrita Parpati
- Lohasava

Lead (Naga/Sisaka) :

Naga is an important Puti Loha known since ancient times, also identified by other terms like Sisaka or Sisa. Charak emphasizes that medicinal uses of this metal should be external,

partiicular in cases of Mandala Kusta. The Brihad Rasa Raja Sundara describes two varieties

of Naga viz. Kumara and Samala the former being the acceptable variety for therapeutic applications. Samples which melt easily (Drutadravam), and are heavy (Mahabharam), externally black in color (Bahihkrishnam), and when incised shine with bright black luster (Chede Krishna Samujwalam) should be considered genuine and preferred for therapeutic purposes. Quantitatively Naga Bhasma is a combination of lead oxide (75.6%), ferric oxide (7.5%), together with traces of calcium and magnesium chlorides and carbonates.

Since ancient times lead has been known as an important loha. Lead Bhasma topically, in particular for rashes, has been advocated by Charaka. Lead quickly melts and is heavy, externally black, and when cut shines a bright black. Quantitatively, lead Bhasma contains lead oxide (7..6%), ferric oxide (7..%), and small amounts of calcium and magnesium chlorides and carbonates.16,17 Various formulations are useful for obesity, pre-diabetes and diabetes, various abdominal lumps, and leucorrhea. The lead Bhasma dose is between 30–120 mg.Different formulations of 'Naga' are beneficial in diseases like Prameha, Gulma, Arsha, Sweta Pradara, Grahani roga, Antra sotha etc. Therapeutic dosages given for 'Naga Bhasma' range from 30 mg. to 120 mg.

Naga Bhasma is an ayurvedic proprietary medication, with Naga (calcined Lead) as the main component. It usually contains nanoparticles of lead sizing about 60 nm. Naga Bhasma is extensively used for the treatment of urinary incontinence, frequent urination, spleen enlargement, impotence, chronic constipation, heartburn and acidity caused by a hiatus hernia, ulcer, diabetes mellitus, leucorrhoea, rheumatoid arthritis, piles, malabsorption syndrome, non-healing wounds, etc. Additionally, it is also used for providing relief from a ligament injury, haemorrhoids, skin diseases, expectorating cough, gonorrhoea, bronchitis, emaciation, whooping cough, epilepsy, vomiting,

spitting blood, helminthiasis, etc. Naga Bhasma usually impacts on the following organs; namely, urinary bladder, testes, stomach, intestine, pancreas, bones, muscles, joints and ligaments.

Chemical Composition Of Naga Bhasma: PbS

Method: Take the purified lead in a thick-bottomed container and heat it

Once the lead melts into liquid form, add manahshila to it drop by drop with constant stirring. The component then turns into a powder form,

Put this powdered compound in an iron pot and subject it to high flame for 3-4 hours, Remove the pot from the flame and cool it down,

Then, strain the mixture to remove impurities, Next, take this compound in a mortar and pestle and add lime juice and the other herbs one by one

Crush the ingredients in the powder for 5-6 hours, Place it under direct sunlight to remove moisture, Put the compound in an iron vessel and again subject it to high flame, The resultant product obtained after several hours is Naga Bhasma, Store the powdered formulation in amber-coloured, glass bottles for future use.

Naga Bhasma showcases the following medicinal properties:

- Anthelminthic (Vermifuge or anti-parasitic)
- Appetizer
- Digestive
- Carminative
- Antispasmodic
- Anti-inflammatory
- Anti-diabetic
- Antioxidant
- Anti-gout
- Anti-lithiatic

Charaka Samhita, Sarangadhar Samhita and Susruta Samhita. It is primarily indicated for the following health conditions:

- Krimihara (relieves intestinal worms)
- Jantujit (treats worm infestation)
- Deepana (enhances stomach fire)

- Pachana (helps in digestion)
- Rochana (stimulates appetite)
- Amahara (treats indigestion)
- Rasayani (rejuvenates the whole body)
- Vayasthapana (prevents ageing)
- Dahahara (relieves burning sensation)
- Trutahara (relieves excessive thirst)
- Shopajit (reduces swelling)
- Madhumeha (treats diabetes)
- Agnimandyahara (relieves indigestion)
- Klaibya (treats erectile dysfunction)
- Rasayani (rejuvenates the whole body)
- Balya (improves strength)
- Napunsakata (treats impotency),
- Beejopghat (remedies decrease in sperm quantity)
- Kshayaj (treats excessive loss of
- Shukradhatu or reproductive tissue),
- Shukragatavata (treats premature ejaculation)
- Amavata (relieves arthritis)
- Sandhi Shula (treats arthritis)
- Kati prishtha Shula (treats pain in the spinal column and lower back)
- Mehahara (treats urinary tract disorder)
- Ashmari (treats urinary calculi)
- Mutrakrichra (treats dysuria)
- Dahahara (treats burning sensation)
- Mutraghata (treats urinary obstruction)
- Vajikaran (improves libido)
- Udara (treats ascites)
- Antravruddhi (treats Hernia)
- Arsha (treats haemorrhoids)
- Shonitasthapana (prevents bleeding)
- Pushtida (good for nutrition)

Merits of Naga bhasma

Remedies Constipation : Ayurveda, a centuries-old practice strongly recommends the use of this mineral-based powder in the treatment of constipation. It vigorously increases the secretion of

bile by the liver, which in turn, works on the peristalsis movement of the intestines and liver, thereby allowing smooth passage of stool via the large intestine outside the body. It also plays a crucial role in diminishing mucous and excess fat content in the stools and impeding them from adhering to the intestinal walls and thereby letting their easy movement.

Cures Piles : Being a powerful laxative, this magic powder of lead is extensively used for preventing and treating piles or haemorrhoids. It vastly softens the stool and allows easy passage from the intestines. It lessens the strain on the lower portion of the intestines and thereby staving off anal fissure, bleeding or protuberance of a mass from the anus. It also enhances the strength of the intestines and helps in scouring the colon.

Averts Acidity And Gastritis : Excessive production of stomach acids may be extremely upsetting and lead to uneasiness throughout the day. Imbued with strong herbal ingredients, Naga bhasma is the ultimate antidote for acidity and gastritis. It effectively intercedes the secretion of hydrochloric acid and other acids in the stomach and maintains the appetite at an optimum level. It also diminishes burning in the throat, chest, stomach, and abdomen. Regular consumption of this ayurvedic formulation in prescribed doses remedies stomach acidity and other associated symptoms.

Augments Skin Health : Naga bhasma plays a significant role in treating various skin infections and issues. The abundance of antioxidants in this herbomineral formulation is extremely effective in eradicating harmful free oxidative radicals from the body and its antipruritic trait alleviates itching sensation that stems due to allergic conditions like patchy skin, scabies, acne, eczema, psoriasis, sunburn etc. Several studies indicate that Naga bhasma has potent anti-bacterial and anti-parasitic essence that are extensively used for pulling out bacteria from the body. The bioactive compounds present in this traditional lead medication not only deter worm infestation but also treat wounds and speed up healing.

Naag Origin:

Mythologicaly Naga is originated from the semen of divine Snake Vasuki. Due to daughter of Sarparaja Bhogi, Vasuki has been ejaculated and his Semen Turned to Metal Naga.

Types:

नागं च द्विविधं प्रोक्तं कुमारं समलं तथा ।
कुमारं रसकार्येषु योजनीयं गुणाधिकम् ।।(बृ. रसराजसुन्दर)

Naga is of two types as follows:

1) Kumara Naga
2) Samala Naga

Kumara type of Naga is considered to be superior to the Samala type of Naga. So, always Kumara type of Naga should be taken for incineration or in medicaments.

Properties of acceptable Naga:

The Naga which melts easily on fire, Heavy, bright Luster and Bluish black appearance when freshly cut, Gives foul smell and black in colour is considered as superior. It is a Soft metal which can be cut with a knife and due to its softness; Naga makes a line on Paper.

The Naga having opposite properties is considered unacceptable.

Purpose of purification:

Impure Naga causes prameha (obstinate urinary disorders including diabetes), tuberculosis and jaundice. So, Naga should be used after proper purification.

Purification:

The purification of Naga is Performed in Pithara Yantra(just like Vanga). Fill Nirgundi juice in a metallic pot which is covered with a heavy metallic flat plate having a hole in its middle. Haridra, Renuka and Nirgundimula powder should be added to Nirgundi juice. Now Naga should be melted and poured over Nirgundi juice through the hole of the plate. Take out the solidified Naga and repeat this process for three times to obtain the purified Naga.

Incineration:

Purified Naga should be taken and melted by heating it in a pan (Karahi). Sprinkle Ashwattha twaka churna or Chincha twaka churna on the melted Naga and rub it with the help of long iron spatula. After some time, melted Naga will start turning to bhasma (ash) form. This process should be applied until the bhasma of Naga is prepared. After the preparation of bhasma, cover it with a sharava and make the Naga bhasma red hot on the

fire. After self cooling it should be washed with water for several times until it becomes alkaline free in taste. Now make the bhasma dry and add equal quantity of Manahshila and Triturate it with Lemon juice. Now chakrikas should be made and dryied, now it should be introduced to Kukkuta puta after Sharava samputikarana. Apply this process for three times to get Naga bhasma.

Colour of Naga bhasma:

According to Rasa Tarangini colour of Naga bhasma is black.

In Ayurvada parakash colour of Naga bhasma is mentioned Sindurabh.

Properties of Naga bhasma:

Bhasma of Naga (Naga) cures the diseases of kapha and pitta doshas. It destroys the prameha, just like fire destroys the jungle. It is ushna, laxative, colours the silver and cures gulma (phantom tumour), wounds, collitis, and dysentery, just like rising sun which finishes the night. It endows a person with great strength like one hundred elephants, if taking regularly. It cures many diseases, increases longevity, appetite, sex power and prevents death.

Harm of Improper incinerated Naga bhasma:

Taking improper incinerated Naga bhasma can cause leprosy, tumour, anemia, prameha (obstinate urinary disorders including diabetes), fistula, inflammation and dyspepsia.

Complications and their cure:

Complications arises from the administration of improper Purified or incinerated Naga bhasma can be subside by taking Gold bhasma1/8 ratti and Haritaki churna 1 masha with sugar for three days.

Dose:

1/4 ratti to 1 ratti according to the condition of patient and disease.

Anupana or Vehicle:

Honey and with juices and decoction of different drugs according to the diseases.

Important formulations of Naga:

- Kalanala rasa
- Yogeshwara rasa
- Kshayakesari Rasa
- Jwarari rasa
- Trailokya chintamani rasa
- Nrapativallabha rasa
- Manikya rasa
- Ratnagarbha pottali rasa
- Trivanga bhasma
- Suchikabharana rasa

Tin (Vanga/Trap)

Vanga, one of the Puti Lohas was known to ancient Indian physicians by the name of Trapu. In Charaka Samhita, the metal is categorized under Parthiva Dravyas. According to descriptions in Rasa Vagbhata, there are two varieties of Vanga viz.

Khuraka and Mishraka, the former being acceptable for therapeutic applications. Samples with the characteristics, bright white in color (Dhavalam), soft (Mridulam), shiny, smooth (Snigdham), easily melts (Drutadravam), and heavy (Guru) are identified as Khura Vanga and should be preferred for therapeutic purposes.

The use of tin, a loha, has been well described in Ayurveda. The Rasa Vagbhata, an influential Ayurvedic writer, described two varieties of tin (Khurana and Mishraka), with the former being the accepted form of therapy. Khurana that is bright white, smooth, melts at low temperature, and heavy is identified as Khurana that is preferred for therapy. Tin in the form of Bhasma is a combination of stannic oxide (91.4%), ferric oxide (2.9%), potassium (2.9%), calcium oxide (2%), aluminum (2%), and magnesium oxides (0.6%).19 Tin Bhasma formation is used as a therapy for diabetes, respiratory tract disease, asthma, microbes, and bone dislocation. Alone, or in combination, it is beneficial for genitourinary tract pathologies. Also, it is the drug of choice for the treatment of obesity. The tin Bhasma dose is between 120–240 mg.

Formulations of 'Vanga' are variously beneficial in diseases such as: Prameha, Kasa, Shwasa, Krimi, Ksaya, Pandu, Pradara, Garbhashaya Chyuti etc.[35] Singly or in combination with other puti lohas, it is beneficial in disorders of the Genito Urinary Tract. It has also been said that, Vanga Bhasma is the drug of choice in the case of Prameha.

Vanga Origin:

According to Purana, Vanga was originated from the semen of Lord Indra.

Types:

खुरकं मिश्रकहचेति द्विविधं वंङ्मुच्यते।
खरं तत्र गुणैः मिश्रकं न हितं मतम्।। (र.र.समु. 5/153)

There are two types of Vanga:

1) Khuraka Vanga
2) Mishraka Vanga

Khuraka Vanga is best in quality. Mishraka Vanga is not useful for medicinal uses.

Properties of Vanga:

Vanga which is clean, soft and unctuous, Heavy, easily melts on fire and don't produce sound while melting, is called Khuraka Vanga. Mishraka Vanga is blackish white in colour, does'nt easily melts on fire. It is Dhusara in colour and hard due to mixing of other metals.

Properties of acceptable Vanga:

Khuraka type of Vanga is superior and Mishraka type of Vanga is considered as inferior in quality. So, always Khuraka Vanga should be taken for incineration or in medicaments.

Purpose of purification:

Improperly purified and incinerated Vanga bhasma can causes leprosy, kilasa (type of skin disease), tumour, prameha (obstinate urinary disorders including diabetes), tuberculosis, anaemia, inflammation, fistula, shukrashmari(calculi/spermolith), cardiac diseases, piles, cough Asthma, and Vomiting.

Purification:

Generally the purification of Vanga is performed in Pithara Yantra. First, Lime should be dissolved in water in a metallic pot which is covered with a heavy metallic flat plate having a hole in its centre. Now Vanga should be melted and poured over the Lime water through the hole of the plate. Take out the solidified Vanga and again repeat this process for seven times to obtain the purified Vanga.

Jarana of Vanga:

Purified Vanga should be taken and melted by heating it in a pan (Karahi). Sprinkle ¼ part Apamarga churna on the melted Vanga and stir it with the help of long spatula. This process should be applied until the bhasma (ash) of vanga is prepared. After the preparation of bhasma (Ash) Put a sharava on it and make the Vanga ash red hot on the fire. After self cooling it should be taken out and used.

Incineration:

Vanga, obtained from Jarana Process should be mixed with Haratala and triturated with Arka Milk. Triturated Vanga should

be further placed in between the bark of Ashwathha(peepal) in a sharava and introduced to Kukkuta puta. Applying this procedure for seven times Vanga bhasma is obtained.

Properties of Vanga Bhasma:

The way, lion kills the elephant, in the same manner, Vanga cures all 20 types of prameha and promotes body vitality and health and also strengthen the senses and body.

Vanga is bitter in taste, hot in potency, dry and slightly aggravator of vayu. It cures prameha (obstinate urinary diseases including diabetes), diseases of kapha, obesity, cough, asthma, tuberculosis, tympanitis, anorexia, fever and parasitic infestation. It is an excellent promoter of strength, Semen, potency and complexion. It improves sex power, intellect and body metabolism. Vanga improves power of body, wisdom, body metabolism (increasing dhatu of body) appetizer and digestive. It is specially used in preventing premature ejaculation of semen.

Colour of Vanga bhasma:

Colour of Vanga bhasma is white (dhawal or shubhra) as colour of Moon.

Harm of Improper incinerated Vanga bhasma:

Taking improper incinerated Vanga bhasma can cause burning sensation, calculi, inflammation, kilasa (a type of skin disease), leprosy, vitiligo, apachi, tuberculosis, fistula, pain, tumor, anemia, retention of urine, abscess and diseases of Kapha and Vata.

Complications and their cure:

Complications arises from the administration of improper Purified or incinerated Vanga bhasma can be subside by taking Meshashrangi churna and Mishri for three days.

Dose:

Dose of Vanga bhasma is 1 ratti to 2 ratti.(120mg to 250mg.)

Anupana or Vehicle:

Honey, milk, ghee, butter and milk cream. Beside this,Vanga bhasma can be given with juices and decoction of different drugs according to the diseases.

Important formulations of Vanga:

- Nityananda rasa
- Talkeshwara rasa
- Lakshmivilas rasa
- Trivanga bhasma
- Swarna Vanga
- Mahashankha vati
- Induvati
- Yogeshwara rasa
- Mehakesari rasa
- Kshayakesari rasa

Brass (Pittala)

Pittala is an important Misra Loha, an alloy of Copper and Zinc, known since the period of Samhita Kala. Charaka used this metal to prepare Vasti netra. It is known as Brass. As per the descriptions available in Rasa Ratna Samuchaya, there are two varieties of Pittala viz. Ritika and Kakatundi. Undoubtedly, it has a much longer history than Zinc. Ayurvedic treatises such as Charaka Samhita (2nd century BC) and Sushruta Samhita (3rd century BC) have mentioned some instruments used for various therapies and surgical procedures made of Pittala such as Jeevah-nirlekhana (tongue scarper), Vasti Netra etc. The original Sanskrit equivalent for brass was Riti, the word Pittala being subsequently adopted for it. In Kautilya Arthasastra (4th century) it is known as Arakuta. Pittala kills a large number of microorganisms within a few minutes to hours of contact. So, it is a good antifouling material. Its ethno-medicinal use is in Raktapitta, Krimi, Kushta and Pandu Roga. Probably, there is no available literary research study done on Pittala so far. Most of the information is obtained from Rasa Ratan Samuchchaya. Pittala Bhasma retains the property of both Tamra (copper)and Yashada (zinc). It has Tikta Rasa (bitter taste), and its Virya (temperament) is either Ushna (hot) or Sheeta (cold), which depends on the variety of Pittala and various drugs used in the process to make Bhasma. It appears from the thorough search of the process of Marana, that its Bhasma preparation is easier than Tamra.

Formulations of 'Pittala' are beneficial in diseases like Krimi, Kusta, Pandu etc. The therapeutic doses given for 'Pittala Bhasma' range from 60 mg. to 120 mg. Very few references mentioned in Charaka Samhita that hold Pittala as one of the components Brass is a mixed metal alloy of copper and zinc.

Formulations of brass are beneficial in diseases such as various abdominal lumps, rashes, and jaundice. The brass dose is between 60–120 mg

Bronze (Kamiya) :

Kamsya is another important Misra Loha, an alloy of Copper and Tin known since the period of Samhita Kala. Charaka used this metal to prepare Vasti netra. It is known as Bell Metal or Bronze. According to the descriptions given in Ayurveda Prakasha, there are two varieties of Kamsya viz. Pushpa and Tailika, only the former being acceptable for therapeutic applications. Samples giving a sharp sound (Teekshna Shabdam), soft (Mridu), smooth to touch (Snigdha), slightly grayish (Eshat Shyamalam), clear from impurities (Shubhram/Nirmalam) and turning red on heating (Dahe Raktam) possess the characteristic features of the material preferred for therapeutic purposes.

Bronze, the bell metal, is made by mixing copper and tin. According to Ayurveda, there are two bronze varieties called Pushpa and Talika, and only Pushpa is used for therapy. When tapped bronze produces a sharp sound, and is soft to touch, gray in color, devoid of impurities, and following heating, it turns red. Formulations of bronze are used in the treatment of various types of abdominal lumps and rashes. The bronze Bhasma dose is from 60 mg to 120 mg.22 The method of preparation of bronze Bhasma is described by Charaka. It is initiated following metal powder preparation and as with Carla, a 7.4 × 7.4 cm thin sheet of metal, penetrable with a thorn prick, is heated until it is red hot. The red-hot sheet is sequentially drenched till a delicate powder is formed in the decoction of Triphala (a mixture of dried Emblica officinalis, Terminalia bellirica, and Terminalia chebula), cow excreta (urine), Hordeum vulgare (Linn.) ash in water, rock salt, Balanites aegyptiaca (Linn.) ash in water, and Butea frondosa Koen Ex (Roxb.) ash in water.

The soft powder is subsequently mixed with honey and Phyllanthus emblica fruit juice and kept for a year. Once a month it is stirred and yields a semi-solid mixture which is the final form. This applies to gold, silver, copper, or iron as well.24 In Sushruta Samhita, the concepts of Lohaadi Rasayana, chemistry in metals, is converted to powder form using a slightly different procedure described by Charaka. Here, thin metal sheets are softened using different mineral salts and made red hot following intense heating. These sheets are then drenched to

make a powder in Triphala and decoction Shorea robusta Gaertn. f., Acacia catechu, Betula utilis D. Don, Gymnema sylvestre R. Br. 16 times. The powder is sieved using a fabric that is then used as a drug.

In addition to the therapeutic utilization; different metals ranging from gold to iron were also used in preparing equipments like Jihva Nirlekhana Yantra (tongue scrappers), Nabhi Kartana Yantra (sharp instruments to cut umbilical cord), Vasti Netra (nozzle of enema pot),[46] different Anjana Shalakas (metallic applicator for application of medicaments into eyes) etc. Besides this, Charak recommends preparing containers and vessels with different metals like gold, silver, copper, iron and some alloys etc.

Metals as Carcinogens :

Although most metal ions have been reported to be carcinogenic, the three most effective cancer-causing metals are Ni, Cr, and, to a lesser extent, Cd. Nickel sub sulphide, Ni2S3, found in many nickel-containing ores, has been extensively studied and shown to be carcinogenic in humans and other animals. In short-term bioassays including mutagenesis, enhanced infidelity of gene replication in vitro and altered bacterial DNA repair were observed. Chromium is most carcinogenic as chromate ion (CrO42-), which enters cells by the sulphate uptake pathway and is ultimately reduced to Cr(III) via a Cr(V)-glutathione intermediate species. The latter complex binds to DNA to produce a kinetically inert and potentially damaging lesion. Despite the fact that much information is available about metal-DNA interactions, molecular mechanisms of metal-induced carcinogenesis have not been elucidated. Two aspects of the problem are tumour initiation and tumour development, which are likely to involve different pathways. As new methods become available for studying the molecular events responsible for cancer (oncogenesis), it should be possible for bioinorganic chemists to unravel details of how metals act as carcinogens and as mutagens. Since cancer has genetic origins, metal/nucleic-acid chemistry is likely to be prominent in such mechanisms. As discussed later, metal-DNA interactions are an important aspect of the antitumor drug mechanism of cis-[Pt(NH3)2Cl2].

Toxic Effects of Other Essential Metals

When present in concentrations above their normal cellular levels, most of the other metals are toxic. Calcium levels in the body are controlled by vitamin D and parathyroid hormones. Failure to regulate Ca2+ leads to calcification of tissue, the formation of stones and cataracts, a complex process about which little is understood (see Chapter 3). Chronic manganese poisoning, which can occur following ingestion of metal-oxide dust, e.g., among miners in Chile, produces neurological symptoms similar to Parkinson's disease. Neuron damage has been demonstrated. Although Zn toxicity is rare, it can lead to deficiencies in other essential metals, notably calcium, iron, and

copper. Cobalt poisoning leads to gastrointestinal distress and heart failure. Metal poisoning by those elements has been treated by chelating agents, most frequently CaNaiEDTA), but the selectivity offered by the ferrioxamine class of ligands available for iron has not even been approached. Fortunately, there are few cases involving these metals.

Iron Toxicity

Chelation therapy is also used to treat iron overload. Acute iron poisoning, such as that resulting from accidental ingestion of FeSO4 tablets, results in corrosion of the gastrointestinal tract. Chronic iron poisoning, or hemochromatosis, arises from digestion of excess iron usually supplied by vessels used for cooking. A classic case of the latter is siderosis induced in members of the Bantu tribe in South Africa, who consume large quantities of beer brewed in iron pots and who suffer from deposits of iron in liver, kidney, and heart, causing failure of these organs. The chelating agent of choice for iron toxicity is the siderophore desferrioxamine, a polypeptide having a very high affinity for Fe(III) but not for other metals. Ferrioxamine chelates occur naturally in bacteria as iron-transport agents. Attempts to mimic and improve upon the natural systems to provide better ligands for chelation therapy constitutes an active area of bioinorganic research.

Copper Overload and Wilson's Disease

Wilson's disease results from a genetically inherited metabolic defect in which copper can no longer be tolerated at normal levels. The clinical manifestations are liver disease, neurological damage, and brown or green (Kayser-Fleischer) rings in the cornea of the eyes. Patients suffering from Wilson's disease have low levels of the copper-storage protein ceruloplasmin; the gene and gene products responsible for the altered metabolism have not yet been identified. Chelation therapy, using K2Ca(EDTA), the Ca2+ ion being added to replenish body calcium stores depleted by EDTA coordination, 2,3-dimercaptopropan-1-ol (BAL, British Anti-Lewisite), or d-penicillamine to remove excess copper, causes the symptoms to disappear. The sulfhydryl groups of the latter two compounds presumably effect removal of copper as Cu(I) thiolate complexes. Wilson's disease offers an

excellent opportunity for modem methodologies to isolate and clone the gene responsible for this altered Cu metabolism, ultimately providing a rational basis for treatment.

Cadmium and Lead Toxicity

Gastrointestinal, neurological, and kidney toxicity are among the symptoms experienced by acute or chronic exposure to these heavy metals. The use of unleaded gasoline and the removal of lead-containing pigments from paint have substantially diminished the quantity of this element released to the environment each year. Cadmium sources include alkaline batteries, pigments, and plating. Lead poisoning can be treated by chelation therapy using CaNa2(EDTA) (acute) or penicillamine (chronic). Although both Cd(II) and Pb(II) bind to sulfhydryl groups in thionein, we have little information at the molecular level on the mechanisms by which these elements induce toxicity.

Toxicity can arise from excessive quantities of either an essential metal, possibly the result of a metabolic deficiency, or a nonessential metal. Both acute and chronic exposure can be treated by chelation therapy, in which hard-soft acid-base relationships are useful in the choice of chelating agent. Since chelates can also remove essential metals not present in toxic amounts, ligands with high specificity are greatly desired. The design and synthesis of such ligands for chelation therapy remains an important objective for the medicinal bioinorganic chemist. Until recently, studies of the toxic effects of metals and their removal, sometimes categorized under "environmental chemistry," have been empirical, with little insight at the molecular level. Application of the new tools of molecular biology to these problems has the potential to change this situation, as illustrated by rapid progress made in cloning the genes and studying the gene products of the mercury-resistance phenotype in bacteria. The discovery of such resistance phenomena in mammalian cells, and even the remote prospect of transferring Hg-resistant genes from bacteria to humans, are exciting possibilities for the future.

Modern Science Perspectives

Extraction is the initial step to select active natural products from raw materials. According to the principle of extraction, different extraction methods are used, and solvent extraction, distillation, pressing, and sublimation are known methods; however, solvent extraction is most the commonly employed method. The liquid solvent has to penetrate the solid matrix, and subsequently, the active ingredients dissolve. Anything which enhances the diffusion and its solubility facilitates the process of extraction. Moreover, the efficiency of extraction relies on the characteristics of the solvent used for the extraction, particle diameter of raw material, solvent-to-solid ratio, temperature used for the extraction, and the duration. For efficient solvent extraction, the proper solvent selection is essential, and solubility, cost, and safety characters also are required to be considered. For phytochemical extraction, alcohols are regarded as the universal solvents. Currently, based on the required extraction in the phytochemical investigation, alcohol in the appropriate concentration and known strength is used; however, Ayurveda follows unique methods based on different scales and measurements. In Arista and Asava, alcohol extraction was used to extract essential herbs from the herbal formulary. Moreover, alcohol was formed following fermentation within

Arista and Asava and consumers may take herbals in addition to formed alcohol. Once the duration of extraction increases, the extraction efficiency increases; however, once equilibrium is reached between the inside of the solid material and outside the solvent, increased time barely affects the extraction.

For the formation of different Arista and Asava specifically applied periods have been described in the ancient scripts.

The utility of different metals for modern medicine was identified in the 17th century, and was introduced following the use of iron salts for anemia. The roles of metals in the functions of metalloenzymes and metalloproteins are well known, and trace amounts of cobalt, copper, iron, selenium, zinc, and magnesium are essential. The use of selenium, copper, and gold in cancer treatment has been practiced for decades. When considering the concepts of Rasa Rasayan, mercury or other

metals in the form of Bhasma, the bioavailability of the drug is increased. According to modern medicine, mercury use is often limited to a few topical applications, dental fillings, and contact lenses. Compared to the organic form and various compounds, its elementary form is less toxic.

Over the centuries, gold in its elementary form was used as an antipruritic agent. Clinical trials have been conducted to assess the therapeutic potential of gold on arthritis and systemic lupus erythematosus. Following the use of gold compounds, the concentration of rheumatic factor is decreased, and its influence on immunological response was remarkable. Compared to glucocorticoids, gold strongly suppresses the release of histamine following a type-1 hypersensitivity reaction. Sodium aurothiomalate, in a water-soluble form, was discovered around two decades ago, and is useful for treating arthritis.47 However, its pharmacokinetics and dynamics properties are not well established, and its antiinflammatory and stimulatory effects on the reticuloendothelial system could be the reason for the above-described actions. Gold-based medications can be use as an analgesic, and an antioxidant effect also has been described.
Copper-based formulas have liver-protective- antioxidant- and gastroprotective effects. Zinc-based formulas arrest myopia and iron-based ones are hepatic- and gastro-protective.

Often, Bhasma forms can be regarded as different complex compounds and have been shown to have a number of essential activities, especially a cytoprotective effect against different types of ulcers.

Silver has the highest thermal and electrical conductivity and is the most reflective metal. Most importantly, silver can be used to prevent the growth of potentially harmful bacteria. At present, silver nanoparticles are used as antimicrobial products; however, the concepts of infection and infectious agents are not described in detail in Ayurveda.

The consumption of mineral materials is impossible due to their hard consistency. However, chemical and physical processing change their consistency to make them smooth and palatable. This applies to the preparation of various modern-day metallic formulations by utilizing the knowledge of chemistry and physics combined with the battery of knowledge from the

ancient era. The preparation of metal-based formulations involves the conversion of a thin sheet of metal into a powder. Heat and various acidic and alkaline preparations in a particular sequence are used for this conversion.

Moreover, Ayurveda includes various herbs and purifying techniques to increase the quality of the desired herbal formulations. Often these are in the semi-solid phase, and those preparations are topically applied to the eyes as a therapy. However, Western medicine remains reluctant to use topical semisolid preparations on the eyes, only using liquids in the form of eye drops..0 The use of metal-based herbal formulas for therapy is considered to be controversial. Two schools of thought exist, with practitioners of metallic Bhasma representing one while the other is represented by the scientific community holding Western beliefs. The practitioners of metallic Bhasma are invariably in favor of its use and argue that it has been used as a medication for thousands of years. However, in Ayurvedic classics it is mentioned that these drugs should be used with caution.

General observations illustrate that metals are toxic; however, in therapeutic doses, compounds such as metal sulfides are nontoxic. The main concern is whether the metal-based preparations mentioned in the Ayurvedic classics are safe and efficacious. Several studies have been carried out over the years, and many recent studies have shown that toxicity is not generally observed at the therapeutic dose level if used properly. However, a great deal of data were gathered in the last century that oppose the above findings. Often toxicity potential is inherent, if metal-based products are used inappropriately under unacceptable conditions, with fatal outcomes being relatively high. Such toxicity is generally not related to the active pharmaceutical ingredients and instead is often related to the manufacturing process. Since the manufacturing process is cumbersome, lengthy, and requires a high level of skill, only a few experts have gathered and retained the required knowledge. Following the loss of those experts, the retained knowledge has been gradually lost, resulting in a deficiency in the standard operating procedures and standardization has reduced its reproducibility.. There is a demand to standardize all aspects of

herbal preparation. Moreover, observations and facts are sufficient to claim that metal-based preparations used in Ayurveda contain essential biological effects. Therefore, these should not be discarded without an in-depth analysis to decide on the usability and safety.

Complexes of mercury and sulfur are prepared using different methods. During the preparation of Kajjali sulfur is provided in excess compared with that required for the stoichiometric arrangement of HgS. The idea behind this is to minimize oxidation. The processing of mercury reduces its toxicity and the adopted methods of purification are unique. Allium sativum (Rasona), which contains sulfur, is used for the purification of mercury. Also, for processing, heat is applied and then it is subsequently boiled in a liquid bath. Later grinding, sublimation, and distillation are carried out. The solubility of HgS is low. Therefore, the toxic threshold is also low. While passage along the gastrointestinal tract due to the interaction with enzymes in the digestive tract and a change of pH leads to the development of complex biomolecules in food. As a result, the solubility of HgS would increase greatly. By using scanning electron microscopy and X-ray diffraction, the results of mercury and sulfur mixing have been elucidated. Following 60 min of grinding it slowly forms black HgS, which contains mercury globules. Interestingly, following 90 min of grinding, free mercury was not detected; however, after 120 min of grinding, particles were formed containing 2–1. weight % of mercuric oxide. It was also found that sulfur particles surround the HgS particles. In Kajjali free sulfur in excess is detected and often trapped in the mesh of HgS.

Biomolecules including methionine, cysteine, taurine, and enzymes act as antioxidants, and those such as glutathione are rich in sulfur. Most Ayurveda formulas contain excess amounts of antioxidants, and their influence on its therapeutic effect is remarkable. Antioxidants protect cells following free radical-induced damage. Based on its antioxidant properties, it is possible to explain the rejuvenating effects and antiaging effects of metal-Bhasma. Mercury in Bhasma may serve as a transient catalyst also.

The trituration of the prescribed powder of herb with Kajjali develops a unique molecular layer which is capable of acting as a sustained-release formulation. When consumed, it gradually releases an effective dose, that is adsorbed and acts on the target area. Preparations with sustained-release are advancements in modern medicine, which can improve the therapeutic activity. With regards to the concept of slow-release, Ayurveda classics pose similar concepts.

During the formation of metal Bhasma, quality assurance and quality control are carried out to assure the quality and efficacy of the formulation. This is compatible with the concepts of modern-day quality control; however, they should be reassessed and reassured. Also, modern techniques could be introduced to make it safer. Also, drug formulation knowledge is kept secret and hidden. Nevertheless, it has been kept and protected through various modes, such as in the form of sloka (poetic form in Sanskrit) and phrases. These forms provide the methods in the correct order and can be considered as ancient standard operational procedures.

Compressed single or multiple powdered ingredients form hard tablets or smooth-coated capsules that following ingestion break down in the digestive tract. Most tablets contain additives and active ingredients, which hold the pill together and improve the taste, texture, and appearance. Tablets can be round, oblong, or disc-shaped. Oblong tablets are known as caplets, which can be easier to swallow. Similarly, in Ayurveda, vati has been prepared as a single or mixture of medications required for ingestion. The size and the shape of tablets are considered to be important for ingestion and insertion to the gastrointestinal tract through mouth or anus. Moreover, Ayurveda has considered the importance of a base to ensure the stability, taste, and texture of the final product. Most are swallowed, while some have to be chewed before swallowing. This is similar to concepts in modern tablets. However, based on pharmacokinetics and pharmacodynamics properties, in-depth studies on such Ayurvedic preparations are required to assess their bioavailability and efficacy. Other formularies, churna, are similar to powdered formulations in modern medicine.

Depending on their use, the physical, chemical, and biological characteristics can vary.

The oral transmucosal route is useful for the absorption of drugs, both systemically and locally. Avala is a formulation intended to be administered through the oral cavity. Ayurveda has developed such a formulation that can bypass the first-pass metabolism of the liver to enhance its bioavailability. Ghrita is an almost anhydrous milk fat prominent in the Indian diet and that is given great importance. Ghrita is used as a food and is the main ingredient for many Ayurveda medicines and is an excellent vehicle for the administration of drugs. Its spreading nature facilitates the dispersion of all medicinal properties to the deepest tissues. In this context, it is also referred to as a catalytic agent. Ghrita made from cows' milk is considered superior to all other Ghrita. Like many dairy products, Ghrita is composed almost entirely of fat, with 62% saturated fats. Plant-based oils are generally rich in unsaturated fatty acids, while the products derived from animals are rich in saturated fatty acids.

Saturated fatty acids (SFAs) are produced as a result of ruminant biochemical hydrogenation, producing mostly the cis configuration of SFAs, and it differs quite extensively from the FAs (fatty acids) produced by industrial hydrogenation, which converts some cis FAs to trans FAs through cis–trans isomerization. The trans configuration of SFAs is not recognized by the enzymes present in the biological systems of humans and other animals and so they tend to collect in the body, thus being associated with higher coronary vascular disease risk.

Most of the activities described for Ghrita in the classics are known to be imparted by antioxidants and docosahexaenoic acid (DHA), an essential fatty acid. Several studies have proved that using traditional methods to produce Ghrita results in a higher amount of DHA and omega-3 long-chain polyunsaturated fatty acid (PFA). Dietary DHA reduces the risk of ischemic heart disease, malignancy, type-2 diabetes mellitus, and arthritis..9 For years, Ghrita has been considered to be fattening and unhealthy and it has been associated with many diseases and increased mortality. Several studies have revealed Ghrita has saturated fatty acids and that heated products contain a high level of oxidative products of cholesterol which would increase the

prevalence of ischemic heart diseases in Asians, particularly Indians. Studies have shown that up to 10% Ghrita in the diet positively affects the serum lipid profile. There was a dose-dependent decrease in triacylglycerol, low-density lipoprotein, and VLDL cholesterol and triacylglycerol when Ghrita was given at a rate higher than 2..% in the diet. The level of 3-hydroxy-3-methylglutaryl coenzyme A reductase activity in microsomes of the liver was not affected by dietary Ghrita, indicating that cholesterol biosynthesis was not affected by it, but instead, the excretion of bile constituents was increased by 18–30%, lowering the serum cholesterol levels.

Moreover, conventional herbal extraction methods have several drawbacks, such as excess time consumption, solvents with residual effects, stickiness, and handling difficulty of highly inflammable solvents. Hence, it is necessary to develop a novel method for extracting the phytoconstituents utilizing traditional knowledge. In regard to oil preparations, the decoction was mixed with different seed or plant oils. Depending on the source of the oil, the duration and intensity of heating were prescribed. These oils often act as a base and soluble media for lipophilic herbs, which helps in the better absorption for lipid-soluble substances and allowing greater affinity through the cell membrane when used for different mucosa.

Guggulu contains a mixture of steroids, diterpenoids, triterpenes, aliphatic esters, alcohols, carbohydrates, amino acids, cholesterol, Guggulu-sterol, flavonoid, and a variety of inorganic compounds. Guggulu has antiplatelet activity, cardiac protective activity, antioxidant activity, reducing the pro-inflammatory cytokines and antibacterial activities. L-arabinose is a good source of sugar ferulic acid esters and has antitumor properties.

Guggulu and Guggulu-lipid are used for cardiovascular diseases, including dyslipidemia and atherosclerosis.

Guggulu is generally used in compound dosage forms such as Ayurveda tablets, oils, and topical preparations. The different choices of therapy are based on soluble alkaloid and the insoluble resinous gum content of Guggulu. The formulation concept is also designed for better pharmacokinetics of Guggulu in clinical practice in Ayurveda. Gum Guggulu acts as a binder

in the preparation of pills and tablets, while it acts as a suspending and emulsifying agent in the case of liquid dosage forms. The solid dosage forms thus have a longer disintegration time, which delays the therapeutic action of Guggulu formulations. Possibly considering this in view, the seers of ancient times advised dissolving Guggulu completely in suitable liquids before its consumption, and Ayurvedic physicians in the present scenario advise breaking Guggulu solid dosage forms like pills and tablets before oral administration for proper assimilation and absorption in the gastrointestinal tract.

The possible modes of action of Ayurvedic formulations can be multidimensional and include scavenging of free radicals, antioxidation, antimicrobial, pro-enzymatic, and immunomodulation. The kajjali complex is more effective due to its sustained release. In Ayurveda, herbal mixtures have been used, and concepts of the molecule, its size, weight, and intermolecular interactions were not considered. Moreover, thermodynamics and other characteristics were not considered explicitly in Ayurveda drug preparation. However, for the preparation of different herbal formularies, the intensity and duration of heat were specifically considered following changing characteristics of fire by using different types of firewood and other fire sources.

In Ayurveda, raw herbal plant materials were used by volume to volume, weight to weight, or volume to weight ratios to extract herbs efficiently. The Ayurveda disease management system was mainly practiced on a small scale as a service without industrial measures. Herbal preparations were created using abundant herbal plants; concepts of efficient extraction would not have been considered to any great extent. In Ayurveda, the quality of the final drug subjective parameters is assessed, while in modern medicine, multiple analytical and advanced bio techniques are employed. The development of herbal formulations and the methods used to assess their therapeutic usability and validity were not described in Ayurveda and it is generally believed that spiritual activities were depend upon. In oppose, laboratory studies, clinical assays, and trials in various phases have been done to assess their validity and safety. The Ayurveda system have different scales and parameters and

can be compared easily with those in current scientific scales. In-depth scientific studies are required to ascertain the essence of Ayurveda concepts to make them more applicable to modern medicine.

Health is a complex phenomenon. To maintain health and balance of mind & body at any time numerous interrelated physiological, biochemical and hormonal functions need to act together in harmony with great precision. The ancient Ayurvedic physicians have explained the delicate anatomy and physiology of human body in a very holistic way. They saw the living entity as sum total of physical body, senses, the psyche and the soul. Ayurveda describes the healthy person as one whose anatomy and physiology in terms of Dosha, Dhatu and Mala are in a state of balance and who is in a state of sensorial, mental and spiritual well being.

Avurveda describes its objectives in two broad ways one is preservation of health and second is treating the disease. For preservation of health there is detailed description of measures like Dincharya, Ratricharya, Rittucharva, Sadvritta and periodic seasonal Panch-Karma. Details about lifestyle, diet, exercise, personal and social hygiene have been described. Similarly, Rasayana-Chikitsa, a separate speciality branch of Ayurveda is devoted mainly for preservation and promotion of health by revitalizing the metabolism and enhancing immunity. It has therapeutic potential in combating

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Metals and Ayurveda

(Dhatu varga)

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