

## Three Cases of Lead Toxicity Associated with Consumption of Ayurvedic Medicines

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**Abstract** Ayurveda is a traditional form of medicine used by majority of the Indians. Here we report three cases of lead toxicity, following intake of Ayurvedic medicines. Three patients presented with blood lead levels (BLLs) of 122.4, 115 and 42.8 µg/dl respectively at the time of hospitalization. The first case was chelated with D- penicillamine, the second with calcium disodium ethylene diamino tetra acetate (EDTA) and the third with environmental intervention and education. Associated Ayurvedic products were collected from patients and analyzed for metallic concentration. Cessation of Ayurvedic medication along with chelation, nutritional intervention and education, reduced the BLL to 27.4 µg/dl in the first case after 1 year, 21.1 µg/dl after 9 months in the second and 18.2 µg/dl after 6 months in the third case.

**Keywords** Lead toxicity · Ayurvedic medicine · Abdominal pain · Chelation · Blood lead level

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### Introduction

Ayurveda is a traditional Indian medical system used by a majority of the Indian population [1]. Ayurvedic medicines are primarily composed of herbs, minerals, metals and/or animal products [2]. These all are included in either purely herbal or Rasa shastra products. Rasa shastra is an ancient practice where metals like lead, mercury, iron and zinc etc. are processed and added to herbs. Heavy metals are commonly incorporated into Ayurvedic preparations as ashes or bhasmas. Experts in this field claim that Rasa shastra products if adequately prepared are safe for administration [3]. Further they claim that the role of bhasmas is to enhance the herbal products potency to act as a catalyst and an adjuvant to enter into the relevant cells. However in 2004 Saper et al. [4] found that 20% of Ayurvedic medicines sold in the Boston area contained high concentrations of lead, arsenic and mercury above daily permissible limits. Further analysis indicated that 21% of both American and Indian manufactured Ayurvedic medicines sold via the internet contained detectable levels of lead, arsenic or mercury. Rasa shastra products were more than twice as likely to contain heavy metals when compared to non Rasa shastra products. All metal containing products exceeded one or more standards for acceptable daily metal intake [3]. Case reports indicative of severe adverse effects due to consumption of traditional Indian medicines have been reported in the past [5, 6]. However the vast majority of these cases have been identified in patients outside the Indian subcontinent.

Here we present three cases of lead poisoning in India associated with consumption of Ayurvedic medicines. Initial blood lead levels (BLLs) before treatment and after discontinuation of Ayurvedic medicines were estimated by ESA-3010B lead analyzer at National Referral Centre for Lead Poisoning in India (NRCLPI).

All Ayurvedic medicines consumed by each patient were collected and sent to the trace metals lab at Harvard School of Public Health for analysis of metallic concentrations. Lead, arsenic, cadmium and manganese concentrations were determined by Inductive Coupled Plasma methods based on Mass Spectrometry (ICP-MS) and mercury content was detected by Direct Mercury analyzer (DMA).

## Brief Case Histories

### Case 1

A 45-year-old male software professional was admitted to a hospital in Bangalore twice within a period of 10 days for the treatment of generalized weakness, vomiting and abdominal pain. Both times the treatment was unsuccessful. The patient's history revealed that he had been consuming 12 different Ayurvedic medicines for the past 4 years. The Ayurvedic medicines were used for stress relief and maintenance of health. All products were purchased over the counter by the patient without consulting an Ayurvedic physician.

The doctors suspected lead poisoning and referred the case to the National Referral Centre for Lead Poisoning in India, situated in St. John's Medical College Bangalore for blood lead estimation. The patient's blood pressure was 120/84 mm of Hg, Hemoglobin level was 14.2 g/dl and BLL was 122.4 µg/dl, which confirmed lead poisoning. He was advised to discontinue all the Ayurvedic medicines and was chelated with D-penicillamine-250 mg thrice in a day for a period of 2 months. He was also advised to take calcium (Shelcal tablet once daily), B-complex and consume large quantity of liquids. Abdominal pain was relieved following 2 months of chelation therapy. His BLL

reduced to 48 µg/dl. Chelation was discontinued and a second blood lead estimation after 15 days revealed a BLL of 46.5 µg/dl. He had advised to take a good nutrition and to drink enough fluids. After 1 year his blood lead level was dropped to 27.4 µg/dl and he was comfortable.

Analysis of the 12 Ayurvedic products revealed that 75% of the products contained high levels of lead, arsenic and mercury in magnitudes higher than the daily permissible limits (Table 1).

### Case 2

A 36-year-old male wing commander from Bangalore, India had symptoms of abdominal pain, headache, insomnia, generalized weakness, facial pallor and joint pain and got admitted to Air Force Command Hospital in Bangalore. Doctors noticed a decrease in Hemoglobin level (8 g/dl) and suspected some internal bleeding. All the routine tests including tests for HIV and cancer were negative. Endoscopy, colonoscopy and barium meal follow through were carried out and internal bleeding was ruled out. The patient mentioned that he contacted a local Vaidya in Pune, Maharashtra for the treatment of psoriasis. The local Vaidya prescribed Gulkand, a product comprised of Mukta Bhasma, Sapta Ratna, Kumar Kalyan Ratna and Sal Bhaskar Ratna. He was advised to consume 2 tablespoons of Gulkand in the morning and night before food, for a period of 2 months. The patient experienced generalized weakness and severe abdominal pain. The peripheral blood picture showed basophilic stippling, after consuming the product for 1 month. Doctors suspected lead poisoning and referred the case to NRCLPI for a blood lead test, which revealed a blood lead level of 115 µg/dl.

He was advised to discontinue Gulkand. Chelation therapy with 2 grams of calcium disodium EDTA in

**Table 1** Heavy metal content of Ayurvedic medicines consumed by Case 1

Name of the product	Pb-pill (µg/g)	Cd-pill (ng/g)	As-pill (µg/g)	Hg-pill (µg/g)	Number of pills ingested/day
Shulwarjini Bati	69.47	310.20	9.32	10922.50	2
Shukramatrika Bati	49.36	273.80	2.05	1247.90	2
Mahayograj Guggulu	41182.11	94607.04	6.42	6389.41	2
Puspadhanva Ras	124556.73	<DL (34 ng/g)	13.94	2707.12	2
Brahmi Bati	23.27	<DL (34 ng/g)	3.11	9647.71	3
Mehmudgar Bati	199.09	<DL (34 ng/g)	1.18	45.60	2
Manmath Ras	119.12	<DL (34 ng/g)	4.75	31494.60	2
Swarnamakshik Bhasm	167.57	<DL (34 ng/g)	5.73	1939.06	50 mg
Big Boss Plus	<DL (0.05 µg/g)	<DL (34 ng/g)	<DL (0.2 µg/g)	310.50	2
Thirty Plus (capsule)	<DL (0.05 µg/g)	<DL (34 ng/g)	<DL (0.2 µg/g)	<DL (0.003 µg/g)	2
Tentex Royal (capsule)	<DL (0.05 µg/g)	72.04	<DL (0.2 µg/g)	<DL (0.003 µg/g)	2
Brahmi Bati SMAK yukt	32.34	253.66	8.75	2275.03	1

**Table 2** Heavy metal content of Ayurvedic medicines consumed by Case 2

Name of the product	Pb-pill ( $\mu\text{g/g}$ )	Cd-pill ( $\text{ng/g}$ )	As-pill ( $\mu\text{g/g}$ )	Hg-pill ( $\mu\text{g/g}$ )	Amount ingested/day
Gulkand (Semisolid)	11798.63	<DL (34 $\text{ng/g}$ )	<DL (0.2 $\mu\text{g/g}$ )	<DL (0.003 $\mu\text{g/g}$ )	2 Tablespoons twice daily

**Table 3** Heavy metal content of Ayurvedic medicines consumed by Case 3

Name of the product	Pb-pill ( $\mu\text{g/g}$ )	Cd-pill ( $\text{ng/g}$ )	As-pill ( $\mu\text{g/g}$ )	Hg-pill ( $\mu\text{g/g}$ )	No. of pills ingested/day
Chandraprabha Vati	<DL (0.05 $\mu\text{g/g}$ )	70.00	0.96	<DL (0.003 $\mu\text{g/g}$ )	4
EVR Tablet-Unja	36044.07	<DL (34 $\text{ng/g}$ )	521.75	2244.38	2

<DL—means less than detectable limit

500 ml saline was given for 5 days. A repeated blood lead estimation after 12 days revealed a BLL of 88.4  $\mu\text{g/dl}$ .

A second cycle of chelation therapy with the same dosage of calcium disodium EDTA was given and a blood lead estimation 5 days after EDTA administration showed a blood lead level of 85.8  $\mu\text{g/dl}$ .

A third cycle of chelation therapy of the same dosage was given and blood lead estimation 20 days later was 56.4  $\mu\text{g/dl}$ . The patient's Hemoglobin level was estimated at 9.7  $\text{g/dl}$ .

Colicky abdominal pain had reduced and the doctors advised him a course of calcium and multivitamin tablets. Liver, kidney function tests and serum calcium and phosphorous levels were within normal limits. Blood lead estimation after 6 months showed a BLL of 21.1  $\mu\text{g/dl}$ . The psoriasis reappeared following the reduction of the BLL. The patient had no other known risk factors for lead.

Analysis of Gulkand revealed a lead concentration of 11,798  $\mu\text{g/g}$  and arsenic and mercury concentrations were below the permissible limits (Table 2).

### Case 3

A 46 year old security guard consumed two different Ayurvedic medicines for a period of 1 month and experienced severe abdominal pain. These medicines were prescribed by an Ayurvedic physician for treatment of weakness in his right hand. He consulted a neurologist in Bangalore who diagnosed peripheral neuropathy. The patient had a history of consuming Ayurvedic medicines leading the neurologist to suspect lead poisoning. The patient was referred to NRCLPI for a blood lead test; which revealed a BLL of 42.2  $\mu\text{g/dl}$ . He was advised to take calcium (Shelcal tablet one daily) and B-complex tablets, drink large quantity of fluids and discontinue all Ayurvedic medication. The patient reported cessation of abdominal pain within a month and the BLL reduced to 18.2  $\mu\text{g/dl}$  after

6 months. The patient had no known risk factors for lead exposure other than the Ayurvedic medicine use.

Analysis of both Ayurvedic products revealed that EVR Tablet—Unja had lead, arsenic and mercury (Table 3).

### Discussion

The World Health Organization survey indicates that about 70–80% of the world populations rely on non conventional medicines mainly of herbal sources in their healthcare [7]. There is a common misconception that use of herbal medicine does not produce any adverse effects.

Our analysis of Ayurvedic medicines showed the presence of heavy metals such as lead, arsenic, cadmium and mercury in remarkably high concentrations. Of the 12 products consumed by patient 1, Mahayogaraj Guggulu and Puspadhanva Ras contained the highest concentrations of lead. These findings are consistent with other case reports of lead poisoning associated with prolonged consumption of Mahayogaraj Guggulu [8–10].

Gulkand contained high concentration of lead and is likely responsible for the ill effects seen by patient 2. Remarkably high concentrations of lead in EVR tablet—Unja (Table 3) are almost certainly responsible for the lead associated symptoms in patient 3.

Lead undergoes cumulative accumulation in the bones and the appearance of toxic effects depends on the level and duration of exposure. Blood lead levels and the toxic effects in these patients can be correlated with the duration of exposure. Discontinuation of all the herbal medicines, nutritional interventions and chelation in the first two cases helped to reduce the blood lead levels in these three patients.

Our results indicate that patients consuming lead containing Ayurvedic medicines manufactured using lead based bhasmas may be at risk of developing lead toxic symptoms.

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