

Metal Toxicity

Part -3



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Metal Toxicity



Toxicity of heavy metals:

Most common heavy metals

- lead (Pb)
- mercury (Hg)
- cadmium (Cd)
- arsenic (As)
- They are mainly produced by industrial activities, and deposit slowly in the surrounding water and soil

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Toxic effect of some heavy metals:

Mercury:

- Mercury is the only metal that is liquid at room temperature.
- Elemental symbol is Hg:
- It exists in three forms but all are toxic.

The three forms are-

- Elemental (metallic) mercury (Hg₀)
- Organic mercury
- Inorganic mercury

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Mercury (contd...);

Exposure to the various forms of mercury can result in some similar and some different symptoms.

Mercury is generated naturally in the environment from the degassing of the earth's crust, from volcanic emissions.

SOURCES :

Mining operations

Chlor alkali plants

Paper Industries

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Mercury toxicity:

- Mercury reacts with sulfhydryl (SH) groups, resulting in enzyme inhibition and pathologic alteration of cellular membranes.
- Elemental and methyl mercury are particularly toxic to the CNS. Metallic mercury vapour is also a pulmonary irritant.
- Methyl mercury is teratogenic.
- Inorganic mercuric salts are corrosive to the skin, eyes, and gastrointestinal tract, and are nephro toxic.

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Elementary mercury toxicity:

- Toxicity by inhalation exposure.
- Poorly absorbed from GIT .
- Once inhaled, it is mostly converted to inorganic Hg

Acute toxicity result in:

- Fever
- fatigue
- clinical signs of pneumonitis.

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Chronic exposure results in :

- neurologic, dermatologic, and renal manifestations.
- neuropsychiatric disturbances (e.g., memory loss, irritability, or depression)
- Tremor
- Paresthesias
- Gingivostomatitis
- flushing, discoloration and desquamation of the hands and feet
- hypertension

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Organic mercury:

- Ingestion is the main route of entry.
- Largest outbreaks are related to organic mercury (fungicide, seed dressing, contaminated fish)
- Marine animals convert elemental to organic mercury in their tissues
- Methylmercury poisoning causes minamata disease that occurred in humans who ingested fish and shellfish contaminated by MeHg.

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Organic mercury toxicity:

- Toxicity is mainly neurologic
- Visual field defects
- Hearing loss
- Tremor
- Dysarthria
- Mental deterioration

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Inorganic mercury toxicity:

- Main absorption by ingestion and through skin.
- Can be corrosive to mucosal membranes
- Poor lipid solubility:
- causes a non-uniform distribution with kidney accumulation, causing renal damage.
- Limit CNS penetration, but chronic exposure allow for CNS accumulation & toxicity.

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SYMPTOMS:

- High blood pressure
- Abdominal pain
- Constipation
- Joint pains
- Muscle pain
- Declines in mental functioning

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SYMPTOMS (contd....)

- Pain, numbness or tingling of the extremities
- Headache, Memory loss, Mood disorders
- Reduced sperm count, abnormal sperm
- Miscarriage or premature birth in pregnant women

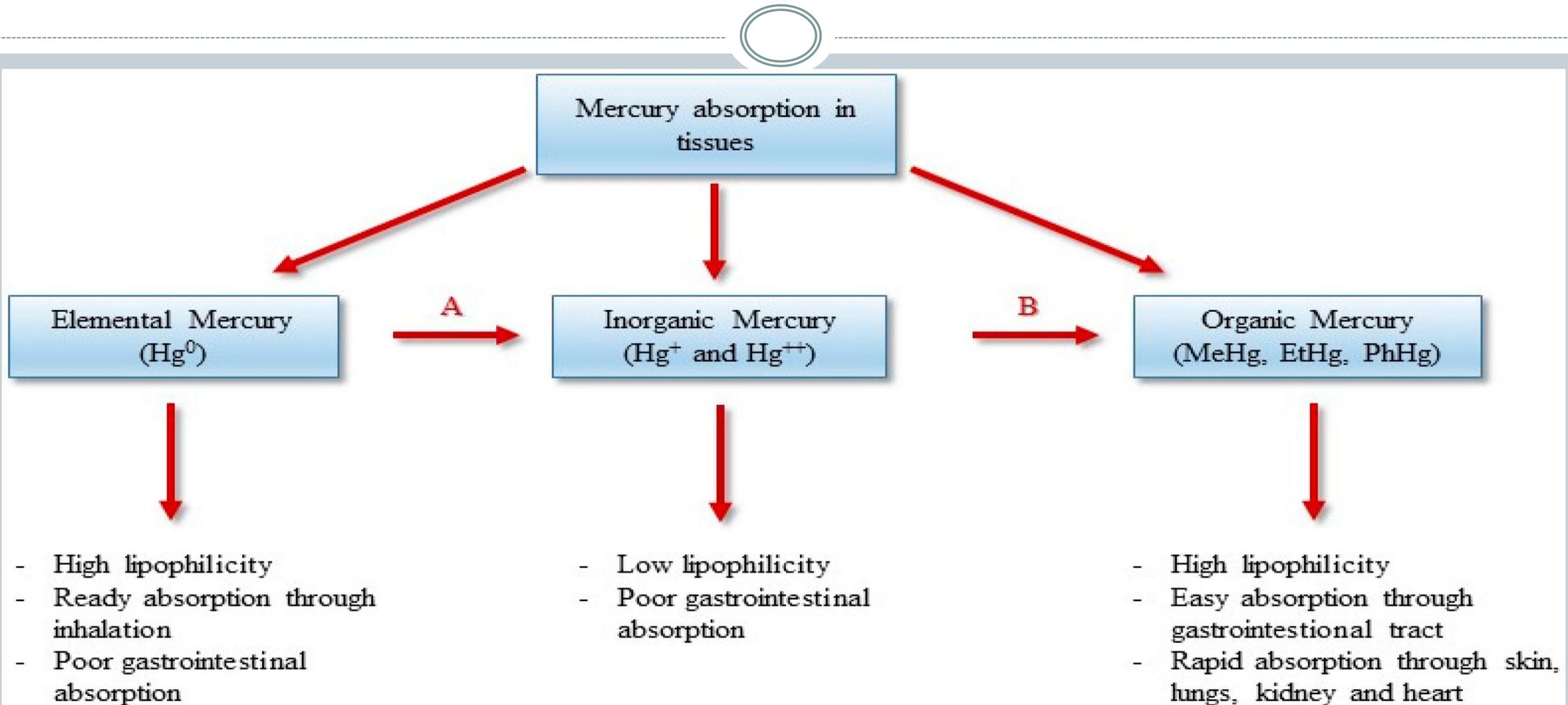
Metal Toxicity



TOXIC EFFECT ON MERCURY

FORM OF MERCURY	ELEMENTAL	INORGANIC	METHYLME-RCURY
ROUTE OF EXPOSURE	INHALATION	ORAL	ORAL –FISH CONSUMPTION
TARGET ORGAN	CNS , Kidney Peripheral nervous system	KIDNEY, PNS	C N S
LOCAL CLINICAL SIGN	Lung :bronchial irritation	GI-irritation Skin – irritation ulceration	
SYSTEMIC EFFECTS	Kidney- proteinuria CNS –mood change PNS - Tremors	Kidney – proteinuria, Tubular necrosis Is PNS TREMORS NUMBNESS	Developmental Effects in fetus And newborn. CNS IN ADULT TREMORS PARAESTHESIA

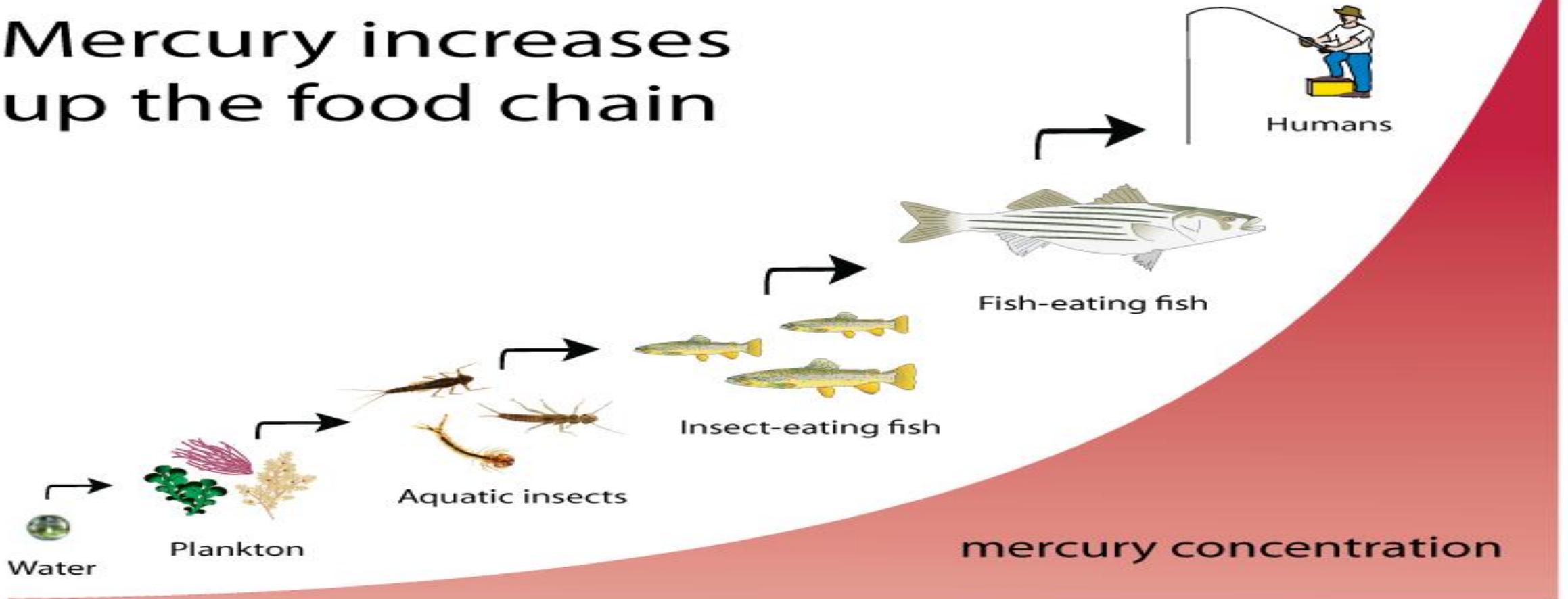
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Metal Toxicity



Mercury increases
up the food chain



Metal Toxicity



Mercury Poisoning

Exposure : High toxicity: **mercurialism**



Acrodynia ('Pink Disease')

- Pain
- Pink discolouration



Minamata Disease

- Ataxia
- Impairment of speech & hearing



Metal Toxicity



Mercury poisoning

SYMPTOMS OF MINAMATA DISEASE

GENERAL

- Muscle weakness
- Damage to hearing, vision and speech
- Crippling hands and feet

EXTREME CASES

- Paralysis
- Coma
- Death



Thank You

