



**" TWELFTHS ANNUAL CLINICAL TOXICOLOGY  
STUDENTS SCIENTIFIC ONLINE COFERENCE "**

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## **Abstract:**

### **1-Abstract of lithium toxicity:-**

Lithium toxicity is the condition of having too much lithium. Symptoms may include a tremor, increased reflexes, trouble walking, kidney problems, and an altered level of consciousness. Lithium toxicity can occur due to excessive intake or decreased excretion. Excessive intake may be either a suicide attempt or accidental. Decreased excretion may occur as a result of dehydration such as from vomiting or diarrhea, a low sodium diet, or from kidney problems. Gastric lavage and whole bowel irrigation may be useful if done early. Activated charcoal is not effective. For severe toxicity hemodialysis is recommended

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### **2-Abstract of cyanide poisoning:**

Cyanide poisoning is a very dangerous condition, because cyanide is highly lethal systemic poison causing rapid death. Cyanide has many sources :- industrial sources – natural sources – Smoking inhalation in fires. Its manner of poisoning may be accidental, suicidal or homicidal. Cyanide interferes with cellular respiration as it locks cytochrome c oxidase enzyme which contains ferric iron, thus there

no ATP synthesis by electron transport chain . This induces multi systemic manifestations: CNS manifestations , CVS manifestations , Dermal manifestations , Retinal manifestations , pulmonary manifestations , GIT manifestations , Delayed neurologic sequel : Parkinsonian like syndrome . Death usually due to central respiratory and circulatory failure . Physicians use kelocyanor as antidote for cyanide poisoning .

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### **3-Abstract of phenytoin toxicity**

Phenytoin (eg, Dilantin) is an anticonvulsant medication used to treat many seizure disorders. Phenytoin toxicity may result from intentional overdose, dosage adjustments, drug interactions, or alterations in physiology. Intoxication manifests predominantly as nausea, central nervous system dysfunction (particularly confusion, nystagmus, and ataxia), with depressed conscious state, coma, and seizures occurring in more severe cases. Cardiac complications such as arrhythmias and hypotension are rare in cases of phenytoin ingestion, but they may be seen in parenteral administration of phenytoin or fosphenytoin. Deaths are unlikely after phenytoin intoxication alone. The mainstay of therapy for a patient with phenytoin intoxication is supportive care.

Treatment includes attention to vital functions, management of nausea and vomiting, and prevention of injuries due to confusion and ataxia. Activated charcoal should be considered if the patient presents early; however, the role of multiple-dose activated charcoal is controversial.

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**4-Abstract of scombriod poisoning:**

Scombroid poisoning has become an almost world-wide medical problem. It is probably the most common cause of fish poisoning, although frequently misdiagnosed as ‘Salmonella infection’. While there remains some question as to the definitive etiology, there is little doubt that the poisoning is caused by the ingestion of certain mackerel-like fishes whose tissues have undergone a number of changes provoked by bacteria, and involving the conversion of histidine to histamine, potentiated by diamines. Improper storage of the fishes, usually at temperatures above 20°C, appears to be the most important predisposing factor. The organisms most commonly involved are *Proteus* sp., *Clostridium* sp., *Escherichia* sp., *Salmonella* sp. and *Shigella* sp. Twenty-five cases of scombroid poisoning are presented. The clinical manifestations were very similar in most cases, consisting of: alterations in taste; anxiety; hyperemia, particularly of

the face and neck; nausea; pruritis; headache; certain other symptoms and signs. Most patients responded to antihistamitics, and all cases were self-limiting.

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### **5-Abstract Tetrodotoxin Poisoning**

Many natural and some synthetic toxins act at a point in the electrical propagation of the nerve impulse. Tetrodotoxin, from the puffer fish (Fugu or *Lagocephalus scleratus*), blocks electrical conduction. Puffer fish is a delicacy in the Japanese diet and chefs must cautiously prepare it in a manner that excludes the tetrodotoxin containing fish parts from ending up on the plate. In fact, in Japan, chefs must be certified by the government before they are permitted to prepare puffer fish for consumption by their customers. There is very little toxin in muscle but levels in liver may be as high as 10 mg/g. The LD50 of this toxin in mice is only 300 µg/kg. Therefore, consuming only a tiny quantity of liver is fatal if humans are as susceptible as mice. The toxin also is found in fish skin, gonads, and intestine. Despite the high level of preparation that is required of chefs who make this delicacy, there are approximately 50 deaths each year in Japan from this source.

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## **6-Abstract of ciguatera poisoning:**

Ciguatoxin originates from tiny organisms eaten by small herbivorous fish which is then eaten by larger carnivorous fish and the toxin becomes concentrated in their flesh, adipose tissue and viscera. The toxin does not harm the fish which is normal in smell, taste and consistency. There are more than 500 fish species involved and the common factor is the large size of the fish. Time delay "incubation period" ranges from 2-6 hours after ingestion. Initial GIT manifestations: nausea, vomiting, abdominal pain and watery diarrhea. This is followed by Headache, myalgias, numbness in mouth and extremities Temperature inversion (hot feels cold), itching, vertigo and ataxia, hypotension and bradycardia. It is a self limited intoxication but need symptomatic treatment.

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### **7-Abstract of hydrogen sulphide toxicity:**

\*Hydrogen sulfide (also known as H<sub>2</sub>S, sewer gas, swamp gas, stink damp, and sour damp) is a colorless gas known for its pungent "rotten egg" odor at low concentrations. It is extremely flammable and highly toxic.

\*Hydrogen sulfide is used or produced in a number of industries, such as: Oil and gas refining, Mining, Tanning, Pulp and paper processing, Rayon manufacturing.

\*Hydrogen sulfide also occurs naturally in sewers, manure pits, well water, oil and gas wells, and volcanoes. Because it is heavier than air, hydrogen sulfide can collect in low-lying and enclosed spaces, such as manholes, sewers, and underground telephone vaults. Its presence makes work in confined spaces potentially very dangerous.

The health effects of hydrogen sulfide depend on how much H<sub>2</sub>S a worker breathes and for how long. However, many effects are seen even at low concentrations. Effects range from mild, headaches or eye irritation, to very serious, unconsciousness and death.

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### **8-Abstract of spider venom:**

More than 40,000 species of spiders have been identified in the world. Spider bites are a common problem among people, however, few of them are harmful but delay in treatment can cause death. Since spider bites are a risk full to humans, they should be taken seriously, especially in endemic areas. Our objective in this review was to study poisonous spiders and find out treatments for them. Therefore, we collected related articles from the PubMed database and Google Scholar. Three important syndromes caused by spider bites are loxoscelism, latrodectism, and funnel-web spider syndrome. Many treatments are used but much more studies should have done to decrease the mortality. In this review, we describe different venomous spiders according to their appearance, symptoms after their bites, and available treatments.

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## **9-Abstract Mercury poisoning**

Mercury is a widespread heavy metal with potential severe impacts on human health. Exposure conditions to mercury and profile of toxicity among humans depend on the chemical forms of the mercury: elemental or metallic mercury, inorganic or organic mercury compounds. Acute inhalation of metallic or inorganic mercury vapours mainly induces pulmonary diseases, whereas chronic inhalation rather induces neurological or renal disorder. Methylmercury poisonings from intoxicated food occurred among some populations resulting in neurological disorders and developmental troubles for children exposed in utero. Treatment using chelating agents is recommended in case of symptomatic acute mercury intoxication; sometimes it improves the clinical effects of chronic mercury poisoning. In case of occupational exposure to mercury and its compounds. Clinicians should work with toxicologists for the diagnosis and treatment of mercury intoxication.

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## **10-Abstract of Ethylene glycol poisoning:**

Ethylene glycol, a common antifreeze, coolant and industrial solvent, is responsible for many instances of accidental and intentional

poisoning annually. Following ingestion, ethylene glycol is first hepatically metabolised to glycoaldehyde by alcohol dehydrogenase. Glycoaldehyde is then oxidised to glycolic acid, glyoxylic acid and finally oxalic acid. While ethylene glycol itself causes intoxication, the accumulation of toxic metabolites is responsible for the potentially fatal acidosis and renal failure, which characterises ethylene glycol poisoning. Treatment of ethylene glycol poisoning consists of emergent stabilisation, correction of metabolic acidosis, inhibition of further metabolism and enhancing elimination of both unmetabolised parent compound and its metabolites. The prevention of ethylene glycol metabolism is accomplished by the use of antidotes that inhibit alcohol dehydrogenase.

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**11-Abstract CARBAMAZEPINE TOXICtY**

Carbamazepine is a commonly prescribed agent for focal epilepsy and other nonepileptic conditions such as neuropathic pain, schizophrenia and bipolar disorder in the pediatric and adult patients. The first overdose was reported in 1967, and significant toxicity occurs at levels higher than 40 mg/L (usual therapeutic levels are 4 to 12 mg/L).

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## 2-case study

### 1-lithium toxicity

Lithium is a mood stabilizer that is used to treat or control the manic episodes of bipolar disorder (manic depression). It has a narrow therapeutic index and toxicity is enhanced by dehydration, thiazide diuretic and renal failure.

\*Mood of toxicity:-

- Suicidal.
- Accidental.

Toxicodynamics:-

Lithium's physiologic role is unknown, and its mechanism is not well understood; however, some proposed mechanisms include:

- Producing brain inositol depletion, leading to reduced responsiveness to alpha-adrenergic stimulation. Reducing neuronal responsiveness to neurotransmitters due to inhibitory

effects on adenylate cyclase and G proteins vital for ion channel opening.

- Stimulating serotonin release from the hippocampus. Being a cation, acting similar to potassium and sodium, thus affecting ion transport and cell membrane potential.

Clinical picture of acute toxicity:-

CNS:Mild toxicity: mental confusion, ataxia, tremors and exaggerated reflexes. Severe toxicity: convulsions and coma.

Renal:Polyuria, polydipsia, nephrogenic diabetes insipidus and renal failure.

CVS:Arrhythmias.

GIT : Nausea, vomiting and diarrhea.

Investigation:

- Serum lithium level (therapeutic level 0.6-1.2 mEq/L)
- Renal functions.
- ECG.
- serum electrolytes

Management:-

1-Stabilization of the patient (ABCD).

2-Elimination Induction of emesis or G. lavage.

- • G. Lavage : - A tube is placed through the nose or mouth into the stomach. The tube is used to remove lithium that has not been digested yet. It may also be used to put medicines directly into the stomach to help stop lithium from being absorbed.
- Charcoal is not effective . Whole bowel irrigation release is effective especially in sustained preparations.

3-In mild to moderate cases with serum level < 4 meq/L:

- Diuretic medications such as furosemide.
- Hydration via intravenous normal saline appear to be effective in speeding the removal of lithium and also rehydrate patients who've lost fluids.
- Maintenance of electrolyte and fluid balance.
- ECG monitoring.
- Serial estimation of lithium level.

4-Hemodialysis:

- Hemodialysis is widely advocated as a means of reducing the risk of permanent neurological sequelae following lithium poisoning.
- Used in:-
  - 1-Severe toxicity (coma, convulsions or arrhythmias).
  - 2-Serum lithium level > 4 meq / L.

## 2-Cyanide poisoning

### Case scenario

A 28-month-old girl presented to the emergency department with sudden onset unconsciousness and seizure when she was eating apricot seeds with her father. Glasgow coma score was 4. She was transported to the intensive care unit and mechanical ventilation was begun. Gastric lavage was performed and pieces of apricot seeds were observed. On laboratory investigation, blood gas analysis revealed pH 6.8;  $p\text{aO}_2$  80 mmHg;  $\text{PaCO}_2$  15 mmHg;  $\text{HCO}_3^-$  5.5 mmol/L; base excess  $-29.6$  mmol/L; plasma lactate level 10 mmol/L; plasma glucose level 290 mg/dl. With the help of laboratory findings and knowing she had been eating apricot seeds, the patient was diagnosed with acute cyanide poisoning. After collecting a whole blood sample for measurement of cyanide level, cyanide antidote dicobalt edetate (Kelocyanor) was given 10 hours after the patient arrived at the hospital. Repeated arterial blood gas analysis showed that the difference between arterial and venous  $\text{PO}_2$  levels was 8 mmHg. The result of whole blood cyanide level was more than 3mg/L at hour 4 after presentation. Dicobalt edentate was repeated. The patient died on the 22th day of hospitalization, following supportive care in the intensive care unit.

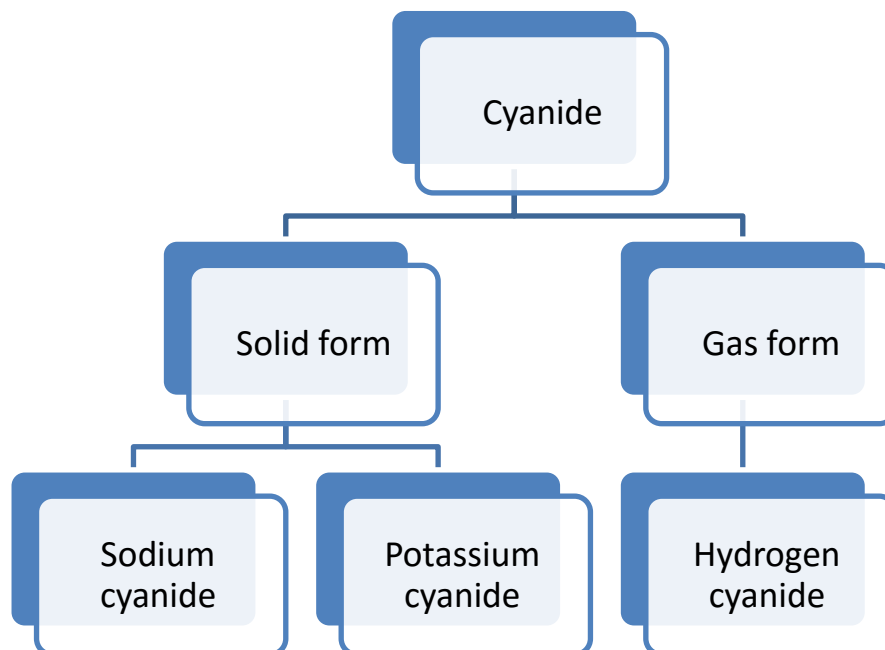
### ILOs

- 1- What is cyanide
- 2- sources of cyanide

- 3- manner of poisoning
- 4- Explain the toxicodynamic
- 5- Describe the clinical picture
- 6- outline manegment

What is cyanide ?

- Highly lethal systemic poison causing rapid death
- Derivatives of cyanide



- CN poisoning (chemiacal asphyxiant):
  - Hydrocyanic acid (prussic / vegetable acid).
  - Liquid / Gas / Salt.
  - HCN gas: bitter almond like odor / colorless.

Sources of poisoning



- Natural sources
- Industry such as metal trade, mining, jewelry manufacturing
- Smoke inhalation in fires
- Rarely suicidal cyanide ingestion by lab workers and health care providers

Natural sources of cyanide

Plants capable of causing cyanide (HCN) poisoning:

- Peach trees
- Apricot trees
- Arrowgrass
- Johnson grass
- Plum trees
- Cherry trees
- Almond trees
- Elderberry

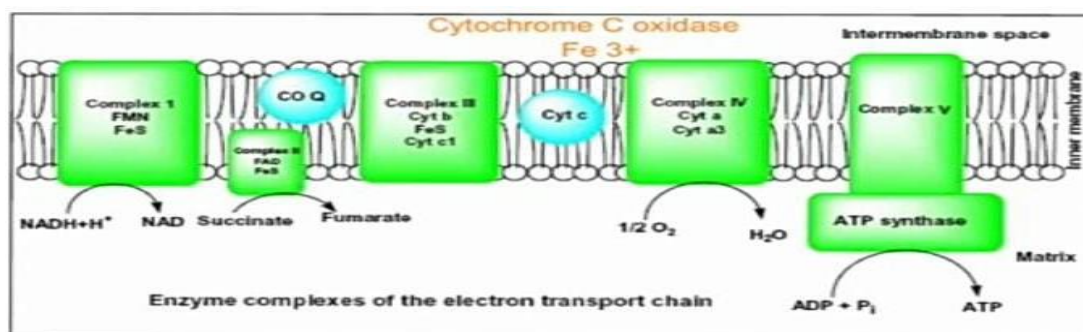
Manner of poisoning

- Accidental: farmers , HTN ( non-intentional iatrogenic).
- Suicidal: insecticides , HCA , CA salts.
- Homicidal: gas chambers.

Toxicodynamics

1. Need HCL (achlorohdria: atrophic gastritis)

2. protoplasmic / Mitochondria poisoning: inhibit cellular respiration /oxidative phosphorylation (loves Fe<sup>3+</sup>in the cytochrome oxidase enzyme)
3. O<sub>2</sub> content of venous and arterial blood are equal
4. Heart and brain -->hypoventilation



### Clinical manifestation

- inhalation is the faster route for death , IV infusion (nitroprusside) is the slowest.
- Hypoxia without cyanosis.

CNS: Reflect progressive hypoxia, headache, confusion, lethargy, Convulsion and coma.

CVS: Initially bradycardia and hypertension followed by hypotension and reflex tachycardia. The terminal event is consistently bradycardia and hypotension.

Pulmonary: initial centrally mediated tachypnea followed by bradypnea. CPE and acute lung injury.

GIT: Gastritis, nausea, vomiting, and abdominal pain occurs due to ingestion of corrosive cyanide salts.

Delayed neurologic sequel: in form of parkinsonian like syndrome including dystonia, rigidity, dysarthria, and bradykinesia typically develop over weeks or months. This syndrome may progress or resolve.

Dermal: flushing

Management:

- Investigation:

A. Laboratory:

ABG:

1. Metabolic acidosis & elevated lactate due to blockade of aerobic metabolism.
2. Oxygen saturation is not altered except when respiratory failure occurs.
3. Elevated venous oxygen saturation.

Cyanide determination in the blood:

- Can confirm exposure, but it is not usually available.

B. ECG and cardiac monitoring

C. Imaging:

1. Chest x-ray: pulmonary edema in severe cases.
2. Brain CT and MRI, especially in patients with ACL.

- Diagnosis

- History (occupation).
- Metabolic acidosis & lactate (like CO), elevated venous O<sub>2</sub>% sat (unlike CO).

- Blood CN level.
- Fundus: vein=artery.
- Treatment

I- First aid : CPR

II- Detoxification: according to the route of exposure with protection of the rescuer:

- Pulmonary: remove from site
- Dermal: washing
- Gastrointestinal: secure airway with cuffed ETT, then GL and AC

III. Cyanide antidote kit : Components: nitrites + thiosulphate ± hydroxocobalamin.

Mechanism of action:

- Sodium nitrite works by inducing methemoglobinemia. The ferric iron in MetHb combines with cyanide producing cyanomethemoglobin and liberates cyanide from cytochrome oxidase.
- Thiosulfate provides sulfur that binds to cyanide producing thiocyanate (mediated by rhodanese enzyme). Thiocyanate is minimally toxic substance that is eliminated renally.
- Hydroxocobalamin provides cobalt which combines to cyanide to form relatively non-toxic cyanocobalamin .

IV. Specific treatment for complications:

- Acidosis: adequate ventilation and NaHCO<sub>3</sub> IV (monitor blood and urine pH and make sure it does not exceed 8).

- Hypotension: I.V fluids and vasopressors.
- Seizures: oxygen, BDZ.
- Dysrhythmias: antidysrhythmic & cardioversion.

### 3-Phenytoin toxicity

#### Case

A 4-year-old female child presented to the pediatric emergency room of our tertiary-level referral hospital, with complaints of two episodes of generalized tonic-clonic seizures associated with up-rolling of eye balls and frothing lasting for 10 min followed by a postictal loss of consciousness of 20 min. The parents also gave history of vomiting, rapid eye movements, hypotonia, irritability, dysarthria and dysphagia of 4 days duration. The symptoms were noted by the mother after the child woke up from sleep. There was no history of fever, diarrhea, cough, cold, trauma, dog bite, toxin exposure or drug intake forthcoming at admission. Past history was non-contributory. The child was born out of a non-consanguineous marriage and was fourth in the birth order. Her development was appropriate for her age. Her hemodynamics were stable with a heart rate of 98/min, respiratory rate of 26/min and blood pressure of 96/60 mm Hg.

Neurologic examination revealed a Glasgow Coma Scale score of 9, irritability, terminal neck stiffness, horizontal nystagmus, decreased motor power, normal knee and exaggerated ankle jerks bilaterally. Rest of the systemic examination was normal. In view of the above clinical spectrum, initially, a provisional diagnosis of viral

meningoencephalitis was made in the emergency room. However, on subsequent transfer to the ICU (after 5 h) the parents informed us that the elder sibling (a 6-year-old boy) was taking phenytoin syrup at 5 mg/kg/day. Thus, a suspicion of phenytoin intoxication was made and serum phenytoin levels sent accordingly for confirmation.

Her initial investigations revealed:

Normal blood glucose levels (random blood sugar –108 mg/dL), normal complete blood count, normal blood biochemistry (serum electrolytes, liver function tests, kidney function tests), normal arterial blood gases, electrocardiogram and chest x-ray. Her cerebrospinal fluid was acellular, with protein of 96 mg/dL and sugar of 88 mg/dL. The serum phenytoin levels sent on suspicion of acute phenytoin toxicity was 80 µg/mL (normal 10–20 µg/mL).

ILOs

- What are the therapeutic uses of phenytoin?
- What is the toxicodynamic / mechanism of action of phenytoin?
- What is the toxicodynamic / mechanism of action of phenytoin?
- What is the clinical picture of acute toxicity?
- What is the clinical picture of chronic toxicity?
- What is the proper investigation needed for such case?
- What is the line of treatment of phenytoin toxicity?
- What is the Differential Diagnosis of phenytoin toxicity?

➤ What are the therapeutic uses of phenytoin?

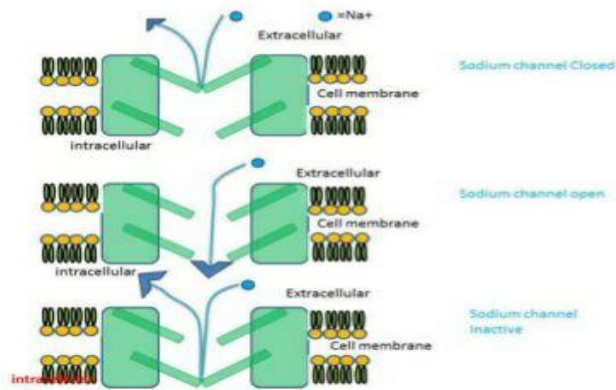
1. Oral phenytoin is used to treat grand mal epilepsy.

2. Intravenous phenytoin is used to treat status epilepticus and arrhythmias.

➤ What is the toxicodynamic / mechanism of action of phenytoin?

Phenytoin is a voltage-gated, sodium channel blocker, stabilizing the inactive state of the sodium channel and prolonging the neuronal refractory period. Phenytoin acts on the sodium channels on both neuronal and cardiac tissue. In the central nervous system, it targets neurons with high-frequency activity (as observed in seizures), with the majority of its actions on the motor cortex. This prevents the spread of a seizure's focal point and reduces the activity of brain stem regions responsible for the tonic phase of a tonic-clonic seizure. In cardiac tissue, phenytoin shortens cardiac action potentials and prolongs the refractory period between them.

## Mechanism of action



### Action of phenytoin on Na channel

- (A) Resting state in which Na channel activation gate (A) is closed
  - (B) Arrival of an action potential causes depolarization and opening of activation gate (A) and Na flows into the cell.
  - (C) When depolarization continues, an inactivation gate (B) moves into the cell.
- Phenytoin prolongs the inactivated gate of the Na channel by preventing the reopening of inactivation gate (B).

### ➤ What is the clinical picture of acute toxicity?

#### ❖ Oral toxicity

1. Nystagmus, ataxia and dysarthria.
2. GIT irritation may be seen.
3. Hyperglycemia due to inhibition of insulin release.
4. Convulsions (if occur, they are most probably due to coexisting factor as anoxia or other co-ingestions).
5. Stupor, coma and respiratory arrest.

#### ❖ Intravenous toxicity

Rapid intravenous injection leads to (cardiac effects): Profound hypotension, bradycardia and cardiac arrest

These effects are caused by the propylene glycol diluent that is used with phenytoin, so IV infusion must be done slowly at a maximum rate of 50mg/min and patients must be observed continuously especially blood pressure and ECG monitoring.



- What is the clinical picture of chronic toxicity?
  1. The classical signs are Nystagmus, Ataxia, and Drowsiness.
  2. Peripheral neuropathy characterized by hyporeflexia and sensory deficits.
  3. Gingival hyperplasia in 40% of patients (it is dose related).
  4. Osteomalacia due to disturbed vitamin D metabolism.
  5. Fetal malformations in the form of cleft palate and lips, in infants born to mothers exposed to phenytoin during pregnancy.
  
- What is the proper investigation needed for such case?
  6. Serum level monitoring (therapeutic serum level is 1020 mg/L).
  7. ECG monitoring (during intravenous infusion).
  8. Electrolytes, glucose, liver and kidney function tests.
  
- What is the line of treatment of phenytoin toxicity?
  - I-Emergency measures (ABCD)
  
  - II-Decontamination
    1. Induction of emesis.
    2. Gastric lavage.
  
  - III-Enhancement of Elimination

1. Activated charcoal MDAC (due to prolonged absorption).

IV-Supportive treatment.

V-Chronic intoxication:

1. Stop the drug.
2. Monitor serum level.
3. Supportive measures.

➤ What is the Differential Diagnosis of phenytoin toxicity?

1. Barbiturate toxicity
2. Benzodiazepine toxicity
3. Carbamazepine toxicity
4. Encephalitis
5. Erythema multiforme
6. Isoniazid toxicity
7. Shock
8. Stevens-johnson syndrome
9. SLE
10. Toxic epidermal necrolysis
11. Acute Hypoglycemia
12. Alcohol & Substance Abuse

#### 4-Scombriod poisoning

Scombrotxin mixture of histamine histamine-like compounds produced when histidine in fish tissue decomposes by effect of enzymes of bacteria. Most common species Dolphin (mahi-mahi), tuna, mackerel, bluefish.

Clinical picture of scombroid poisoning :-

The first symptoms are cutaneous, htiw facial flushing, pruritus, and erythema of the face and trunk having an urticarial appearance, together with sweating and itching.

Gastrointestinal symptoms include nausea, vomiting, abdominal cramps, burning peppery taste sensation and occasionally diarrhea. Symptoms subside within a few hours.

cardiopulmonary manifestations in the form of hypotension, tachycardia, bronchospasm.

Neurological manifestations in the form of faintness, headache were highly significant in the studied groups.

Toxicodynamics(mechanism of action):

Scombrotxin is a mixture of histamine and others histamine-like compounds produced when histidine in fish tissue decomposes (decarboxylated to histamine ) by the effect of enzymes of bacteria on their body surface when they are not refrigerated. The decarboxylation of histidine present in the fish is accelerated at 20-30° C. Histamine is considered toxic when levels are higher than 100 mg per kg.

## INVESTIGATIONS

- The diagnosis is generally clinical.
- can be confirmed by measurement of histamine in spoiled fish.
- Diagnosis supported by plasma histamine level or histamine metabolites (e.g., n-methylhistamine) in patient's urine .

## TREATMENT:

Mild symptoms:

- No treatment or Oral H1 or H2 antihistamines for 1-2 days.

Moderate symptoms (pruritis, diarrhea, oral treatment not possible ...):

Intravenous H1 or H2 antihistamines

- Fluids in the case of dehydration
- Promethazine in the case of nausea

Severe symptoms (vascular involvement, bronchospasm...) and/or underlying condition (lung/heart):

- Intravenous H1 or H2 antihistamines
- Fluids in the case of dehydration Epinephrine/dopamine
- Methylprednisolone
- Public health authorities should be notified to investigate the source and remove the product from distribution.

## 5-Tetrodotoxin (TTX)

1-TTX is a potent neurotoxin, Puffer fish which recently invaded Egypt regional water in the red and Mediterranean seas is common example of fish containing TTX.

2-Its route of toxicity is via the ingestion of contaminated puffer fish ( the eggs, liver and skin .(

3-Neurotoxicity is produced by inhibition of sodium channels and blockade

of neuromuscular transmission .

4-In human, the lethal dose of TTX is around 1 to 2 mg The onset of symptoms usually occurs from 10 to 45 minutes after ingestion

Toxicodynamics of tetrodotoxin poisoning:

The mechanism of action of this toxin is that it inhibits voltage-gated sodium channels, preventing cell membranes from depolarizing. This, in turn, inhibits action potential propagation and prevents neurons and myocytes from functioning.

Clinical pic.

abdominal pain

Headache

ataxia

weakness

dysphagia

respiratory muscle paralysis

nausea

lack of coordination

Vomiting

Initial symptoms include tingling (paresthesias) of the tongue and lips, followed

by or concurrent with headache and vomiting, which may progress to muscle weakness, ataxia and paralysis especially in lower limbs .

Severe numbness, disequilibrium, vertigo and sensory deficits

In severe cases death may occur due to respiratory and/or heart failure .

the onset of symptoms was observed within 30 min of ingestion of puffer fish in 66% of the total number of cases .

Investigation:

history is key for diagnosis.

TTX also may be detected by fluorescent spectrometry .

.Measure routine serum electrolytes, calcium, magnesium, and ABGS

### Complications

Sever hypotension

cardiac arrhythmias

muscle paralysis

cranial nerve dysfunction may develop .

Death results from respiratory failure and cardiovascular collapse

### Treatment

careful attention to the airway (the mainstay), breathing, and circulation (ABCs(

Patients may require endotracheal intubation for oxygenation and airway protection due to muscle weakness and respiratory failure

Cardiac dysfunction may require IV intervention with fluids and antiarrhythmics.

There is no antidote available for TTX poisoning.

Activated charcoal and/or gastric lavage can be done if the patient presents within 60 minutes of ingestion

Hemodialysis may be useful, especially in patients with renal disease .

A monoclonal antibody against tetrodotoxin (anti-tetrodotoxin) is available .

1-Naloxone has a high affinity for opioid receptors in the central nervous system and is used for treating depression of the central nervous system and respiratory system .

2-Currently, the only treatment for TTX poisoning is to support respiration until the TTX is excreted completely .

3-Endotracheal intubation can be provided to facilitate ventilation of the lungs.

4-Mechanical ventilation may also be provided

## **6-Ciguatera poisoning**

A healthy 38-year-old woman experienced generalized pruritus and reported symptoms of temperature inversion in which her hands felt burning hot when touching cold water or cold objects for past three

days. . Her husband had familiar symptoms. The symptoms started after 5 hours from eating a large red snapper. On examination She was alert, Blood pressure: 84/45mmHg, Pulse: 60 beats/min, Temp: 37.2°C, Respiratory rate: 18 breath /min, ECG: was sinus bradycardia

1. What is the provisional diagnosis of this case? ( Justify your answer).
2. What is Toxicodynamic of this case ?
3. Management of this case?

Diagnosis: ciguatera poisoning.

- Snapper is source to ciguatera, and ciguatera is The most commonly reported fish-borne illness worldwide
- Clinical picture of acute toxicity
- ❖ Initial GIT manifestations: nausea, vomiting, abdominal pain and watery diarrhea. This is followed by:
- ❖ Neuro : Reversal of hot and cold tactile perception :may last for months, Headache May have numbness, paresthesias (non-dermatomal), vertigo, tremor, blurred vision, ataxia, coma
- ❖ Pruritis : may persist for weeks
- ❖ Cvs:hypotension and bradycardia.
  - Toxicodynamic:



- Caused by 5 toxins produced by dinoflagellate *Gambierdiscus toxicus*
- Concentrated up the food chain ; larger and older fish are more toxic
- Ciguatoxin(s) is heat stable, resistant to gastric acid and freezing ; not harmful to fish itself
- The mechanism of intoxication is uncertain but may involve increased sodium permeability in sodium channels and stimulation of central or ganglionic cholinergic receptor.

- Management:

- A) Investigations

- Visual contrast sensitivity
- ECG.
- Serum electrolyte
- CBC
- Cardiac enzymes
- Liver enzymes

- B) Treatment:

- A. Emergency measures (ABCDEFG)

- B. Decontamination:

Gastric lavage / activated charcoal if caught early

- C. Symptomatic measures

- Bradycardia :atropin
- GIT :prochlorperazine (10 mg) or hydroxyzine (50 mg) IM.

- Hypotension :IV LR / NS + IV CaCl<sub>2</sub>
- H/A;. Acetaminophen
- Indocin for other pains
- paresthesias :amitriptyline (25 mg po bid).
- Neuro: Mannitol (1 gm/kg) IV.
- Purpitis :cold shower , Antihistamines
- Avoid any fish ingestion for 6 months

#### D. Avoid :

- Barracuda ingestion
- Larger (> 5 lbs) fish ingestion
- Viscera ingestion (higher toxin content)

### 7-hydrogen sulphide toxicity

#### \*Description:

Hydrogen sulfide is a colorless, flammable, highly toxic gas. It is shipped as a liquefied, compressed gas. It has a characteristic rotten-egg odor that is detectable at concentrations as low as 0.5 ppb.

#### \*sources

- It is product of bacterial decomposition of proteins (decay of organic matter) and from mixture involving sulphur acids. It is also produced by industrial activities such as pulp paper mills, petroleum distillation, leather industry, and oil and gas production.
- Natural sources of H<sub>2</sub>S are volcanoes, caves, sulfur springs, and under- ground deposits of natural gas.

## \*Pharmacology and Toxicokinetics

- Hydrogen sulfide is a colorless gas, more dense than air, with an irritating odor of “rotten eggs.” It is highly lipid soluble, a property that allows easy penetration of biologic membranes.
- Systemic absorption usually occurs through inhalation, and it is rapidly distributed to tissues.
- The tissues most sensitive to H<sub>2</sub>S are those with high oxygen demand.

## \*Toxicodynamics

- The systemic toxicity of H<sub>2</sub>S results from its potent inhibition of cytochrome oxidase, thereby interrupting oxidative phosphorylation. Hydrogen sulfide binds to the ferric (Fe<sup>3+</sup>) moiety of cytochrome a<sub>3</sub> oxidase complex with a higher affinity than does CN. The resulting inhibition of oxidative phosphorylation produces cellular hypoxia and anaerobic metabolism.
- Besides producing cellular hypoxia, H<sub>2</sub>S alters brain neurotransmitter release and neuronal transmission through potassium channel–mediated hyperpolarization of neurons, NMDA receptor potentiation, and has other neuronal inhibitory mechanisms.
- The olfactory nerve is a specific target of great interest. Not only does the toxic gas cause olfactory nerve paralysis, but it also provides a portal of entry into the CNS because of its direct contact with the brain. It is also cytotoxic through formation of reactive sulfur and

oxygen species. It also reacts with iron to fuel the Fenton reaction , causing free radical injury.

- In addition to systemic effects, H<sub>2</sub>S reacts with the moisture on the surface of mucous membranes to produce intense irritation and corrosive injury. The eyes and nasal and respiratory mucous membranes are the tissues most susceptible to direct injury. Despite skin irritation, it has little dermal absorption.

\*Clinical picture

A- Acute toxicity

- The primary target organs are central nervous system and respiratory system.

I- Central nervous system

- Headache, dizziness, convulsions, and coma.

II- Cardiovascular

- Hypotension, tachycardia, arrhythmias then bradycardia and arrest.

III- Gastrointestinal

- Nausea and vomiting.

IV- Respiratory

- Dyspnea, respiratory depression, cyanosis and may be pulmonary edema.

V- Dermal

- Erythema and cyanosis.

#### Delayed neuropsychiatric sequelae

- Involves memory failure, disorientation, delirium, dementia, transient hearing impairment, visual loss, and anosmia.
- Motor symptoms resulting in ataxia, tremors and muscle rigidity due to basal ganglia damage.

#### B- Chronic exposure to hydrogen sulphide

- Reduced pulmonary function.
- Neuropsychiatric abnormalities.
- Chronic eye irritation.

#### \*Management

##### (A) Diagnosis

H<sub>2</sub>S toxicity should be suspected in any person found unconscious in an enclosed space especially if the odor of rotten eggs is noted.

#### Investigation

##### 1. ABG:

- Metabolic acidosis and elevated lactate due to blockade of aerobic metabolism
- Oxygen saturation is not altered except when acute lung injury occurs
- Elevated venous oxygen saturation

## 2. Sulphide determination in the blood

- Can confirm exposure.
- Not readily available.
- Whole blood sulphide greater than 0.05 mg /l is considered abnormal.

## 3. Imaging Studies

- Chest radiography
- Chest radiographic findings initially may be normal, but up to 20% of patients present with evidence of acute lung injury.
- ARDS is viewed as a complication in H<sub>2</sub> S poisoning.
- CT scan or MRI of the head: Often only delayed findings, such as basal ganglia lesions, are found.

## (B) Treatment

1. First aid is to move victim to fresh air and focus attention to airway patency, ventilator support, administer high flow oxygen as soon as possible.

## 2. Cyanide antidote: nitrites Mechanism of action of antidote:

- Nitrite-induced methemoglobin binds to sulfide ions removing them from cytochrome oxidase.
- Dosing: same as cyanide.

## 3. Specific treatment for complications :

- Acidosis: adequate ventilation and sodium bicarbonate administration.
- Hypotension: I.V. crystalloids and vasopressor.

\*Differential diagnosis

- Carbon monoxide toxicity
- Cyanide toxicity
- Hydrocarbon toxicity
- Lactic acidosis
- Methemoglobinemia
- Smoke inhalation injury

## 8-Spider Toxins

### 1. The brown recluse spider

The brown recluse spider is recognized by the violin-shaped marking on its back. This spider takes a rest during the day and is not aggressive but it will attack in the case of provocation.

Patients are usually bitten by wearing clothes and shoes with spiders in them. Loxoscelism syndrome is the symptom caused by the bite of the brown recluse spider. This spider's bite is usually painless but it later becomes an inflammatory, hemorrhagic and painful lesion. Necrosis spreads a few days following the bite and loxoscelism syndrome results in dermatitis necrosis in the site of biting, around which becomes red, white, and blue, respectively.

- The venom of this spider contains hyaluronidase and sphingomyelinase D enzymes and results in necrosis. Moreover, neutrophil activity and platelet aggregation, and thrombosis exacerbate necrosis.
- Local manifestations of the bite of this spider include edema, inflammation, hemorrhage, damage to the vessel wall, thrombosis, and necrosis but systematic symptoms including acute renal failure, rhabdomyolysis, and intravascular hemolysis have also been reported. In some cases, severe coagulopathy can result in a stroke. Considering extensive differential diagnosis for skin necrosis, the standard criteria for the diagnosis of loxoscelism syndrome is capturing the spider during biting or capturing it in the place where biting occurred and its confirmation by a reliable arachnologist.
- Treatment: Dapsone, antihistamines, colchicine, corticosteroids, and hyperbaric oxygen have been used for treatment. Treatment with dapsone can alleviate bite marks and symptoms. Antivenom reduces the size of the necrotic area. The faster the antivenom is administered, the fewer the manifestations. It has been proven useful during the first 4 hours after the bite but according to an investigation, it was useful even after 12 hours. The bite-induced necrosis spreads in a few days and completes in a few weeks. Treatments include initial debridement and in later stages, after improvement of the inflammation, a graft is used in case of severity.



## 2. Black widow spider

Black widow spiders have a black hairless body. Males are smaller than females. Its major characteristic is a red marking on its abdomen similar to an hourglass. It is not aggressive under normal circumstances but attacks if disturbed, especially while protecting its egg sacs. Moreover, it is the most important venomous spider in North America and Australia.

- The venom is alpha-latrotoxin (neurotoxic venom) which results in the exocytosis of synaptic vesicles from parasympathetic terminals due to the stimulation of calcium-dependent mechanisms, releasing catecholamines and acetylcholine
- The symptoms induced by the bite of this spider are called latrodectism. The pain from its bite is similar to that of a pinprick. A lesion similar to the target lesion can be observed in the site of biting.

Latrodectism starts in a few minutes with the development of pain through the whole body and symptoms such as emesis, respiratory failure, delirium, partial paralysis of limbs, abdominal muscle cramps, hypertension, pyrexia, fasciculation, and muscle spasm are developed within a few hours.

Symptoms may be mistaken with acute abdomen.

Mortality following biting is less than 1 % and the risk of death following biting is high in two age spectrums. Bites usually occur during warm months. The chelicerae of this spider rarely leave a mark. Following the bite, erythema, diaphoresis, and

piloerection are observed around the site of bite in 25 % of the cases.

- Diagnosis is based on the patient's history. While it can be difficult in children, hypertension, distress, diaphoresis, and irritability can suggest the diagnosis in these cases.
- The Treatment of these patients consists of using muscle relaxants, narcotics, analgesics, intravenous calcium, and antivenom. Narcotics and benzodiazepines relieve muscle spasms. Antivenom treatment is recommended for children, pregnant women the elderly, and also patients with severe local symptoms, severe pains necessitating repeated administration of narcotics, and systematic symptoms. In the case of IV administration, the antivenom should be diluted and injected slowly. However, some centers have recommended IM administration to reduce its complications. In the case of IM administration, the effect is delayed and symptoms take longer to improve (within 1-5 days). Some may suffer from chronic pains even after proper antivenom treatment.

## 9-Mercury poisoning

### Mercury forms

Mercury is an element and a metal that is found in air, water, and soil. It exists in three forms ( elemental, inorganic, and organic ).

### Mercury sources

Elemental mercury vapor: dental amalgam, mercury of medical instruments glass thermometer and as sphygmomanometers. It causes

toxicity after inhalation and has no toxic effects when swallowed as it is poorly absorbed.

Inorganic salts of mercury: used as laxatives, teething powder, mercuric fulminate which is an explosive, mercuric Cl used as disinfectant.

Organic Mercury compounds: which have incorporated and concentrated in the aquatic food as eating contaminated fish due to discharge of contaminated waste

### Pathophysiology

- Mercury has a high affinity for SH groups, which attributes to its effect on enzyme dysfunction. Choline acetyl transferase is one of the inhibited enzymes, which is involved in acetyl choline production. This inhibition may lead to acetyl choline deficiency, contributing to the signs and symptoms of motor dysfunction.
- Glomerulonephritis is attributed to an immune mechanism.
- Elemental mercury is pulmonary irritant and toxic to the CNS.
- Inorganic mercury salts are corrosive to the skin and the GIT. Deposition of mercuric ions in the renal tubules causes acute tubular necrosis.
- Organic mercury is especially toxic to the CNS and has teratogenic effects.

### Clinical picture of Acute mercury toxicity

- Acute inhalation of mercury vapors

- GIT manifestations: irritation leading to nausea, vomiting, diarrhea, severe abdominal cramps, hematemesis, dehydration and collapse, burning sensation with metallic taste, dysentery (mercury is re-excreted in the caecum), also due to its reexcretion in the saliva leads to mouth ulcers, stomatitis, increased salivation and gingivitis (gingivostomatitis).

#### Chest manifestations:

- Severe chemical pneumonitis, cough and dyspnea.
- Acute respiratory distress syndrome.
- Pulmonary fibrosis.
- Metal fume fever: pyrexia, cough, malaise, flu-like symptoms .

#### Renal manifestations :

- Kidney is final target organ where mercury accumulates as body tries to clear toxin.
- Leads to Acute toxic renal tubular necrosis with hematuria and casts.

#### CNS :

- Mad hatter syndrome, is a neurological disorder which affects the whole central nervous system, derived from mercury poisoning.

- including mood alteration (emotional lability), shyness, anxiety, sleep disturbances, memory impairment, parasthesia, ataxia, muscle rigidity, visual and hearing impairment.
- Shock and death may occur. Within 24 hours due to dehydration. Later, in 1-2 weeks due to uremia.

## Investigation of mercury

### 1. Blood mercury concentrations

- rapidly increase immediately after or during brief exposure. in cases of those who have been chronically exposed to mercury, blood mercury concentration levels maintained a high level even when the exposure has ceased, due to the heavy burden of mercury on the body

### 2. Urine mercury concentration

- is used to assess chronic exposure to inorganic and elemental mercury.
- Organic mercury exposure (i.e. through seafood ingestion) usually only has a minimal effect on urine mercury levels.
- Elevated mercury in urine usually indicates exposure to an elemental or inorganic source of mercury, such as from a job that uses mercury.
- Everyone has a small amount of mercury in his/her body. Some people may have higher than usual levels from eating fish and

seafood, working with mercury-containing materials, or from other exposure sources.

### 3. Hair mercury concentration

- with exposure to mercury, the mercury concentration can become high in hair, and hair can show the level of mercury exposure that has occurred over a long period of time.

### 4. general laboratory tests to evaluate mercury intoxication include:

CBC / electrolyte assays

renal and hepatic function tests. / ECG

pulmonary function test / cardiovascular monitoring

electroneuromyography, and neuropsychological tests are also used for the evaluation, Regarding the lab tests to evaluate the influence of mercury exposure to health.

### Treatment

1. Emergency measures (ABCD)

2. Elimination by Induction of emesis or gastric lavage if ingested

3. Antidote (chelators) Immediate chelation therapy is the standard of care for a patient showing symptoms of severe mercury poisoning or the laboratory evidence of a large total mercury load (blood/urine mercury persistently > 100 - 150 mg/l).

- Chelators of mercury include: Dimercaprol "BAL", D-penicillamine, Dimercapto succinic acid "DMSA" or 2, 3-Dimercapto-1-propanesulphonate "DMPS"
- DMPS is the chelation therapy of choice for mercury for both acute and chronic mercury poisoning and for all forms of Hg (inorganic, metallic and organic).

4. Symptomatic treatment IV fluids for dehydration, mouth hygiene, hemodialysis in renal failure.

### 10-Ethylene glycol Poisoning

Case:

A 78-year-old male, AC mechanic with a history of hypertension, alcoholism was brought to ER by his wife for altered sensorium and gait disturbance.

GCS was 8.

Rapid breathing.

Investigations:

His blood investigations showed acute kidney injury with creatinine level of 1.84 mg/dl, up from a baseline of 1 mg/dl.

ABG: high anion gap, metabolic acidosis with pH of 7.090, PaCO<sub>2</sub> of 10 mmHg, serum bicarbonate of 8 mMol /L, and anion gap of 29mMol/L

Lactates.

ABG: A point-of-care arterial blood gas revealed a lactic acid of 27 mMol/L.

Despite 2L of NS IV fluid boluses and sodium bicarbonate administration, the acidosis and lactate levels didn't improve in ER.

Lactic acid was 2mMol/L on a venous sample sent to laboratory;

Further investigations revealed an osmolar gap of 53 mOsm/kg, at this time repeat lactic acid levels were sent from both venous blood and arterial blood gas and demonstrated the same significant discrepancy (1.8 versus 20 mMol/L, resp(.

Urine sediment now revealed the typical envelope –shaped calcium oxalate crystals.

Corrected serum calcium dropped from 9.7 to 7.9 mg/dl.

ethylene glycol toxicology; undetectable methanol level, and serum ethylene glycol level of 54mg/dl.

What is the most probable diagnosis?

Ethylene glycol

What is pathophysiology of Ethylene glycol toxicity?

- Once absorbed ethylene glycol is rapidly distributed to total-body water.
- Ethylene glycol is partially eliminated unchanged through the kidney and expired air



- Addition of thiamine and pyridoxine enhance formation of nontoxic metabolites.
- Glycolic, glyoxalic and oxalic acid metabolites are the cause of metabolic acidosis
- Oxalic acid metabolite binds with calcium:
  - 1 -Forming Calcium oxalate crystals which precipitate in the renal tubules, leading to acute renal failure which may be caused also by direct toxic effect of ethylene glycol.
  - 2- Causing hypocalcaemia and QTC prolongation with dysrhythmias and cranial nerve abnormalities.

What is the clinical picture of ethylene glycol toxicity?

- Tingling and numbness
- Twitches
- Convulsions
- Tetany
- Arrhythmia
- Acute renal failure
- Other features are similar to ethyl alcohol toxicity

What are the investigations used in ethylene glycol abuse?

- ✚ Routine investigations: CBC, ABG, electrolytes (Ca, K)
- ✚ ECG changes.
- ✚ Urine analysis: calcium oxalate.
- ✚ Renal profile: urea, creatinine

How to manage this patient?

1 -Emergency Measures: ABCDEFG

2 -Antidotes:

- Ca gluconate IV slowly
- Ethanol and 4 Methyl pyrazol (fomepizole) are used to prevent glycolate accumulation.
- Thiamine and Pyridoxine enhance metabolism to less toxic products

3 -Symptomatic treatment:

- Correct acidosis.
- IV fluids: prevent calcium oxalate precipitation in the kidney.
- Dialysis in case of renal failure

## 11-CARBAMAZEPINE TOXICTY

Carbamazepine "Tegretol\*" is structurally related to TCA

1. Indications: Only oral preparations are available. It is used for:

- a. Treatment of trigeminal neuralgia
- b. Partial or tonic-clonic epilepsy
- c. Patients with manic-depressive illness
- d. Post-herpetic neuralgia
- e. Phantom limb pain
- f. Drug withdrawal reactions

2. Dosage form:

.Tegretol®

Chewtabs 100 mg

Chewtabs 200 mg

- Suspension (liquid)®.
- Tegretol-CR®

CR 200 mg:(controlled-release)

CR 400 mg

### 3. Mechanisms of action

Blockade of neuronal sodium channels

Elevation of brain 5-1 IT

Potentiates GABA receptors

Anticholinergic effect

### 4. toxicokinetics

- Absorption

Slow but almost complete .More rapid on a full stomach .Peak plasma concentration according to dosage form: after 4 to 12 hours in tablets may be delayed up to hours after overdose. Only after 2 hours in Syrup and 24 hours in

CR table products.

- Distribution

Binding to plasma proteins:

Carbamazepine: 76% (moderate)

Carbamazepine epoxide: 50%

Rapidly and uniformly distributed . Have enterohepatic circulation. Can cross blood brain barrier rapidly also Crosses placenta, breast milk concentration is 60mg.

- Metabolism

Mainly in the liver . Metabolic pathway is oxidation by microsomal enzymes. Also inactivated by conjugation with glucuronic acid and hydroxylation. Induce

its own metabolism "autoinduction".

- Elimination

73% in urin (1-3% unchanged). 28% in stool.

#### 5. Acute Toxicity:

Its clinical course is unpredictable. It comprises:

Nystagmus, ataxia and dysarthria followed by lethargy, coma, and respiratory arrest.

Fluctuations in level of consciousness

Seizures in non-epileptic patients and seizure deterioration

Tachycardia, hypotension, cardiac conduction defects

Anticholinergic manifestations

In children: higher incidence of dystonic reactions, choreoathetosis seizures with lower incidence of ECG changes.

#### 6- Chronic toxicity

Irritability, impaired concentration, and cognitive and memory impairment, Drowsiness, headache, diplopia, and ataxia,

Hypersensitivity, which includes:

Hypersensitivity reactions ranging from mild skin rash up to cutaneous vasculitis. Aplastic anemia that could be serious and fatal

Mild transient leucopenia

Mild elevation of the liver enzymes, but fatal hepatic toxicity may occur.

#### 7- Differential diagnosis:

TCA and other drugs with anticholinergic action

8- Investigations..

Serum level monitoring (therapeutic serum level is 4-12 mg/L).

ECG

CBC, electrolytes, and glucose

9- treatment

Acute toxicity\*

#### DECONTAMINATION & ELIMINATION

Induction of emesis or GL

MDAC, due to:

Slow absorption caused by the anticholinergic effect of the drug.

Enterohepatic circulation

Formation of concretions

Hemoperfusion

Supportive treatment

Cardiac monitoring and management of dysrhythmia

Chronic toxicity\*

1- stop the drug

2- monitor serum level.

3- supportive measures.

### 3-Recommendation:

#### 1-lithium toxicity

1. Lithium intoxication can be avoided by conservative dosing.
2. care in combining drug therapies.
3. regular clinical observation.
4. monitoring drug plasma concentrations.
5. educating patients and caregivers to recognize early signs of intoxication.

#### 2- cyanide poisoning

1. The contents of an industrial workplace cyanide emergency kit should be determined by a qualified occupational health assessor.
2. Prehospital emergency medical services and hospitals assess their likelihood of having to treat a victim of cyanide poisoning, and the possible availability of the recommended cyanide antidotes from external sources, when deciding on the selection and quantity of cyanide antidote they should stock.
3. Home should be fitted with smoke alarms
4. A workplace should educate the worker on cyanide toxicity and prevention
5. people who work with cyanide-related chemicals must wear appropriate garments and protective inhalational devices. So strict work safety regulations must be followed to prevent occupational exposure.

6. Childproofing a home is essential for all households with young children, particularly if a parent or caregiver works in an industry that uses cyanide.
7. All patients exposed to cyanide should follow up with their healthcare provider to ensure they have not developed any residual neuropsychiatric sequelae.
8. Patients treated with hydroxocobalamin should avoid sun exposure to prevent photosensitivity.

### **3- phenytoin toxicity**

1. All patients suspected of possible phenytoin overdose should be evaluated with a broad differential in mind.
2. Fingertick glucose should be obtained on all patient as well as a pregnancy test on all female patient of child-bearing age.
3. An ECG is recommended on all suspected phenytoin overdose patients, especially patients that have received parenteral phenytoin.
4. Laboratory work should be obtained including a complete blood count (CBC), basic metabolic panel (BMP), liver function test (LFT), total serum phenytoin concentration, and serum albumin.
5. Urine toxicology, as well as acetaminophen, salicylic acid, and alcohol levels, should also be obtained to complete the toxicologic workup.
6. Patients taking phenytoin should be advised of the importance of adhering strictly to the prescribed dosage regimen, and of informing

the physician of any clinical condition in which it is not possible to take the drug orally as prescribed, e.g., surgery, etc.

7. Patients should be instructed to call their physician if skin rash develops.

#### **4- scombriod poisoning**

1. Refrigerate fish (at 41 o F or less) from the time of capture to the time it is cooked.
2. Fish with a bad odor or “honey-combed” appearance should not be consumed.
3. Purchase fish only from reputable retail outlets.

#### **5- Tetrodotoxin Poisoning**

1. Fugo is a delicacy food, so always make sure that the restaurant you go is certified
2. Swim away from the deep water as the puffer fish tend to be there
3. Don't get too close if you see a puffer fish, as they attack really fast

#### **6- ciguatera poisoning**

1. Seek advice from the local fishermen. They have, most of the time, a very good knowledge of the fishing areas and species to avoid.
2. Consult our ciguatoxic risk map,
3. Avoid eating the head and Viscera.

#### **WHAT TO DO IN CASE OF POISONING?**

1. Consult a physician or a medical professional, as soon as the first symptoms occur.



2. Avoid consuming any marine products, animal proteins, alcohol, coffee, energy drinks and nuts (walnuts, peanuts ...), for several weeks, as consumption of certain type of food can trigger or worsen CP related symptoms.
3. In addition to the treatment prescribed by your physician, it is suggested to take a vitamin C, B1, B6 and B12 therapy until the symptoms resolve
4. Avoid breastfeeding for a month.
5. Some situations such as, intense physical activity, passing under a stream of cold air, sun exposure, may also trigger CP related symptoms (itching, tingling...). Therefore, these situations must be avoided as much as possible.

## **7- hydrogen sulphide toxicity**

1. There are several ways you can protect against exposure to hydrogen sulfide. One is by using engineering controls such as ventilation systems that remove gas from work spaces. Since hydrogen sulfide is highly flammable, the ventilation system must be explosive-proof.
2. Another safety measure is to employ administrative controls. Administrative controls can come in the form of company rules for entering, exiting and working in spaces where hydrogen sulfide gas is present. Safety training and gas level testing are also effective administration controls.
3. using personal protective equipment (PPE). PPE for hydrogen sulfide includes full-face air purifying respirators (APR) for gas amounts up to 100 ppm, and self-contained breathing

apparatuses (SCBA) or supplied air lines for gas amounts reaching 100 ppm or higher. If direct skin contact with hydrogen sulfide is possible, workers must wear protective gloves and clothing made from material that cannot be permeated or degraded by the substance

## **8- spider venom**

1. The human being has always been frightened of spiders but few of them are venomous and thus real threat to human health. However, since venomous spiders are sometimes fatal, bites should be taken care of. Moreover, it is recommended to be adequately familiar with necessary treatments.
2. With regard to the identification of venomous spiders in our country including widow spider, which exists in the majority of provinces, healthcare personnel must be familiar with the symptoms of the bites of venomous spiders and it is essential to prepare antivenoms in the country for the treatment of spider bites.
3. Finally, further domestic investigations are necessary on the distribution of venomous spiders and suspected cases of spider bite should be reported to related centers to reduce the damages caused by biting.

## **9- Mercury poisoning**

1. Promote the use of clean energy sources that do not burn coal . Coal contains mercury and other hazardous air pollutants that are emitted when the coal is burned in coal-fired power plants, industrial boilers and household stoves.

2. Eliminate mercury mining, and use of mercury in gold extraction and other industrial processes
3. Recycling of the mercury for other essential uses, with no further need for mercury mining.
4. Non-mercury gold-extraction techniques need to be promoted and implemented
5. where mercury is still used safer work practices need to be employed to prevent exposure.
6. 6.Phase out use of non-essential mercury-containing products and implement safe handling, use and disposal of remaining mercury-containing products

#### **10- Ethylene glycol poisoning**

1. It is important to keep all antifreeze products and related substances in their labeled containers and stored out of reach of children.
2. All patients with ethylene glycol toxicity should be managed in consultation with a medical toxicologist or the local poison center.
3. If hemodialysis is determined to be indicated by toxicologist, then nephrology consultation is indicated .
4. If ethanol is utilized as an antidote, critical care management is recommended.

#### **11- CARBAMAZEPINE TOXICTY**

1. Test the serum level of carbamazepine regularly.
2. In the case of toxicity, patient must be observed closely and give a neurological exam due to deterioration of symptoms.

3. Anesthesia and intubation kit must be bedside ready for any worthiness of symptoms.
4. EKG must be done and serial carbamazepine should be obtained every four hours.

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## 5- Tetrodotoxin Poisoning

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