

DEFINITIONS

❑ TOXICOLOGY

It is a branch of medical science which deals with

- ❑ the nature, character and source of poisons,
- ❑ their fatal dose, fatal period,
- ❑ the signs and symptoms they produce,
- ❑ method of their detection and
- ❑ the treatment in case of poisoning.

❑ Toxics : arrow poison

DEFINITIONS

❑ **FORENSIC TOXICOLOGY :**

It is the branch of Forensic Medicine which deals with the **medical & legal aspect of the harmful** effects of the poisonous substances on human bodies.

❑ **CLINICAL TOXICOLOGY :**

Branch of toxicology which deals with

- ❑ signs and symptoms produced by poisons and
- ❑ their method of treatment.

TOXINOLOGY:

- branch of toxicology which deals with the toxic substances produced by living organism in the human body and their effects.

DEFINITIONS

❑ DRUG

- ❑ Any substance natural or synthetic which produces
- ❑ physiological or psychological changes on the living &
- ❑ used for treatment/diagnosis of disease ,
- ❑ producing beneficial effects with minimum ill effects.

❑ Teratogenicity :

- ❑ Toxic effect, either structural damage or functional deficit that occurs in fetus due to exposure of the mother to an agent, beneficial to her during pregnancy.

DEFINITION OF POISON

- Any substance – solid, liquid or gas –
- which when enters the living body either by ingestion, injection, inhalation or through natural orifices (i.e. Urethra, anus, ear or vagina) or when applied on the body surface
- causes ill-health, disease or death by its local or remote action.
- Poison : (Potio : Drink)

(Any substance in any form, entering into a living body through any route or coming in contact with the body surface, produces disease, ill health or death by its local or remote action.)

□ DEFINITION OF POISON (AS PER STATUTE OF LAW) :

- any substance, Irrespective of its quality or quantity, when
given with an intention to endanger, injure or kill a person, will be called poison.

Acts related to POISON

- ❑ The Narcotic & Psychotropic Substances Act-1984 (NDPS)
- ❑ The Drug & Magic Remedies Act-1954
- ❑ The Drug Control Act-1950
- ❑ The Pharmacy Act- 1948
- ❑ The Drug & Cosmetic Rules-1945
- ❑ The Drug & Cosmetic Act-1940
- ❑ The Drug Act-1940
- ❑ The Poison Act-1919

LAWS OF POISON

- IPC's :176,193,201,202, 270, 278, 284, 299, 300,304A, 306, 307, 309, 324, 326, 328, 329.
- The Cr PC : 39, 40, 175
- The IEA : 32, Clause I
- Deals with poison

LAWS OF POISON : IPCs

IPC	
176	Dr must report all cases of homicidal poisoning to IO, if not Reported : punishable
193	Dr is Punishable for giving False Information
201	Destroying the evidences
202	Dr must divulge information about poisoning case to IO, Dr is Punishable for concealing fact from IO, about A case of poisoning.
284	Penalty for causing harm by rash & negligent act
299	Culpable Homicide by any method (including poisoning)
300	Murder by any Method
304A	Rash & Negligent – Homicide by method including Poisoning
324, 326	Causing Hurt by dangerous weapon
328	Causing Hurt by Poison (10 yr Imprisonment)

Cr PC s :

- **39** : Public Bound To Give Information Regarding any crime occurred
- **40** : officer bound to give information of certain offences
- **175** : If summoned by IO must go & give information
- **IEA 32 CL-1** : Recording dying Declaration
 - if pt is on the verge of death - call magistrate. Or record yourself,
- Certify compose mentis

Acts :

The Narcotic & Psychotropic Substance Act -1985 (NDPS)

The act consolidates & amends the act relating to narcotic drug (The opium act 1878, 1957 : the dangerous drug act 1930) 1989,& 2001.

- ❑ Drug of abuse
- ❑ **Penalties for drug trafficking**
- ❑ Control over psychotropic substances
- ❑ **Narcotic Drugs** : opiates, cannabis, cocaine
- ❑ **Psychotropic Substances** : mind altering drugs : LSD, phencyclidine, amphetamine, barbiturates, methacolon, benzodiazepine, mescaline, psilocybin, Designer drugs : MDPA, DMT

- ❑ **Narcotic drugs** : opiates, cannabis & cocaine
- ❑ **Psychotropic Substances** : mind altering drugs :
LSD, phencyclidine, amphetamine, barbiturates,
methacolon, benzodiazapine,
- ❑ Prohibition on cultivation, manufacture, sale,
purchase, use, transport, of both except for
medicinal/ scientific purpose.
- ❑ **Minimum punishment** -10 yr imprisonment &1
lakh fine.
- ❑ **Maxi** : 20 yr rigorous imprisonment & 2 lakh fine

- ❑ Repeated offence : imposition of even death penalty,
- ❑ To constitute offence first time minimum qty sized should be
- ❑ 250 mg heroin,
- ❑ 5 gm hashish, charas, opium,
- ❑ 125 mg cocain,
- ❑ 500mg ganja.
- ❑ Opium year -1/10 to 30/09.

Acts:

- ❑ **Opium Act-1857** : Empowers the central Govt. to cultivate poppy plant & manufacture opium.
- ❑ **Opium Act-1878** : Prohibited the import, export, transport, possession, and sale of opium,
- ❑ The act was further amended in 1957.
- ❑ **BOMBAY Poison act** : control sale of certain drugs in Bombay
- ❑ **Poisons Act** :

The Drug & Magic Remedies act-1954

OBJECTS

To ban advertisement which offends decency or morality

To prevent self medication and treatment which cause harmful effect.

**Advertisement of magic remedies for

- procuring abortion or prevention of conception,
- increase the sexual potency,
- correction of menstrual disorder and
- treatment of venereal disease is completely prohibited.

The Drug Control Act, 1950

CONTROL : sale, supply and distribution of drug.

: the issue of cash memo for sale.

: the existing list of price and stock.

GIVES POWER to fix the maximum price of drug,
which may be charged by dealer or producer

The Pharmacy Act, 1948

REGULATE :

the profession of pharmacy & to constitute

- Central Council of Pharmacy

- State Council of Pharmacy

OBJECTS : To allow only registered pharmacist to compound, prepare, mix or dispense any medicine on prescription of medical practitioner.

The Drug and Cosmetics Act, 1940

- **REGULATE:** Import, manufacture, distribution and sale of all kind of drugs.
- **CONTROL:** Quality, purity and strength of drugs
- Any patent or proprietary medicine should be displayed on label or container.

Drugs and Cosmetics Act, 1945:

- (amended in 1964)
 1. to regulate importation of drugs.
 2. functioning of Central Drug Laboratory.
 3. appointment of licensing authorities and for manufacture, distribution and sale of drugs.
 4. Drugs are classified into different schedules.

Drugs are classified into different schedules as follows :

1. **Schedule C** — Biological and special products.
2. **Schedule E** - -List of poisons including substances under ayurvedic, siddha and unani system.
3. **Schedule F** — Vaccines and sera.
4. **Schedule G** — Hormone, anti-histamines, anticancer drugs.
5. **Schedule H** - Drugs / poisons to be sold only on prescription of a RMP. i.e.. Barbiturates. Amphetamines, Reserpine, Ergot & some of sulfonamide
6. **Schedule J** - List of the diseases like appendicitis, blindness, Cancer, cataract, epilepsy, Hydrocele etc. for the cure and prevention of which no drug should be advertised
7. **schedule L**- antibiotics, Anti-histaminics and other recent chemotherapeutic agents.

INSPECTION OF DRUG

Procedures to be followed by the Drug inspector while collecting and sending a sample of drug or cosmetic for analysis :

- 1. He is required to pay fair price of the drug.
- 2. He will have to divide the sample in 4 portions and will utilize it as follows :
 - (a) One part is to be restored to the vendor.
 - (b) 2nd part is to be sent to the Government analyst for examination.
 - (c) 3rd part is to be retained for production in the court.
 - (d) 4th part is to be sent to the warrantor – if he supplied it or if has undergone any change since its supply.
- Offences are tried in the Court of Judicial Magistrate.

epidemiology

- ❖ According to WHO **3 million** cases of acute poisoning occurs with **2,20,000 deaths** occurring annually in world.
- ❖ 90% cases occurs in developing country.

History

2700 B.C.- Chinese journals : various plant poisons & fish poisons are described

1900-1200 B.C. : Egyptian documents states directions for collection, preparation, and administration of more than 800 medicinal and poisonous recipes.

800 B.C. India – Ayurveda includes notes on poisons and antidotes.

50-100 A.D. - Greek physicians classified over 600 plant, animal, and mineral poisons.

50- 400 A.D. - Romans used poisons for execution & assassination. Eg. *The philosopher, Socrates, was executed using hemlock for teaching his ideas to youths.*

1200 A.D. - Spanish rabbi Maimonides Wrote first-aid book for poisonings, “Poisons and Their Antidotes”

physician Paracelsus (1493-1541)

credited with

“The father of modern toxicology.”

“All substances are poisons: There is none which is not a poison. The right dose differentiates a poison and a remedy.”

Spanish physician Orfila (1815)

Founder of modern toxicology

established toxicology as a distinct scientific discipline.

Poison Information Center

- ❑ AIIMS, New Delhi.
- ❑ Occupational Health Centre , Ahmadabad
- ❑ AIMS (Amrita Inst of Med Sciences), Trivandrum.

CLASSIFICATION AS PER MEDICOLEGAL USE

Common Intentions/Causes of poisoning

□ **1. Criminal –**

- Homicidal,
- Suicidal,
- Stupefaction,
- Cattle poisoning,
- Abortion.
- Adulteration of food and drink or causing annoyance or injury to a person.

2. Accidental –

- Wrong medication,
- over medication,
consumption of poison as medicine,
- Consumption of contaminated food or drink,
- bite by venomous animals,
- poisoning at commercial industrial or agricultural field.

(1) Ideal Homicidal Poison:

1. It must be cheap, & easily available.
2. Colourless, odour-less, tasteless. SO can be easily administered with food, drinks or medicine without arousal of any suspicion.
3. highly toxic and will be certain in action.
4. Signs and symptoms should appear late giving the culprit the scope to escape and
5. Signs and symptoms will simulate a disease process : without arousing any suspicion.
6. no specific postmortem findings.
7. appropriate antidote will not be available.
8. No proper chemical or biological tests for easy detection and will be destroyed in the body quickly.

(1) Ideal Homicidal Poison:

- Aconite. Arsenic. Mercury, Nux Vomica. Opium. Powdered glass. Combination of two or more. Organic compounds of fluorine. Thallium satisfy many of the criteria.
- However. aconite can be regarded as the best, because of its sweetish taste, signs and symptoms simulating disease and difficulty in detection.
- Heavy metals including **arsenic** satisfies most of the criteria's of ideal homicidal poison, but can easily be detected long after death- even from the hair- nail, bones.

(2) Ideal suicidal poison: :

1. It must be easily & readily available,
 2. cheap.
 3. either tasteless or with agreeable taste.
 4. can easily be consumed with food/drinks.
 5. highly toxic and will be certain in action.
 6. and will cause painless death.
- Organophosphorus compounds. Opium, scopalamine, Barbiturate Oleander. Oxalic acid. Copper sulphate. Combination of two or more.

(3) Accidental Poisoning

- ❑ IGNORENCE : in Medicine : Dose , way to take
- ❑ CARELESSNESS : in storing poisons
- ❑ MISBELIEF : Love filter, Aphrodisiac, Fare Complexion
- ❑ INDUSTRIAL : in Manufacturing ,Storing
- ❑ FOOD/DRINKING Poisons due to :
- ❑ CONTAMINATION
- ❑ PESTICIDE IN AGRICULTURE
- ❑ WRONG MEDICATION
- ❑ SNAKE BITE : INSECT BITE
- ❑ COOKING GAS POISONING
- ❑ SPURIOUS / LOW QUALITY COSMETICS
- ❑ OXALIC ACID, POISONOUS SNAKE OR INSECT BITE.

(4) Infanticidal :

Opium, Organophosphorus compound

(5) Abortifacient :

Ergot, Madar, Oleander, Marking nut.

(6) Stupefying agents: Substances given in sub-lethal dose mixed with chapati. chutney. curry. tea. coffee. liquor or sherbet or in cigarette or bidi causing lethargy, deep sleep, Or somnolence or making the victim idiot or imbecile. e.g.

Dhatura, Cannabis, Chloroform.

7) Cattle poisoning : (To kill cattle to procure hide) Arsenic. Abrus precatorius, Oleander. Organophosphorus compounds.

(8) Aphrodisiac / Love Philter :

The drugs which increase and enhance sexual passion but it can do so only when it is given in a very big dose which is likely to cause toxic symptoms.

(9) Arrow poisons : Abrus precatorius, aconite, croton oil. Calotropis, snake venom, strychnine.

(10) Rarely : Bacteria. Insulin.

Factors which modifies the actions of poisons

- (1) Quantity
- (2) Form
- (3) Mode of administration;
- (4) Condition of the body.

(1) Quantity :

- Usually with **increase in dose-**
 - death occurs rapidly with few exceptions.
 - very Large dose may initiate / induce profuse vomiting. Thus effect is lessened (e.g.. copper sulphate).
 - while some poisons in large dose without producing usual effects may lead to death by shock : fulminating
(e.g.. Arsenic may lead to death by shock without producing any irritant effect.
Oxalic acid - may cause death instantaneously by shock by local corrosive action without producing any remote action following absorption).
- On the other hand.
repeated smaller sublethal doses, due to cumulative effect, may lead to chronic poisoning.

(2) Form :

- It may be considered under the following headings
 - (a) Physical state;
 - (b) Mechanical combination;
 - (c) Chemical combination.

(a) Physical state –

- ❑ Gaseous form : act earlier than in other physical states.
- ❑ Solution act : rapidly than the powdered form.
- ❑ Poisons in solid state or when coated by some inert substance will show their effect late.
- ❑ Powder Form or Stone Form

(b) Mechanical combination –

- ❑ When used in combination with some inert substances, action will be altered
- ❑ e.g. concentrated mineral acids largely diluted with water:
- ❑ heavy poisonous powder mixed with water - the powder settles down at the bottom due to gravity and therefore sediment escapes swallowing).

- **(c) Chemical combination** — The action of the poisons in combination will depend upon the solubility or insolubility of the combination .
- (e.g. Silver nitrate and Hydrochloric acid are both poisonous separately but in combination the salt silver chloride will be produced which is insoluble;
- on the other hand Lead carbonate or Copper arsenite are insoluble in water but in combination with gastric acid secretion become soluble and will be readily absorbed).

(3) Mode of administration :

Rapidity of action of a poison depends upon the mode of administration. The followings are the routes in order of rapidity of onset of action of a poison.

- (a) **Inhalation.**
- (b) **Intravenous injection.**
- (c) **Intramuscular injection.**
- (d) **Subcutaneous injection.**
- (e) **Ingestion** — Absorption will be more rapid through stomach than rectum (**exception** Paraldehyde - readily absorbs through rectal route).
- (f) **Application on open wounds.**
- (g) **Application on serous surface**, cellular tissue & mucous membrane
- (h) **Application on unbroken intact skin.**

Poisons which are readily absorbed through unbroken intact skin.

- (a) Phenol;
- (b) Alcohol;
- (c) Organophosphorus compounds;
- (d) Mercury;
- (e) Hydrocyanic acid;
- (f) Nicotine;
- (g) Methyl salicylate;
- (h) Mustard gas;
- (i) Local anaesthetics.

ratio between medicinal dose and lethal dose of a substance is 1 : 10.

(4) Condition of the body :

- The following conditions are taken into account -
 - (a) Age
 - (b) Allergy;
 - (c) idiosyncrasy
 - (d) Habit / Tolerance / Drug dependence;
 - (e) Synergism / Drug interaction / Drug potentiation ;
 - (f) Cumulative effect;
 - (g) Sleep and intoxication;
 - (h) State of health.

□ (a) Age:

- Poisons have greater effect on extremes of age (exception — **Mercury and Belladonna** are well-tolerated by children. however, even a smaller dose of Opium cannot be tolerated by them).

□ (b) Allergy/Hypersensitivity :

It is the hypersensitive reaction to a particular substance.

- Penicillin, Aspirin, Opium, Belladonna etc. are the common examples.
- This may be the result of previous administration of the agent.

□ (c) idiosyncrasy :

- It is the abnormal reaction of a person to a particular substance.
- This may be due to inherent personal hypersensitivity (Inborn peculiarity). Iodides, bromides, sulphur salts , opium, egg, shell fish. prawn. pulses, mushrooms etc.

□ (d) Habit :

- By long continued use of some substances **tolerance increases.**
- To get the same desired effect larger dose is required.
- Repeated and long continued use may also lead to addiction and drug-dependence.
- Eg. Opium, alcohol, tobacco, cocaine. arsenic

- **(e) Synergism** : The effect of a poison may be increased by the action of another. The substances each in nontoxic doses, when given together, may produce much more toxic effects than the sum of their effects. **Eg** : Sedatives, tranquillizers, antihistamines, barbiturates when given together with alcohol will cause synergistic effects.
- **(f) Cumulative effects** : Repeated administration in a small dose at short intervals may produce the effect of poisoning like that of large single dose due to accumulation of it in the body when the rate of elimination is less than the rate of administration. **Eg. Digitalis poisoning** .

- ❑ (g) Sleep and intoxication :
- ❑ Unconsciousness, sleep, intoxication retards the effect of poison due to slow absorption at the lower metabolic level.
- ❑ (h) State of health :
- ❑ Some disease conditions alters the effect of the poison on the body .
- ❑ Diseases of kidney and liver increase the effect of most of the poisons.
- ❑ On the other hand, in acute fever, the effect may seem to be less because of the lower rate of absorption.

Common Sources/ Circumstances of poisoning

1. Domestic source -

- (a) **Cosmetic** : Nail polish removers, Body powder, hair wave lotion, depilators etc.
- (b) **Kitchen articles** : Safety match, detergents. cleaning agents. baking agents etc.
- (c) **Poisons** : Rodenticides, insecticides etc.
- (d) **Sanitary** : Disinfectants. deodorants etc.
- (e) **Miscellaneous** : Ink remover, paint remover, shoe polish, furniture polish etc.

2. Agricultural and horticultural –

- Insecticides, pesticides , weed killers etc.

3. Industrial source

- Where poisons are dealt with or produced as byproduct.

Common Sources/ Circumstances of poisoning

4. **Commercial source** - Where poisonous substances are stored, distributed or sold.
5. **Therapeutic source** - Self medication, overmedication medication or abuse of drugs.
6. **Through food and drinks** - Accidental contamination or intentional adding of colouring or odouring agents.
7. **Other:** - Sewer gas, polluted atmosphere, Bite by animals, insects etc.

Presentation of a case of poisoning

- The patient in a case of poisoning is brought to the physician in the following forms :
 1. **Fulminating** - Poisoned with massive dose where death is eminent with sudden collapse even without any preceding symptoms.
 2. **Acute** - Poisoned with a single dose or with some doses taken at short interval with sudden onset of symptoms.
 3. **Subacute** - with features of both acute and chronic poisoning.
 4. **Chronic** - with gradual onset of symptoms due to intake of small dose for a long period.

Features suggestive of poisoning

- **GIT** : Sudden onset of Abdominal pain, Nausea, Vomiting & Collapse,
- **CNS** : Sudden onset of Coma with constriction of pupil, OR
- Delirium with dilated pupils,
- Paralysis specially of lower motor neuron type
- Sudden onset of Convulsions,
- **HEPATIC** : Jaundice & Hepatic failure,
- **KIDNEY** : Oliguria with proteinuria & haematuria, Persistent cyanosis.

Symptoms of Chronic Poisoning

- Symptoms exaggerated after administration of suspected food , fluid or medicine .
- Malaise, Cachexia, Depression & Deterioration of General condition,
- Repeated attacks of diarrhoea, vomiting.
- Traces of poison may be found in the urine, stool or vomit,
- When the patient is removed from his usual surroundings, symptoms disappears.

And is presented with the following
common non specific symptoms :

1. Dehydration;
2. Respiratory distress;
3. Cardiovascular depression;
4. Hypothermia;
5. Convulsions;
6. Blurring of consciousness;
7. Cardiac arrhythmias.

Fate of the poison in the body

- Greater part **thrown out** of the body as a result of vomiting and purging.
- Portion absorbed is mainly deposited in the **liver** which metabolizes or completely destroys.
- Unaltered poison enters in circulation and acts on particular organs unless **excreted by kidney** or made harmless by the metabolism.

- Certain poisons like **Arsenic & Antimony** retain in tissues like nails ,Hair, Bones etc.
- Some poison like **Chloroform, Phosphorus** etc. disappear by evapourization or get oxidized.

CLASSIFICATION

Classification of Poisons

[A] According to Site & Mode of Action

[B] According to Nature of Use

Continue

I. Corrosives:

I. Strong acids:

- a. Mineral/inorganic acids : Sulphuric, Nitric, HCL
- b. Organic acid: Carbolic, Oxalic, Acetic, Salicylic

II. Strong alkalis: Hydrate and Carbonate of sodium, potassium and ammonia.

III. Metallic salts: Zinc chloride, Ferric chloride, copper sulphate, Silver nitrate, Potassium cyanite, chromate and bichromate.

II. Irritant:

1) Inorganic:

- a. Non-metallic: phosphorus, chlorine, bromine, iodine, carbon tetrachloride
- b. Metallic: arsenic, antimony, copper, lead, mercury, silver, zinc
- c. Mechanical: Powdered glass, diamond dust, hair etc.

2) Organic

- a. Vegetable: abrus precatorious, castor, croton, calotropis, aloes.
- b. Animal: snake and insect venom, cantharides, ptomaine

3) agriculture

iii. Systemic:

1. Cerebral:

1. **CNS stimulant:** Cyclic antidepressant, amphetamine, caffeine, methyl phenidate.
2. **CNS depressant:** alcohol, general anesthetics, analgesics, hypnotic, sedative
3. **Deliriant:** Datura, belladonna, cannabis, cocaine, hyocyamus.

2. Spinal : Nux-vomica, gelsemium

3. Peripheral : Conium, curare.

4. Cardiovascular : Aconite, quinine, oleander, tobacco, hydrocyanic acid.

5. Asphyxiants : CO, CO₂, hydrogen sulphide.

IV. Miscellaneous: food poisoning, botulism

Treatment of poisoning

1. Immediate resuscitative measure
2. Removal of unabsorbed poison from body
3. Administration of antidotes
4. Elimination of poison by excretion
5. Symptomatic treatment

Immediate resuscitative measure : ABCD

- A. **Airway** : opening up and cleaning up airway of secretion, vomiting and other foreign body, protect and secure airway by endotracheal tube.
- B. **Breathing** : if arterial blood gas can not be maintained, administer oxygen via ventimask or through ET tube.
- C. **Circulation** : IV fluid administration
- D. **Depression** of CNS should be corrected.

The general line of treatment of cases of poisoning

Treatment is based on the following principles :

- (1) Removal of the unabsorbed poison
- (2) Neutralization of effects of poison by antidotes.
- (3) Elimination of the poison already absorbed in the system.
- (4) Symptomatic treatment.

(1)

Removal of unabsorbed poison

(a). When applied locally :

- **Removed immediately** : Contaminated clothes & articles
- **Wash** : thoroughly with water/sp antidote over intact skin, ulcerated area, eyes / introduced into the natural orifices like rectum, vagina
- **Eye** should be irrigated with normal saline every 15 minutes.
- **If acids or alkalis** : washing for 15 to 20 minutes and no chemical antidote should be used.
~~(because it will liberate heat, causing more damage)~~

(b) When injected or bitten :

If injected subcutaneously from a bite or injection,

- **A tight ligature** should be applied immediately above the wound, which **must be loosened for 1 minute after every 10 minutes to prevent gangrene.**
- **Wound should be excised** , poison sucked out and neutralized by suitable substance or **Multiple incisions** are given for allowing bleeding, through which a portion of unabsorbed poison will be removed. .
- **Local vasoconstriction** by adrenaline.
- **Immersion of extremity** in water at 10 'C
- ~~Then suitable **antidote is to be applied** over the area~~

(c) When inhaled :

- ❑ Remove Pt from place of occurrence to fresh air.
- ❑ Artificial respiration by oxygen mask or nasal catheter at the rate of 6-8 liter per minute.
- ❑ Airway should be kept free of mucous discharge by postural drainage.
- ❑ Nikethamide 2 ml i.v. if necessary
- ❑ Aminophylline 250 to 500 mg if bronchospasm
- ❑ Diuretics if pulmonary oedema

(d) When ingested :

unabsorbed poison can be removed by

- ❑ Stomach wash or
- ❑ Induction of vomiting or
- ❑ Catharsis.
- ❑ But in most of the cases dilution of the poison can be induced by giving water, milk etc. as an immediate measure.

STOMACH WASH

STOMACH WASH

- It is the best method of removal of the **unabsorbed** ingested poison even in unconscious patients if proper care is taken **upto 2 to 5 hours** of ingestion.
- Stomach wash is done **with the help of stomach** tube in adult and with Ryle's tube or French rubber catheter (of 8 to 12 size) in children.

Stomach tube.

- It is a flexible, non-collapsible rubber tube 5' (1 & ½ meter) in length, 1/2" (12.5 mm) in external diameter with a rubber funnel at the upper end and the other end is rounded with more than one opening at the sides just proximal to the tip.
- One suction bulb is provided at the mid part to suck fluid or push air when required.
- The tube is provided with a marking at 20" (50.5 cm) from the lower end. [The distance between mouth to cardiac end of stomach is approx. 18" (45 cms).]
- When the marking reaches the mouth after introduction of the tube the lower end will be within the stomach.

Procedure of stomach wash

- Position : lie **in prone or on the Lt lat sides** with head at the lower level than hips. Mouth is to be kept open by mouth gag and tongue is to be kept depressed by spatula (If artificial denture is there, it is removed earlier).
- Stomach tube is **lubricated** with olive oil / glycerine/ liquid paraffin/any sweet oil. It is to be introduced in the mouth through central hole of the mouth gag, then to be gradually pushed into the stomach.
- **Sudden aphonia** or **induction of cough** or **any resistance** during pushing means false passage into the larynx.
- In such cases no force should be applied and the tube is to be withdrawn partially and again introduced with caution.

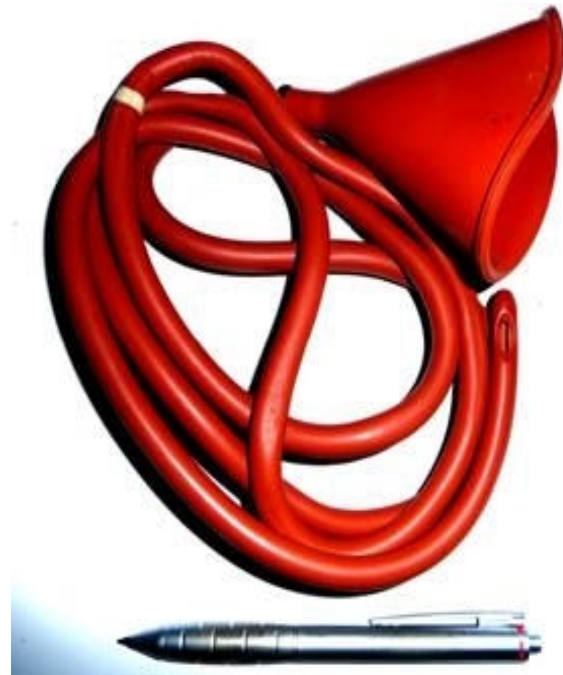
Tests :

The tube has reached the stomach can be tested in the following ways :

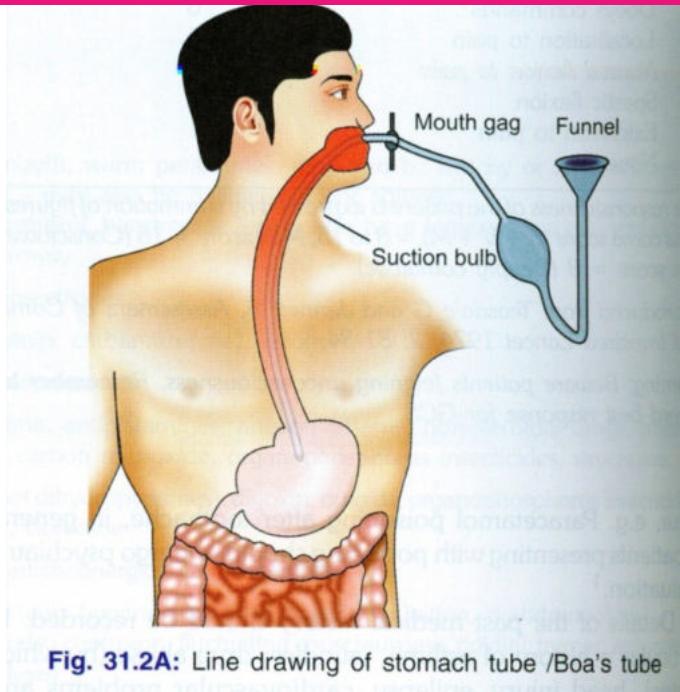
- (a) No cough reflex.
- (b) No breath sounds will be heard through the tube.
- (c) If entered into stomach initially air bubbles comes out, but if it entered larynx air bubbles comes out continuously.
- (d) No air bubble will be seen if the funnel end of the tube is dipped in water.
- (e) if air is pushed through the tube bubbling sound can be auscultated through the abdomen.

Procedure :

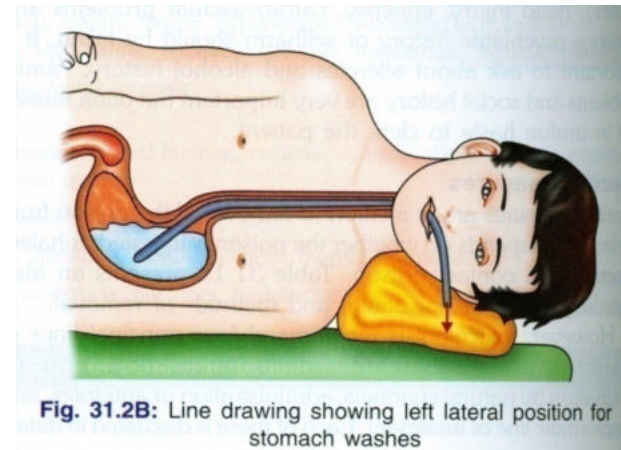
- Stomach contents are removed by mechanical suction.
- **First about 250 ml of plain water** or suitable solution (according to the type of suspected poison) is passed through the tube keeping the funnel end high up above the level of the head.
- When the funnel is almost empty, stomach contents are emptied by syphonic action.
- **The first stomach** wash should be done with plain water & the material should be preserved for sending to the Chemical Examiner.
- **Procedure : continued** until the original colour of the stomach wash fluid returns or the smell of poison passes off.
- **Some antidote solution** or Sodi. Bicarb.. or Mag. Sulph. or activated charcoal should be left in the stomach Before taking out the tube,

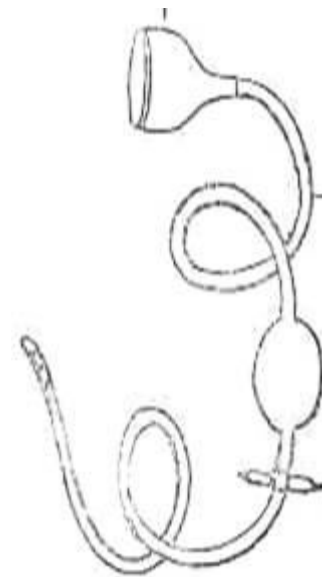
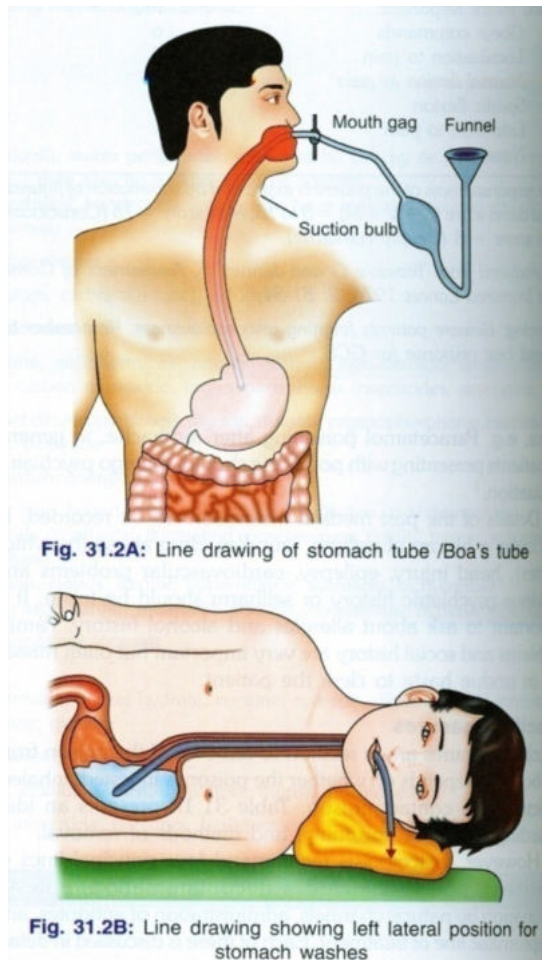


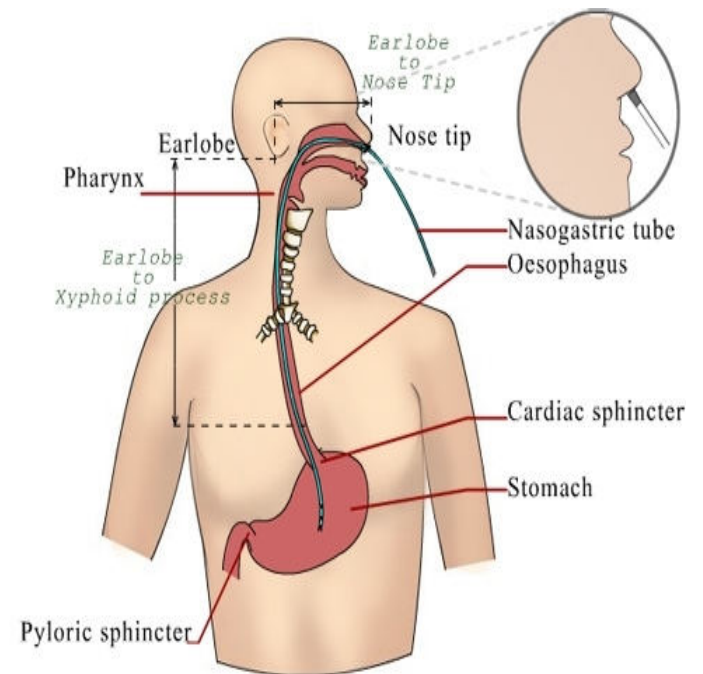
Stomach Tube

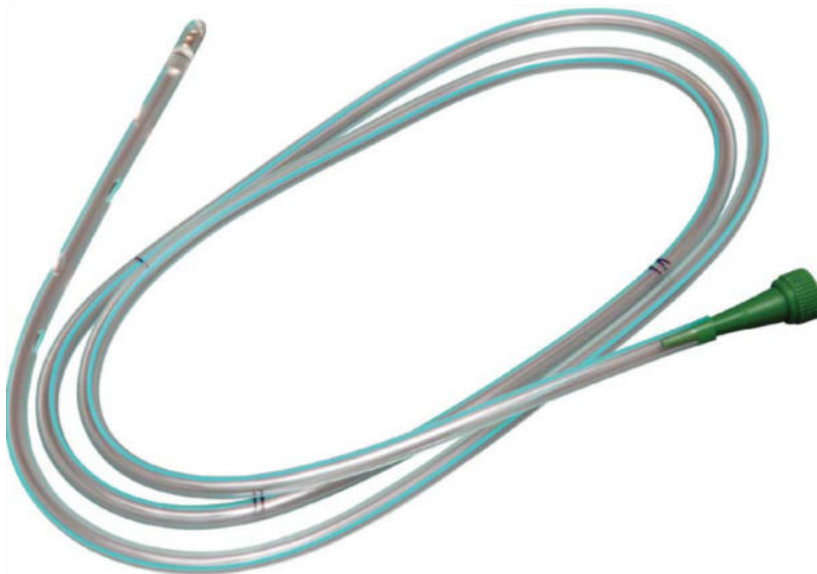


Body Position









Solutions commonly used for stomach wash.

- (a) **Saline or water** - Commonly used in most of the poisoning: (particularly in unknown poisoning).
- (b) **Potassium permanganate (KMNO_4 : 1 in 5000/1 in 1000 dil.)** - For alkaloids. salicylate etc. For oxidizable poisons
- (c) **Castor oil and warm water** (1 in 2 dil.) – In carbolic acid.
- (d) **Calcium gluconate** - For oxalates.
- (e) **Sodium thiosulphate** (25%) - In cyanide.
- (f) **Desferrioxamine** (2 gm in 1 litre of water)– iron poison
- (g) 5% sodium bicarbonate
- (h) 4% tannic acid
- (i) 1% potassium or sodium iodide
- (j) 1-3% calcium lactate
- (k) Saturated lime water or starch solution
 - 0.9% saline

Contraindication of Stomach Wash

- (1) **Corrosives** - acid or alkali poisoning - To avoid perforation.
- (2) **Poisoning with volatile poisons** - To avoid pneumonia.
- (3) **Strychnine poisoning** — To avoid induction of convulsion.
- (4) **Deeply unconscious or comatose patient** – To avoid asphyxia, aspiration pneumonia.
- (5) **In full stomach to avoid asphyxia**, aspiration pneumonia
[For 3. 4 & 5. stomach wash can be given when proper assistance of an anaesthetist is available.)
- (6) **Upper alimentary disease**: esophageal varices.
 - In marked hypothermia and heamorrhagic diastasis

- *protective coating on gastric mucous membrane*
- *milk, starch, egg white, mineral oil, milk of magnesia, aluminum hydroxide*
- *fat and oil should not be used for oil soluble like kerosene, phosphorus, DDT, organo-phosphorus, phenol, aniline, turpentine, acetone, carbon tetrachloride.*

Bulky food :

mechanical antidote to glass powder

EMETICS

- Should be used only in difficulty in obtaining or using stomach tube.
- Vomiting can be induced only if medullary centre are responsive.
- Due to risk of aspiration vomiting is induced only in conscious patient lying in bed with head dependent.
- **EMETICS:**

□ House hold emetics :

- Mustard powder and common salt are not effective and can lead to complication.
- Apomorphine
- Copper sulphate
- Tarter emetic
- Zinc sulphate

Emesis

- (1) Tickling the throat by a feather, with blunt end of a spoon or with finger.
- (2) 5 mg (1/10 gr) of apomorphine hydrochloride can be given hypodermally. or
- (3) Oral administration of some amount of
 - (1) plain warm water or
 - (2) 1 tablespoonful of ground mustard /
 - (3) two table-spoonful of common salt in a glass of warm water not much effective and can lead to complications.

Oral administration of

4. 1.5 gm zinc sulphate in a glass of warm water.
 5. 2 to 3 gm of ipecacuanha powder or
 6. 15 ml of ipecacuanha syrup.(in children 1/2 to 2 tsf)
(But fluid extract instead of syrup must not be given as that may lead to fatality).
- 1 to 2 gm of ammonium carbonate in water/ ipecacuanha powder 1 to 2 g.
 - 30 ml of ipecac syrup for adult, 15 ml from 1 to 12 year, 10ml from 9 to 12 month, 5 ml 6 to 9 month followed by several glasses of water.
 - Syrup of ipcac contain cephaeline and emetine.

Contraindications of emesis

- (1) **corrosive** poisoning – To avoid the risk of perforation of the stomach.
- (2) **volatile** substance like kerosene oil etc. poisoning - to avoid aspiration pneumonia precipitating fatality.
- (3) strychnine poisoning - To avoid the risk of induction of **convulsion**.
- (4) After ingestion of CNS stimulant, because further stimulant cause convulsion with vomiting.
- (5) **deep unconsciousness** or comatose patient - To avoid the risk of obstruction of air-passage by aspirated vomitus.
- (6) advanced state of **pregnancy**.
- (7) advanced **stage of heart or lung diseases**.

Disadvantages of use of emetics

- Only 20% of ingested poison comes out by emesis.
- On the other hand, there remains the danger of pushing of poison to the lower bowel (small intestine) from the stomach facilitating absorption.
-

(2)

Neutralization of the effects of a
poison by an antidote

Antidote:

- Any substance which counteracts or neutralize the effects of a poison.
- types of antidote
 - (a) Mechanical:
 - (b) Chemical;
 - (c) Physiological.
- Universal Antidotes

Antidotes

□ Work on :

1. **Inert complex formn** : & excreted, eg , chelating agents, Prussian blue+ thallium, dicobalt edta +cyanide, digoxin + sp AB fragment
2. **Accelerated detoxification** : thiosulfate converts conversion of cyanide to nontoxic thiocynate
3. **Reduced toxic conversion** : ethanol for methanol
4. **Receptor site competition** : nalaxon for nicotine
5. **Receptors site blockage** : ace for OP
6. **Toxic effect bypass** : 100 % O₂ in cyanide poisoning

A) MECHANICAL

- They either neutralize the poison by mechanical action or prevent their absorption. e.g.
- **Activated charcoal** : 4 to 8 gm acts mechanically by adsorbing and retaining within its pores of some organic and mineral poisons and thus delays their absorption from the stomach. (1gm :1000 sq m)
- **Demulcent drinks** – forms a protective coating on the gastric mucosa and thus prevent the poison from causing damage.

Eg. like milk. white of egg. milk of magnesia etc.

- **Bulky food** - acts mechanically by imprisoning the poison within its meshes, thus preventing damage as in the case of poisoning by powdered glass, diamond dust etc.

Activated charcoal

- It is fine, black, odourless, tasteless powder prepared by burning wood, coconut shell, rice starch. Bone or sucrose and then treated with activating agents like steam or O₂ etc. at high temperature. These particles are extremely small and has a very large surface area. 1 gm of powder has about 3000 metre square surface area.
- Now-a-days **super activated charcoal** having double of the absorbing surface area with the same quantity, is also available. It acts by adsorbing the poisons on its surface.
- thus prevents absorption of the poison in the system.
- 1 gm of activated charcoal adsorbs
 - 300 mg of barbiturate.
 - 300 mg of alcohol. 400 mg of carbolic acid.
 - 700 mg of nicotine. 1000 mg of strychnine.
 - 35 mg of potassium cyanide.

Dose : 1 gm/kg of body weight.

i.e.. 50 to 100 gms in adult and 10 to 30 gms in child.

to be given orally after gastric lavage or emesis. in the form of suspension by mixing it with 4 to 8 times of water.

Disadvantages :

- (1) Unpleasant taste.
- (2) Induction of vomiting.
- (3) Pulmonary aspiration.
- (4) Constipation or diarrhoea.
- (5) Intestinal obstruction.

contraindications :

- (1) In case of small bowel obstruction or in absence of peristaltic sounds;
- (2) Poisoning with petroleum distillates.

(B) CHEMICAL ANTIDOTE

- They counteract the action of poison - either by oxidizing them or
- by forming a harmless or insoluble compounds. e.g.
 - acid neutralizes alkali.
 - albumen precipitates mercuric chloride.
 - Dialyzed iron neutralizes arsenic.
 - copper sulphate precipitates phosphorus etc.

CHEMICAL ANTIDOTE

Counteract the action of poison by forming harmless or insoluble compound or oxidizing poison.

1. Common salt reacts with silver nitrate by forming insoluble silver chloride
2. Albumen precipitates mercury chloride
3. Dialyzed iron is used to neutralize arsenic
4. Copper sulphate is used to precipitate phosphorus
5. Potassium permanganate has oxidizing properties. 1:5000 solution used in opium, strychnine, phosphorus, HCN, barbiturate. Wash until pink color of KMnO_4 comes out as it was introduced.

6. A solution of tincture iodine or lugol's iodine 15 drops to half glass of warm water precipitates most alkaloid, lead, mercury, silver, quinine, strychnine
7. Tannic acid 4 % or tannin in form of strong tea or one teaspoonful in glass of water precipitate apomorphine, cinchona, strychnine, nicotine, cocaine, aconite, pilocarpine, lead, silver, cobalt, aluminium, copper, mercury, zinc.
8. Alkali neutralize acid by direct action. Weak alkali of magnesia, ammonia is safer. Bicarbonate should not be used as possible risk of rupture of stomach by liberation of CO_2 .
9. Acid neutralize alkali by direct action. Vinegar, lemon juice, canned fruit juice can also be used.

(C) PHYSIOLOGICAL ANTIDOTE :

- Produces signs and symptoms exactly opposite to those caused by the poison
 - Counteract all the evil effects of poison.
 - But known physiological antidotes are partial in their action & in higher doses they may be dangerous to life
 - Atropine & physostigmine are real physiological antidotes.
 - Other examples are
 - atropine and morphine.
 - strychnine and barbiturate.
-
- oximes and organophosphorus compounds etc.

(D) Universal antidote :

- They counteract the action of poison,
- If identity of which is not known or where there is suspicion of more than one poison having been ingested.

Composition :

- (1) Magnesium oxide - 1 part
- (2) Tannic acid - 1 part.
- (3) Powdered animal charcoal - 2 parts.

It is a combination of physical and chemical antidotes.

- Animal charcoal adsorbs alkaloid;
- tannic acid precipitates alkaloids, glycosides and some metals;
- magnesium oxide neutralizes acids without formation of gas.

Universal antidote

- In emergency, the following may be used as an alternative (prepared from common household articles) :
 - (1) Scrapping from wall - 1 part.
 - (2) Strong black tea - 1 part.
 - (3) Charred toasted bread - 2 parts.

Coma cocktail

- In a poisoned comatose patient where identity of the poison is not known a combination of :
 - (1) Dextrose - 100 ml of 50% solution.
 - (2) Thiamine (Vit B1) - 100 mg.
 - (3) Naloxone - 2 mg. may be given i.v.
- with the apprehension that these persons are the victims of opiate, alcohol or any hypoglycaemic agent poisoning.
- **for children** : thiamine is omitted and the concentration of dextrose is reduced to 20% to 2.5%.
- Even when the patient is not suffering from poisoning with these, administration of this solution will not cause harm to the patient.

CHELATING AGENTS

- These are agents which inactivate metallic ions with formation of an inner ring structure in the molecule. The metallic ion becomes the member of the ring.
- These agents form non-toxic stable but soluble compounds with metals like Arsenic. Copper, Calcium, Mercury. Lead etc.
- A. BAL (Dimercaprol,
- B. EDTA
- C. DMSA
- D. DMPS
- E. Penicillamine
- F. Desferal

A. BAL (Dimercaprol, (British anti-lewisite):

- Used as an antidote for :
- Arsenic, Mercury, Copper and other heavy metal poisoning.
- The metals have affinity for **sulphydryl (SH)** radicals and combine with them in the tissues displacing hydrogen. thus renders the enzymes non-functioning as their activities depend on the SH-group.
- BAL has two unsaturated SH-groups which combine with the metal and thus dislodge the metal from its combination with the SH-radical of tissue enzyme and thus the tissue becomes free from the harmful effects of the metal.

BAL

- **Dose:** 3-4 mg/kg BW
- 2 ml ampule (100mg/ml) as a preparation of 10% BAL in peanut oil/arachis oil with 20% Benzyl benzoid given deep **intra-muscular** (gluteal)
- **4 hourly** for first **2 days** followed by **twice** daily for **10 days**.
- BAL should be given at the least within 4 hours of poisoning to get adequate result.
- **BAL cannot be given through intra venous route** : as the preparation contains oil and will cause oil embolism.

BAL

□ untoward effects of use of BAL :

Anorexia. nausea. vomiting. restlessness. salivation. lacrimation. body ache. rise of temperature. fall of blood pressure. sense of constriction in the chest. Burning pain in the eyes. throat etc.

□ Contraindications

- (1) Pre-existing liver damage.
- (2) Severe form of kidney damage.
- (3)) Cadmium poisoning - as cadmium-BAL combination is nephrotoxic
- (4). In G-6PD deficiency individuals it causes haemolysis.

B. EDTA (Ethylene Diamine Tetra-acetic acid, Calcium disodium versenate)

- Used as an antidote in Manganese, Cadmium, Iron, Copper poisoning.
- It forms readily soluble, non-ionized non-toxic compounds with the multivalent heavy metals.
- **Dose** : 5 to 25 mg/kg of body weight. 5 cc ampoules of 20% solution in normal saline or 5% glucose-saline 250 to 500 cc, concentration not exceeding 3%. is given through **intravenous route** in a time period not less than two hours and to be continued for 5 days twice daily.
- **Contraindications** :
 - (1) Raised intracranial tension.
 - (2) Damaged kidney.
- **Untoward effect of use of EDTA**
Hypersensitive reactions. fever. headache. malaise. fatigue. nausea. vomiting. vertigo. fall of blood pressure

C. DMSA (Succimer, Meso 2, 3-dimercaptosuccinic acid)

- Used as antidote in lead, arsenic, mercury poisoning.
- It is less nephrotoxic.
- It can be given in patient with G-6PD deficiency where BAL cannot be used.
- In combination with EDTA, it is more effective in the treatment of lead poisoning.
- It is superior to EDTA because it does not cause redistribution of lead in the brain.
- **Dose** : 10mg/kg of body weight 8 hourly orally for 5 days, then in the same dose 12 hourly for 14 days.

(2,3-mercaptopropane 1-sulphonate)

- Used as an antidote in arsenic, Lead and mercury poisoning.
- It can be used both orally & parantarally.
- **Dose** : 5 mg/kg of bw. intravenously
or 250 mg infusions every 4 hourly for 24 hours,
then 100 mg twice daily. orally for 24 days.

E. Penicillamine (Cuprimine) :

- It is a product of hydrolysis of penicillin.
- It possesses a stable SH-group.
- Used as an antidote in Copper, Lead. Mercury. Zinc poisoning.
- it can be given orally. Also IV.
- **Dose** : 30 mg/kg of BW orally in four divided doses (upto 2 gm) with pyridoxine 25 to 50 mg/day for 7 to 10 days.
- It can also be given by slow intravenous route at the dose of 1 to 3 gms in normal saline for 2 to 4 days.
- **Untoward effects**
Hypersensitivity; pyridoxine deficiency in prolonged use.
Rarely skin rash. fever. leucopenia. thrombocytopenia.
nephrotic syndrome can also occur.

F. Desferal (Desferrioxamine) :

- It is water soluble and has affinity for iron.
- in acute iron poisoning.
- It can be given orally. intramuscular or by I/V route
- **Dose : 8 to 10 gms orally**, (dissolved in distilled water) which prevents absorption of iron from stomach.
- It can also be given **intramuscularly : as** 1 gm stat and then 0.5 gm twice or thrice daily as required. Or
- **Intravenously.** 1 to 2 gm in 5% glucose saline in 500 ml and not to exceed 15 mg/kg of body weight/hour or 80 mg/kg of body weight/day

		ROUTE	/kg BW	
1	BAL	I/M	3-4mg/kg	
2	EDTA	Oral/iv		
3	DMSA			
4	DMPS			
5	Penicillamine			
6	Desferral	ORAL/ I.M./ I.V.	8-10 gm 1 gm stat-0.5 gm bd/tid 1-2 gm slow ivin 5% glu	

(3) Elimination of poison already absorbed in the system

After 6 to 8 hours of ingestion of poison, it is expected that it might have been considerably absorbed in the system.

Elimination of absorbed poison can be done in the following ways

(a) Renal excretion :

- (a) It can be improved by giving orally plenty of water, tea or lemonade.
- (b) **urine is to be maintained acidic** : in strychnine amphetamine, or quinine poisoning, and
- (c) **urine to be made alkaline** : in salicylate or long-acting barbiturate poisoning,
- (d) **osmotic diuresis** : by i.v. 20% mannitol 500 ml in 12 hours or by frusemide : in aspirin , Pheno-barbitone poisoning.

(b) Catharsis

Sodium sulphate 30 gm in plenty of water helps in elimination of poison through stool.

Magnesium sulphate or castor oil can also be used.

Castor oil – 1/2 oz. (Contraindicated in chlorinated insecticide poisoning as it may increase intestinal absorption)

Vegetable cathartics should better be avoided.

liquid petroleum, solvent for fat soluble agent prevent absorption from intestinal tract

sorbitol 50 ml of 70% solution is better purgative, but in child may cause electrolyte disturbance

Contraindications :

1. Corrosive acid or alkali poisoning - As it may cause intestinal damage.
2. Where there is excess fluid loss following vomiting or purging.

(c) Use of diaphoretics :

- Application of heat by covering the body with blanket
- Application of hot water bottle or
- Administration of hot drinks.

can cause excess sweating, but is of doubtful value in speeding excretion of the toxic agent.

In case of poisoning with aspirin or where there is high rise of temperature, cold sponging may be helpful.

(d) Dialysis :

Helpful in speeding excretion of poisons.

Can be used in alcohol. long acting barbiturate and salicylate poisoning.

Exchange transfusion - particularly in children - is very beneficial. But dialysis is not useful in poisoning by librium. Valium, heroin, digitalis, antihistamine etc.

(e) Charcoal haemoperfusion :

The technique is same as haemodialysis.

Here the perfusion column replaces the dialysis bath.

Acrylic hydrogel is commonly used for this purpose.

This method can be used in barbiturate poisoning.

3. Whole bowel irrigation :

www.FirstRanker.com

www.FirstRanker.com

- involve use of polyethylene glycol with electrolyte lavage solution which is non absorbable, osmotically active compound
- Should be administered via nasogastric tube

6. Peritoneal dialysis :

- alcohol, long acting barbiturate, chloral hydrate lithium, salicylate, bromide, inorganic mercury, quinidine theophylline and sodium chlorate are effectively removed by peritoneal dialysis.
- For adult exchange : 2 liter
- For children under 5 year : 200 ml
- exchange transfusion is useful in children in barbiturate, CO, salicylate poisoning.

7. Hemodialysis :

useful for removing alcohol, methanol, ethylene glycol, chloral hydrate, lithium, trivalent arsenic, acetamenophen, bromide, phenobarbital, salicylate, flouride, sodium chlorate,digitalis.

8. Charcoal hemoperfusion : it is useful even with

highly protein bound substances that have large volume of distribution and are lipid soluble

e.g. barbiturate, salicylate, paraquat, phenytoin, theophylline, chloral hydrate, digitalis, glutethimide, methaqualone, methotrexate, phenobarbital, carbamazepine, paracetamol.

Blood is circulated extra corporeally from an arterial source through a filter filled with adsorbent material that is charcoal coated with various polymers (acrylic hydrogel) or resin and then back to patient's venous side

(4) Symptomatic treatment

(4) Symptomatic treatment

The symptoms arising out of poisoning are to be treated in general lines.

Nausea, vomiting, gastric pain, diarrhoea, oedema glottis, shock, respiratory difficulties, cardiac failure, renal failure. cerebral oedema, convulsion, delirium, coma etc. require treatment.

- ❑ **For shock** : Head to be kept at lower level than feet at least 9 inches, till the blood pressure reaches 100/60 mm of Hg.
- ❑ **For oligemic shock** : following dehydration : Blood Transfusion or blood plasma or dextran followed by 5% glucose saline may be given.
- ❑ **Electrolyte balance** : is to be maintained in diarrhoea. vomiting or kidney damage.
- ❑ **Body should be covered** by blanket along with hot water bottle.
- ❑ In case of rise of temp. above 102 °F : Cold sponging is beneficial.

- ❑ **To relieve pain** : Morphine 1/4th gr im/pethidine 100 mg im can be given.
- ❑ **For abdominal colic** : Atropine can be given.
- ❑ **For convulsions** : following strychnine poisoning : Procaine by iv route or paraldehyde i/m route is advocated
- ❑ **For asphyxia** or in all cases of unconsciousness : Airway is to be kept clean and unobstructed.
- ❑ **Intratracheal intubation/tracheostomy** is to be done. if required. In all cases of poisoning. patient should be kept under close observation and proper nutrition should be maintained

DUTIES OF MEDICAL PRACTITIONER

Duties and legal obligations of a registered medical practitioner

(1) In all suspected cases of poisoning,

The primary duty is to **diagnose and treat the patient.**

He will try to **detect the nature and character of the poison** responsible for poisoning.

(2) He will try to collect all **detailed history** regarding the onset of signs and symptoms and its progress to exclude and differentiate the condition from any disease process.

So also he will enquire whether a number of people of the same locality are suffering from similar type of signs and symptoms at the same time after taking food or drinks from common source.

Whether the patient suffered from same type of signs and symptoms previously and whether any treatment was given to the patient prior to the attendance.

(3) Physician will try to assess the nature of poisoning - whether suicidal, homicidal or accidental.

(4) If the physician is not sure, he should not express any opinion as to the type of the poison, Other- wise action for damages can be brought against him.

(5) **In case of suicidal or accidental poisoning** : private practitioner is not legally bound to inform the legal authority as per the provision and obligation of Sec. **39 Cr. P.C.** (which refers that public is to give information of commission of certain offences to the Police) because this Sec. does not include Sec. 309 I.P.C. (which refers attempt to commit suicide).

But in case of **suspected homicidal poisoning**, the physician is bound by law (Sec. 39 Cr. P.C.) to inform the matter to the legal authority.

~~Non-compliance of which is punishable : **Sec. 176 I.P.C.**~~

- A medical officer, working in Govt. Hospital. Will have to inform all cases of suspected poisoning, Irrespective of whether suicidal, accidental or homicidal.

The physician is absolved from the said duty. if he knows that persons like chowkidar, Panchayat members or other similar persons, under the provision of Sec. 39 Cr. P.C.. has already informed the matter to the proper authority.

- (6) CONSULTATION : Physician will have to **consult with a practitioner** of higher professional standard regarding the case in confidence, for the second opinion and keep him aware of progress or deterioration of the condition at intervals.
- (7) **MAINTAIN DETAILED RECORDS** : of the case starting from history, signs and symptoms, treatment, progress or deterioration including dates and times of examination of the patient.

8) He is required to preserve suspected food or drink.

full or empty container. foils of capsules or tablets or paper packets. if available at or near the place of incidence. if the same was detected.

he will have to preserve stomach wash material. vomitus. urine. stool and the sweating if stained with those after proper labeling.

And to confirm the nature and character of the poison.

Failure : punishable :

Sec. 201 I.P.C. (causing disappearance of evidence).

(9) **Suspected homicidal poisoning** cases should better be treated in the Hospital or Nursing home. If the physician is to treat the patient at patient's residence, he will have to appoint fulltime nurses of his confidence and only they will give food. drinks. medicines to the patient and by no one else. So also. no one. other than the trustworthy nurses will be allowed to stay with the patient (specially when friends. relatives are the suspicious persons).

(10) As per **Sec. 175 Cr. P.C.**, the physician is bound to supply all the information to the queries of investigating police officers or Magistrates on demand, even in a suspected case of suicidal or accidental poisoning not to speak of homicidal cases.

Non-compliance or deliberate concealing of the facts will make him liable for prosecution under **Sec. 202 I.P.C.**

Supply of false information is prosecuted under **Sec. 193 I.P.C.**

(11) arrange for recording **dying declaration** : in case of apprehension of death

(12) **In case of death**, irrespective of nature of death he will have to inform the matter to the police and recommend for PM exam.

(13) **He will not issue any death** certificate and if at all to be issued to be mentioned about poisoning and mark: 'Police case'.

viscera to be preserved in a case of suspected poisoning

Bottle : (1) Whole of the stomach with its contents and upper 30 cm of the small intestine in adult or whole of small intestine in children.

Bottle(2) : At least 500 gm of liver with the gall bladder and common bile duct in adults and whole of it in children. & Halves of each kidney.(not a full single kidney as One kidney may be non-functioning.)

Bottle (3) BLOOD (10 ml)

Bottle (4) preservative

preservation in special cases

- ❑ Heart : In acute arsenic, yellow oleander poisoning.
- ❑ Brain : Barbiturate poisoning.
- ❑ Brain and Spinal Cord : At least 200 to 300 gm of brain with spinal cord in neurotic & spinal poisoning. alcohol poisoning. barbiturate poisoning.
- ❑ Lung: In Coal gas. Sulphur dioxide. CO poisoning.
- ❑ Spleen : In haemolytic poisoning.
- ❑ Ends of long bones : In heavy metal poisoning like arsenic. antimony etc.

- Uterus & its appendages :
 - in case of suspicion of use of any abortifacient poisons locally.
 - in case of suspicion of criminal abortion.
- Blood : 50 to, 100 ml to be preserved without any preservative (in suspicion of poisoning with a volatile substance).
- Urine : Not less than 100 ml in alcohol. Phenol. Datura poisoning.
- Skin : 2.5 cm x 2 cm with subcutaneous tissue and muscle from site of injection in suspicion of poisoning by injection.

preservative of viscera :

- saturated solution of NaCl, is used commonly, though ideal preservative is rectified spirit.
- S. S. of NaCl cannot be used as preservative in (AVA)
(1) Aconite; (2) Corrosive acids; (3) Vegetable poisons; (4) Heavy metals like corrosive substances.
- rectified spirit cannot be used in (pappa;k)
(1) Alcohol; (2) Acetic acid; (3) Phenol:(4) Phosphorus; (5) Paraldehyde (6) Kerosene oil.
- Qualitative detection of a poison is sufficient for giving opinion about poisoning.

quantitative detection of poison is required in

- (1) When there is history of ingestion of a drug or poison in repetitive small doses.
- (2) Medicine used in overdose.
- (3) in cases of drug addicts. where there is a possibility of the poison being already present.
- (4) Production of some poison within the body during the process of decomposition.

When detection of poison by chemical examination becomes unreliable

- Unreliability of detection of poisons by chemical examination : .
 - (1) Poisons which gain access to the body as a constituent of food materials (oxalates of Na. K. Ca. NI-Ia through vegetables like spinach. cabbage. guano etc.).
 - (2) Poisons which are present normally in the body tissue. as a constituent. in the form of salts.
 - (3) Poisons being used therapeutically.

When poisons cannot be detected during chemical examination

- (1) Completely evaporated in cases of volatile poisons.
- (2) Oxidized in the body : Alkaloids. Glucosides.
- (3) Detoxicated or eliminated : Through excretory channels like kidney. skin etc.
- (4) Faulty preservation

S/S

Poisons which resist putrefaction:

- (1) Carbon monoxide;
- (2) Cyanides;
- (3) Fluoride;
- (4) Barbiturates;
- (5) Organophosphorus compounds;
- (6) Endrine;
- (7) Datura;
- (8) Strychnine
- (9) Yellow oleander;
- (10) Nicotine;
- (11) Arsenic;
- (12) Antimony;
- (13) Mercury;
- (14) Lead;
- (15) Thallium.

Name some Hallucinogens



(1) LSD; (2) Opiate; (3) Alcohol; (4) Cannabis;
(5) Cocaine; (6) Amphetamine; (7) Mescaline.

Poisons which can be identified on examination of eyes.

(1) From dilatation of pupils-

(a) Alkalies; (b) Barium; (c) Alcohol; (d) Barbiturate; (e) DDT; (f) Endrine; (g) Datum; (h) Atropine; (i) I-Iyocyamus; (j) Cocaine; (k) Calotropis; (l) Cyanide; (m) Ephedrine; (n) Carbon monoxide; (o) Amphetamine; (p) Antihistamine.

(2) From constriction of pupils –

(a) Carbolic acid; (b) Otzanopbosphorus compounds; (c) Opium; (d) Nicotine; (e) Barbiturate; (l) Caffeine; (g) Clonidine; (h) Carbamates; (i) Nicotine; (j) Methyl dopa; (k) Benzodiazepines; (l) parasympathomimetic

(3) From alternate constriction and dilatation of pupils –

(a) Aconite; (b) Barbiturates (at times).

(4) From nystagmus —

(a) Alcohol; (b) Barbiturate; (c) Carbamazepine; (d) Phencyclidine; (e) Phenytoin.

Poisons which can be identified from the smell of breadth

- (1) Acetone like smell : Aspirin. alcohol. chloroform
- (2) Garlic like smell : Phosphorus. arsenic. thallium.
Tellurium. selenium. dimethylsulphoxide
- (3) Kerosene like smell : Organophosphorus compounds
- (4) Radioactivity of breadth : Radio-active substances ;
- (5) Phenolic / hospital like smell Carbolic acid. Creosole ;
- (6) Vinegar like smell : Acetic acid
- (7) I-hydrocyanic acid. cyanide
- (8) Almond like smell : Opium;
- (9) Moth ball like smell : Camphor. Naphthalene
- (10) Pear like smell : Chloral hydrate. Paraldehyde.

Poisons which can be identified from the smell of breath

- (11) Oil of wintergreen'(Methyl sylicyiate)
- (12) Fishy smell : Aluminium phosphide. zinc phosphide
- (13) Coal gas like smell : Carbon monoxide
- (14) Rotten egg like smell : Carbon disulphide. hydrogen sulphide, disulphiram. mercaptans
- (15) Burnt roap like smell : Cannabis.
- (16) Kerosene oil;
- (17) Shoe polish like smell : Nitrobenzene ,
- (18) Endrine;
- (19) DDT;
- (20) Nicotine.

• Poisons which has got affinity for haemoglobin.

- (1) Sulphuric acid. Nitric acid. hydrochloric acid
(Converts Hb into acid haematin).
- (2) Carbon monoxide (Forms carboxyhaemoglobin)
- (3) Hydrogen sulphide (Forms sulphmethaemoglobin)
- (4) Lead (90% of blood lead combines with red cells).

- Poison which causes depression of sexual power.
chronic opium poisoning, ganja poisoning

Poisons which inhibit enzyme system

- (1) Organophosphorus compounds (inactivate and neutralize n-cetyl cholinesterase by 25% to 30%).
 - (2) Arsenic. Mercury. Lead. Antimony (Combining with — 'SH' radicle).
 - (3) Hydrocyanic acid (Inhibits cytochrome enzyme system)
 - (4) Barbiturate and hypnotics (Interfering dehydrogenase system).
- poisons which will produce blister-like patches on skin.
- (1) Carbon monoxide; (2) Barbiturates; (3) Meprobamate.

- Poison which will produce parkinsonism like symptoms.
Chr. Manganese poisoning.
- Poison which will produce thyrotoxic crisis like symptoms :
Dinitro- orthocresol
- Poison which causes sex perversion :
Cocaine (Also causes Nymphomaniac, Satyriasis. Homosexuality).
- Poison which causes Heat stroke like hyperpyrexia: Datura.
- Poisons /drugs which has metallic taste.
(1) Arsenic; (2) Lead; (3) Copper; (4) Mercury; (5) Iron; (6) Cadmium; (7) Lithium; (8) Metronidazole; (9) Ethambutol; (10) Disulphiram; (11) Acetaldehyde; (12) Iodine.

poisons: which can be identified from of urine.

- (1) Oxalic acid (From calcium oxalate crystals);
(2) Carbolic acid (From olive green colouration);
(3) Alcohol: (4) Ether: (5) Chloroform (From smell).

- **From change in colour of urine.**
 - (1) Red or pink - Aniline. phenytoin. Phenothiazine. ibuprofen.
 - (2) Reddish brown — Chloroquine. Metronidazole. phenacetin. iron.
 - (3) Orange - Rifampicin. phenothiazine.
 - (4) Purple - Porphyrin.
 - (5) Brownish black — Homogentisic acid.
 - (6) Yellow — Fluorescein dye. riboflavin.
 - (7) Yellowish orange - Vitamin A. Carrot.
 - (8) Yellowish brown — I-urazolidone. Nitrofurantoin. sulphamethoxazole. pritnaquine. ~
 - (9) Brownish green - Cresol. phenol.
 - (10) Greenish blue - Methylene blue. thymol.

- ❑ Poison which on ingestion will show barium like radio-opaque shadow on x-ray abdomen : Arsenic trioxide.
- ❑ Poison which are radio-opaque.
 - (1) Heavy metals; (2) Iron; (3) Potassium chloride. iodide and permanganate; (4) Sodium chloride; (5) iodides; (6) Chloroform; (7) Chloral hydrate; (8) Ammonium chloride; (9) Acetyl salicylic acid; (10) Carbon tetrachloride; (11) Methotrexate; (12) Vitamins; (13) Penicillin G and K; (14) Phenothiazine; (15) Acetazolamide.

- Poison which has depilatory action :
 - Madar juice. Orpiment (arsenic trisulphide). Realgar (arsenic bisulphide)
- Poison which cause fall of hair : **Thallium. Radiation.**
- Poisons /drugs which cause alopecia :
(1) Arsenic; (2) Gold salts; (3) Lead; (4) Mercury; (5) Titaliumz (6) Iodine; (7) Selenium; (8) Chloroquine; (9) Quinacrine; (10) Androgens; (11) Anticoagulants; (12) Amphetamines; (13) Cimetidine; (14) Heparin; (15) Hcxachlombenzene; (16) Metltyldopa; (17) Levodopa; (18) Methotrexate; (19) Thiocyanates; (20) Oral contraceptivcas; (21) Vitamin A.

poison. which cause dermal pigmentation

(1) Reddish colouration –

- (a) Rifampicin; (b) Borates; (c) Clofazimine.

(2) Brownish colouration –

- (a) Arsenic; (b) Chromium; (c) Phenacetin; (d) Nitrates and nitrites; (e) Metltyldopaz (f) Levodopa.

(3) Bluish colouration –

- (a) Mercury; (b) Silver; (c) Bismuth; (d) Oxalic acid; (e) Tetracycline; (e) Oxalic acid: (2) Phenothiazine.

(4) Yellowish colouration –

- (a) Chloroquine; (b) Picric acid; (C) Quinacrinc; (d) Carotene; (e) Sodium nitrate; (f) Nitrazepam.

Poison: which can be identified on examination of teeth

- (1) Sulphuric acid (Chalky white):
- (2) Nitric acid (Yellow);
- (3) Cocaine (Black).

Poisons which can be identified on examination of gum.

- (1) Copper sulphate (Bluish green/ Purple line at the junction of teeth and gum).
- (2) Lead (Stripped bluish line at the junction of teeth and gum).
- (3) Cocaine (Black).

Poison identified from color of hypostasis

- (1) Cold - bright pink.
- (2) CO poisoning – pinkish.
- (3) In CO₂ poisoning – deep blue.
- (4) In aniline dye poisoning - deep blue.
- (5) HCN poisoning - cherry red.
- (6) Potassium chlorate, potassium bichromate poisoning – chocolate brown.
- (7) Phosphorus poisoning - dark brown.
- (8) Nitrate poisoning - reddish brown.
- (9) KCN. NaCN poisoning - brownish.
- (10) Nitrobenzene poisoning - dark purple.

- Poison which will cause green coloration of cartilages :
In Chr. Carbolic acid poisoning(Phenol marasmus).
- When phenol was routinely being used as a disinfectant. It is characterised by anorexia, loss of body weight. headache vertigo. dark coloured urine (alkaptonuria) with deposition of homogentisic acid in cartilage. ligaments and fibrous tissue and in the cornea- The condition is called Ochronosis.
- Poisons where KMnO_4 is used as an antidote :
(1) Alkaloids; (2) Amidopyrin; (3) Barbiturate; (4) Phosphorus; (5) Cyanides.

Dialysis

□ Indications :

(1) Deep coma; (2) Anuria; (3) Low BP. (4) Apnoea.

□ Poisons where haemodialysis and peritoneal dialysis is helpful. _

(1) Alcohol; (2) Barbiturate; (3) Methanol; (4) meprohamate; (5) Aspirin; (6) Salicylates; (7) Phenacetin; (8) Amphetamines; (9) Arsenic; (10) Lead; (11) Mercury; (12) Iodides; (13) Bromine; (14) Quinine; (15) Strychnine; (16) Antibiotics; (17) Sulphonamides; (18) Carbon tetrachloride.

□ Poisons where dialysis is not helpful.

(1) Anticholinergics; (2) Antihistamines; (3) Anti-depressants; (4) Toiranol (5) Valium; (6) Librium; (7) Methaqualone; (8) Heroin; (9) Phenothiazine.

□ Exchange transfusion is more helpful : In children. rather than adults. (In case of poisoning with Barbiturate. Salicylate. CO. CO₂)

Toxicity of a chemical substance is graded

- (1) Extremely toxic - 1mg/mg of body weight or less.
- (2) Highly toxic - 1 to 50 mg/kg of body weight.
- (3) Moderately toxic — 50 to 300 mg/kg body wt
- (4) Slightly toxic — 0.5 to 5 g/kg of body weight.
- (5) Practically non - toxic - 5 to 15 gm/kg body wt.
- (6) Relatively harmless - 15 gm/kg of body weight

Consciousness grading (Reed's classification)

- The degree of loss of consciousness can be assessed clinically by the response of the patient to painful stimulus and is graded as follows
- (a) Gr. 0 - Fully conscious.
(b) Gr. I - Drowsy but responds to vocal command.
(c) Gr. II - Unconscious but responds to minimal stimuli.
(d) Gr. III - Unconscious but responds to only maximal painful stimuli.
(e) Gr. IV - Unconscious and no response whatsoever. Loss of all the reflexes including corneal, laryngeal and pharyngeal reflexes.
- **What is standard painful stimulus ‘**
Standard painful stimulus is rubbing of sternal region of the chest of the patient with the clenched fist.

‘Glasgow Coma Scale’

- ❑ Alternatively, now-a-days ‘Glasgow Coma Scale’ is considered to be the single most neurological observation for graduation of the level of consciousness.
- ❑ Terms and grading which require definition (like ‘Coma’. ‘Stupor’etc.) should better be avoided.
- ❑ This scale is based on 3 criteria –
 - ❑ (a) Eyes open.
 - ❑ (b) Best verbal response.
 - ❑ (c) Best motor response.
- ❑ Graph is prepared basing on the consecutive observations and progressive changes as follows :

