Review Article

www.ijrap.net

(ISSN Online:2229–3566, ISSN Print:2277–4343)

A CRITICAL APPRAISAL ON SUVARNA (GOLD) BHASMA

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Received on: 04/08/23 Accepted on: 12/09/23

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DOI: 10.7897/2277-4343.1405146

ABSTRACT

The Ayurveda system of medicine has appreciable antiquity, dating back to about 5000 years B.C. Materia Medica of Ayurveda contains resources in the form of drugs derived from plant, animal, metal, and mineral sources. Gold is found in the form of fine gold dust, red colloidal solution, *Suvarnapatra, Suvarnabhasma, Suvarnaparpati, Kharaliya* (triturated) formulations, and *Sindoorkalpa*. These are used in single or in combination form along with *Ghrita* and *Madhu* (honey) to enhance *Medhya* (intellect) and *Rasayana* (rejuvenation). *Bhasmas* are Ayurvedic metal-based preparations manufactured through various steps along with the use of certain herbs. Thus converting raw metal into its therapeutic active form known as *Suvarna Bhasma.* This *Suvarna Bhasama* is a traditional *Ayurvedic* medicine that contains nano and colloidal gold particles. In this review article, the author tries to gather all available information on gold that establishes its anti-inflammatory, antimicrobial, anti-carcinogenic, anti-rheumatic and antioxidant properties through published research articles and experimental and clinical studies.

Keywords: *Suvarna Bhasma, Medhya, Suvarnapatra*

INTRODUCTION

Nature not only bestows us with a bounty of fresh fruits and vegetables but also several metals that are blessed with healing properties. Since ancient times, several sages and physicians adopted the holistic age-old practice of *Ayurveda* and used precious metals, minerals, and herbs to concoct supernatural formulations and compounds that are answers to a myriad range of diseases and anomalies. One such incredible mineral formulation for our health is *Suvarna Bhasma.*

In *Veda, Upanishada* gold is mentioned as *Hiranya*. It is mentioned in relation to the sun for its antimicrobial properties in Rigveda; in *Shatpath Brahman*, it is described under the healing of *Panchadhatu*. The ancient *Ayurvedic* text '*Rasa-Jala-Nidhi'* states: "Gold is a soothing, pure, nutritive, curer of poison, phthisis, insanity, and other diseases. Gold improves vitality, fortune, beauty, intelligence, and memory.[1] It is placed under *Shuddha Lauha* (pure metals)[2]. In ancient times, the use of gold was mentioned to increase intellectual powers and longevity of life through the procedure of *Suvarnaprashan.* In the Samhita period, in *Charaka Samhita* [3] the properties of gold and its compound formulations, such as *Lauha Rasayana* are mentioned.

In the new pharmacopoeia of the 17th century, the use of gold could be found and was advocated by Nicholas Culpepper for the treatment of ailments caused by a decrease in the vital spirits, such as melancholy, fainting, fever, and falling sickness. Later in the 19th century, for the treatment of syphilis, a mixture of gold chloride and sodium chloride, i.e., muriate of gold, was used. In 1890, the German bacteriologist Robert Koch proved that gold cyanide was bacteriostatic towards the tubercle bacillus. Gold therapy for tuberculosis was subsequently introduced in the 1920s. A clinical study sponsored by the Empire Rheumatism Council confirmed the effectiveness of gold compounds against rheumatoid arthritis. Since that time, gold compound drugs have also been used to treat a variety of other rheumatic diseases, including psoriatic arthritis, a form of arthritis associated with psoriasis, juvenile arthritis, palindromic rheumatism, and discoid lupus erythematosus.

GOLD

Science recognises gold's medical value and employs it in the form of colloidal solution[4-5] and nanoparticles[6]. It has been proven beneficial in several ailments like asthma, rheumatoid arthritis, immuno-suppressive disorders, and dental ailments because of its anti-inflammatory and immunomodulatory properties[7]. Gold alloys are used in restorative dentistry, especially in tooth restorations[8]. In various surgical procedures like prostate cancer, gold-plated stents are new gold-related discoveries.

Suvarna Bhasma

Suvarna Bhasma is also known as Gold Bhasma. *Suvarna Bhasma,* or Monatomic gold, is a traditional *Ayurvedic* medicine that consists of nano and colloidal gold particles. Being a powerful rejuvenating, antitoxic, antioxidant, cardioprotective, and nervine tonic, it is a remedy for numerous physical problems and positively affects overall health. It promotes cardiac health, increases lifespan, intelligence, memory, and skin glow, and

prevents several diseases. It is also extremely useful in the case of tuberculosis, chronic fever, phthisis, asthma, cough, burning sensation, acidity, microbial infection, loss of vitality, toxicity, infertility, conjunctivitis, rheumatoid arthritis, etc. Additionally, it also increases overall strength and endurance and improves mental health. *Suvarna Bhasma*, a therapeutic form of gold metal of nano-sized particles, was found to have a crystallite size of 28-35 nm and was 90% pure gold, as visible from X-ray diffraction and elemental analysis.

Pharmacological and Therapeutic Properties

Rasa: Kashaya, Tikta, Madhura
Guna: Guru, Snigdha
Veerya: Sheeta (cold), Picchila
Vipaka: Madhura
Doshaghanata: Tridosahara[12-13]

Table 1: Pharmacological and Therapeutic Properties of Gold (*Suvarna Bhasma*) in Ayurvedic Classical Texts

	K.S.	C.S.	S.S.	A.H.	B.R.	B.P.	R.T.	R.R.S.	R.P.S.	A.P.	R.S.S.
Snigdha	-	-	-	-	-	-	+	+	-	+	-
Tikta	-	-	-	-	-	-	-	-	-	+	+
Kshya	-	-	-	-	-	-	-	+	-	-	-
Guru	-	-	-	-	-	-	-	+	-	+	+
Shital	-	-	+	-	-	-	-	-	-	+	-
Vrishya	+	-	-	-	-	-	+	+	-	+	-
Rasayana	-	-	+	-	-	-	+	-	+	+	-
Pawan Shyamaka	-	-	-	-	-	-	+	-	-	-	-
Punsavan Karma	-	+	-	-	-	-	+	-	-	-	-
Tridosha Shyamak	-	-	+	-	-	+	-	+	+	+	-
Hridaya	-	-	+	-	-	+	+	-	-	+	-
Aayushya	+	-	-	+	+	+	+	-	-	+	-
Agni Vardhan	+	-	-	-	-	-	-	-	-	-	-
Mangal	+	-	-	-	-	-	-	-	-	-	-
Punya	+	-	-	-	-	-	-	-	-	-	-
Medhya	+	-	-	+	-	+	+	+	-	+	-
Smritiprdham	-	-	-	-	-	+	-	-	-	+	+
Varnya	+	-	-	-	+	-	+	-	-	+	-
Kantipradam	-	-	-	-	+	+	-	-	+	-	+
Balya	+	-	-	+	-	-	+	+	-	+	+
Netrya	-	-	-	-	-	+	+	-	-	+	-
Chakshusya	-	-	+	-	-	-	-	-	-	+	+
Shoshshyaghan	-	-	-	-	-	-	+	+	-	+	+
Vishamjwarhar	-	-	-	-	-	-	+	-	-	+	-
Punyam	-	-	-	-	-	-	+	-	-	-	-
Dipya	-	-	-	-	-	-	-	+	-	+	-
Vishgarhar	-	-	+	-	-	-	-	+	+	+	+
Vaakshuddhikar	-	-	-	-	-	+	-	-	-	+	+
Grahapaham	+	-	-	-	-	-	-	-	-	-	-

In the above tables, + sign denotes present, and the – sign denotes absent. Abbreviations used are as K.P. for Kashyap Samhita[14], C.S. for Charaka Samhita[15], S.S. for Sushruta Samhita[16], A.S. for Ashtanga Sangraha[17], B.R. for Bhaishajya Ratnavali[18] B.P. for Bhava Prakasha[19], R.T. for Rasa Tarangini[20], R.R.S. for RasRatna Samuchya[21], R.P.S. for RasPakash Sudhakar[22], A.P for Ayurveda Prakash[23]

Table 2: Depicting Dose of Suvarna (Gold) in Various Ayurveda Textbooks

Name of Textbook	Dose of Gold (As per textbook)	Dose of Gold (As per textbook in modern measurement units)
Sushruta Samhita[16]	1 *Gunja*	125 mg
Astanga Hridaya[17]	1 *Harenu*	250 mg
Bhaishajya Ratnavali[18]	*1/32 Ratti*	3.9 mg
Rasataranagin[20]	1/4th–1/8th *Ratti*	15–30 mg
Rasaratna Samuchaya[21]	2 *Gunja*	250 mg
Rasa Prakash Sudhakar [22]	*1/2 Ratti*	62.5 mg
Ayurved Prakash[23]	*1 Yava*	62.5 mg
The Ayurvedic Formulary of India[24]		15.5–62.5 mg

Pharmacological Action of Gold

Immunomodulatory Activity

Kushta Tila Kalan (KTK), a gold preparation used in *Unani,* is claimed to possess general tonic, anti-infective and rejuvenating properties. Its immunomodulatory activity was evaluated in male mice. KTK was orally administered to animals at a dosage of 6.25, 12.5, 25, and 50 mg/kg body weight for 10 days. Besides general immunopathological parameters, cell-mediated immunity was evaluated by measuring the delayed type of hypersensitivity response (DTH), while humoral immunity was assessed using a plaque-forming cell (PFC) assay. KTK augmented both the immune responses at dose levels of 6.25, 12.5, and 25 mg/kg. The optimum activities were recorded at 25 mg/kg. A higher dose of 50 mg/kg showed suppressive effects on immune functions.[25]

Suvarna Bhasma mixed with *Ghrita* and *Madhu* (*Suvarna Bindu Prashana*) was given in 12 healthy children in the dose of 4 drops of *Suvarna Bhasma* suspended *Ghrita* (4 mg gold/dose) followed by four drops of honey once every month for 6 months. The study showed an increase in mean levels of immunoglobulins (IgG,

IgM, IgA) after 6 months and a significant reduction in duration, severity, and frequency of illness[26]. An immunomodulatory study was done by taking Phagocytic activity by calculating the Carbon Clearance test in male Wister Albino rats. Immunomodulatory shows significant results for *Suvarna Bindu Prashana* daily for 10 days.[27]

Gold acts within the body as gold compounds, which are introduced into the body, inhibit macrophages to inhibit pathological immune responses. Gold helps to suppress the immune system when it is overactive on the other hand, gold can trigger an allergic reaction, which is an inappropriate immune response. While gold inhibits some immune cells that create inflammation, it simultaneously stimulates others.[28]

The immunomodulatory effect of Suvarnaprashana was tested in Charle's Foster Albinorats in an experimental study. For ten days, the test drug and vehicle were given out. When comparing the drug-treated group to the sheep red blood corpuscles group, the platelet count was substantially higher in the drug-treated group. When compared to the control group, the test drug caused a mild but non-significant risein paw edema after 24 hours and 48 hours. Suvarna Prashana increased cellularityin the spleen and lymph nodes, according to histopathological reports.[29]

The potential of gold nanoparticles (NP) to disrupt the functions of dendritic cells (DC), a major player in both innate and acquired immune responses, was studied to see how they affect the immune system. DCs were grown from mouse bone marrow progenitors for this reason, and the viability of the cells after incubation in the presence of gold NP revealed that these NPs are not cytotoxic even at high concentrations. Intracellular analysis of the cells shows significant quantities ofgold NP accumulating in endocytic compartments. Furthermore, cytokine secretionis dramatically altered, suggesting a possible immune response disruption.[30]

Antioxidant Activity

In rat models, nanosized gold particles (27 +/ 3 nm) have been shown to alleviate the symptoms of mycobacterial, collagen, and pristane-induced arthritis. Sodium aurothiomalate, on the other hand, was only effective against mycobacterial-induced arthritis and not to the same degree as Au.[31]

The curative effect of gold nanoparticles on the splenic tissue of mice infected with Schistosoma mansoni was investigated in a report. The amount of histological impairment and oxidative stress in the splenic tissue of mice treated with AuNPs was decreased.[32]

In an experimental study, *Suvarna Bhasma* was investigated for analgesic effects in rats and mice using four types of noxious stimuli. It was observed that the test drug *Suvarna Bhasma* at a dose of 25-50 mg/kg, p.o. exhibited analgesic activity against chemical (acetic acid-induced writhing), electrical (Podo dolorimeter),Thermal (Eddy's hot plate and analgesia meter), and mechanical tests.[33]

Antibacterial Activity

AuNPs have potential stability over the antibacterial activities against gram-negative bacteria like *E. coli Pseudomonas aeruginosa* and gram-positive bacteria like *Bacillus subtilis,* respectively, that are dependent on the concentration of Auionic nature. The growth of cells treated with gold nanoparticles was unaffected by pH, incubation environment, or temperature, indicating that green synthesised AuNPs have active and stable antibacterial activity in both gram-positive and gram-negative bacteria, but it is more efficient for gram-negative organisms as compared togram-positive organisms.[34]

The antibacterial activity of green synthesised AuNPs was tested using the agar well diffusion method against two-gram negative bacteria, *Shigella flexneri* and *Proteus mirabilis*, and two-gram positive bacteria, *Bacillus cereus, and Bacillus subtilis*. At very low concentrations of nanoparticles, AuNPs synthesised with the graft copolymer had strong antibacterial activity against gram-positive bacteria.[35]

Antifungal Activity

According to a research study, the antifungal activity of gold nanoparticles is size dependent, with 7 nm gold nanoparticles having a greater biocidal effect against Candida isolates than 15 nm gold nanoparticles in terms of restricting Candida species' transmembrane H+ efflux.[36]

Catalyst Activity

To ascertain the catalytic activity of gold, a study was conducted with the help of silk fibroin fibers supported with a high density of gold nanoparticles that exhibited good catalytic activity and may have potential applications in a range of fields, such as biomarkers and textiles.[37]

Antiasthmatic Activity

The efficacy of parenteral gold therapy was evaluated in patients with steroid-dependent asthma. Five of eight patients improved in terms of reduced steroid requirement while they were maintaining or improving lung function. Two patients developed significant proteinuria that resolved with cessation of gold[42]. Hence, its role in the management of severe refractory asthma should be further assessed.

Carcinogenic Activity

Nanoparticles of Gold reveal that colloidal gold provides a surface for easy conjugation of ligands, including antibodies, which can be used for immuno-targeting of the nanoparticles to biomarkers of cancer cells. The intense surface Plasmon absorption of gold nanoparticles, followed by rapid photo-thermal conversion, has been used for the selective photo-thermal treatment of cancer by using a suitable immune targeting strategy.[43]

According to a study conducted on AuNP (Gold Nano Particles), AuNP is used as therapy for various diseases, particularly cancer, Alzheimer's, HIV, hepatitis, tuberculosis, arthritis, and diabetes.[44]

Cognitive Activity

Gold can have a balancing and harmonising effect on the body, particularly with regard to unstable mental and emotional states, such as depression. It is believed that the nanometre-sized particles in colloidal Gold affect the electrical charges that are produced in neurons. It enhances the normal synaptic communication that takes place between the nerve cells. This enhancement is believed to be responsible for increased brain functions. Gold reduces the effects of depression, as well as enhances the ability to focus.[45]

The updated Wechsler Intelligence Scales Battery of Tests (WAIS-R) was administered to 5 volunteers aged 15 to 45 years

to assess the effect of colloidal metallic gold on cognitive functioning. There was a 20% improvement in I.Q scores after 4 weeks on colloidal gold, with mean + SE of 112.8 + 2.3 pre-gold and 137 + 3.8 post-gold (p0.005). This improvement in I.Q. was due to both performance and verbal test results. The impact of colloidal gold was maintained in three people after one to two months off gold, although I.Q scores were back to baseline in two patients who took the tests three months after quitting the gold.[45]

The study revealed the anti-amnesic activity of the *Suvarna Bhasma* by inducing antagonism to hyoscine-induced amnesia and enhancing the capacity of learning and memory in mice. The study employed young Swiss albino mice of both sexes separated into three groups. The trial medicine comprised *Suvarna Bhasma,* honey, and ghee, but the adjuvant treatment simply contained ghee and honey, which formed into drops and immediately delivered to two groups of mice, with the other group serving as a control group. The effect of test medications on transfer latency, which is perceived as an influence on learning and memory, was assessed using an elevated plus maze. When compared to starting values and the control group, the trial medicine demonstrated a significant reduction in transfer latency ($p<0.05$) on the second and third days of the research.[46]

In another study, it was proved that *Suvarna Bhasma* could prevent rats from cognitive impairment caused by sleep deprivation. Radial arm maze and raised plus maze approaches were employed to study behavioural taste in rats. The male albino rats were divided into five experimental groups: normal, sleep-deprived galantamine, and two *Suvarna Bhasma* test groups. For the induction of cognitive impairment, all the animals were put on a daily sleep restriction of 8 to 9 hours. Cognitive performance was measured on the 7th, 14th, and 20th days. *Suvarna Bhasma* treatment improved spatial memory, increased accurate arm entries, decreased the frequency of errors, and decreased transfer latency.[47]

Fertility Activity

The effects of gold chloride, a metallic earth salt, on the steroidogenic and gametogenic activities of juvenile rat testis, were investigated in an experimental investigation. The findings revealed that gold chloride therapy was linked to considerable stimulatory effects on testicular activity, which might have therapeutic implications for fertility stimulation.[48]

Safety and Efficacy

The toxicity study of *Suvarna Bindu Prashan* was carried out for 90 days in 30 albino rats and did not show any mortality. Weight gain and an increase in SGOT and SGPT levels were seen in the experimental group.[49]

Suvarna Bhasma (gold nanopowder) toxicity was investigated using different imaging techniques in both cancerous and noncancerous cells (HeLa and HFF-1) to characterise its spectral properties. Even at high concentrations and long incubation periods, gold ash particles did not affect the viability of both HeLa and HFF-1 cells, according to the findings.[50]

DISCUSSION

Historically, India probably was the first to maintain records of useful drugs. Charaka, the great Ayurveda scholar of 1500 B.C., has mentioned the types of drugs based on source, various formulations, and, surprisingly, the pharmacology of drugs with considerable precision. The later treatises describe the medicinal properties of various metals like mercury, gold, lead, etc. The *Bhasmas* containing heavy metal salts are currently enlightened mainly from the toxicological point of view [38-40]. The ancient Ayurveda scholars have mentioned the ill effects of improperly prepared metallic preparations, and emphasis has been given to methods through rational various pharmaceutical processing like *Shodhana* (purification), *Marana* (incineration), etc. Gold purification has been explained in *Arthassthra* (2.13.31). In the new pharmacopoeias of the 17th century, gold cordial could be found for the treatment of ailments caused by a decrease in the vital spirits, such as melancholy, fainting, fever, and falling sickness.

Further, with the convergence of modern medicine, *Suvarna Lavana,* i.e., Gold Chloride / colloidal form of gold, was also incorporated into the Ayurveda system of medicine. Gold chloride has found a place in British Pharmacopoeia. The most common use of gold is in Rheumatoid arthritis, asthma, cancer, infertility, etc., maybe by virtue of its immunomodulatory/ immunosuppressive properties. The results are interesting in view of the reported suppressive effects of other gold preparations .[41]

CONCLUSION

The present review reveals that gold has been used since ancient times for ornamental as well as maintenance of health. Vedas, *Ayurveda*, and many other ancient classics provide shreds of evidence regarding the use of gold for health benefits. Present clinical studies also document the efficacy of gold in various diseases. Many research studies reveal that gold in various forms is beneficial to human health by enhancing immunity, cognition, testicular activity, protection from infectious agents, etc. Beyond this, *Suvarna Bahama* or gold nanoparticles are utilised in the treatment of cancer, arthritis, tuberculosis, diabetes mellitus, rheumatoid arthritis, nervous diseases, and asthma, indicating that gold can be successfully applied in the maintenance of human health and treatment of diseases.

REFERENCES

1. Mookerji, Kaviraj Bhudeb [Translator]: Rasa-Jala-Nidhi or Ocean of India Chemistry and Alchemy, vol 2, Delhi, 1990, Parimal publ., p. 239
2. Siddhinandan Mishra, Rasa Prakasha Sudhakar, Siddhiprada Hindi Commentary Chaukhamba Orientalia, Varanasi, Reprint 2009, 4/4, p. no. 66
3. Agnivesh Acharya, Charaka Samhita, elaborated by Charaka and Drudhabala with Ayurveda Dipika Commentary by Chakrapanidatta, Edited by Yadavaji Trikamaji Acharya, Reprint Edition-2008, Chaukhamba Surbharti Prakashana, Varanasi, Sutra'Sthāna-46/132
4. Brown CL, Bushell G, Whitehouse MW, Agarwal DS, Tupe SG, Paknikar KM, Tiekink ERT, Nanogold Pharmaceutics (1) The use of gold to treat experimentally induced arthritis in rat models (2) Characterisation of the gold in Swarna Bhasma: a microparticulate used in traditional Indian medicine, Gold Bull., 2007, 40:3.
5. Boisselier E, Astruc G, Gold nanoparticles in nanomedicine: preparations, imaging, diagnostics, therapies and toxicity, Chem. Soc. Rev., 2009; 38: 1759- 82.
6. Biswas NM, Chattopadhyay A, Sarkar M, Effect of gold on testicular steroidogenic and gametogenic functions in immature female albino rats, Life Sci., 2004; 76(6): 629-36.
7. Miguel ED, Armalieh F, Tato E, Vazquez JJ, Banos JG, Hermanz A, The effect of gold salts on substance P in rheumatoid arthritis, Neuroscience letters, 1994; 174(2):185.
8. Champion GD, Graham GG, Ziegler JB, Ballieres, Clin. Rheumattol, 1990; 4: 491.

9. Simon P Fricker, Medical uses of gold compounds: Past, Present, Future, Gold Bull., 1996; 29(2):1.
10. Jerome A, Colloidal Chemistry -Theoretical and Applied, The Chemical Catalog Company, New York, Serum diagnosis of Syphilis, Vol. II (Biology and Medicine), 1928; 767.
11. British Pharmacopeia, Her Majesty's Stationary Office, London, 1st edi, 1988, Vol. II. Appendix I A, A16.
12. Shastry K (editor), Rasatarngini of Sadanad Sharma, chapter 15, verse no. 69-70, 11th edition, Delhi (India), Motilal Bansidas; 2004;376.
13. Kulkarni D. A. (editor), Commentary: Vidnayanbodhini of Vagbhata on Rasaratnasammuchaya, chapter 5, verse no. 18, New Delhi (India), Meherchanda Laxmikant Publications; 2007; 95.
14. Vriddhjivak. Kashyap Samhita, Lehadhyay, Sutrasthan, Reprint 2009, Chaukhamba Sanskrit Sansthan, Varanasi, p. 4
15. Dalhana, Commentator, F. Varanasi: Chaukhamba Orientalia; 2005. Sushruta Samhita, Sharira Sthana 10/13-15, 68-70, reprint ed; p. 388–95
16. Agnivesha, Charaka Samhita, revised by Charaka, commentator Chakrapani, Vidyotini Hindi commentary, Kashinatha Shastri, Part II, Chikitsasthana, Vishachikitsa (23:240), P. 585, Chaukhamba Sanskrit Sanstha, Seventh edition, Varanasi; 2002
17. Vagbhata, Ashtanga Hridaya, Uttara Sthana, Balopcharniya Adhyaya. 1/9, 47-48. In: Hari Shastri Paradkar., editor. 9th ed. Varanasi: Chaukhambha Orientalia; 2002. p. 778–781.
18. Govind Das, Bhaishajya Ratnavali, Balarogachikitsa. In: *71/5-6.* 19th ed. Brhmashankar Tripathi., editor. Varanasi: Chaukhamba Prakashan; 2009. p. 1073
19. Bhavprakash Nighantu, Dhatwadi Varga, In: 7/10-11. 1st ed. Varanasi: Chaukhamba Bharati Academy; 2018. p 590-59
20. Kashinath Shastri., editor. 11th ed. New Delhi: Motilal Banarasidas; 2009. Sadananda Sharma, Rasataranagini, 15th Taranga, 2-3,14,27; p. 361–67
21. Kulkarni DA, editor. New Delhi: Meharchand Lachhmandas Publications; 1998. Vagbhata, Rasaratna Samuchaya, Vol. 1, 5/1,11,18; p. 13–6
22. Mishra S. Rasaprakashsudhakar of Acharya Yashodhar. 1st ed. Varanasi: Chaukhambha Orientalia; 1983. p. 69 [Chapter 4], Verse 20.
23. Mishra G, Commentary: Arthavidyotini and Arthaprakashini in Sanskrit and Hindi on Ayurved Prakash, chapter 3, verse no. 39, Reprint edition, Varanasi (India), Chaukhambha Bharati Academy, 1999; 352
24. Government of India; The Ayurvedic Formulary of India. Anonymous Part-1, Sect 18:20. 2d (Edn.), Delhi, The Controller of Publications, 2003; p 247.
25. Bajaj S, Ahmad I, Raisuddin S, Vohora SB, Augmentation of nonspecific immunity in mice by gold preparations used in traditional systems of medicine, Ind. Jou. Med. Res., 2001; 113: 192-6.
26. KB 0109003, To clinically evaluate the effect of *Swarna* Bindu Prashan on immunity and intelligence of children, MD Dissertation, 2012, KLE University, Belgaum.
27. KB 0109001, Immunomodulatory study of *Swarna* Bindu Prashan on Albino rats, MD Dissertation, 2012, KLE University, Belgaum.
28. Sravani K, A Review on Traditional Ayurvedic Preparations Containing Gold, International Journal of Pharmacognosy and Phytochemical Research 2017; 9(6); 801-807
29. Khedekar S. AP, Patgiri B, Nariya M, Prajapati PK. Immunomodulatoryactivity of Swarna Prashana in Charle's Foster albino rats. J Ayurveda Med Sci 2016;1(2):6
30. Villiers C, Heidi Freitas,Rachel Couderc, Marie Bernadette Villiers and Practice Marche. Analysis of toxicity of gold nanoparticles on the immune system:Effect on dendritic cell system functions J. Nanopart Res. Jan 2010; 12 (1):55-60
31. Brown CL, Bushell G, Whitehouse MW, Agrawal DS, Tupe SG, Paknikar KM, Tiekink ERT. Nanogoldpharmaceutics. Gold Bull. 2007; 40(3):245–250
32. Dakhil AM, Amira A Buomy, Marwa SM Diab, Saleh Al-Quraishy, Antioxidant and hepatoprotective role of gold nanoparticles against murine hepatic schistosomiasis, International Journal of Nanomedicine, 2015;10:7467-7475.
33. Bajaj S, Vohora SB. Analgesic activity of gold preparations used in Ayurveda and Unani-Tibb. Indian J Med Res. 1998 Sep; 108:104-11
34. Senthilkumar S, Kashinath L, Ashok M, Rajendran A. Antibacterial Properties and Mechanism of Gold Nanoparticles Obtained from Pergularia DaemiaLeaf Extract. J Nanomed Res 2017;6(1): 00146. DOI: 10.15406/jnmr.2017.06.00146
35. Das S, Akhil Pandey, Sagar Pal, Haradhan Kolya, Tridib Tripathy, Green synthesis, characterisation, and antibacterial activity of gold nanoparticles using hydroxyethyl starch-g-poly (methyl acrylate-co-sodium acrylate): A novel biodegradable graft copolymer, Journal of Molecular Liquids, 2015;212:259-265.
36. Ahmad T, Irshad A. Wani, Irfan H. Lone, Aparna Ganguly, Nikhat Manzoor,Aijaz Ahmad, Jahangeer Ahmed, Ayed S. Al-Shihri, Antifungal activity of gold nanoparticles prepared by solvothermal method, Materials Research Bulletin, 2013;48(1): 12-20.
37. Youyi Xia, Junmin Wan, Qianfeng Gu, Silk fibroin fibers supported with a high density of gold nanoparticles: fabrication and application as a catalyst, Gold Bull., DOI 10.1007/s13404-0110024-7.
38. Saper RB *et al.,* Heavy Metal Content of Ayurveda Herbal Medicine Products, J Amer Med Assoc, 20014;292: 2868-2873.
39. Saper RB, Phillips RS, Sehgal A, Khouri N, Davis RB, Paquin J *et al*. Lead, Mercury, and Arsenic in US- and Indian-Manufactured Ayurveda Medicines Sold via the Internet, J Amer Med Assoc, 2008;300:915-923.
40. Kales SN and Saper RB, Ayurveda lead poisoning: An under-recognised, international problem, Indian J Med Sei, 2009;63:379-381.
41. Bajaj S, Ahmad I, Fatima M, Raisuddin S, Vohora S 8. Immunopharmacol Immunotoxicol, 1999; 21(1):151-61.
42. William B Klustermeyer, Dean T Noritake, Frank K Kwong, Chrysotherapy in the treatment of corticosteroid dependent Asthma, Journal of Allergy and Clinical Immunology, 79(5): 720725.
43. Xiaohua Huang, Prashant K Jain, Evan H El Sayeed, Mostafa H El Sayeed, Nanomedicine, 2007; 2(5); 681-693.
44. Boisselier E, Astruc D. Gold nanoparticles in nanomedicine: preparations, imaging, diagnostics, therapies, and toxicity. Chem Soc Rev. 2009 Jun;38(6):1759-82. DOI: 10.1039/b806051g. Epub 2009 Apr 21. PMID: 19587967.
45. Abraham, Guy E., Souhaila A. McReynolds, and Joel S. Dill. Effect of colloidal metallic gold on cognitive functions, A pilot study, Frontier Perspective 1998;7(2):39-41.
46. K B Jyothy *et al.,* Effect of Swarna Bhasma on Memory and Learning, J. Res. Trad. Medicine, Nov-Dec 2015;1(1):6-7
47. Khan A.Y *et al.,* Neuroprotective efficacy of Swarna Bhasma on sleep deprived induced cognitive impairments in rats. Indian drugs. 2018;55(3):10-11
48. Biswas NM, Chattopadhyay A, Sarkar M. Effects of gold on testicular steroidogenic and gametogenic functions in immature male albino rats. Life Sci. 2004 Dec 24;76(6):629-36. DOI: 10.1016/j.lfs.2004.03.038. PMID: 15567188.
49. KB 0109005, Toxicity study of *Swarna* Bindu Prashan in Albino Rats, MD Dissertation, 2012, KLE University, Belgaum

50. Kashani AS, Kuruvinashetti K, Beauet D, Badilescu S, Piekny A, Packirisamy M. Enhanced Internalization of Indian Ayurvedic Swarna Bhasma (Gold Nanopowder)for Effective Interaction with Human Cells. J Nanosci Nanotechnol. 2018 Oct 1;18(10):6791-6798. DOI: 10.1166/jnn.2018.15503. PMID: 29954495

Cite this article as:

Pallavi Joshi, Prem Prakash Vyas and Harish Kumar Singhal. A critical appraisal on Suvarna (Gold) bhasma. Int. J. Res. Ayurveda Pharm. 2023;14(5):58-63
DOI: http://dx.doi.org/10.7897/2277-4343.1405146

Source of support: Nil, Conflict of interest: None Declared