

Antimicrobial Studies of *Rasaushadhies* (Herbomineral Preparations): A Review

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Abstract

Ayurved *Rasaushadhies* (Herbomineral preparations) are immersing now a days due to its ultimate therapeutic properties on acute and chronic disorders. Microbial infections is an acute condition which needs quick treatment in the form of different Antimicrobial agent. Due to increasing irrelevant use of antibiotic and increasing susceptibility of microorganism to antimicrobial agents, there are increasing numbers of drug resistance cases in most of developing countries. So there is urgent need to develop a new antimicrobial agent which is based on targeted drug delivery system. Ayurvedic *Bhasma* (Incinerated minerals)Preparation are proven antimicrobial agents in various infectious diseases since ancient times but it requires to prove on modern ground as an efficient and effective antimicrobial agents by repeated antimicrobial studies. These *Bhasma* contain nano particles which could help to explore target base drug delivery system with less or no side effects along with immunomodulatory benefit. Presently various researches studies on antimicrobial properties of *Bhasma* are carried out to prove its antimicrobial potential. Present paper aimed to review these studies. Antimicrobial studies on *Yashad Bhasma, Tambra Bhasma, Hartal and Hartalgodanti Bhasma, Tuttha Bhasma, Suvarnamakshik Bhasma, Sphatica Bhasma and Rasaka Bhasma* are included in the present study noted remarkable result against various gram positive and gram negative bacteria against standard antibiotics. Those *Bhasmas* which have proven *Jantughna* (Antihelminthic) and *Krimighna* (Antimicrobials) property needs repeated studies on different species of bacteria and fungi in order to get such antimicrobial agents which do not develop resistance having less or no side effect.

Keywords

Drug resistance, Tambra bhasma, Nano particles



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INTRODUCTION

In the era of evidence base medicine ancient system of medicine like Ayurveda is trying to establish on modern standardized tools by various research studies such as Pre clinical trials, safety toxicity study on animals, Reverse pharmacology etc. *Rasaushadhies* (Herbomineral preparations) in Ayurveda which are known for its low dose, good palatability and quick action¹. It is always been a quest for medical science due to its chemical identity. As these medicines have already proved its therapeutic potential on various acute and chronic ailments it is beyond doubt that it may act on various infectious diseases.

Due to changing climate conditions and increasing global population various infectious diseases are on rise, so as the newer antibiotics are also flourishing to resist these infections.

Although extremely effective, antibiotics are able to induce resistance in bacteria. For more than 50 years, bacterial resistance has been the main factor responsible for the increase of morbidity, mortality and health care costs of bacterial infections. Also increasing drug resistance cases due to irrelevant use of Antibiotics is also the cause concern for India. According to data by the

for Disease Dynamics, Economics & Policy (CDDEP), Washington DC, found that India has among the highest rates of antibiotic resistance for 12 common bacteria including *Escherichia coli* (E. coli), *Salmonella*, *Klebsiella* and methicillin-resistant *Staphylococcus aureus* (MRSA) in the 30 countries studies³. Hence there is urgent need to search for alternative option to minimise the side effects and resistance cases of antibiotics.

Rasaushadhies in Ayurveda could be the solution for this as it has already been used as *Jantughna*(Antihelminthic) and *Krimighna*(Antimicrobial) since ancient time. *Rasaushadhies* which includes metallic *Bhasmas* (Incinerated metals) are also known for its *Rasayana* (Immunomodulatory) property⁴. Metallic *Bhasma* having immense potential to rejuvenate the disease cell of the body by fulfilling the need of various essential elements and trace elements which are involved in different important enzymatic activities of the normal physiology.

These *Bhasmas* although yet to be developed and rationalized in various respects like clear qualitative and quantitative information about the medicinally active principles

(inorganic/organic compounds or conjugates etc.), pharmacodynamics, pharmacokinetics and clear picture about mechanism(s) of action of the active principle(s) at molecular level which involves relevant understanding of their possible involvement in intra/extracellular signalling mechanism⁵.

Bhasma is the oldest form of Nanotechnology and it is a scientific process in which metal is transformed into therapeutically active form using herbal ingredients it is called as nano medicine for various chronic diseases⁶. The emergence of nano science and nanotechnology in the last decade presents opportunities for exploring the bactericidal effect of metal nanoparticles. The bactericidal effect of metal nano particles has been attributed to their small size and high surface to volume ratio, which allows them to interact closely with microbial membranes and is not merely due to the release of metal ions in solution⁷.

Ayurved mentioned antimicrobial agent as a *Jantughna* and *Krimighna* which can be used for internal and external application also. There are some *Bhasma* which especially referred as *krimighna* and *Jantughna* hence used in wound cleaning and healing termed as *Vranashodhana* and *Vranaropana* properties respectively. It

includes *Yashad Bhasma*(Incinerated Zinc), *Tambra Bhasma*(Incinerated copper), *Hartal Bhasma*(Incinerated arsenic trisulphide), *Tuttha Bhasma*(Incinerated Copper sulphate) etc. On the basis of their therapeutic activities some antimicrobial studies are carried to prove its antimicrobial potential on modern method of antimicrobial study. Present paper in an attempt to review these studies in order to explore its antimicrobial properties and future need for Antimicrobial studies.

Methods

Review of literature for present work was done by referring various national and international journals, published articles in various standard books, *Ayurvedic Samhitas* and referring to various websites on the internet.

Antibacterial activity

Yashad(Zinc)Bhasma :

As per *Rasshastra* one of the therapeutic uses of *Yashad Bhasma* is on *Vrana* and *Vranastrava*(on wound)⁸. Chhaya H Gaggoli(2012) *et al* noted in the study on topical use of *Yashada Bhasma* along with other herbs shows that it has better wound healing properties as it contain essential nutrient for collagen formation and cell division⁹.

Tatke(2015) *et al* noted in comparative study of Herbo-mineral combination of *Yashad Bhasma* with standard drug Framycetin sulphate cream shows that it promotes epithelialization of wound having no irritation of skin¹⁰.

Tambra (Copper)Bhasma:

Tambra bhasma is used in *kshaya*(Tuberculosis), *krimighna*(Antimicrobial), *kushtaghna*(Skin diseases) and *Jwarghna*(Antipyretics) having *Lekhan*(Scraping) and *Ropan*(Healing) quality¹¹. Study on In vitro antibacterial activity of *Tambra Bhasma* shows that it acts on gram positive and gram negative bacteria mainly on *E coli* and *staphylococcus*¹². An another study on *Tambra Bhasma* shows strong antibacterial activity against *P. aeruginosa*, *S. epidermidis*, *S. aureus*, *S.typhi*, *S. paratyphi-B*, *P. vulgaris*, *E. coli*, *E. aerogenes* and *S. typhimurium*, while moderate antibacterial activity against *K. pneumoniae*¹³.

Hartal(Arsenic trisulphide)Bhasma And HartalGodanti(Calcium sulphate)Bhasma

Hartal bhasma is used in old *Firanga*(chronic syphilis), *Vatrakta*(Gaut), *Visarpa*(Cellulitis), *Vicharchika*(Eczema), *Sarvakushta*(All types of skin diseases), *Arsha*(Piles), *Vishamjwar*(Enteric fever),

Apasmar(mental disorders), *Bhagandar*(Fistula), *Vrana*(Wound), *Nadivrana*(Deep seated wounds)¹⁴.

Antimicrobial activity of *Hartal Bhasma* and *Hartalagodanti Bhasma* was conducted against gram positive, gram negative bacteria to evaluate its efficacy as broad spectrum antibiotic. It found an effective antimicrobial activity against *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* in both Diffusion methods (Kirby- Bauer disc diffusion method and Stokes disc diffusion method) and Dilution methods (Broth dilution method & Agar dilution method)¹⁵.

Tuttha(Copper Sulphate)Bhasma

Tuttha Bhasma is *Uttamkriminashak*(Good Anti helminthic)It is also useful in *Netraroga*(Disorders of eyes),*Kaphaj prameha*(Kapha dominant Diabetes) and *Medoroga*(Obesity)¹⁶.

Antimicrobial study on *Tuttha bhasma* against two Gram-positive (*Staphylococcus aureus*, *Bacillus subtilis*) and two Gram-negative (*Salmonella typhi* and *Escherichia coli*) bacteria and antifungal activity against two fungi (*Candida albicans* and *Trichophytonrubrum*) in comparison with standard drugs Gentamicin and

Amphotericin B respectively via Kirby-Bauer method shows antibacterial activity of *Tuttha bhasma* at 20 mg was equivalent to the inhibition shown by 1 mg of Gentamicin and antifungal activity was equivalent to standard drug Amphotericin B at 1 mg. The minimum inhibition concentration of the *Tuttha bhasma* was also estimated in the study to rule the susceptibility¹⁷.

Swarnamakshik(Copper pyrite)Bhasma

Swarnamakshik Bhasma is used in *kshaya*(Tuberculosis), *Pandu*(Anaemia), *Prameha*(Diabetis), *Kushta*(Skindiseases), *Arsha*(Piles), *Krimi*(Various microbes), *Vishavikara*(disorders due to poison)*Udarvikar*(Gastric disorders),*Shotha*(Odema), *Kandu*(Allergic disorders), *Vicharchika*(Eczema)etc¹⁸. When it is tested against gram positive and gram negative organism, it effectively inhibits the growth of *staphylococcus aureus* at 8mg concentration after ½ an hour and *E.coli* at 4mg concentration after ½ an hour where the MIC range was 1mg¹⁹.

Sphatika(Potash Alum)Bhasma

Sphatika(Kankshi)Bhasma is *kanthya*(useful for throat),*Keshya*(Hair tonic),*Vishaghna*(Anti poisonous),*Vranashodhak*(Cleanses wound)and *Raktasthambak*(clots blood)²⁰.

Antimicrobial study on *Sphatika Bhasma* in methanol and aqueous extract by Well Diffusion Method shows 9mm and 7mm Zone of inhibition respectively for *Ecoli* bacteria against streptomycin Sulphate as a control²¹.

Rasaka(Zinc Sulphate)Bhasma

Rasaka Bhasma is useful in *Raktapitta*(Hemorrhage), *Ashmari*(Stone), *Swash*(Asthama),*Gudastrava*(Fistula), *TwakRoga*(Skin Diseases) and *Netraroga*(Disorders of eyes)²². Antibacterial activity study on *Rasaka Bhasma* by Agar gel method with control as a standard drug Ofloxacin against Gram-positive organisms *Staphylococcus aureus*, *Streptococcus pyogenes* and *Streptococcus pneumoniae* and Gram-negative organism *Klebsilla pneumonia* shows better antimicrobial activity against *Streptococcus* as compare to other organism²³.

Discussion

Increasing number of resistance cases against existing antibiotic is a cause of concern for medical fraternity hence need to step ahead to develop target base drug delivery system. Emerging Nanotechnology could be the solution for developing such drugs which not only reach to the target

organ but also not disturb normal physiological conditions. Ayurvedic *Bhasma* are ultimate as most of the *Bhasma* particle size have nano particles. Besides quick action, low dosage, easy palatability these *Bhasmas* have immunomodulatory properties hence needs to explore as a antimicrobial agents to avoid resistance of antibiotics.

Yashad Bhasma used as antibacterial agent locally in the form of ointment since ancient times in Ayurveda. Due to its *kashaya*(Pungent)rasa it has a *Sandhaniya karma*(as it promotes Epithelisation of cells)hence used as *Vranaropana*(Healing of wound)Studies on *Tambra Bhasma*, *Hartal* and *HartalGodanti Bhasma* are concentrated on antibiotics resistant bacteria such as *Eshcheria coli*, *Salmonella typh*e, *Staphylococcus aurious*, *Klebsiella pneouninae*. *Tuttha Bhasma* studies as an antimicrobial agent (Antibacterial and Antifungal) shows remarkable activity against Gram positive and Gram negative bacteria and fungi *Candida Albicans* and *Trichophytonrubrum* in comparison with standard drugs. *Tuttha*(copper sulphate) in pure or in impure form is used locally as good *Vranaropana* and *Vranashodhan*

properties in separate or in combination form such as ointments.

Swarnamakshik Bhasma studies as an antimicrobial agent shows activity on *staphylococcus aurious* and *Ecoli* bacteria. *Sphatika Bhasma* and *Rasaka Bhasma* both shows anti-microbial properties as compare with standard drug.

Although most of antimicrobial studies on *Bhasma* are on those *Bhasma* conventionally known as an anti- microbial agents, and they show remarkable results but still much more work has to carried out in order to elaborate there susceptibility to microbial agents to establish them as a Antimicrobial agents. Also the other metallic *Bhasma* such as *Suvarna*(Gold)*Bhasma*, *Rajat*(Silver) *Bhasma*, *Louha*(Iron) *Bhasma*,*Naga*(lead) *Bhasma* and *Vanga*(Tin) *Bhasma* should be tested for its Anti microbial activity.

CONCLUSION

Ayurvedic *Bhasma* as immense source of possibilities, as various research studies is going on to develop various aspects of drug development. *Bhasma* such as *Tambra Bhasma*, *Yashad Bhasma*, *TutthaBhasma*, *SphatikaBhasma* has proven *krimighna* and *Jantughna* properties and they are generally used as an antimicrobial agent in Ayurveda,

hence need further critical study on its antimicrobial activity for selective bacteria and fungi to develop good antimicrobial agent in the view of developing resistance against existing antibiotics

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