

**COPPER TOXICITY - A COMPREHENSIVE STUDY**Dr. Sonal T. Ramteke\*<sup>1</sup>, Dr. Kalpana R.Chavhan<sup>2</sup><sup>1</sup>PG Scholar, Department of Agadtantra, Government Ayurved Collage, Nagpur, Maharashtra.<sup>2</sup>Assistant Professor, Department of Agadtantra, Government Ayurved Collage, Nagpur, Maharashtra.**\*Corresponding Author: Dr. Sonal T. Ramteke**

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Article Received on 23/05/2018

Article Revised on 14/06/2018

Article Accepted on 04/07/2018

**ABSTRACT**

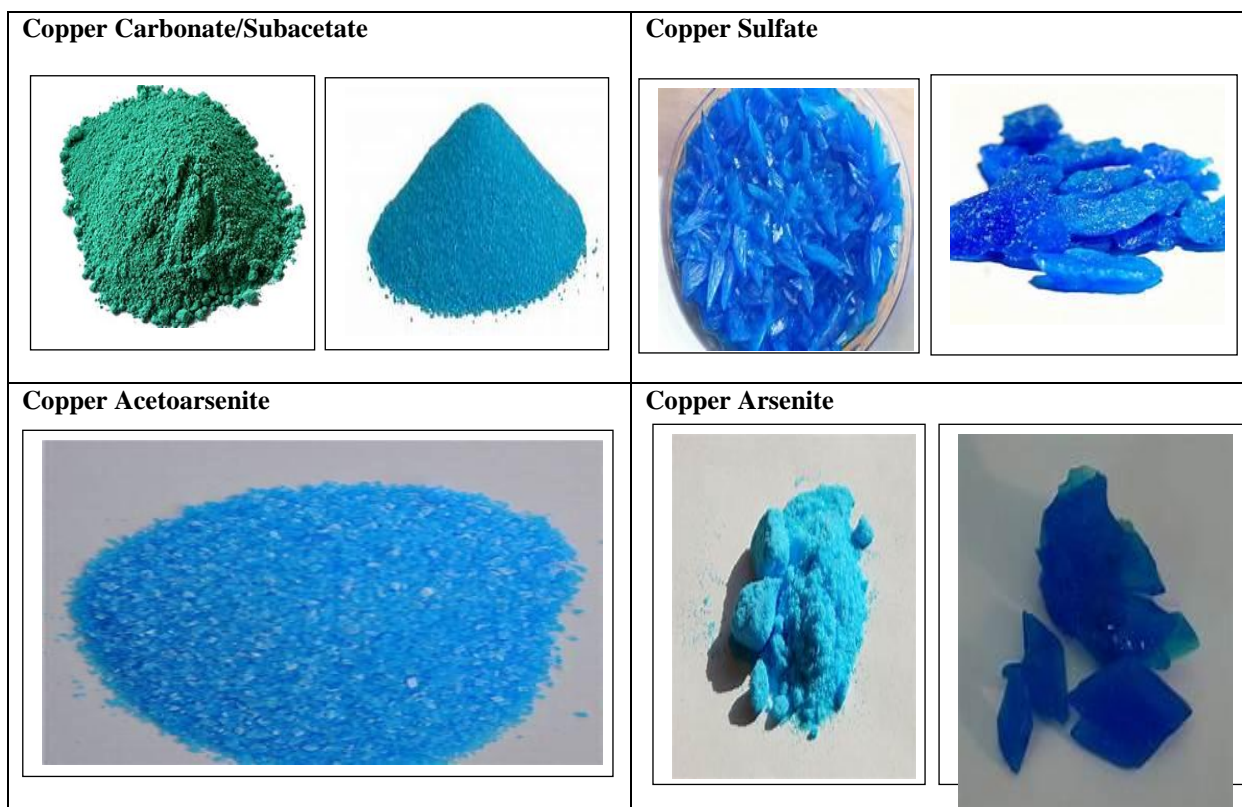
Copper is not poisonous in its metallic state but some of its salts are poisonous. Copper toxicity is increasingly becoming common these days. It is a condition in which an increase in the copper retention in the kidney especially the most common salts of copper are the sulphate or the blue vitriol (nila tutia) & the sub acetate or verdigris (zangal). Chronic copper toxicity is found in form of occupational or environmental exposure with leading encounter during manufacturing, transportation and utilization of lead & its compound. information about copper toxicity is found in various *granthas*. It is also mentioned in many times at *Mahabharata & shreemadbhagwata*. *Tamrabhasma* is mentioned in treatment part of charaka samhita. *Acharya charaka* had got the knowledge about *tamra* toxicity. This article highlights the valuable information about the whole sole of copper like classification, properties, it's another toxic salts, its acute and chronic sign and symptoms, treatment etc.

**KEYWORDS:** Copper, Copper toxicity, Ayurvedic management.**INTRODUCTION****AIM**

- To discuss, evaluate and elaboration on ayurvedic aspect of copper and its Acute, chronic toxicity in human.
- To establish the complete protocol of ayurvedic management for chronic Toxicity of copper.

**OBJECTIVES****1. Nomenclature****Sanskrit name-** *Tamra, Suryaloha, Shulba, Raktak***English name-** Copper (cuprum)**Hindi name-** Tamba**Marathi name-** Tamba**2. Types of Poison-**<sup>(9)</sup>**According to Ayurveda-** Sthawara dhatu visha**According to Modern-** Irritant Metallic poison**3. Fatal dose -** copper sulphate 10-20 gms**4. Fatal period-** Varies from 12-24 hours.**Table 1: Toxic salts of Copper**<sup>[5,6,7]</sup>

Chemical name	Common name	Features
Copper sulfate	Blue vitriol, Blue stone Nila tutia	Crystalline blue powder
Copper subacetate	Verdigris, Zangal	Crystalline Green powder
Copper acetoarsenite	Paris green	Emerald green powder
Copper arsenite	Scheele's green	Greenish powder
Copper carbonate	Mountain green	Crystalline green powder



### Mechanism of action or pathophysiological action of copper<sup>[5]</sup>

It precipitates proteins

It also acts on sulphadryl group of enzymes.

It is powerful inhibitor of enzymes.

**Table 2: Conceptual Study<sup>[1,2,3,4]</sup>**

Sr. No.	Properties	Ayurveda Prakash	Brihat Ras Raj Sunder	Ras Tarangini	Ras Ratna Samuchaya
1	Titka rasa	✓	--	✓	✓
2	Kashaya rasa	✓	--	✓	✓
3	Madhurvipaka	✓	--	✓	✓
4	Katu vipaka	--	--	✓	✓
5	Amlarasa	✓	--	✓	✓
6	Ushna veerya	--	--	✓	✓
7	Sheet veerya	✓	--	--	--
8	Vaatnashaka	--	✓	✓	--
9	Pittanashaka	✓	--	✓	✓
10	kaphanashaka	✓	✓	--	✓

### Common Uses of Copper

1. Insecticide
2. Fungicide
3. Algaecide (to kill algae in water)
4. Used in alloys- Copper is used in alloys such as bronze (copper alloyed with as much as 10 % tin) and brass (copper alloyed mainly with zinc). Money metal, another copper alloy, is copper alloyed with nickel.
5. Used in pigments

### Sources

#### Industrial

1. Pure copper is highly malleable, a good conductor of heat has a moderately high melting point.
2. Copper and its alloys have been used by many different civilizations as far back as 9000 BC.
3. Modern uses of copper include electrical wiring, plumbing materials, roofing, cookware, automobile brake pads & agricultural products.
4. Copper is introduced into the environment through both natural and anthropogenic activities. Anthropogenic sources of copper in the environment are copper mining activities, metal and electrical manufacturing, agricultural & domestic use of

pesticides and fungicides leather processing and automotive brake pads. Natural sources of copper pollution are volcanic eruptions, windblown dust and forest fires.

### Copper Poisoning

#### Acute copper Poisoning<sup>[5,6,8]</sup>

##### Sign and symptoms

1. Astringent metallic taste, salivation, burning sensation in mouth, chest and epigastric region (Upper GIT)
2. Pain and cramps in abdomen (entire).
3. Thirst, nausea, vomiting, (is blue or green), diarrhoea
4. Excessive Oligouria, Hematuria, albuminuria, ureamia.
5. Renal failure - Urine is scanty inky & contain albumin, cast due to toxicity to intravascular hemolysis.
6. Jaundice
7. Muscle cramps, convulsions and collapse.
8. Methemoglobinemia<sup>[6]</sup>
9. Hemolysis<sup>[6]</sup>
10. Liver failure - Jaundice<sup>[6]</sup>
11. Coma<sup>[6]</sup>

Signs of dehydration as per severity will found,<sup>[9]</sup>

1. Tongue-Dries skin tougher -loss, eyes-shrunken, ant.Fontanel (infant)-depressed
2. Pulse- Feeble & Tachycardia, BP- Hypotension, Respiration-sign
3. Death due to Hypovolemic shock and circulatory failure.

#### Inhalation of copper fumes or dust causes<sup>[6]</sup>

Respiratory tract irritation

Cough

Conjunctivitis

Metal fume fever

#### Chronic copper poisoning<sup>[5,6]</sup>

**Inhalation<sup>[8]</sup>** Metallic Fume fever due to chronic occupational Exposure of copper fume

#### Ingestion<sup>[8]</sup>

1. **Vineyard sprayer's lung disease (VSLD):** Copper sulfate is used as an insecticide spray in vineyards. During spraying, chronic inhalation of copper sulfate causes this disease.<sup>[6,8]</sup>
2. **Green hair discoloration:** Hair shows greenish discoloration.<sup>[6,8]</sup>
3. **Wilson's disease:** It is inborn error of metabolism characterized by excessive cumulation copper in Liver, Brain, Kidney & Cornea.<sup>[6,8]</sup>

#### Sign and symptoms

1. Green or purple line on the gums (at times called claptone's line).
2. Nausea, giddiness, headache, vomiting, diarrhea, colicky pain.

3. Conjunctivitis and corneal ulceration.
4. Laryngitis bronchitis
5. Nephrotoxicity
6. Anaemia
7. Neuritis, Muscle atrophy
8. Body secretions are greenish
9. Dermatitis
10. Malaise
11. Debility
12. Peripheral neuritis with foot drop or wrist drop
13. Wilson's disease
14. Bronze diabetes

#### Diagnosis of Acute copper poisoning

1. History of ingestion of copper sulphate or copper acetate.
2. Green/blue colored vomitus which covert to deep blue by reaction of NH<sub>3</sub>OH.
3. Urine is scanty, inky & contain albumin, cast.
4. Stool are liquid & brown but not bloody.
5. Jaundice
6. Sr. Ceruloplasmin level > 35mg.

#### Autopsy findings in copper poisoning<sup>[6,8]</sup>

Bluish line on gums.

**External-** Bluish line on gums, Greenish blue froth at mouth.

**Internal-** (a) stomach -Greenish or bluish colouration of gastric mucosa with Inflammation & congestion. (b) Intestines- Greenish or bluish colouration gastric mucosa.

#### Treatment

Virechan, Dhaniya sheetkashayam, in diet give Milk, rice and ghrita.<sup>[9]</sup>

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