

Critical review on the pharmaceutical vistas of *Lauha Kalpas* (Iron formulations)

Virupaksha Gupta K. L., Pallavi G.¹, Patgiri B. J., Galib, Prajapati P. K.

Department of Rasa Shastra and Bhaishajya Kalpana, IPGT and RA, G Ay U, Jamnagar, Gujarat, ¹Department of Basic Principles, Government Ayurvedic College, Mysore, Karnataka, India

ABSTRACT

Iron is one among the major metals present in the earth's crust and is essential for sound sustenance of human body. Its deficiency leads to various health ailments. Contemporary medicine advises iron supplements in iron deficiency anemia. Ayurvedic classics also quote significant information about administration of iron. *Lauha Kalpas* are the unique compound herbo-mineral formulations where iron (*Lauha*) is used as a major ingredient. Relevant literature (Bhaishajya Ratnavali, Charaka Samhita, Rasendra Sara Samgraha etc.) reviewed to gather information about *Lauha Kalpas*. Critical analysis of these *Lauha Kalpas* reveals that ancient seers administered iron in a better acceptable form. Unlike popular understanding these are not only Khalviya preparations; but Churna (powders), Avaleha (confectionaries), Rasakriya (solidified decoctions), and Putapaka (incinerated) form of preparations are also found. Apart from solid dosage forms, semisolid dosage forms mentioned in classics are very much useful. Unfortunately most of the formulations are not found in the market. Hence Pharmaceutical firms may bring these unique dosage forms in to the market to supply the healthcare needs of the community. It is interesting that iron preparations are used in Ayurveda in different medical conditions apart from anemia (Pandu). This leaves a scope for further researches on different dosage forms of iron and their indications.

Key words: Ayurveda, Bhasma, Hematinics, Iron, Lauha Kalpa, pharmaceuticals, Rasaushadhi

INTRODUCTION

Ayurveda is a well-documented Traditional system of Indian Medicine (TIM). *Rasa Shastra*, an offshoot of Ayurveda popular from medieval period, mostly deals with therapeutic utilization of metals and minerals.^[1,2] Hundreds of formulations are explained in classical texts with the permutation combination of *Bhasmas* along with herbal ingredients. Careful review shows that there are around 30 types of *Bhasmas*, which are frequently used. A simple change in the method of preparation and ingredients can bring a

change in the action, indication, and efficacy. Hence, it is the need of the hour to critically analyze the formulations and the rationality behind it. This may be a guideline for further research to unravel Ayurveda. Iron is a noncontroversial metal for therapeutic use since centuries in east as well as west. Iron containing drugs are widely used in modern medicine as hematinics. These drugs are known to induce some adverse drug reactions -- gastro intestinal symptoms (nausea, vomiting, epigastric pain, eructation, pyrosis, meteorism, borborygmi, colic pain, flatulence, constipation, black feces, and diarrhea)^[3] The hematinics market in India is currently worth around Rs. 900 crore and is growing at 15% per annum.^[4] Hence it is the need of the hour to search some alternative from other systems of medicine like Ayurveda. *Lauha Kalpas* can be a better alternative from Ayurveda. Till date, no scientific comprehensive review has been done on *Lauha Kalpas*. Hence this study is undertaken.

Lauha Kalpas (LK) are formulations which possess *Lauha Bhasma* (*calcx of iron*) as the major ingredient along with the other herbal ingredients. These formulations have "*Lauha*" as suffix in their name. Some *Lauha Kalpas* possess other mineral ingredients including mercury along with *Lauha* as main ingredient.

Background

Charaka Samhita quotes the nonexistence of any entity

Address for correspondence:

Dr. Virupaksha Gupta K.L., Department of Rasa Shastra and Bhaishajya Kalpana, IPGT and RA, G Ay U, Jamnagar, Gujarat, India. virupakshgupta@gmail.com

Received: 15-Aug-2011

Revised: 20-Oct-2011

Accepted: 27-Oct-2011

Access this article online

Quick Response Code:



Website:

www.jaim.in

DOI:

10.4103/0975-9476.93944

which is not a medicine (*Nanaushadhi*) in the universe. Acharya *Charaka* further elucidates that every object can be a medicine if used wisely with a logical thought (*Yukthi*).^[5] Considering this fact, the three forms of natural materials -- herbal, mineral, and animal origins were subjected to trials and their therapeutic values were established. Due to the toxic nature of the minerals and metals, they were less used for the internal administration compared to herbs. Conversion of metals into suitable consumable medicinal form is found in the preparation of *Lohadi Rasayana*^[6] and *Ayaskriti*.^[7] In the *Sambhita* period, iron (*Ayas-Lauha*) was used in the form of fine powder. Later *Rasa shastra* classical texts explained the *Shodhana*^[8] and *Marana*^[9] methods.

Some researches have been carried out on individual *Lauha Kalpas* like *Navayasa Lauha*,^[8] *Nayanamrita Lauha*,^[9] *Sapthamrita Lauha*.^[10]

According to Ayurvedic Formulary of India, *Lauha Kalpas* are the formulations of *Lauha Bhasma* (LB) as main ingredient added to other drugs. The drugs are reduced to fine powder and mixed with *Lauha Bhasma*. The *Bhavana* process is carried out with prescribed liquids if mentioned.^[11] When well protected from moisture and heat, they preserve their potency for a period of about 10 years. Preparations containing mercury or its compounds preserve their potency indefinitely.^[12]

MATERIALS AND METHODS

Important texts of *Ayurveda* commencing from *Charaka Sambhita* (CS) to *Rasa Ratna Samucchaya* (RRS), *Rasendra Sara Samgraha* (RSS), and *Bhaishajya Ratnavali* (BR) have been the sources for *Lauha Kalpas*. BR being a comprehensive source for *LK*'s was the main source and the other important formulations are selected from other classics and enumerated according to the method of preparation.

Only the formulations having suffix as *Lauha* are considered for the study. The other *Lauha Bhasma* containing dosage forms such as *Asava* and *Arishta* (alcoholic formulations) are excluded from the study.

Quantity of *Lauha Bhasma* in few formulations is quoted as "*Sarva dravya samam Lauham*" which means 50% of the formulation will be *Lauha Bhasma*. In other formulations the quantity is calculated in accordance with the solid constituents, where in the ingredients like decoctions (*Kwatha*), fresh juices (*Swarasa*), ghee (*Ghrta* -clarified butter), and honey (*Madhu*) are not taken into consideration. Calculation is based on the raw ingredients taken prior to the pharmaceutical processes. Hence the percentage in the final product may change except in *Churnas*.

Method of calculation

Percentage of LB = $100 \times \text{weight of LB} / \text{weight of total solid ingredients (including LB)}$. E.g., in *Mahamrityunjaya Lauha* (BR 41/136-45) total weight of all ingredients (mineral and herbal) is 17 *Tola*^[iii], i.e., $17 \times 12 = 204$ g out of which 2 *Tola* (24 g) is LB. *Bhavana Dravya*, *Guduchi*, and *Ardraaka Swarasa* are not considered for calculation.

Percentage of LB is $100 \times 24 \text{ g} / 204 \text{ g} = 11.76$, i.e., approximately 12%

Churna Lauha Kalpa (Powder mixtures)

Churnas^[13] (powder mixtures) are prepared by pounding the dry drugs and then sieving through a fine cloth or sieves. *Lauha Kalpa* in *Churna* form are prepared by adding the fine powder of the herbal drugs to the *Lauha Bhasma* and triturated (dry) until homogenous mixture is obtained [Table 1].

Khalviya Lauha Kalpa

Herbal juices advocated are added to mixture of the metals-minerals (*Bhasmas*) and herbs and then triturated till the liquid portion is totally dried. The liquid added should be optimum to form soft or soggy mass^[15] [Table 2].

Some formulations do not contain herbal ingredients. The mineral ingredients are triturated with advocated herbal juices [Tables 3-6].

Lauha Rasakriya Kalpa

When primary liquid dosage forms are boiled until thicker consistency is attained, so that they can be rolled as pills, it is called *Rasakriya*. Here *Lauha Bhasma* is boiled along with different herbal juices and decoctions until it converts to solid dosage form^[19] [Table 7].

Lauha Avaleha Kalpa

Literally, *Lehya* refers to that which is consumed by licking. It is a semisolid dosage form, prepared by solidifying the decoctions, etc. primary liquid dosage forms by boiling along with sugar-, jaggery-like sweetening agents and after it attains proper consistency fine powders of drugs (*Prakshepa Dravya*), ghee, and honey are added^[21] [Table 8].

Putapaka Lauha Kalpa

The formulations which are prepared by the incineration method (*Puti Paka*) are included under this group. *Puti* indicates the specific quantum of heat required for conversion of a particular metal-mineral into an assimilable medicine using the suitable incineration method^[22] [Table 9].

DISCUSSION

Ancient *Ayurveda* even after centuries is an inspiration

Table 1: Churna Lauha Kalpas

Compound name	Reference	Mineral ingredients
* ^Δ Chandanadi Lauha	BR-(Jwara) 5/1145	LB (50%)
Manasuranadya Lauha	BR-(Arsha) 9/212	LB (50%)
Vidangadi Lauha-1	BR-(Pandu) 12/31	LB (50%)
Darvyadi Lauha	BR-Pandu 12/37	LB (50%)
Dhatri Lauha	BR-(Pandu) 12/30	LB (20%)
* ^Δ Navayasa (Lauha) Churna	CS Pandu Chikitsa 16/70-1	LB (50%)
*Satamulyadi Lauha	BR-(Rakta Pitta) 13/75-6	LB (50%)
Sharkaradya Lauha	BR- (Rakta Pitta) 13/77	LB (50%)
*Raktapittantaka Lauha	BR-(Rakta Pitta) 13/79-9	LB (50%)
Yakshmanthaka Lauha	BR-(Raja Yakshma) 14/84-5	LB (50%), Shilajit
*Shilajitwadi Lauha	BR-(Raja Yakshma) 14/86	LB (50%), SMB, Shilajit
Rajatadi Lauha	BR-(Raja Yakshma) 14/87-8	LB (50%), RB, AB
Sama Sharkara Lauha (Kasa)	BR-(Kasa) 15/116-20	LB (2%), AB, YK
*Guduchyadi Lauha	BR- (Vatarakta) 27/59	LB (50%)
Triphaladi Lauha	BR-(Amavata) 29/99-101	LB (33%)
Triphala Lauha	BR-(Shula) 30/128	LB (50%)
Vaishwanara Lauha	BR-(Shula) 30/137-9	LB (50%) Shambhuka Bhasma, Saindava Lavana, Apamarga Kshara, Chincha Kshara
Sharkara Lauha	BR-(Shula) 30/129	LB (50%)
Virdda darvyadi Lauha	BR- Amavata (Parishishta) /110-1	LB (50%)
Madhukadya Lauha	BR-(Netra Roga) 64/231	LB (20%)
Trikatwadi Lauha	BR-(Shotha) 42/131-2	LB (67%)
Varunadya Lauha	BR- (Asmari) 36/44-47 (Parishishta) /119-22 Mutra kriccra	LB (2.75%), AB
Tryushanadya Lauha	BR-(Medoroga) 39/26-29	LB (50%), Chatur Lavana ^[x]
*Pippalyadi Lauha-2	BR-(Udara) 40/130	LB (50%), AB, Saindava Lavana
* ^Δ Rohitaka Lauha	BR- (Pliha Yakrit roga) 41/117	LB (50%),
^Δ Shothari Lauha	BR-(Shotha) 42/133	LB (50%), YK
Suvarchaladya Lauha	BR-(Shotha) 42/134	LB (50%)
^Δ Amla Pittantaka Lauha	BR-(Amlapitta) 56/33	LB (16.7), RS, TB,
Pradarantak Lauha ^[14]	RT-20/118-22	LB (11%), VB, Gairika,
Tapyadi Lauha-2	AH-{Pandu Ch}16/20-2	SMB, RB, LB (12%), MB, Shilajit

Table 2: Khalviya formulations: Prepared by using water for Bhavana

Compound name	Reference	Mineral ingredients
* ^Δ Sarvajwara hara Lauha	BR-(Jwara) 5/1170-4	LB (50%)
Varunadya Lauha	BR-(Medo roga) 39/22-5	LB (50%)
^Δ Chandramrita Lauha	BR-(Kasa) 15/121-26	LB (50%) Saindava Lavana
Vishamajwarantaka Lauha-1	BR-(Jwara) 5/1146-50	LB (50%), AB, Rasaka Bhasma, Manashila
* ^Δ Yakridhari Lauha	BR- (Pliha Yakrit Roga) 41/129-31	LB (22%), AB, TB, Mriga Charma Bhasma
* ^Δ Pradarantaka Lauha	BR-(Udara) 66/79-83	LB (3.3), TB, VB, AB, Haratala, Kapardika Bhasma, Shanka Bhasma, Pancha Lavana

Table 3: Khalviya formulations: Prepared by Bhavana with herbal juices having only mineral ingredients

Compound name	Reference	Mineral ingredients	Bhavana Dravyas
*Vishamajwarantaka Lauha -2	BR-(Jwara) 5/1151-4	LB(50%), Kajjali, TB, SMB	Jayanti, Kokilaksha, Vasa, Ardrakra, Tamala Patra Swarasas
*Sarvajwarahara Lauha (Brihat-2)	BR- (Jwara) 5/1180-92	KLB (33%), Kajjali, SwB, RB, TB, SMB, AB, Haratala	Karavella, Dasamula, Parpata, Triphala, ^[vii] Guduchi, Nagavalli, Kakamachi, Nirgundi, Punamava, Ardrakra Swarasas
*Yakritplihodarari Lauha	BR- (Pliha Yakrit roga) 41/162-66	LB (50%), SwB, RB, TB, VB, AB, SMB	Ardrakra, Shephali (Parijata), Bilva Kirata Tikta, Tulasi Swarasas
^Δ Vadavagni Lauha	BR-(Medoroga) 39/30-1	LB (25%), RS, Haratala, TB	Arka Swarasa

Table 4: *Khalviya* formulations: Prepared with *Bhavana* of *Sneha dravya* (oil and ghee) and *Madhura dravya* (Sugars, Jaggery, and Honey) and *Drava Dravya* (Herbal juices and decoctions)

Compound name	Reference	Mineral ingredients	<i>Sneha dravya, Madhura dravya and Drava Dravya for Bhavana</i>
Ashtadashanga Lauha (Kiratadi Mandura)	BR-Pandu 12/34-36	LB (50%)	Honey, Cow's Ghee
Yograj	C.S Chi. Pandu 16/78-86, BR-(Pandu) 12/109-15	LB (12.8), SMB, Rajata Makshika Bh, Shilajit	Sugar candy, Honey
Maha Shwasari Lauha	BR-(Hikka Shwasa) 16/39-41	LB (15.3%), AB, Vamsalochana	Sugar candy, Honey
* ^Δ Saptamrita Lauha	BR-(Shula) 30/130-64/234-36	LB (50%)	Honey, Cow's Ghee
Yakshmari Lauha	BR-(Rajayakshma) 14/83	LB (50%), SMB, Shilajit	Cow's Ghee
Shularaja Lauha	BR-(Shula) 30/131-36	KLB (3.7%), AB	Sugar candy, Honey
Trikatrayadi Lauha	BR-(Pandu) 12/38-43	KLB (9%), MB	Honey, Cow's Ghee, five types of Sharkara (sugars)
*Pippalyadi Lauha-1	BR-(Hikkashwasa) 16/42-3	LB (50%)	Honey, water
Sarvatobhadra Lauha	BR (Amlapitta) 56/42-53	LB (16%), TB, AB, Kajjali (Dviguna), SMB, Manahshila, Shilajit	Honey, Cow's Ghee

Table 5: *Khalviya* formulations: prepared by *Bhavana* of both mineral and herbal ingredients (solid dosage form)

Compound Name	Reference	Mineral ingredients	<i>Bhavana Dravya</i>
Kamalantaka Lauha	BR-(Pandu) 12/44-51	LB (23.5%), AB, MB, VB	Kesaraja, Bringaraja, Somaraji (Bakuchi), Manduka parni
Kalamegha Navayasa Lauha ^[16]	SYS-(Pandu)	LB (50%)	Kalamegha (Bhavana 7days)
Langalyadya Lauha	BR- (Vatarakta) 27/64-66	LB (50%)	Nimbu Swarasa, Triphala Kwatha
* ^Δ Dhatrī Lauha(Shula)-1	BR-(Shula) 30/149-158	LB (28.5%)	Guduchi Kwatha
Dhatrī Lauha(Shula)-2	BR-(Shula) 30/159-62	LB (4%), MB, AB	Yava, Satavari Swarasa, Amalaki Swarasa
Shlipadari Lauha	BR-(shlipada) 45/39-40	KLB (20%), Shilajit	Triphala Kwatha
Karsyahara Lauha	BR-(Rasayana) 73/55-6	LB (50%)	Bringaraja Swarasa
Tandavari Lauha	BR (Tandava Roga) 80/4-5	LB (75%), Shanka Pashana (Arsenic oxide), YB	Bhanga, Kupilu, Arjuna Kashaya
Bala Yakruddhari Lauha ^[17]	Bala roga Ayurved Vignana	LB (12.5%), 1000 Puti AB, RS	Guduchi Swarasa
Nayanamrita Lauha ^[18]	RSS 2-Netra roga/9-12	LB (5%), AB	Triphala Kwatha, Bringaraja Swarasa

Table 6: *Khalviya* formulations: Prepared with mercurial ingredients (*Kajjali* and *Rasa Sindhura*) and *Bhavana* with herbal juices

Compound name	Reference	Mineral ingredients	<i>Bhavana Dravya</i>
Sarvajwarahara Lauha (Brihat-1)	BR- (Jwara) 5/1175-9	LB (44.5%), Kajjali,	Ardraka Swarasa
Jwarantaka Lauha (Brihat)	BR-(Jwara) 5/1193-203	LB (1.7%), AB, RB, Kajjali, SwB, Shilajit, Saindhava, Vida Lavana	Ardraka Swarasa
Pittantaka Lauha	BR- (Vatarakta) 27/60-63	LB (50%)Kajjali, AB, TB	Guduchi Swarasa
ΔYakritplihari Lauha	BR- (Pliha Yakrit Roga) 41/123-28	LB (9%), Kajjali, AB, TB, Manahshila, Shilajit, Tankana	Danthimula, Trivrit, Chitraka, Sandhalu, Trikatu, ^[viii] Ardraka, Bringaraja swarasas
Yakridari Lauha (Brihat)	BR- (Pliha Yakrit roga) 41/132-5	LB (50%), Kajjali, AB,	Guduchi Swarasa
Mahamrityunjaya Lauha	BR- (Plihayakrit roga) 41/136-45	LB (12%), Kajjali, AB, TB, Sarja, YK, Saindhava, Vida Lavana, Varatika, Shankha Bhasma, Manashila, Haratala, Tuttha,	Ardraka Swarasa, Guduchi Swarasa
Sarveswara Lauha	BR- (Plihayakrit roga) 41/146-53	LB (7.4%), Kajjali, AB, TB, SMB	Ardraka Swarasa

for the researchers to think beyond their imagination and knowledge. The same is true with pharmaceutical aspects. A better understanding of Ayurveda is adding

up new things to the existent pharmaceutical excellence. *Rasaushadhis* are the formulations which are discussed in present era for right or wrong reasons. Even after this

Table 7: Rasa Kriya Lauha Kalpas: Formulations prepared by boiling decoctions until solidification

Compound name	Reference	Mineral ingredients	Kwatha Dravya
* ^a Vidangadi Lauha-2	BR-(Pandu) 12/31	LB (50%)	Cow's urine
^a Tapyadi Lauha-1 ^[20]	AH-(Pandu Chi) 16/16-9	LB, Shilajit, SMB, RB, MB	Cow's urine
Vidangadi Lauha (Amavata)	BR-(Amavata) 29/102-10	Kajjali, Vajra, Pandyadi Loha (25%), AB,	Triphala Kwatha, Satavari, Cow's milk
Panchanana Rasa Lauha	BR-(Amavata) 29/111-19	Kajjali, LB (17%), AB	Satavari, Cow's milk
Shothodarari Lauha	BR-(Udara) 40/120-9	Kajjali, LB (50%), TB, Kankushta,	Punarnava, Guduchi, Chitraka, Indrayana, Mana Kanda, Shigru, Suryavarta, Arka Kwatha, Cow's Ghee, Arka, Snuhi Kshira, Guggulu,
Chitrakadi Lauha	BR- (Plihayakrit roga) 41/118-22	LB (50%), AB, TB, YK, Pancha Lavana ^[xv]	Cow's urine, honey
Amla Pittantaka Lauha-2	BR-(Amlapitta) 56/36-41	Kajjali, MB, KLB (20%), AB, MB, Pravala	Amalaki Swarasa
Lakshmana Lauha	BR-(Pradara) 66/84-6	LB (50%)	Lakshmana
Pradarari Lauha	BR-(Pradara) 66/74-8	LB (10%), AB	Kutaja Kwatha

Table 8: Avaleha Lauha Kalpas: Prepared by boiling decoctions with sugar or jaggery

Compound name	Reference	Mineral ingredients	Kwatha Dravyas
Agnimukha Lauha	BR-(Arsha) 9/213-21	LB (30% to Kwatha Dravya), Shilajit	Trivrit, Chitraka, Nirgundi, Snuhi, Mundi/Munditaki, Bhumyamlaki, Cow's Ghee, sugar
Khandakadya Lauha (guda paka)	BR- (Raktapitta) 13/80-90	LB (50% to Kwatha Dravya), Shilajit	Satavari, Vasa, Guduchi, Bala Mundi, Musali, Khadira, Triphala, Barangi, Pushkaramula, , Guda (Jaggery)
Sama Sharkara Lauha	BR (Raktapitta) 13/72-4	LB (80% to Prakshepa -Vidanga)	Cow's milk (4 times to LB), Cow's Ghee, (2 times to LB), Honey, Sugar candy
Chatuhsama Lauha	BR-(Shula) 30/140-148	LB (25% in mineral ingredients), Kajjali, AB, TB	Cow's Ghee, Cow's milk
Rasayanamrita Lauha	BR-(Gulma) 32/121-126	LB (44.5%), AB, Saindava Lavana	Sugar candy, Triphala Kwatha, Jambhiri Nimbhu, Cow's Ghee
Yakritplihodarahara Lauha	BR-(Pliha Yakrit roga) 41/154-61	LB (50% in mineral ingredients), AB, RS, Pancha Lavana, YK	Triphala Kwatha, Satavari Swarasa, Cow's Ghee
Amritankura Lauha	BR-(Kushtha) 54/186-93	LB (12%), RS, Gandhaka, TB, AB	Triphala Kwatha, Cow's Ghee

Table 9: Formulations prepared with Puta Paka method

Name of the formulation	Reference	Mineral ingredients	Herbal drugs and method processing
*Puta Pakva Vishamajwarantaka Lauha ^[23]	BR- (Jwara) 5/1162-9	LB (9.6%), Parpati, SB, TB, AB, VB, Gairika, Pravala, Mukta, Shankha, Shukti Bh	LAGHU PUTA
Shankara Lauha (Durnamari Lauha) ^[24]	BP Madyama Khanda-(Arsha) 5/96-125	LB, RB (prepared applying Manashila, Parada, SMB for Shodhana)	Triphala, Ardraka, Bhingaraja, Manakanda, Surana, Bhallataka, Chitraka, Cow's Ghee LAGHU PUTA

*. Formulations mentioned in AFI part 1and2, Δ- Formulations available in the market (source -Ayurvedline) AH-Ashtanga Hridaya, YR-Yoga Ratnakara, SYS-Siddha Yoga Samgraha, RT- Rasa Tarangini, LB-Lauha (Iron or Steel) Bhasma, KLB-Kanta Lauha (Magnetite or Lodestone) Bhasma, MB-Mandura (Iron rust) Bhasma, RB- Rajata (Silver) Bhasma, VB-Vanga (Tin) Bhasma, SMB- Swarna Makshika (Copper pyrite) Bhasma, SwB- Swarna (Gold) Bhasma, YK - Yava Kshara

hue and cry it is impossible to discard them due to their effectiveness. *Rasanshadhis* (herbomineral formulations) are being prescribed by *Ayurvedic* physicians since long with a rare mention of toxicity. It is observed that herb--mineral complexes are more stable and more interactive compared to plain herbs as these result in faster therapeutic action and have a longer shelf life.^[25] *Lauha Kalpas* are formulations which are safe, effective, and noteworthy compound formulations of iron. Prior to the period of *Rasa Shastra*, *Lauha* was used in the form of ultra fine powders (*Anjana sadrisha* -- collyrium like). A number of references for internal administration of *Lauha* and noble metals like gold and silver are found in our classics, as they are relatively less toxic than other metals in elemental form.^[26,27] In the

medieval period, the internal administration of all metals and minerals became possible because of the invention of pharmaceutical technology of converting metals and minerals into *Bhasmas*, i.e., detoxification, (*Shodhana*) converting into powders (*Jarana*, causing decay of metals) and incineration (*Marana*, killing metallic properties) methods.

After careful review of *Lauha Kalpas*, it is found that unlike popular understanding they all are not only *Khaliya* preparations but can be classified based on the methods of preparation into *Churna Lauha Kalpa*, *Khaliya Lauha Kalpa*, *Rasa Kriya Lauha Kalpa*, *Avaleha Lauha Kalpa*, and *Puta Paka Lauha Kalpa*. Other than these listed formulations, special

pharmaceutical preparations like *Parpati* (e.g., *Rasa Parpati*, *Panchamrita Parpati*), *Asava*, and *Arishta* are also described.

The percentage of LB varies from as less as 2–75% (*Jvarantaka Lauha* -- 1.7%, *Vidangadi Lauha* -- 2%, *Tandavari Lauha* -- 75%) in *Lauha Kalpas*. Many formulations contain 50% of LB. Herbal ingredients found in maximum formulations are *Trika Traya*.^[vi]

Khaliya Lauha Kalpas are prepared by wet trituration (*Bhavana*, impregnation) with liquid ingredients, i.e., decoctions and herbal juices. In few formulations, water is used as a media for *Bhavana*. Wet trituration (*Toya Sannikarsha*) facilitates particle size reduction and homogenization leading to modification of properties (*Gunanbharadhana*) of the end product.^[28] In the pharmaceutical preparation of *Chandashtha Prabara Pippali*, it was observed that the number of *Bhavanas* with *Pippali Kwatha*, was inversely proportional to the piperine content.^[29] With this information inference can be drawn that reduction of piperine is anticipated in this particular formulation, justifying the significance of the *Bhavana* process. In another work, which was intended for the study of shelf life and interactions of *Vidanga* with iron-in-iron containing formulations like *Vidangadi Lauha*, *Chandanadi Lauha*, and *Navayasa Churna* showed the reduction of embelin content observed in 6 months shelf life studies. *Navayasa Lauha* decreases less compared with other two formulations. This study concludes that iron can interact and can react with embelin and form a complex.^[30]

Triphala mainly consists of tannin, gallic acid, ascorbic acid (vitamin c), and phenolics. Ascorbic acid increases the bioavailability of iron by converting Fe^{3+} to Fe^{2+} , while phenolics can reduce the iron by binding to it. The presence of ascorbic acid or a lack of dietary tannins has both been suggested as contributing to clinical/pathological iron storage disease. Too much iron is toxic. It can damage the liver, heart, and pancreas and irritate the stomach and gut, causing constipation and diarrhea. In other words, this may also be taken as the various constituents of *Triphala* have antagonizing activity. Thus, too much iron absorption is prevented.^[31] *Triphala* is a mild laxative and thereby counteracts the constipating property of iron and thus be beneficial due to which *Acharyas* might have mentioned *Triphala* in maximum *Lauha* formulations.

The findings from one study suggested that *Triphala* and its individual constituents have an inhibitory effect on metabolic enzymes when consumed along with therapeutic products. Further the inhibitory effects were relatively comparable to all the constituents tested, despite the variability of the content of biomarker. *Triphala* and its ingredients are likely to inhibit drug metabolizing enzymes, but less likely to produce significant drug interactions.

Certain major factors of metabolism such as competition between coadministered drugs, unspecific interactions with proteins, and enzyme induction due to chronic intake are not addressed in that *in vitro* assay. However, one study clearly suggested that herbal products containing gallic acid may have the potential to inhibit the metabolism of certain coadministered drugs.^[32] Hence a conclusion can be drawn that the presence of *Triphala* is a facilitator in the formulations.

Many formulations are said to be triturated with honey and sugar, due to which it becomes difficult to store them in tablet form, as honey and sugar (as liquids added while preparation) are hygroscopic and they become semisolid. Hence they have to be stored and consumed in semisolid form. Same is the problem with formulations containing Cow's ghee. *Sapthamrita Lauha* and *Madhukadi Lauha* both comprise *Triphala*, *Yashti* as ingredients. Honey and Cow's ghee are ingredients in *Sapthamrita Lauha* but they are *Anupana* (vehicle, adjuvant) in *Madhukadi Lauha*. Ideally *Sapthamrita Lauha* has to be prepared by adding honey and ghee and should be in semisolid dosage form and *Madhukadi Lauha* should be solid dosage form. But *Sapthamrita Lauha*, which is available in the market, is in solid dosage form^[33] and devoid of honey and ghee, hence it will be rational to name it as *Madhukadi Lauha*.

It is understood that many proteins play significant role in absorption of iron from intestine (such as hspidin, DMT-1, ceruloplasmin) and are also required for efflux of iron from enterocytes. Iron supplements require bioavailability enhancers to minimize the side effects. Herbomineral formulations can be used to reduce various side effects as the processing of various herbal juices with already processed and micro-fined minerals lead to the formation of herbomineral complexes. These complexes upon interaction with digestive juices adopt a colloidal form, for faster absorption. Sometimes they play a catalytic role facilitating absorption of other nutrients and correcting a disease process.^[34]

Few *Khaliya Lauha Kalpas* comprise *Parada* (Hg), *Gandhaka* (S) as ingredients. Initially *Kajjali* (HgS -- black) has to be prepared, later remaining powders are subjected for wet trituration and pills are to be made. These two types of formulations can be made into pills and stored; hence these are solid dosage forms. Few are prepared by adding mineral ingredients in decoctions, fresh juices and cow's urine, etc. and boiled, after it obtains proper consistency the remaining herbal ingredients (*Prakshepa dravya*) are to be added and pills are to be made. Cow's urine if taken has to be eight times to that of the quantity of LB.

Most of the LKs do not comprise mercury as an ingredient

(with few exceptions). *Dhanvanthari Bhaga* (share of the physician in the medicine prepared) has been told separately for *Loha Yogas* and *Rasa Yogas*.^[35] Hence some may doubt the inclusion of *Lauha Kalpas* in *Rasaushadhis*. But while explaining the novel nature of *Rasaushadhis*, *Rasa Vagbhata* describes that *Rasaushadhis* are effective in low dose with better acceptability and potent to reinstate health in short duration in a diseased individual. The author defines *Rasaushadhis* as the formulations which possess *Rasa* (*Parada*, *Maharasa*, *Uparasa*, and *Sadharana Rasa*) or any metal and mineral or poisonous roots as an ingredient,^[36] All *Lauha Kalpas* possess *LB*, an iron metal *Bhasma* as a major ingredient hence *LK* can be termed as *Rasaushadhis*.

Lauha by virtue of its potential can be administered in various dosage forms (*Bahu Kalpam*) and thus fulfilling the criteria of an ideal medicine.^[37] It is understood that iron and its salts produce gastric intolerance. Hence *Acharyas* have used iron as a part of formulations. It is evident that other ingredients of *LK*, processes and dosage forms explained are in line to improve the acceptability by patients of different body types and ages in indicated disease conditions.

Lauha Kalpas are mentioned for different ailments like *Pandu* (anemia), *Arsha* (hemorrhoids), *Rakta Pitta* (bleeding disorders), *Shula* (pain of different origin), *Jwara* (fevers), *Yakrit Pliha Roga* (diseases of liver and spleen), *Udara* (dropsy), *Amavata* (rheumatic arthritis), *Vata Rakta* (gout), *Kushta* (skin disorders), *Medo Roga* (obesity), *Tandava Roga*, *Gulma*, *Kasa* (cough) and *Shwasa* (dyspnoea). The role of *Lauha* in a specific formulation has to be ascertained by an erudite researcher in a respective disease condition. There are many *LKs*, especially semisolid dosage forms which are mentioned in classical texts but these are not available in the market. It is need of the hour for the pharmaceutical houses to work in this aspect and make these formulations available to the needy population.

CONCLUSION

From pharmaceutical viewpoint all *Lauha Kalpas* are not only *Khalviya Aushadhis* (prepared by *Bhavana*, impregnation -- wet trituration with simple water to different herbal juices). They are *Churnas* (mixtures -- prepared by dry trituration), *Rasakriya* (solidified formulations -- prepared by boiling of decoctions, herbal juices and even cows urine), *Avaleha* (confectionery), and *Puta Paka* (calcination products) formulations. Based on the method of preparation, shelf life, pharmacological action, indication varies. There are number of formulations which are not available in the market and but suits the present day healthcare demand. Hence pharmaceutical houses can manufacture and make

them available.

Herbs found repeatedly in the formulations irrespective of indication are *Trika Traya*. These might have some role (bio enhancer) in absorption, distribution, metabolism, and excretion of iron. This work may serve as preliminary data and can be a torch bearer for the further studies on *Lauha Kalpas*.

Notes:

- i. *Shodhana*: It is a procedure, where the metal or mineral or other poisonous substances are subjected to specified pharmaceutical procedures like trituration etc. with required plant or animal products so as to remove unwanted properties, if any.
- ii. *Marana*: Literal meaning of *Marana* is killing. In this process of *Marana*, minerals are incinerated to obtain *Bhasma*. The minerals which have undergone the process of *Shodhana* are ground with specified liquid to form a paste. This paste is flattened into small discs (*Chakerikas*) and dried. These discs are then kept in between two convex earthen plates (*Sharava*) and sealed with the help of mud soaked cloth strips. After complete drying this is kept in the pit of *Putra*, containing *Vanyopala* (cow dung cakes), and ignited. After self-cooling, it is taken out and the baked discs are removed and powdered. This whole process makes one *Putra*. It is repeated for several times to obtain the *Bhasma*.
- iii. *Tola*: It is a measurement used in Ayurvedic classics (1 *Tola*=12 g).
- iv. *Bhasma*: Bio-accessible forms of minerals and metals intended for internal administration obtained after *Shodhana* and *Marana*.
- v. *Kshara*: Alkaline inorganic substances obtained from the ash of herbal drugs.
- vi. *Trikatraya*: Formulation containing *Triphala*, *Trikatu*, *Trimada*.^[ix]
- vii. *Triphala*: Formulation containing *Amalaki* (*Embilica officinalis*) *Vibhitaki* (*Terminalia bellerica*), *Haritaki* (*Terminalia chebula*).
- viii. *Trikatu*: Formulation containing *Pippali* (*Piper longum*), *Shunthi* (dry ginger- *Zingiber officinale*), *Maricha* (*Piper nigrum*).
- ix. *Trimada*: Formulation containing *Vidanga* (*Embelia ribes*), *Musta* (*Cyperus rotundus*), *Chitraka* (*Plumbago zeylanica*).
- x. *Chatrur Lavana* (four salts): Formulation containing *Vida Lavana* (fictitious salt procured by boiling earth impregnated with saline particles), *Audbhida Lavana* (fossil salt), *Saindhava Lavana* (rock salt), *Sauvarchala Lavana* (sochal salt, prepared by boiling down soda with embelic myrobilon).
- xi. *Pancha Lavana* (five salts): Formulation containing *Chatrur Lavana* and *Samudra Lavana* (sea salt).

REFERENCES

- Gupta KL, Chinta S, Reddy KR. Importance of Ananda kanda in the history of Indian alchemy. Bull Ind Inst Hist Med Hyderabad 2006;36:159-66.
- Madhavacharya. *Sarva Darshana Samgraha*, (*Raseshwara Darshana*) verse 9/18 In: Umashankar Sharma Rishi, editor. Varanasi: Choukhamba Vidya Bhavan; 1964. p. 383.
- Milman N, Byg KE, Bergholt T, Eriksen L. Side effects of oral iron prophylaxis in pregnancy—myth or reality? Acta Haematol 2006;115:53-7.
- Bafna Pharma to focus on haematinic drug mkt. Available from: <http://www.kdpma.com/wp-content/themes/twentyten/pdf/drugs-cosmetics-act/33.pdf> [Last accessed on 2011 Jan 09].
- Agnivesha, Charaka Samhita – Sutra Sthana (Atreya Bhadrakapyiya)* verse-26/12, *Ayurveda Dipika* Sanskrit commentary by Chakrapani. In: Acharya YT, editor. Varanasi: Krishnadas Academy; Reprint 2000. p. 128.
- Agnivesha, Charaka Samhita - Chikitsa - (Rasayana/Karaprachatiya)* verse - 1/3/15-23 *Ayurveda Dipika* Sanskrit commentary by Chakrapani. In: Acharya YT, editor. Varanasi: Krishnadas Academy; Reprint 2000. p. 384.
- Sushruta, Sushruta Samhita Chikitsa Sthana (*Mahakushtha Chikitsa adhyaya*) verse- 10/11 *Nibandha Samgraha* commentary by Dalhana, In: Acharya YT. 5th ed. Varanasi: Choukhamba Orientalia; 1992. p. 449.
- Namrata Joshi, Dash, Hota S, Srikanth, Dwivedi LK. Exploration of *Navayasa Lauha*: A literary scientific study. *Indian J Anc Med Yoga* 2009;2:219-27.
- Chauhan DB, Singh K, Mehta AJ, A clinical study on Adhimantha and it's management with *Nayanamrita Lauha* and *Triphaladi Varti*. Ayu 2010;31:62-6.
- Sharma KR, Bhatia RP, Kumar V. Role of the indigenous drug *Sapthamrita Lauha* in hemorrhagic retinopathies. Ann Ophthalmol 1992;24:5-8.
- Anonymous, Ayurvedic Formulary of India, *Lauha Kalpa*, Department of AYUSH, Ministry of H and FW. 2nd ed, Part 1 and 2. India: Government of India; 2003.
- Anonymous, Drugs and Cosmetics (Sixth Amendment) Rules, 2009. Ministry of Health and Family Welfare (Department of AYUSH) Available from: <http://www.kdpma.com/wp-content/themes/twentyten/pdf/drugs-cosmetics-act/33.pdf> [Last accessed on 2011 Jan 09].
- Sarangadhara, Sarangadhara Samhita, Madhyama Khanda verse 6/1 Parashuram Shastri Vidyasagar. 7th ed. Varanasi: Choukhamba Orientalia; 2008. p. 178.
- Sharma S, *Rasa Tarangini*, 20/118-22. 11th ed. New Delhi: Motilal Banarasidas; Reprint 2004. p. 515.
- Sharma S. *Rasa Tarangini*, In: Shastri K, editor. 2/49-50. New Delhi: Motilal Banarasidas; Reprint 2004. p. 21-2
- Yadavji Trikamji Acharya, Siddha Yoga Samgraha. 11th ed. Allahabad: Baidyanath Ayurved Bhavan; 2003. p. 61.
- Anonymous, *Ayurveda Sara Samgraha*. 21st ed. Nagpur: Bhaidyanath Ayurved Bhavan; Reprint 2004. p. 501.
- Krishna Gopala Bhat, *Rasendra Sara Samgraha*, Hindi trans and commentary by Indradev tripathi, 2-*Netra roga*/9-12. 3rd ed. Varanasi: Choukhamba Orientalia; 2003. p. 477.
- Sarangadhara, Sarangadhara Samhita, Madhyama Khanda verse 8/1 Parashuram Shastri Vidyasagar. 7th ed. Varanasi: Choukhamba Orientalia; 2008. p. 206.
- Vagbhata Laghu, Astanga Hridaya, Chikitsa Sthana – (Pandu)*, verse-16/16-9, Varanasi: Krishnadas Academy; Reprint 2000. p. 702.
- Sarangadhara, Sarangadhara Samhita, Madhyama Khanda verse 8/2 Parashuram Shastri Vidyasagar. 7th ed, Varanasi: Choukhamba Orientalia; 2008. p. 206.
- Rasa Vagbhata, *Rasa Ratna Samucchaya*, English commentary by Ashok D Satpute, 10/47, Varanasi: Choukhamba Sanskrit Prathishtan; 2003. p. 233.
- Govindadas Sen, *Bhaishajya Ratnavali*, Hindi commentary of Ambika datta Sastry, verse-(Jwara) 5/1162-9. 17th ed. Varanasi: Choukhamba Sanskrit Bhavan; 2004. p. 124.
- Bhava Mishra, Bhava Prakasha Madhyama Khanda, (Arsho Chikitsa) verse 5/125 Hindi commentary by Sri Brahma Shankar Mishra. 11th ed. Varanasi : Choukhamba Sanskrit Bhavan; 2009. p. 61
- Chauhan Vijay Singh, Nicholas Piramal India Ltd, Mumbai, Herbal (Ayurvedic) Drug Industry for Compliance to Quality parameters. New Delhi: Regional Training Course at India International Centre; 6th Nov 2004: Available from www.ics.trieste.it/media/134533/df2498.pdf (last accessed 2012 Jan 09)
- Sunil S Inamdar, Sharma HS. A Critical Study of the Literature on *Rasatantra* between the Vedic Period to 4th Century AD with special reference to Charaka Samhita, MD dissertation, Department of RS and BK including Drug Research. Jamnagar, Gujarat: IPGT and RA, G Ay U; 1994. p. 65-94.
- Galib, Barve M, Mashru M, Jagtap C, Patgiri BJ, Prajapati PK. Therapeutic potentials of metals in ancient India: A review through *Charaka Samhita*. J Ayurveda Integr Med 2011;2:55-63.
- Agnivesha, Charaka Samhita – Vimana Sthana -(Rasa Vimana)* verse-1/22 *Ayurveda Dipika* Sanskrit commentary by Chakrapani In: Acharya YT, editor. Varanasi: Krishnadas Academy; Reprint 2000. p. 235.
- Ashlesha A Raut. Evaluation of *Bhavana Samskara* with reference to *Pippali Churna* and *Chaushashti Pippali*, M.D. Theses, Department of *Rasa Shastra*. Worli, Mumbai: R.A. Podar Ayurvedic College; 1996.
- Sandhya P, Grampurohit ND. Interaction of Embelin and Iron in Ayurvedic Formulations. Indian J Pharm Sci 2004;66:739-44.
- Singh N, Reddy K. Pharmaceutical study of *Lauha Bhasma*. Ayu 2010;31:387-90.
- Ponnusankar S, Pandit S, Babu R, Bandyopadhyay A, Mukherjee PK. Cytochrome P450 inhibitory potential of *Triphala*—a Rasayana from Ayurveda. J Ethnopharmacol 2011;133:120-5.
- Anonymous, classical medical index, *Mano vaha Srotas*, Ayurvedline -Ayurvedic drug index. Bangalore: Setharam Prasad; 2001. p. 405.
- Trivedi A, Mishra SH. Evaluation of Haematinic Potential of a Herbomineral Formulation (HMF-TE) in Haloperidol Induced Anaemic Rats. Phcog Res 2009;1:192-6. Available from <http://www.phcogres.com/article.asp?issn=0974-8490;year=2009;volume=1;issue=4;epage=192;epage=196;aulast=Trivedi> (last accessed on 2012 Jan 9)
- Rasa Vagbhata, Rasa Ratna Samucchaya*, commentary by Kulkarni DA, verse 2/8, New Delhi: Meharchand Laccmandas Publications; Reprint 1998. p. 144.
- Rasa Vagbhata, Rasa Ratna Samucchaya*, telugu translation by Venkateshwara Sharma Indraganti, 28 (*Uttara Khanda* 17)/1-2. 1st ed. Adyar, Chennai: Indian Medical Practitioners Co-Operative Pharmacy Ltd; 1963. p. 453.
- Agnivesha, Charaka Samhita – Sutra Sthana (Khuddaka chatuspada)* verse-9/7 *Ayurveda Dipika* Sanskrit commentary by Chakrapani. In: Acharya YT, editor. Varanasi: Krishnadas Academy; Reprint 2000. p. 63.

How to cite this article: Virupaksha Gupta KL, Pallavi G, Patgiri BJ, Galib, Prajapati PK. Critical review on the pharmaceutical vistas of *Lauha Kalpas* (Iron formulations). J Ayurveda Integr Med 2012;3:21-8.

Source of Support: Nil, **Conflict of Interest:** None declared.