

Lead Poisoning due to Ayurvedic Medications

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Lead

Toxic to Blood, Renal, Reproductive and
CNS & PNS

Several health effects can occur at levels
previously considered safe

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Non-occupational Sources of Exposure (MMWR 2004)

- N= 338 (state registries)
- 23% shooting firearms
- 19% remodeling or renovation activities
- 13% hobbies
- 11% retained bullets
- 7% pica
- 4% *lead-contaminated food, liquids or "folk" medicines.*

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Ayurvedic Medicine

Originated in India > 2000 years ago

196 Ayurvedic medical schools and >100
hospitals in India today

Estimated 80% of India's population uses
Ayurvedic medicines

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Ayurvedic Medicine

Therapeutic roles attributed to Metals

Estimated 30- 65% of medicines
Intentionally contain one or more
Metals

Metals "detoxified" by heating/cooling
cycles and adding herbs

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Ayurvedic Medicine

> 55 cases of heavy metal intoxication
reported in Literature (since 1978)

Permanent sequelae have included:

Status Epilepticus
Fatal Infant Encephalopathy
Congenital Paralysis & Deafness

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Lead Poisoning Associated with Ayurvedic Medications — Five States, 2000–2003.
MMWR July 09, 2004

| State | Year | Age (yrs) | Sex | Patient's country of origin | BLL* at presentation (µg/dL) |
|---------------|------|-----------|--------|-----------------------------|------------------------------|
| New Hampshire | 2001 | 37 | Female | India | 81 |
| California | 2003 | 31 | Female | India | 112 |
| California | 2003 | 34 | Male | India | 80 |
| Massachusetts | 2002 | 62 | Male | India | 89 |
| Massachusetts | 2002 | 56 | Female | India | 60 |
| Massachusetts | 2003 | 19 | Female | Nepal | 46 |
| New York | 2000 | 25 | Female | India | 91 |
| New York | 2001 | 52 | Male | India | 49 |
| New York | 2000 | 57 | Female | India | 27 |
| New York | 2000 | 40 | Female | India | 92 |
| New York | 2001 | 56 | Male | India | 100 |
| Texas | 2003 | 50 | Male | Not stated | 92 |

| Type of ayurvedic medications ingested | Lead concentration of medications (ppm) |
|---|--|
| Two powders, three tablets | Powders: 12,000–17,000 Tablets: 60–100 |
| Nine medications, including pill taken four times daily | Pill taken four times daily: 73,900; Three others: 21, 65, and 285 |
| 10 powders, tablets, syrups | Tablet: 78,000; Pill: 36 |
| Guglu tablets | 14,000 |
| Guglu tablets | 14,000 |
| Sundari Kalp (pill and liquid) | Pill: 96,000; Liquid: 0 |
| Pill | 79,000 |
| Unknown form | Not known |
| Unknown form | Not known |
| Jambrulin | 44,000 |
| Powder | Not known |
| Jambrulin | 22,700–26,700 |

MMWR July 09, 2004

Heavy Metal Content of Ayurvedic Herbal Medicine Products

Saper RB, Kales SN et al. JAMA 2004

- Identify all stores ≤ 20 miles from Boston City Hall selling Ayurvedic HMPs
- Visit each store & purchase all unique HMPs
- Measure ppm of Pb, As, Hg by XRF
- Compare estimated daily intake to US Pharmacopeia and EPA Standards

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Heavy Metal Content of Ayurvedic Herbal Medicine Products

Saper RB, Kales SN et al. JAMA 2004

- 14 (20%) of 70 HMPs contained Pb, As, or Hg
- 13 Pb: 5- 37,000 ppm (median 40)
- 6 As: 37- 8,130 ppm (median 430)
- 6 Hg: 28- 104,000 ppm (median 20,225)
- All 14, taken as recommended, could result in intakes exceeding regulatory standards

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Lead- 12,974ppm (High)
Arsenic- 9,900ppm (High)
Mercury- 4,208ppm (High)

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Lead-12.2ppm (High)
Arsenic- 9.48ppm (High)
Mercury-1392ppm (High)

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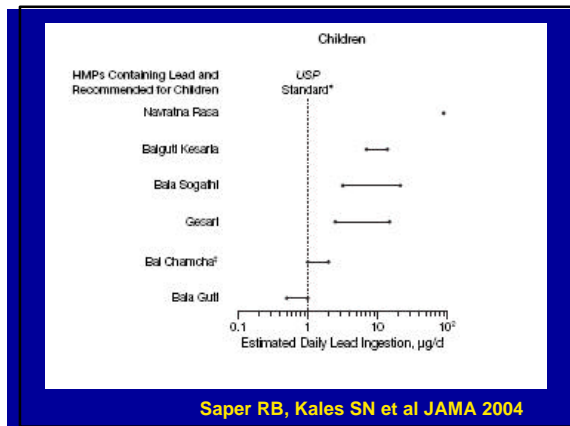
Kales SN



Lead- 12.86ppm (High)
Arsenic- 0.31ppm (Low)
Mercury- 10.6ppm (Moderate)

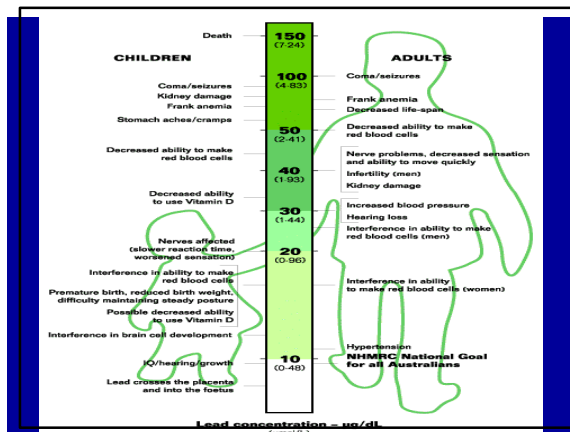
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Saper RB, Kales SN et al JAMA 2004

| | Ayurvedic Associated Lead Poisoning CHA evaluated (N=4) | Lead Paint Associated Lead Poisoning (N=19) | P Value |
|----------------------|---|---|---------|
| Age | 41 +/- 21 | 38 +/- 14 | 0.785 |
| Gender % male | 25% | 100% | 0.002 |
| Blood Lead ug/dl | 64 +/- 18 | 62 +/- 22 | 0.921 |
| Anemia | 100% | 37% | 0.037 |
| Basophilic Stippling | 50% | 16% | 0.194 |
| ZPP ug/dl | 438 +/- 158 | 117 +/- 56 | 0.025 |
| Hemoglobin g/dl | 10.6 +/- 1.3 | 14.1 +/- 2.1 | 0.004 |



| | Ayurvedic Associated Lead Poisoning Literature (N=45) | Lead Paint Associated Lead Poisoning (N=19) | P Value |
|----------------------|---|---|---------|
| Age | 39 +/- 13 | 38 +/- 14 | 0.727 |
| Gender % male | 56% | 100% | 0.002 |
| Blood Lead ug/dl | 94 +/- 36 | 62 +/- 22 | <0.001 |
| Anemia | 93% | 37% | <0.001 |
| Basophilic Stippling | 82% (n=34) | 16% | <0.001 |
| ZPP ug/dl | 269 +/- 160 (n=15) | 117 +/- 56 | 0.003 |
| Hemoglobin g/dl | 9.4 +/- 1.8 (n=35) | 14.1 +/- 2.1 | <0.001 |

| | Ayurvedic Lead Poisoning Literature | Lead Paint Removal Poisoning (N=19) | P Value |
|---|-------------------------------------|-------------------------------------|---------|
| Men with BLL < 80 ug/dl (N=9) | | | |
| Age | 43 +/- 14 | 38 +/- 14 | 0.390 |
| Blood Lead ug/dl | 68 +/- 7 | 62 +/- 22 | 0.281 |
| Anemia | 89% | 37% | 0.016 |
| Basophilic Stippling | 40% (n=5) | 16% | 0.270 |
| ZPP ug/dl | 232 +/- 132 (n=4) | 117 +/- 56 | 0.179 |
| Hemoglobin g/dl | 9.2 +/- 1.3 | 14.1 +/- 2.1 | <0.001 |

Ayurvedic Associated Plumbism

> 85-90% of Indian Subcontinent / Asian

Diagnosis Often Delayed

13% reported Bone Marrow Biopsy

16% reported Endoscopies

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Greater Hematic Toxicity

Women experience toxicity at lower BLL

Delayed Diagnoses -- Greater Chronicity

Co-presence of Arsenic and other
contaminants

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Positive Developments- Canada

Health Canada- July 2005

Banned 12 Ayurvedic HMPs w/ Pb, As or Hg

Advised Canadians to use only Health
Canada- Authorized HMPs

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Positive Developments- India

Ministry survey: 20% contain potentially toxic
metals

Starting Jan 2006: test all HMPs for Export

Must list all ingredients

Warning Label if any one of 18 toxic elements

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Persistent Problems

Testing NOT yet mandated for Domestic Indian
Consumption

Indian Testing is a "self-certification" process

??? Enforcement in Canada and India

NO action by FDA to date

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Future Directions

Study of HMPs available by Internet

Surveys of Extent of use of HMPs

Screenings of HMP users, Indian
population, Indian Diaspora

Animal studies regarding "detoxified"
metals

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Suggested Reading

CDC. Lead poisoning associated with use of Ayurvedic medications- five states, 2000-2003. *MMWR*. 2004;53:582-584.

Ernst E. Heavy metals in traditional Indian remedies. *Eur J Clin Pharmacol*. 2002;57:891-896.

Saper RB, Kales SN, Paquin J, Burns MJ, Eisenberg, DM, Davis RB, Phillips RS. The Heavy Metal Content of Ayurvedic Herbal Medicine Products. *JAMA* 2004;292: 2868-2873.

Lynch E, Braithwaite R. A review of the clinical and toxicological aspects of 'traditional' (herbal) medicines adulterated with heavy metals. *Expert Opin Drug Saf* 2005;4:769-778.

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