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# A comprehensive and detailed review on Mercury Toxicity

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## ABSTRACT

**Introduction:** Mercury is a chemical element with the symbol Hg and atomic number 80. It is also known as quicksilver and was formerly named hydrargyrum. In *Ayurveda*, use of Mercury in *Rasa-Aushadhis* has been known to all of us since the era of *Nagarjuna* who experimented with mercury with intention to eliminate poverty from world. With proper use of mercury in medicinal formulations diseases can be cured but their improper use can lead to various diseases such as *Nasabhanga*, *Mukhroga*, *Pakshaghat*, *Twacha Vaivarnya*, *Unmad* and other psychic disorders and can lead to Toxicity. Mercury is an Irritant Inorganic Metal Poison. Metallic mercury is not poisonous when taken by mouth. Poisoning occurs if the finely divided particles or vaporized mercury is swallowed, inhaled or rubbed on the skin. **Material & Methods:** Various *Samhita Granthas*, Articles, Textbooks related to Mercury Toxicity were studied. **Results & Conclusion:** Wide use of Mercury in *Ayurvedic* & *Siddha* medicines is evident since many years. As mercury gets deposited in tissues, it can lead to toxicity as a chronic effect. Also, occupational exposure by means of inhalation of vapors can cause many symptoms such as conjunctivitis, stomatitis, cough, dyspnoea, etc. Case studies also reported how Mercury toxicity can affect CVS, Respiratory & CNS systems. PM Appearances, Medicolegal aspect, Treatment, of Mercury Toxicity and *Ayurvedic* description were discussed.

**Key words:** Mercury Toxicity, Metal, Ayurveda, Poisoning, Medicolegal

## INTRODUCTION

Mercury is a chemical element with the symbol Hg and atomic number 80. It is also known as quicksilver and was formerly named hydrargyrum.<sup>[1]</sup> Mercury is the only metallic element that is known to be liquid at standard temperature and pressure.<sup>[1]</sup> In *Ayurveda*, use of Mercury in *Rasa-Aushadhis* has been known to all of us since the era of *Nagarjuna* who experimented with mercury with intention to eliminate poverty from

world.<sup>[2]</sup> Mercury has many synonyms in *RasaShastra* and each such synonym depicts for itself. Such as,<sup>[3]</sup>

1. **Rasa** - ability to absorb all *Maha-Rasa* (Mica etc.) and metals (Gold etc).
2. **Rasendra** - Being superior to all *Maha-Rasa*.
3. **Soot** - Creation of healthy cells and tissues in human body.
4. **Chapal** - Highly motile nature.
5. **Parada** - able to pull out & save peoples from bunch of diseases.
6. **Rasaraj** - King of all *Maha-Rasa* etc.

Various Medicinal Formulations containing Mercury are as follows<sup>[4]</sup>

Kupipakwa Rasayan	Kharaliya Rasayan	Parpati Rasayan	Pottali Rasayan
Rasasindur	Kajjali	Rasaparpati	Hemgarbhapotalli

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Makardhwaj	Vasantmalati	Lohaparpati	Hiranyagarbhapottali
Sameerpannag	Vasantkumakar	Tamraparpati	Rajatgarbhapottali
Rasakarpur	Rasrajras	Suvarnaparpati	Tamragarbhapottali
Rasapushpa	Yogendra Ras	Vijayparpati	Vaishvanarpot tali
Talsindur	Arogyavardhanirasa	Bolparpati	Lokeshwarpottali
Mallasindur	Mrityunjays	Panchamrutparpati	Shankhagarbhapottali
Siddhamakardhwaj	Ratnagirirasa	Sarveshwarparpati	Abhrakgarbhapottali
Shilasindur	Krishnachaturmukh Ras	Abhraparpati	Mrugankpottali Ras

With proper use of mercury in medicinal formulations diseases can be cured but their improper use can lead to various diseases such as *Nasabhangha*, *Mukhroga*, *Pakshaghat*, *Twacha Vaivarnya*, *Unmad* and other psychic disorders and can lead to Toxicity.<sup>[5]</sup> So let's proceed towards what Mercury Toxicity is and how it can be managed.

## MATERIALS AND METHODS

Various *Samhita Granthas*, Articles, Textbooks related to Mercury Toxicity will be studied.

## OBSERVATIONS AND RESULTS

Mercury is an Irritant Inorganic Metal Poison. Metallic mercury is not poisonous when taken by mouth. Poisoning occurs if the finely divided particles or vaporized mercury is swallowed, inhaled or rubbed on the skin.<sup>[6]</sup>

### Source of Exposure

Most human exposure to mercury is caused by<sup>[7]</sup>

- Outgassing of mercury from dental amalgam.
- Ingestion of contaminated fish.
- Occupational exposure.

### Common poisonous compounds of mercury<sup>[6]</sup>

- Mercuric chloride (corrosive sublimate)
- Mercurous chloride (ras kapoor)
- Mercuric oxide (sipichand)
- Mercuric cyanide
- Mercuric nitrate
- Mercuric sulphate
- Mercuric methide
- Mercuric sulphide (cinnabar, china Sindur)
- Mercury fulminate
- Mercurochrome

### Mechanism of Action

The inorganic & insoluble salts of mercury are corrosive to the skin, eyes and GIT, and may induce kidney toxicity if ingested.<sup>[8]</sup> Neurological & behavioral disorders may be observed after inhalation, ingestion or dermal exposure of different mercury compounds.<sup>[8]</sup> Mercury combines with Sulphydryl (SH) group of enzymes & depresses cellular enzymatic mechanisms.<sup>[6]</sup> Soluble forms of mercury when consumed, get deposited in body tissues- in kidney, liver, spleen, intestines, heart, muscles and lungs<sup>[6]</sup>

### Clinical Presentation

#### Poisoning occurs in 2 ways -

1. Acute Poisoning
2. Chronic Poisoning/ Hydrargyris

#### Chronic poisoning occurs -

- As a late effect of acute poisoning.
- Injudicious medicine administration.
- Multiple repeated small doses of mercury containing salts.
- People working in industry using mercury.

### Signs and Symptoms of Acute Poisoning<sup>[6]</sup>

- Metallic taste.
- Burning sensation.

- Pain & feeling of constriction in mouth & upper GIT.
- The oral cavity may be corroded & is greyish-white in color.
- Nausea.
- Vomiting containing blood & mucous followed by profuse bloody diarrhoea & pain in anus.
- Insensibility, Convulsions & Collapse.
- If death is delayed - salivation, inflammation of gums, foul breath, loosening of teeth & nephrotoxicity features appears.

#### On Inhalation of Vapours<sup>[6]</sup>

Salivation, Stomatitis, Vomiting, Diarrhoea, Cough, Dyspnoea, Conjunctivitis, Corneal ulceration, Nephrotoxicity.

#### Signs & Symptoms of Chronic Poisoning/ Hydrargyris<sup>[9]</sup>

- Ptyalism/ Sialorrhoea.
- Metallic Taste & GIT disturbances.
- Gums: Blue line, inflammation, ulceration & necrosis.
- Skin: Penetrating ulcers on fingers, nails & knuckles.
- Acrodynia/ Pink disease : Pink cheeks, nose, hands and feet.
- Kidney: Uraemia, Nephritis.
- Mercuria lentis: Brownish discolouration of eye lens capsule.
- Mercurial tremors (Danbury tremors / Hatter's shakes / Glass blower's shakes, affecting fingers, tongue, face, arms & legs.
- Concussio mercurialis is most severe form when no activity is possible.
- Erethism: disturbed personality characterized by shyness, irritability, tremors, loss of memory, insomnia, delusions & hallucinations, which may result in insanity.

- Skin eruptions.

#### Fatal Dose<sup>[6]</sup>

1gm of corrosive sublimate (Mercuric chloride).

#### Fatal Period<sup>[6]</sup>

Variable between few hours to 3-5 days.

#### Chemical Test for Detection<sup>[9]</sup>

To suspected solution are added HCL & Copper wire - silvery coating of mercury is formed.

#### Blood & Urine levels for Mercury Detection<sup>[10]</sup>

The most commonly accepted methods of detecting mercury exposure are to test urine or blood. Both tests usually measure levels of total mercury (elemental, inorganic and organic). Elevated mercury in urine usually indicates exposure to an elemental or inorganic source of mercury, such as from a job that uses mercury. Elevated mercury in blood usually indicates exposure to organic mercury (such as from eating fish containing methylmercury) or recent exposure to a high level of elemental mercury vapor. Healthcare providers and laboratories are required by the New York State Sanitary Code to report the results of blood or urine mercury tests to the NYS Department of Health when mercury is at or above the following levels:

**Blood** - 5 ng/mL (nanograms per milliliter)

**Urine** - 20 ng/mL

Mercury levels at or above these values do not mean that you will develop adverse health effects. The reporting system is designed to identify workers who might be exposed to mercury so measures to reduce exposures can be taken before health effects are expected.

#### Medicolegal Aspects<sup>[9]</sup>

- Suicidal & Homicidal Poisoning is rare.
- Sometimes used for criminal abortion.
- Commonly accidental poisoning occurs due to overuse of diuretics, mercury ointments, using bleaching creams, the snake tablet (Mercuric thiocyanate) used in Diwali (Diwali poisoning).

- Minamatee Bay Disease - Epidemic due to chronic mercury poisoning near Minamatee Bay in Japan due to contaminated fish due to factory wastes.
- Bones, teeth, hair & nails are preserved as additional viscera.

#### Post Mortem Appearances in Mercury Poisoning<sup>[9]</sup>

- Greyish-white Tongue & Mouth.
- Oesophagus & Stomach is corroded, softened, areas of blood oozing & color is greyish-white or black.
- Small & large intestines are ulcerated, congested & gangrenous sometimes.
- Kidney: Nephritis
- Liver: Cloudy swelling & Congested.
- Heart: Subendocardial haemorrhages & fatty degeneration.

#### Treatment & Management<sup>[11]</sup>

- Removal from site of exposure.
- Use of Emetics, Gastric lavage, I.V. fluids, Peritoneal or Hemodialysis (in case of renal damage).
- Use of Antidote
  - Physical:** Demulscents, Activated Charcoal (3 TSF in 2 cups of water) for absorbing mercury salts.
  - Chemical:** 5% solution of Sodium formaldehyde sulphonylate with 5% Sodium bicarbonate (reduces HgCl<sub>2</sub> to metallic mercury).
  - Pharmacological:** BAL or Penicillamine.

BAL or Dimercaprol (3-5 mg/kg I.M. 4 hourly for first 2 days, followed by 6 hourly on 3<sup>rd</sup> day and then 12 hourly for 10 days).

- Symptomatic management.

#### Case Study on Mercury Toxicity

##### Case 1

Mercury Toxicity following Unauthorized Siddha Medicine Intake - A mimicker of Acquired Neuromyotonia - Report of 32 Cases says<sup>[12]</sup>

Mercury toxicity following Siddha medicine intake closely mimics acquired Neuromyotonia, severe intolerable neuropathic pain, predominantly involving lower limbs.

##### Case 2

Mercury Toxicity: A Family Case Report says<sup>[13]</sup>

Environmental pollution exposes humans to toxic substances. This case study presents 5 family members aged 20-54 years that were poisoned by liquid mercury.

Heavy metal exposure- although rare-should be considered in patients that present with numerous symptoms involving multiple systems, including the cardiovascular, respiratory, and neurological system. This report is unique in that it describes mercury poisoning in 5 members of the same family.

#### CONCLUSION

Metal toxicity is an issue of concern for public health. Mercury is a heavy metal and it is an irritant inorganic metal poison. Wide use of Mercury in *Ayurvedic* & *Siddha* medicines is evident since many years. As mercury gets deposited in tissues, it can lead to toxicity as a chronic effect. Also, occupational exposure by means of inhalation of vapors can cause many symptoms such as conjunctivitis, stomatitis, cough, dyspnoea, etc. Case studies also reported how Mercury toxicity can affect CVS, Respiratory & CNS systems. PM appearances & Medicolegal aspect of Mercury toxicity also showed the need to study about Mercury toxicity in detail. Mercury Toxicity, description of Mercury according to Ayurveda and its *Vikara*, & Treatment along with Antidotes has been discussed in detail.

#### REFERENCES

1. Wikipedia. Mercury (element) [Internet]. Available from: [https://en.wikipedia.org/wiki/Mercury\\_\(element\)](https://en.wikipedia.org/wiki/Mercury_(element))
2. Balendu Prakash. Use of purified mercury in Ayurveda and its safety evaluation. VCP Cancer Research Foundation, Dehradun, Uttarakhand, India; ictm-2012.
3. Mishra S. Ayurvediya Rasashastra. Chaukhamba Orientalia, Varanasi; 3rd chapter, Parada, p. 140.

4. Mishra S. Ayurvediya Rasashastra. Chaukhamba Orientalia, Varanasi; 3rd chapter, Parada, p. 208.
5. Mishra S. Ayurvediya Rasashastra. Chaukhamba Orientalia, Varanasi; 3rd chapter, Parada, p. 285-286.
6. Singhal SK. Toxicology at a Glance. 8th edition. The National Book Depot, Mumbai; Chap 8, Irritants-Mercury, p. 72.
7. Robin A. Bernhoft. Mercury toxicity and treatment: A review of the literature. J Environ Public Health. 2012; 2012: 460508. doi: 10.1155/2012/460508.
8. World Health Organization. Mercury and health [Internet]. Available from: <https://www.who.int/news-room/fact-sheets/detail/mercury-and-health#:~:text=The%20inorganic%20salts%20of%20mercury,exposure%20of%20different%20mercury%20compounds.>
9. Singhal SK. Toxicology at a Glance. 8th edition. The National Book Depot, Mumbai; Chap 8, Irritants-Mercury, p. 73.
10. New York State Department of Health. Mercury - General Information [Internet]. Available from: [https://www.health.ny.gov/environmental/chemicals/mercury/docs/exposure\\_levels.htm#:~:text=The%20most%20commonly%20accepted%20methods,a%20job%20that%20uses%20mercury.](https://www.health.ny.gov/environmental/chemicals/mercury/docs/exposure_levels.htm#:~:text=The%20most%20commonly%20accepted%20methods,a%20job%20that%20uses%20mercury.)
11. Achal A, Tiwari R (editors). Agadtantra Textbook of Ayurvedic Toxicology. Chaukhamba Surbharati Prakashan, Varanasi; Chap 11, Parad (Mercury), p. 113.
12. Gnanashanmugam G, Balakrishnan R, et al. Mercury toxicity following unauthorized Siddha medicine intake – A mimicker of acquired neuromyotonia - Report of 32 cases. PMC. 2018 Jan-Mar; 21(1): 49–56. doi: 10.4103/aian.AIAN\_274\_17.
13. Rahsan Yildirim, Fuat Erdem, Mehmet Gundogdu, Yusuf Bilen, Ebru Koca, Yalcin Yillikoglu, Yasar Nuri Sahin. Mercury toxicity: A family case report. PMC. Published online 2012 Mar 5; 29(1): 76–79. doi:10.5152/tjh.2011.16.

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