

Poisons are the substances administered either by mouth, injection, inhalation or through skin/mucous membrane. They produce harmful, dangerous or fatal symptoms in animals and human beings.

Poisoning could be accidental, occupational, suicidal or criminal. Generally, self-medication is an important cause of drug poisoning and is particularly seen with OTC drugs. Acute poisoning is generally observed with over-use of drugs or insecticides and hence emergency treatment of acute poisoning is symptomatic.

CLASSIFICATION OF POISONS

Poisons are classified into three main categories:

1. Corrosives:

Strong acids (H_2SO_4 , HNO_3 , HCl)

Strong alkalies (caustic soda, caustic potash)

2. Irritants:

a. Inorganic:

Non metallic (P, Cl, Br, I)

Metallic - heavy metal (As, Sb, Pb, etc).

b. Organic:

Herbal - castor seeds, croton oil etc.

Animal - snake venoms, cantharides.

c. **Mechanical:** Diamond dust, glass powder.

3. **Neurotics:**

a) Cerebral

(i) Sleep causing (Narcotics) opium and its derivatives.

(ii) Intoxicants - Alcohol.

(iii) Anaesthetics - Ether, CHCl_3 .

(iv) Deliriant - Datura, belladonna.

b) Acting on spinal cord - Nux vomica.

c) Acting on cardiac system - Digitals, aconite, tobacco.

d) Poisons acting peripherally - CO_2 , CO, coal gas.

General Treatment of Poisoning (Clinical - Manifestation)

1. Immediate removal from the environment:

When poisoning appears to have occurred due to gases like carbon monoxide or from surface absorption, the patient must be immediately removed for fresh air.

Poisons introduced due to snake bite needs tourniquating which prevents the poison from reaching vital organs like heart, kidneys, brain and liver through circulating blood. Make an incision (cut) and the tissue bleeds. Neutralise the poisons by a suitable method. Poisons into body cavities should be thoroughly washed with plenty of water or should be neutralised by a specific chemical agent.

2. Emesis:

Emesis plays very important role in poisoning with oral ingestion of some material.

Note: Vomiting should never be attempted in the following cases.

- (i) Ingestion of corrosives (acids and gases), perforations may occur.
- (ii) Kerosene oil – aspiration pneumonia may occur.
- (iii) Convulsant drug – vomiting may induce convulsions.

Vomiting can be induced by following methods.

- (1) Mechanically.
- (2) Ipecac syrup or powder.
- (3) Mustard Powder.
- (4) 3 teaspoonfuls of salt in water.
- (5) Apomorphine (6mg) causes prompt vomiting usually within 3-5 minutes. The only disadvantage is that it should be administered parentally and should never be used if the poison itself is a CNS depressant.

3. Gastric Lavage:

It is necessary if the poison is ingested. The poison is washed out by inserting catheter into alimentary canal upto stomach.

Washings are usually done with:

- i. NaHCO_3 , 2gm in 300ml water.
- ii. 30gm (Mag. Or Sod. Sulphate in $\frac{1}{4}$ litre water)
- iii. 100ml liquid paraffin + 150ml water.
- iv. 8gm of activated charcoal in water.
- v. Use of emetics, e.g. common salt, ipecac powder, mustard powder.

It should never be attempted in drowsy or in coma patients because of risk of inhalation of stomach contents.

4. Common Antidotes :

Drug	Antidote	Mechanism
1. Acids (Corrosive)	Antacid or weak alkali (Milk of magnesia) Avoid inducing emesis or gastric lavage.	Chemical antagonism.
2. Alkalies (caustic)	Weak acid (Lemon juice or diluted vinegar)	Chemical antagonism.
3. Acetaminophen	Acetyl cysteine	Restores depleted glutathione stores, protects against renal and hepatic failure.
4. Alkaloids (Nicotine, quinine, strychnine)	Potassium permanganate (1:10,000)	Chemical antagonism.
5. Aspirin	Activated charcoal	Adsorption

6. Hydrocarbons Gasoline, Kerosene, Paint, Thinner	Mineral oil cathartics followed by lavage with sodium bicarbonate 1 to 2%	Adsorption, Mechanical antagonism, chemical antagonism
7. Iron salts	Desferrioxamine (Deferoxamine), sodium bicarbonate 1% lavage	Chelation of ferrous ions
8. Arsenic, copper lead, mercury	Penicillamine, Dimercaprol	Chelation
9. Methanol	sodium bicarbonate 3% lavage	Chemical antagonism
10. Narcotics (opoid)	Naloxone	Competitive inhibitor at opoid receptor sites
11. Lead	Sodium-calcium edetate (Ca EDTA)	Chelation of lead ions.
12. Phenol	Vegetable oil (olive or castor) and lavage later on.	Mechanical antidote
13. Unknown	Activated charcoal	Adsorption.

5. Acceleration of elimination of poisons:

- (i) Purgation.
- (ii) Diuresis.
- (iii) Dialysis.
- (iv) Peritoneal dialysis.
- (v) Haemodialysis.

Intravenous fluids are administered to excrete poisons. It should be kept in mind not to overhydrate the patient as it may lead to circulatory impairment or even pulmonary oedema. Forced diuresis is done in amphetamine poisoning. Peritoneal dialysis involves instilling dialysis fluid into peritoneal cavity. Poison in the blood enters the dialysis fluid which is then drained and replaced.

In Haemodialysis, a semipermeable membrane separates blood from dialysis fluid and poison passes passively from the blood, where it is present in high concentration into the fluid. It is useful for many poisons like barbiturates, bromides, boric acid, salicylates, digitalis, and methyl alcohol.

6. CLINICAL MANIFESTATION OF GENERAL SYMPTOMS

1. For increase in body temperature sponge with water.
2. Morphine sulphate or pethidine relieves pain. Abdominal pains can be relieved by atropine.
3. Convulsions and restlessness can be controlled with barbiturates.
4. To overcome dehydration blood transfusion is advised.

5. In anaphylaxis, antihistamine and corticosteroids with adrenaline are used.
6. For asphyxia, i.e., suffocation, cessation of breathing, artificial respiration and oxygen through nasal catheter is useful.

ANTIDOTES

Remedies which counteract the effect of poison are called antidotes. They can be classified as:

1. Mechanical antidotes.
2. Chemical antidotes.
3. Systemic antidotes.
4. Universal antidotes.

1. Mechanical antidotes

These substances interfere with the absorption of poison. They act by forming a coat over mucous membrane of the stomach, e.g., fats, oils, egg albumin, activated charcoal (4-8gm) is specifically used in adsorbing alkaloidal poisons.

2. Chemical antidotes:

They react with poison to form harmless or insoluble compounds, e.g.,

- i. Acids are neutralised by alkalies and vice-versa.
- ii. KMnO_4 used in opium poisoning.
- iii. MgO or calcium oxide neutralises acids.

3. Systemic antidotes:

They produce the action which are opposite to that of poison e.g., Caffeine for morphine; Atropine for pilocarpine.

Universal antidotes:

It is given in all such cases where the nature of the poison is not known or where more than one poison is suspected to be taken.

Charcoal (powdered)	2 parts
Tannic acid (or strong tea)	1 part
MgO (milk of magnesia)	1 part

Uses

Charcoal: Adsorbent of toxins and alkaloids

Tannic acid: Precipitates alkaloids, glycosides and many metals,

Milk of magnesia: It neutralises acid.

5. Chelating agents

Chelating agents are widely used as specific antidotes for heavy metals. They form stable, soluble, non-toxic complexes with some heavy metals. They promote dissociation of bound metal from tissue enzymes and other functional macromolecules. These metal chelates are water soluble.

Examples:

BAL

EDTA

Desferrioxamine

INSECTICIDE POISONING:

Insecticide are generally discussed as organo-phosphorous compounds, D.D.T. and Endrin

1. ORGANOPHOSPHOROUS COMPOUNDS

1. Hexaethyl tetraphosphate (HETP)
2. Tetraethyl pyrophosphate (TEPP)
3. Octamethyl pyrophosphoramidate (OMPA)

Symptoms

- Headache.
- Diarrhoea.
- Malaise.
- Giddiness.
- Profuse sweating.
- Nausea.
- Vomiting.
- Abdominal cramps.
- Excessive bronchial secretions, bradycardia.

Antidote

Anticholinergic, i.e., atropine to block the cholinergic reactions.

CLINICAL MANIFESTATION:

Treatment consists of:

1. **Decontamination:** The patients must be removed from the source of poison by washing the external surface and by inducing vomiting to remove ingested poison.
2. **Respiration therapy:** Artificial respiration is necessary in some cases. Sometimes suction is applied to cause hyperventilations.

3. **Antidote therapy:** (i) Atropine can antagonise the peripheral action of organophosphoric compounds and is administered in dose of 2mg for every 15-30 minutes. I.M or I.V route is followed, sometimes the dose may higher as per need of the patient. (ii) Another antidote is PAM - Pyridine - 2- aldoxime methiodide is given in dose of 1gm/I.V or by infusion in saline. It is then repeated after half an hour if necessary. This is useful to prevent nicotinic symptoms.

4. **Administration of choline esterase reactivation:** The oxime compounds like paraldoxime chloride and pyridine aldoxy methiodate are given. The dose of 1 to 2 g/I.V is for adults and 25-50 mg/kg for children. It is given as 5% solution in isotonic saline and repeated after every 12 hours of the day.

2. DDT (DICHLORODIPHENYLTRICHLOROETHANE)

Symptoms:

- Excess of saliva.
- Parthesias of tongue, lips, face,
- Vomiting, irritability, tremors.
- Abdominal pain.

As poison is generally absorbed through the skin or by inhalation.

The symptom are irritation of eyes, blurring of vision, cough, pulmonary oedema. Clonic and tonic convulsion, hyper irritability and paralysis of limb muscles are sometimes observed. DDT in the dose of 150-1000 mg/kg body weight is a fatal dose.

CLINICAL MANIFESTATION:

1. Ingested material can be removed by gastric lavage and by using saline cathartics.
2. Adrenaline and its related compounds should never be used.
3. Artificial respiration is required in some cases.
4. Phenobarbitone in the dose of 100mg recommended for tremors along with some antibiotic.
5. Wash the skin with soap and water.
6. In chronic poisoning remove patient from the site.
7. In case of liver/kidney damage a low fat, high carbohydrate and protein diet is recommended.

3. ENDRIN

Symptoms

- Abdominal pain
- Vomitting
- Tremors
- Convulsions
- Occasionally blood stained from mouth and nostrils.

Convulsions become severe if continued for a long time and followed by coma which may terminate in respiratory failure and ultimately death. The fatal dose is 6gm.

CLINICAL MANIFESTATION

1. It is always symptomatic (treatment of general symptoms).

2. Decontamination must be carried out.
3. For convulsion barbiturates can be used.
4. Calcium decreases toxicity of endrin.

HEAVY METALS POISONING

Mechanism:

Heavy metals block the body enzyme system as they form chelates with body enzymes.

1. Arsenic :

Symptoms of acute toxicity are:

Nausea, cramps in legs, dilated pupil, vomiting, diarrhoea, faintness, pale anxious face, malaria, tachycardia, burning pain in stomach, dyspnoea.

Vomiting initially consists of stomach contents but later it becomes greenish or black in colour due to the presence of bile. Diarrhoea is complained and stools contain mucous tinged with blood.

When arsenic dust is inhaled it may cause pulmonary oedema, restlessness, cyanosis.

Fatal dose: 130mg – 300mg.

CLINICAL MANIFESTATION

1. Stomach wash with sodium and magnesium sulphate is recommended.
2. Morphine and atropine is given to relieve colic pain.
3. EDTA acts as chelating agent.

Symptoms of Chronic toxicity are:

- Redness of skin
- Loss of weight
- Horny growth of cornea
- Inflammation of mucous membrane
- Coughing
- Patchy brown pigmentation of skin
- White strips of fingernails
- Tenderness of muscles.

CLINICAL MANIFESTATION

1. Dimercaprol 3mg/kg is administered intramuscularly at 4 hourly intervals.
2. Fluid replacement and use of pressor agents like dopamine is used to control hypotension.

2. Lead

Symptoms

Acute poisoning

Abdominal pain

Cramps in legs, irritability

Headache

Drowsiness, lethargy

Paralysis of limbs

Tremors of eyes, mouth and fingers

Loss of vision, loss of appetite

Hallucination

Delirium

Slurred speech

Chronic poisoning

- Convulsions
- Anaemia
- Colic pain and constipation
- Bluish black line on the gums
- Coma and even death

Fatal dose : 0.5 gms

CLINICAL MANIFESTATION OF LEAD POISONING:

Acute poisoning

1. Gastric lavage with zinc sulphate followed by large draughts of milk and eggs with sodium and magnesium sulphate.
2. Morphine and atropine are used to relieve colic pain.
3. EDTA is used as chelating agent.

Chronic poisoning

1. Removal of patient from source of further exposure.
2. Chelation therapy with edetate calcium disodium is used.
3. B.A.L (Dimercaprol) – British anti lewisite is used as complexing agent.
4. Penicillamine is also included in the dosage regimen.

CLINICAL MANIFESTATION

1. Further absorption of barbiturates can be controlled by administering activated charcoal.
2. Artificial respiration must be given by a mixture of 95% oxygen + 5% carbon dioxide (CO_2).
3. Haemoperfusion and haemodialysis are the available options for the severe toxicity.
4. Amphetamine sulphate in the dose of 10mg every half-an-hour must be given intravenously till improvement occurs.
5. Alkalisiation of urine to pH8 with sodium bicarbonate helps in the elimination of phenobarbitone.

NARCOTIC DRUG POISONING

Narcotics are the drugs which produce unconsciousness, e.g., paraldehyde, barbiturate, CO_2 in high amount. Narcotics from plant sources are :

Opium, Cannabis, etc.

OPIUM POISONING

Symptoms

If opium is consumed in large doses, respiration becomes shallow constriction of pupil takes place and heart rate decreases. Body temperature drops, cyanosis and ultimately death occurs due to respiratory depression and cardiac arrest.

Fatal dose : Morphine – 200mg

CLINICAL MANIFESTATION

1. Naloxone 0.4mg is given either by I.M/I.V route immediately.
2. Gastric lavage is done to remove any unabsorbed drug.
3. Patients must be kept awake, as in awake condition ventilation and basic metabolic rate is more which is responsible for detoxification of the opium.

2. CANNABIS POISONING

Symptoms

First excitement then necrosis is followed.

Chronic poisoning results in anorexia, loss of weight, weakness, tremors.

Fatal dose : Charas 2000mg/kg body weight.

CLINICAL MANIFESTATION

The stomach must be washed with warm water. Hypodermic injection of strychnine and saline purgatives are very useful.