Preface

The research work entitled, “Chemical and Medicinal Evaluation of Different Putas of Louha Bhasma (Iron)” for the degree of Doctor of Philosophy under the University of Calcutta consists of different aspects of study on Kaphaja Pandu vis-à-vis Iron deficiency Anaemia and effect of a specialized preparation of iron in Ayurvedic procedures in the domain of chemical analysis, pharmacological evaluation and clinical study. The thesis begins with review on Kaphaja Pandu vis-à-vis Iron deficiency Anaemia and Louha Bhasma in ‘Chapter 2 & 3’ entitled, “Disease and Drug Review”. In the review part, it was observed that the disease Kaphaja Pandu is a specialized variety under the broad disease Pandu which is mainly characterized by the clinical features like Gourava (heaviness of the body), Tandrā (lassitude), Sāda (loss of body strength), Murchā (syncope), Bharama (vertigo), Śwāsa (dyspnoea), Ālasya (fatigue), Śukla-Mutra-Netra-Varcha (pale urine, eye and stool), Śotha (oedema), etc. These features closely resembles with iron deficiency anemia. The disease mainly originate due to involvement of Rakta, Mamsa and Rasa dhatu, ultimately vitiate whole body. Iron deficiency anemia, on the other hand, is due to deficiency of iron supplement in the body. This disease is prevalent worldwide but is common in the developin countries like India. It has been reviewed that most preschool children and pregnant women in non-industrialized countries, and at least 30-40% in industrialized countries, are iron deficient. Nearly half of the pregnant women in the world are estimated to be anaemic: 52% in non-industrialized - as compared with 23% in industrialized – countries. In industrialized countries, however, most pregnant women are thought to suffer from some degree of iron deficiency.

In iron deficiency anemia, due to insufficient supply of iron, there is over load in RE system, which is reflected with impairment of function of bone marrow, liver, spleen as well as generalized immune system. This pathogenesis ultimately hampers synthesis of haemoglobin. The lower production of haemoglobin leads to manifestation of clinical symptoms like pallor, weakness, lassitude, fatigue, dryness of skin, pale sclera, koilonychias, palpitation, dizziness, numbness, etc. All these features are relevant to Kaphaja Pāndu, and the comparison is justified.
Louha Bhasma has been taken in the present research work as test drug for the treatment of Kaphaja Pāndu or iron deficiency anemia. Many classical description of preparation of Louha Bhasma is available in different Ayurvedic text. The widely accepted procedure among them is described in Rasaratnasamucchaya. The procedure was standardized by the great Buddhist sage Ayurvedacharyya Nagarjuna. The procedures like Šodhana (purification) by means of Bhavana, Mārana (calcinations) and Bhasmikarana (incineration) by means of Putapaka, as developed by Nagarjuna, has been described vividly in this text. The gold standard of quality control in every steps of this preparation is described in the classical texts with the physical and chemical tests like Apunarbhava (inability of returning in its original form), Niruthhatta (conversion), Vāritaram (floating on water), Rekhā Puritam (filling of finger lines), Nischandrikā (loss of glistens), etc. In modern pharmacology, ferrous sulphate is the commonest form of iron used for the treatment of iron deficiency anemia. The thumb rules for the administration of iron in this diseases are administration of iron in oral route without food in a schedule dose is more effective than three times of the dose of the same with meals. Oral iron therapy is noncompliance. Absorption of iron may be diminished in oral iron therapy in insufficient duration of therapy, concurrent inhibitors of iron absorption, concomitant use of drugs like antacids, H2 receptor, blockers, calcium salts, etc. Absorption of iron may be diminished in oral iron therapy in association of phytates in food, co-existent chronic inflammatory conditions, co-existence of vitamin B12 & folic acid deficiency, etc.

The preparation of Louha Bhasma in present research work was followed in accordance with the description as mentioned in the review part of the thesis. The description regarding preparation of Louha Bhasma is mentioned in the ‘chapter 4’ under the heading Chemical Investigation and Result. A special digitalized oven was prepared for the purpose mimicking with Gajaputa Yantra. During this procedure, series of incineration was done from puta 1 to puta 150. All the samples were preserved in the air tight container for further chemical, pharmacological and clinical investigations. The chemical investigations was done by conventional techniques like sulphur determination, bromium, chloride, carbon estimation, etc. The advance chemical analysis was done with the help of the sophisticated instruments like AAS, EDX, WDXRF, IR and LD.
It has been observed in these investigations that as the putas increases, there was decrease amount of iron in per cent and increase amount of beneficial trace elements in ppm like Mg, Ca, Na, Al, K, Mn, Zn, Ni, Cu, etc. In the next stage, the chemical screening was done with the help of HPLC and HPTLC. Interesting findings was observed on 150 puta of *Louha Bhasam* with this screening method having presence of iron-ion complex with several bio-active constituents like polyphenols, galatonoids, purine, gallic acid complex.

In ‘Chapter 5’ entitled, “Pre-Clinical Investigation and Results”, a detail description of toxicological and pharmacological investigation is narrated. The toxicity studies like LD$_{50}$, sub-acute toxicities like LFT, urea and creatinine of animals fed with doses like 0.1, 0.2 and 0.6 g Kg$^{-1}$ of Louha Bhasha were tested and no toxicity was observed. Effect of 50, 100 and 150 putas of Louha Bhasma was screened in Wister strain albino rats on iron deficient agar gel model with phlebotomy. It has been observed that treatment with 150 puta of Louha Bhasma could be able to regenerate Hb%, RBC, PCV, MCV, MCH, MCHC, serum ferritin, serum & decrease TIBC significantly ($p<0.001$).

The ‘chapter 6’ entitled, “Clinical Investigation and Results” deals with therapeutic application of 150 puta of Louha Bhasma in patients of iron deficiency anemia. Effect test drug was compared with standard comparator ferrous sulphate on the basis of the clinical feature as well as hematological parameters like Hb%, RBC, PCV, MCV, MCH, MCHC, serum iron, serum ferritin, TIBC, IgG, IgA, IgM, etc. All results were significantly favourable ($p<0.001$) towards correction of anemia and improvement of general health and was quite comparable with standard comparator.

The thesis concluded in chapter 7 with Discussion of whole works and it is predicted that the drug Louha Bhasma could be able to ameliorate the iron bio-availability in the system and ultimately improve the health. Main focus of the present research work is scientific exploration of unique technique of Ayurveda under modern parlance towards the benefit of human being.