



**KNOWLEDGE OF MERCURIAL TOXICITY FROM ANCIENT CLASSICS OF
RASASHASTRA AND AYURVEDA**

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ABSTRACT

Rasashastra mainly deals with formulations of metals, minerals, ores, alloys along with herbomineral formulations and Mercury is whose main subject matter. Toxicity of Mercury was well known and explored in depth in ancient classics of Rasashastra and Ayurveda, inspite of which Mercurial formulations are used in Ayurvedic therapeutics since ancient times [era of Sushrut Samhita(3000 BC) and widely used since era of Rasendramangal (8th century AD), Chakradutta (11th century AD)]. Collective information on knowledge of toxicity of Mercury to ancient Ayurvedic scholars is not documented, hence current attempt was done. Contemporary knowledge of Mercurial toxicity was reviewed from standard modern texts, online Research journals, online official government documents related to toxicology, Pharmacology, environmental toxicity, chemistry, epidemiology and occupational health specifically related to human health hazards. Ancient texts of Rasashastra and Ayurveda were screened for knowledge of toxicity of Mercury in view of human health hazards. It is concluded that Toxicity of mercury in terms of Human health hazards has been well explored in ancient classics of Rasashastra and Ayurveda since much before than 8th century AD. Ancient Ayurvedic scholars and Rasacharya (scholars of Rasashastra) were well aware of Acute, chronic toxicity of Mercury, teratogenicity of mercury and toxicity due to inhalation of fumes of Mercury and the knowledge of these toxicity is comparable to contemporary knowledge of its toxicity in humans.

KEYWORDS: Mercury, Heavy metal, Toxicity, Parada, Rasashastra, Ayurveda, Alchemy.

INTRODUCTION

Rasashastra is a unique division of science including variety of streams like philosophy, Ancient pharmaceutical, pharmacological and therapeutic sciences, metallurgy, minerology, Alchemy, pharmaceutical engineering etc. It has its own basic principles and is widely adopted in Ayurvedic pharmaceutico-therapeutics since ancient times. Rasashastra mainly deals with formulations of metals, minerals, ores, alloys along with herbomineral formulations and Mercury is whose main subject matter. Toxicity of Mercury was well known and explored in depth in ancient classics of Rasashastra and Ayurveda, inspite of which Mercurial formulations are used in Ayurvedic therapeutics since ancient times [era of Sushrut Samhita (3000 BC) and widely used since era of Rasendramangal (8th century AD), Chakradutta (11th century AD)]. Collective information on knowledge of toxicity of Mercury to ancient Ayurvedic scholars is not documented, hence current attempt was done.

MATERIALS AND METHODS

So as to know and compare knowledge of Mercurial toxicity with reference to its health hazards from ancient classics of Rasashastra and Ayurveda, Contemporary knowledge of Mercurial toxicity was reviewed from standard modern texts, online Research journals, online official government documents related to toxicology, Pharmacology, environmental toxicity, chemistry, epidemiology and occupational health specifically related to human health hazards. Ancient texts of Rasashastra and Ayurveda were screened for knowledge of toxicity of Mercury in view of human health hazards. Repetition of health hazards from different texts was considered as one. Observations were summarized and few were tabulated.

OBSERVATIONS AND DISCUSSION

Physical characteristics of acceptable and unacceptable Mercury for Pharmaceutico-therapeutic purpose are mentioned in ancient classics of Rasashastra.^[1] It is observed that, Mercurial toxicity was well known and well explored much before period of Rasahridaya tantra,^[2] Rasendra mangal (8th century AD),^[3] as in this

text not only the general toxic health hazards of consumption of unprocessed mercury are mentioned, but also specific health hazards after consumption of particular type of Mercury with pronicity to cause those specific hazards are also mentioned. Specific pharmaceutical processing of mercury has been mentioned in this text so as to get the mercury devoid of its particular pronicity to cause particular health hazard. Later on many texts of Rasashastra and Ayurveda explored in detail these toxicities and particular pharmaceutical processings for mercury as per its pronicity to cause these hazards. All available texts of Rasashastra and Ayurveda were not systematically screened for toxicity of Mercury in humans, as the review was aimed to only document the information of knowledge of Mercurial toxicity, known to ancient Rasashastry and Ayurveda scholars. Numerous mercurial formulations are widely practiced in Ayurvedic therapeutics and widely and highly recommended for wide therapeutic arena by all classics of Rasashastra as well as many ancient Ayurvedic texts. The detailed knowledge of mercurial toxicity in humans is found mentioned in texts like-**in Ancient era**-Rasendra Mangal, Rasahridaya tantra ,Rasaratnakara, Chakradutta, Rasaratna samucchaya, Rasarava, Anandakanda, **in Medieval period in texts** like- Rasendra chintamani, Rasaprakash sudhakara, Sharangdhara samhita, Rasendra Chudamani, Rasachintamani, Rasakamadhenu, Rasachandamshu, Rasamanjiri, Bhaishajya Ratnavali, Ayurved Prakasha, Rasapaddhati, Rasapradipika, Rasakaumudi, Rasasanket kalika, Rasadhyaya and **in recent texts** like Rasatarangini, Rasopanishat, Parada vijnaniyam etc (Table 7,6, 1,2,3,4 and 5). It has been revealed that Ancient scholars were having knowledge of Acute toxicity (Tables 3 and 8), chronic toxicity of Mercury (Table 9), mercurial toxicity due to inhalation

of vapors of mercury (Table 2), autopsy findings of mercury toxicity on internal organs (Tables 3) were known to Ayurvedic scholars and well explored in texts of 16th century (Tables 1, 2 and 3, 8 and 9). Even autopsy findings of diseased kidney are mentioned in 16th century AD text “Bhaishajya ratnavali” and it is mentioned to avoid Mercurials in *Vrukkaroga* (Renal failure), which suggest their knowledge of autopsy nephrotoxic signs of Mercury toxicity.^[4] Presentation of teratogenicity^[5] has been mentioned as lightness in genital parts i.e. scrotal atrophy in “*Rasajirna lakshana*”;^[6] signs to know undigested (improperly metabolized) mercury after consumption. Although specific manifestations of its toxicity in pediatric age group like Acrodynia / Pink disease^[7] are not separately mentioned under such heading, but its features are mentioned in general presentation and administration of mercurial is usually avoided in pediatric and during pregnancy. It is also revealed that ancient classics of Rasashastra and Ayurveda had mentioned toxicity due to local effects like corrosiveness in the form of gastroenteral toxicity and systemic toxicity like Nephrotoxicity, Neurotoxicity, ocular toxicity, Dermal toxicity, Hematopietic disturbances and general health hazards. Although today more fine information and mechanisms of actions of Toxicity of mercury are known with advancement of technology and science, even clinical presentation of toxicity as per blood and urine levels of mercury, along with molecular basis of toxicity is known today, still the clinical and autopsy presentation of toxicity as described in then written Ancient classics of Rasashastra and Ayurveda, is comparable to its contemporary knowledge (Table 2, 8 and 9) and was of its highest possible exploration in terms of technology of then existed era.

Table 1: Toxicity due to improperly consumed Mercury/ Medicinal formulations of mercury-from text Bhashajya ratnavali.^[8]

Presentation of Mercury toxicity from Bhaishajya Ratnavali	Translation or Extended meaning in concerned
<i>Nasabhangha</i>	Persistent Rhinorrhea, recurrent upper respiratory complaints.
<i>Pinasa</i>	Features similar to sinusitis-Features like Recurrent Upper respiratory tract infections
<i>Dantapata</i>	Loss of dentures, Dental carries
<i>Netraroga</i>	Eye disorders
<i>Visarpa</i>	Suddenly increasing edema, edematous lesions(wheals), Erysipelas like presentation
<i>Kotha</i>	Gangrene, necrosis
<i>Kandu</i>	Itching
<i>Mastake cha Atipida</i>	Severe Headache
<i>Tvag Vaivarnyam</i>	Skin discolouration
<i>Nasikadau Kshatam</i>	Nasal Ulcers
<i>Pidayukta Granthivat shotha</i>	Tender nodular swellings
<i>Andakosha Kathinya</i>	Hardening of scrotum
<i>Andakoshe Pidayukta Granthivat shotha, kathinya</i>	Tender nodular swelling and Hardening of scrotum
<i>Pakshaghata</i>	Paralysis
<i>Granthi</i>	Nodules
<i>Vatavyadhi / Asthi sandhigatavata</i>	Rheumatic complaints

<i>Jadya</i>	Sluggishness
<i>Daha</i>	Burning sensation
<i>Ghora chitta vikara (Manasavyadhi)</i>	Anxiety
<i>Bhagandara</i>	Discharging sinuses, fistulae
Different types of <i>Kushthavikara</i>	Skin disorders
<i>Upadamsha</i> like signs (presentation)- Oozing Ulcers, Chancre	Oozing Ulcers, Chancre like lesions
Other Critical diseases	-

Table 2: Toxicity due to excessive inhalation of fumes of Mercury/ medicinal formulations of Mercury - from text Bhaishajya Ratnavali.^[9]

Presentation of Mercury toxicity due to excessive inhalation of fumes from Bhaishajya Ratnavali	Similar effects of inhalational mercury toxicity mentioned in current, recent medical literature, Research studies ^[10,11,12,13]
<i>Kampa</i> initially – <i>Vadana kampa</i> later on progressing to limbs and other body parts.	Nervous symptoms like- tremors- muscles of tongue-muscles of face- arms and legs. Non coordination of movements
Severe loss of muscle power, easy fatigability	General wasting, dies from exhaustion.
	Polyneuropathy Neuromuscular changes (weakness, muscle atrophy, muscle twitching, electromyographic abnormalities)
Sluggishness in <i>indriya vyavahara-Vagindriya</i> - slurred speech <i>Ghranendriya-Nasabhanga</i> , <i>Pinasa</i> , impaired smell. <i>Tvacha</i> - Impaired sensation, hypo, paraesthesia. Slowness in routine work, Apathy.	Below normal score on neurobehavioral tests of motor speed, visual scanning, verbal and visual memory and visuo-motor coordination.
	Stammering and hesitation of speech, Erethism- Loss of memory, loss of confidence, timidity, mental depression, insanity.
	Exposed mothers gives birth to infants with Mental retardation, Retention of primitive reflexes.
	Headaches, Some long-term exposures to elemental mercury vapor have resulted in unsteady walking, poor concentration, tremulous speech, blurred vision, performance decrements in psychomotor skills (e.g., finger tapping, reduced hand-eye coordination), decreased nerve conduction, and other signs of neurotoxicity. Recent studies using sensitive tests for psychomotor skills, tremor, and peripheral nerve function suggest that adverse effects may be associated with very Elemental mercury and inorganic mercury compounds: human health aspects.

Table 3: Acute toxicity due to administration/ consumption of Mercury/medicinal formulations of Mercury- from text Bhashajya ratnavali.

Acute toxicity of Mercury from Bhaishajya Ratnavali	Presentation of Acute toxicity of Mercury as per Contemporary knowledge ^[15]
<i>Adhiyamashaya shotha</i> along with pain- painful deglutition, <i>Anna nalikashotha</i> , <i>Shvasanalika shotha</i> .	Mouth , tongue ad fauces get corroded, swollen and coated with grayish, white coating, hot burning sensation in mouth, stomach, abdomen
<i>Amashaya shotha</i> along with pain, colic	Hot burning pain is felt in the mouth extending down to the stomach and abdomen
<i>Madhyantra shotha</i> along with pain ,colic	Severe gastrointestinal corrosion. Blisters of Upper gastrointestinal tract, Tenesmus- Modi's Medical jurisprudence ad Toxicology
Death at end	Death at end
Diarrhoea, Bloody stools, Malaena	Diarrhoea, Bloody stools, Malaena
Vomiting with blood	Vomiting with blood
Moha-impaired sensorium (Semi consciousness)	Unconsciousness before death due to Uremia

Common Toxic effects of Mercury on human body as per many texts on Rasashastra

Table 4: Naisargika (natural/ by nature, Native to mercury) Dosha of Parada and their effects.^[16]

Naisargika Dosha (Inhabitant toxicity)	Effect on human body after consumption of Parada with this Dosha
<i>Visha</i>	Death
<i>Vahni</i>	Burning sensation of body
<i>Mala</i>	Increased excreta certain bi products of metabolism of diet -Persistent salivation, loss of urinary control, Frequent sweating etc.

Table 5: Saptakanchuka Dosha of Parada and their effects on human body after consumption of Parada with this dosha.^[17]

<i>Saptakanchuka Dosha of Parada</i>	Effect on human body after consumption of Parada with this dosha
<i>Parpati</i>	Thinning of skin, depilation of skin, cracks, ulcerations
<i>Patini</i>	Tearing like sensation, cracks, ulcerations
<i>Bhedi</i>	<i>Mala bhedana- Atisara, vamana</i>
<i>Dravi</i>	<i>Sharira dhatu dravaka</i>
<i>Malakari</i>	Increases <i>mala</i> (<i>Atisara, atisveda, Atimutra pravrutti</i>)
<i>Andhakari</i>	Blindness
<i>Dhvankshi</i>	Hoarseness of voice, Change of voice.

Table 6: Aupadhika , Sapta kanchuka, Yougika Dosha and other Dosha of Parada and their effects on human body after consumption of Parada with respective Dosha.^[18,19,20,21]

<i>Aupadhika Dosha of Parada</i>	Effect on human body after consumption of Parada with this Dosha
<i>Bhumija</i> (Natural contaminants, mines, ores)	<i>Kushtha</i> (Different skin disorders)
<i>Girija</i> (Natural contaminants, mines, ores)	<i>Jadya, Jadata</i> (Sluggishness, intellectual impairment)
<i>Varija</i> (Natural contaminants contaminated water)	<i>Vatasanghata</i> ; Disorders of <i>Vata</i> (Rheumatic disorders)
<i>Nagaja</i> (Mercury containing lead)	<i>Doshadhya</i> (with many complications), <i>Unmada</i> (Causes mental disorders), <i>Shyama-Prameha</i> (disorders representing polyurea, disorders of urinary tract representing polyurea), <i>Kamala</i> (Jaundice), <i>Kushtha</i> (Different skin disorders), <i>Pandu</i> (Anemia), <i>Udararoga</i> (Ascites), <i>Tridoshavikara</i> (Disorders of all 3 <i>Dosha</i>).
<i>Vangaja</i> (Mercury containing Tin)	<i>Doshadhya, Mahashula</i> (Severe pain), <i>Kalika-Marmacchedi</i> (Disabling functions of vital organs), <i>Bastiruk</i> (causes diseases of urinary system), <i>Kapalika-Viryahani</i> (Derangement of general health), <i>Tridosha vikara</i> (Diseases of all 3 <i>Dosha</i>).
<i>Ayoja</i> (Due to contamination with different metals)	<i>Kanthavrut</i> (diseases of throat, Dyspnoea, obstructive pulmonary diseases)
<i>Kalini</i>	<i>Krushna varna</i> (Hyperpigmentation)
<i>Malini</i>	<i>Mala samgraha</i> [either excessive production or reduced excretion of excretory biproducts of metabolism of food (impaired either production or excretion of stool, urine and sweat)]
<i>Salomi</i> (<i>Parada</i> with hairy adhered matter)	<i>Vamana</i> (vomiting)
<i>Pingali</i> (Mercury with Yellowish tinch)	<i>Netrarupaghna</i> (Disorders of eyes, blindness and or skin disorders, impaired appearance)
<i>Kapauti</i> (Mercury with Grayish tinch)	<i>Svara sada</i> (reduced, impaired voice)
<i>Raktanchuka</i> (Mercury with Reddish tinch)	<i>Visphota</i> (bullae, vesicular skin lesions)
<i>Mrunmaya</i> (Mercury seems like mud)	<i>Kushtha</i> (skin disorders)
<i>Pashana</i> (contaminated with rocks)	<i>Jadata</i> (Sluggishness)
<i>Uddinatva</i>	<i>Shool, Pain</i>
<i>Kautilya</i>	Headache
<i>Anavarta</i>	<i>Bhrama</i> (Giddiness), <i>Udvega</i> (Mental disorders, Nausea, Vomiting)
<i>Sankara</i>	Accumulation of <i>Dosha</i> in body
<i>Shadatva</i>	Infertility, sterility
<i>Vahni</i>	<i>Daha</i> (burning sensation), skin diseases
<i>Mala</i>	<i>Vamana</i> (Nausea), <i>Murccha</i> (unconsciousness), Diseases of abdomen
<i>Guruta</i>	<i>Jadata</i> (sluggishness in routine work, Apathy), <i>Murccha</i> (unconsciousness)
<i>Visha</i>	<i>Gatra kshaya</i> (Cachexia)

Different variety of *Saptakanchuka dosha* of *Parada* have been mentioned in different ancient texts on Rasashastra. Here few representative texts among them are mentioned for reference.

Table 7: Effects of consumption of Parada possessing Dosha (unacceptable Parada for medicinal use) on human body as mentioned in various classics of Rasashastra. ^[22,23,24,25,26,27,28,29,30,31,32]

Effects of consumption of Parada possessing Dosha on human body as mentioned in various classics of Rasashastra	Meaning
<i>Jadya</i>	Sluggishness
<i>Adhmana</i>	Gaseous distension of abdomen, impaired excretion, secretion of several fluids, excretory bi products.
<i>Murccha</i>	Unconsciousness
<i>Mrutyu</i>	Death
<i>Shulam</i>	Pain, abdominal
<i>Kushtha</i>	Skin disorders
<i>Mala yukta udara</i>	Accumulation of waste in abdomen
<i>Udara</i>	Ascites, Fluid retention
<i>Mada</i>	Disorientation, mental disorders
<i>Darpa</i>	Mental disorders, Excitation
<i>Sphota</i>	(bullae, vesicular skin lesions)
<i>Shirobhrama</i>	Giddiness
<i>Asahyagni</i>	Burning sensation, intolerance to heat
<i>Jadyamgandastanau</i>	Facial edema, Gynecomastia
<i>Ruja</i>	Pain
<i>Rujamalat</i>	Pain and impairment of body wastes
<i>Bijanasha</i>	Infertility, sterility
<i>Chanchalya</i>	Excitation, Dysarrhythmia, imbalance, tremulousness, loss of ability to concentrate
<i>Gajacharma</i>	Lichenification, thickening of skin
<i>Pundarika</i>	Skin disorder
<i>Visarpa</i>	Fast spreading disorder with skin manifestation of edema.
<i>Haridra</i>	Advanced stage of Jaundice
<i>Raktacharma</i>	Superficial Bleeding disorders, patechae, thinning of skin, bruisability, Vasculitis like presentation, sensitive skin
<i>Naranga</i>	-
<i>Raktabinduka</i>	Patechae
<i>Badhiryanaabhaso</i>	Deafness
<i>Dadru</i>	Itching skin disorder
<i>Pandu</i>	Anemia
<i>Raktaakshi</i>	Reddened eyes
<i>Akshipatalam Raktabija</i>	Subconjunctival, scleral haemorrhages
<i>Masurika</i>	Papular rashes
<i>Moha</i>	Semi consciousness
<i>Charmakila</i>	Skin tags, Painless sharp elevations over skin, Warts
<i>Viryakshaya</i>	General health deterioration due to loss of Veerya
<i>Chapalata</i>	Excitation, Dysarrhythmia, imbalance, tremulousness
<i>Galagandaroga</i>	Nodules over cervical region
<i>Rogapunja</i>	Production of several disorders
<i>Unmatta</i>	Disoriented psychiatric disorder
<i>Dharma</i>	-
<i>Angasphutati</i>	Skin ulceration, wounds, loss of body parts, severe pain
<i>Vrana</i>	ulceration, wounds
<i>Vrukkaroga</i>	Disorders of Kidney
<i>Rasajirna</i> ^[33,34]	Complications of <i>Rasajirna</i> - <i>Murccha</i> , <i>Bhrama</i> , <i>Shoka</i> , <i>Kampa</i> , <i>vamana</i> , <i>Moha</i> , <i>Jvara</i> , <i>Hikka</i> , <i>Vepathu</i> , <i>Shula</i> , <i>Nidra</i> , <i>Alasya</i> , <i>Arochakata</i> , <i>Lingastambha</i> , <i>Atisara</i> , <i>Kasa</i> , <i>Shwasa</i> , <i>Jrumbha</i> , Burning sensation of ear, eyes, abdomen (<i>Kukshi</i>), <i>Srcotum</i> , <i>Udara</i> , <i>Head</i> , <i>Genitals</i> , impaired digestion(Loss of appetite) and diseases related to loss of appetite leading to serious systemic diseases.
<i>Vishavat</i> ^[35]	Like poison (if consumed without <i>Kshetrikarana</i> ^[36])

Table 8: Signs and symptoms of Acute toxicity of Mercury after consumption of Mercury/medicinal formulations of Mercury.

Signs and symptoms of Acute toxicity of Mercury after consumption of Mercury/medicinal formulations of Mercury. ^[37,38,39,40,41]	Effect on human body after consumption of <i>Parada</i> with <i>Dosha</i> from Classics on Rasashastra and Ayurveda
Acrid, metallic taste.	<i>Vamana</i>
Feeling of constriction or choking sensation in the throat, hoarseness of voice	<i>Shvasanalika shotha.</i> , <i>Kanthavrut</i> (diseases of throat, Dyspnoea, obstructive pulmonary diseases), <i>Dhvankshi</i> (Rough voice, Change of voice.)
Difficulty in breathing	<i>Kanthavrut</i>
Mouth, tongue, fauces becomes corroded, swollen and coated with grayish white coating. Severe gastrointestinal corrosion. Blisters of Upper gastrointestinal tract.	<i>Adhiamashaya shotha</i> along with pain- painful deglutition, <i>Anna nalikashotha</i> , <i>Shvasa nalikashotha</i> , <i>Vrana</i> (ulceration, wounds), <i>Angasphutati</i> , <i>Visphota</i> , <i>Sphota</i> , <i>Vahni dosha</i> , <i>dantapata</i> , Vomiting with blood
Hot burning pain is felt in the mouth extending down to the stomach and abdomen	<i>Vahni dosha</i> , <i>Ruja</i> , <i>Asahyagni</i> , <i>Mahashula</i> (Severe pain)
Nausea, retching	<i>Vamana</i> ,
Vomiting , vomitus matter containing grayish, slimy, mucoid material with blood and shreds of mucous membrane	Vomiting with blood , <i>Vamana</i>
Diarrhea with blood stained stools and tenesmus	<i>Mala dosha</i> , <i>Mala samgraha</i> , <i>Doshadhya</i> , <i>Mahashula</i> (Severe pain)
Urine is suppressed or scanty, containing blood and Albumin, necrosis of renal tubules and damage to glomeruli acute Renal failure.	<i>Vrukka roga</i> , <i>Bastiruk</i> (causes diseases of urinary system), <i>Marma cchedi</i> (Disabling vital organs of functions), <i>Kotha</i> (necrosis).
Circulatory collapse-quick, small and irregular pulse.	<i>Bhrama</i> (Giddiness), <i>Vrukka roga</i> (Disorders of kidney),
In some cases-Spasm, convulsions, unconsciousness before death due to uremia	<i>Moha</i> (Semi consciousness), <i>Bhrama</i> (Giddiness, disorientation), <i>Vrukka roga</i> (Disorders of kidney), <i>Mrutyu</i>
Gangrenous colitis - if survives for 6 or more days	<i>Malayukta udara</i> , <i>Maladhya</i> , <i>Kotha</i> , <i>Mala samgraha</i>
Thrombocytopenia and bone marrow depression	<i>Raktaakshi</i> , <i>Raktabinduka</i> , <i>Rakta charmaka</i> (Superficial Bleeding disorders, patechae, thinning of skin, bruisability, Vasculitis like presentation, sensitive skin), <i>Akshipatalam</i> , <i>Raktabija</i> (Subconjunctival, scleral haemorrhages), <i>Pandu</i> (Anemia),
Exfoliative dermatitis	<i>Patini</i> (Cracks, ulcerations of skin)
Paraesthesia, Impaired peripheral vision, hearing, taste and smell sensations	Sluggishness in <i>indriya vyavahara</i>
Slurred speech	Sluggishness in <i>indriya vyavahara</i> , <i>Jadya</i> , <i>Jadata</i> ,
Unsteadiness of Gait and limbs, muscle weakness and irritability, memory loss and depression.	<i>kampa</i> initially - <i>Vadana kampa</i> later on progressing to limbs and other body parts, <i>Chanchalya</i> , <i>Chapalata</i>

Table 9: Signs and symptoms of chronic toxicity of Mercury after consumption of Mercury/medicinal formulations of Mercury.

Signs and symptoms of Chronic toxicity of Mercury after consumption of Mercury/medicinal formulations of Mercury. ^[42,43,44]	Effect on human body after consumption of parada with <i>Dosha</i> from Rasagrantha-
Nausea	<i>Vamana, Adhmana</i>
Digestive disturbances	<i>Adhmana, Malayukta udara</i>
Colicky pain	<i>Mahashula, Udara</i>
Foul breath	-
Swollen, Painful salivary glands	<i>Galaganda roga</i>
Inflamed, ulcerated gums	<i>Vrana, Dantapata</i>
Brownish bluish line at the junction of Gum and teeth	
Loose teeth	<i>Dantapata</i>
Necrosis of jaw-rare	<i>Kooha</i>
Evidence of nephritis	<i>Vrukkaroga, Bastiruk</i>
Mercurialentis-Brownish reflex form on anterior lense capsule of both the eyes	<i>Netra rupa hani</i>
Skin eruptions – Erythematous, Eczematous or papular with thickening of skin of hand and feet.	<i>Gajacharma, Charmakila, Sphota, Visphota, Raktacharma, raktabindu</i>
Neuro toxicity-Mercurial tremors- Fingers affecting first, then muscles of tongue producing stammering and hesitation in speech, Then extends to the muscles of face, arms and legs. Exited by voluntary movements and absent during sleep.	<i>Kampa</i> initially – <i>Vadana kampa</i> later on progressing to limbs and other body parts, Sluggishness in <i>indriya vyavahara, Jadya, Jadata</i>
Non co-ordination of movements, increased deep reflexes	<i>Kampa, Chanchalya, Chapalata</i>
Paresis of limbs following peripheral neuritis	<i>Kampa, Sluggishness in indriya vyavahara, Jadya, Jadata, Asahyagni, Vahni dosha</i>
Amyotropic lateral sclerosis	Severe loss of muscle power, easy fatigability, Sluggishness in <i>indriya vyavahara, Jadya, Jadata, Chanchalya, Kampa</i>
Cough with bloody expectoration	<i>Shvasanalika shotha., Kanthavrut</i> (diseases of throat, Dyspnoea, obstructive pulmonary diseases), <i>Dhvankshi</i> (Rough voice, Change of voice.)
General wasting	<i>Ojokshaya</i>
Anemia	<i>Pandu</i>
Chronic nephritis	<i>Vrukkaroga, Bastiruk</i>
Death from exhaustion	<i>Mrutyu</i>
Mental symptoms- Erethism (mad as hatter)-shyness, timidity, irritability, loss of confidence, mental depression, loss of memory and insomnia, Hallucinations, delusions.	<i>Unmatta, Mada, Unmada, Moha, Bhrama, Sluggishness in indriya vyavahara, Jadya, Jadata</i>
Insanity	<i>Unmada</i>
Increased blood pressure	<i>Bastiruk, Vrukkaroga</i> (Systemic arterial hypertension as presentation)
Tachycardia	<i>Pandu, marmacchedi</i>

Table 10: Signs and symptoms of toxicity of Mercury after exposure to vapors of Mercury/medicinal formulations of Mercury.

Signs and symptoms of toxicity of Mercury vapor as per contemporary documentations	Signs and symptoms of inhalational toxicity of Mercury vapor and toxicity of after consumption of <i>Parada</i> with <i>Dosha</i> from Classics on <i>Rasashastra</i> and <i>Ayurveda</i>
Metallic taste	<i>Vaman</i>
Salivation	<i>Vaman</i>
Gingivitis	<i>Dantapata, Pidayukta Granthivat shotha, Vrana, Angasphutati</i>
Loosening of teeth	
Foetid breath	<i>Kotha</i>
Lethargy	<i>Jadyata</i>
Slurring of speech	<i>Sluggishness of indriya vyavahara</i>
Diarrhea	<i>Raktatisara</i>
Pneumonitis	<i>Vrana, Kotha</i>
Cough	<i>Shvasana nalika Shotha</i>
Cyanosis	<i>Tvak vaivarnya</i>
Anuria	<i>Vrukka roga, bastiruk</i>
Mercurialentis	<i>Netrarupa hani</i>
Dyspnoea	
Tightness, burning sensation in chest	<i>Shvasana nalika Shotha, Adhiamashaya shotha, Annanalika shotha</i>
Respiratory distress, pulmonary edema	<i>Shvasana nalika Shotha</i>
Desquamation of bronchiolar epithelium	<i>Shvasana nalika Shotha, Vrana</i>
Neurologic toxicity- tremors	<i>Kampa</i>
Emotional lability	<i>Mada, Unmatta</i>
Headache	<i>Mastake cha atipida</i>

CONCLUSION

From above observations and tables, it is concluded that Toxicity of mercury in terms of Human health hazards has been well explored in ancient classics of Rasashastra and Ayurveda since much before than 8th century AD. Ancient Ayurvedic scholars and *Rasacharya* (ancient scholars of Rasashastra) were well aware of Acute, chronic toxicity of Mercury, teratogenicity of mercury and toxicity due to inhalation of fumes of Mercury and the knowledge of these toxicity is comparable to contemporary knowledge of its toxicity in humans.

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