Exchange Transfusion

- Adv. of Exchange transfusion removes poison affecting RBCs (as in Methemoglobinemia or arsenic induced hemolysis)

5. Symptomatic Treatment

Preservation of Viscera

1. Stomach and its contents
2. 30 cm small Intestine and contents
3. Liver > 500 gms
4. One kidney/Half of each
5. Blood 100 cc (in NaF), (Minimum 10 ml)*
6. Urine > 100 cc—in Thymol* [Toulene* is the best preservative for urine examination]

The best preservative for preservation of viscera is rectified spirit.
- Most commonly used preservative is saturated sodium chloride.
- Rectified spirit is not used in:
  - Alcohol
  - Phenol
  - Phosphorous
  - Paraldehyde.
- Formaldehyde is used for preservation of Museum specimens and not for preservation of viscera for toxicological analysis.
- Formalin is 40% formaldehyde.
- NaF should be added to urine, blood, vitreous humor for Alcohol estimation and to samples of
  - Cocaine (C)
  - Carbon monooxide (C)
  - Cyanide (C)

→ 3C's

Special Preservations

- Heart—Strychnine, Digitalis.
- Spleen—It is the best organ for Cyanide poisoning.
- Brain—Alkaloids, organophosphates, volatile organic poisons.
Bile—Narcotic drugs, cocaine, methadone, Glutathione, Barbiturates, Tranquilizers.

Vitreous—Alcohol, Chloroform.

Lung—Gaseous poison, HCN, Alcohol, Chloroform.

Bone—Arsenic, Antimony, Thallium, Radium.

Skin—C/o hypodermic injections (10 cm radius about site with muscle and fat), snake bite.

Hair, Nails, Uterus, spinal card—When indicated.

CSF—(in 10 mg NaF/ml of fluid) in Alcohol intoxication.

Body Fat—Endrin, DDT (Organo Chlorines).

Muscle—When internal organs badly putrified.

- Viscera is stored at 4°C.
- Histopathology specimen is preserved in 10% neutral formalin/95% Alcohol.
- Virology specimen → 80% Glycerol in Buffer saline.

**Coloration of Postmortem Staining**

- Dark brown/yellow
- Brick Red
- Cherry Red
- Chocolate color
- Dark brown
- Bluish-green
- Bronze colour
- Black Colour

**Smells of different Poisonings (Cranial Cavity is opened First to differentiate Smells)**

- Garlic—Phosphorus, Arsenic, Al—phosphide (Celphos)
- Bitter Almonds—Cyanide Poisoning (HCN), Prussic Acid
- Sewer Gas smell—H₂S
- Kerosene Odour—Organophosphates
- Smell of Burnt Rope—Cannabis.
Sweet and Fruity—Ethanol, Methanol, Chloroform
Acid—Cloral hydrate, Paraldehyde

Miosis
Mitotic (Pilocarpine)
Opiates
Pontine hemorrhage
Organophosphates

Mydriasis
Chlorinated hydrocarbons
[Endrin, aldrin, DDT, BHC, toxaphene, strobane]

Autopsy Changes in Certain Poisoning

Chalky white Teeth—Sulphuric Acid
Black tongue and Teeth—Cocaine

Stomach
- Bloating Paper Appearance—Sulphuric Acid
- Leathery Mucosa of Stomach—Carbolic Acid
- Red Velvet Mucosa—Arsenic

Coloration of mucous membrane of stomach

<table>
<thead>
<tr>
<th>Color</th>
<th>Poison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Ferrous sulphate</td>
</tr>
<tr>
<td>Blue</td>
<td>Amytal</td>
</tr>
<tr>
<td>Pink</td>
<td>Soneryl</td>
</tr>
<tr>
<td>Slate</td>
<td>Mercury</td>
</tr>
<tr>
<td>White particulate</td>
<td>Arsenic</td>
</tr>
<tr>
<td>Black</td>
<td>Sulphuric acid, Acetic acid, Hydrochloric acid</td>
</tr>
<tr>
<td>Yellow</td>
<td>Nitric acid</td>
</tr>
<tr>
<td>Buffed white</td>
<td>Carbolic acid</td>
</tr>
<tr>
<td>Brown</td>
<td>Cresols</td>
</tr>
<tr>
<td>Blue/Green</td>
<td>Copper</td>
</tr>
<tr>
<td>Grey white/yellow</td>
<td>Phosphorus</td>
</tr>
</tbody>
</table>

Heart
- Subendocardial haemorrhage: Arsenic
- Subendocardial infarct: Alumunium phosphide
- Intestine
  - Multiple Patchy haemorrhages—Mercury
  - Kidney

Poisons Causing Necrosis of Proximal Convoluted Tubule

- Mercuric chloride
- Lysol
- Carbon tetrachloride
- Oxalic acid
- Phenol
Conditions which delay putrefaction:

- Carbolic acid
- Zinc chloride
- Strychnine
- Chronic heavy metal poisoning
- Washing disease
- Anaemia

Putrefaction sets in rapidly in cases of:

- Septicemia
- Peritonitis
- Inflammatory and septic condition
- General Anasarca
- Asphyxia

CORROSIVE POISONS

Mineral Acids

- They produce coagulation necrosis.
- Nitric acid produces a yellowish stain.
- Sulphuric acid and caustic alkalis reddish-brown stains.
- Hydrochloric acid and carbolic acid whitish or greyish yellow stains on the skin and mucous membranes.

Sulphuric Acid

- Sulphuric acid is the strongest corrosive poison.
- Brown to black streaks from angle of mouth present.

Blotting paper appearance* of mucosa of stomach is seen in H₂SO₄ poisoning.

- The vomit is brown or black, mucoid, strongly acid and may contain shreds of charred wall of the stomach.
- Teeth are chalky-white.* Tongue is swollen, sodden and black.
- Constipation is severe and there is tenesmus.
Edema, erythema and ulceration of the esophagus may be followed by **fibrosis with stricture** formation and obstruction of the gastric outlet.

- **Fatal dose** – 5 to 10 ml
- **Fatal period** – 18 to 24 hours
- **Causes of death**
  - i. Circulatory collapse
  - ii. Spasm or oedema of glottis
  - iii. Collapse due to perforation of stomach
  - iv. Toxaemia
  - v. Delayed death may occur due to hypostatic, pneumonia, secondary infection, renal failure or starvation due to stricture of oesophagus

**Treatment:**

1. Gastric lavage or emetics are **contraindicated**.

2. The acid should be immediately diluted and neutralised by giving 250 ml of water or milk mixed with 4 t.sf. Of calcium or magnesium oxide (antidote), aluminium hydroxide gel or calcined magnesia or soap water may be used.

3. Alkaline carbonates and bicarbonates, are **contraindicated** in treatment of H₂SO₄ poisoning because it liberates carbon dioxide, should not be used as they cause gastric dilatation and sometimes rupture.

4. Give a demulcent-olive oil, milk, egg-whites, starch water, mineral oil, melted butter.

5. Prednisolone 60 mg/day may be given to prevent oesophageal stricture and for shock. Later, half an inch diameter of mercury-filled bougie should be passed daily if stricture develops.

7. **Tracheostomy**—If there is edema of the glottis.

8. **Give nothing by mouth.**

9. **Skin burns** are washed with large amount of water and a paste of magnesium oxide or soda. Bicarbonate is applied.

10. **Eye burns** are irrigated with water or sodium bicarbonate solution for 10 to 15 minutes.

11. **Symptomatic.**

   - **Postmortem appearance**
   
   i. Corrosion of the mucous membranes of lips, mouth and throat and of the skin over the chin, angles of mouth and hands is seen.
   
   ii. The necrotic areas are at first greyish-white but soon become brown or black and leathery.

   - **Intestines**

   i. **Blotting paper appearance of stomach mucosa** (e.g., Red Velvet mucosa in Arsenic poisoning).

   ii. The greater part of stomach may be converted into a soft spongy black mass which disintegrates when touched. The stomach wall has a brown or black colour.

   iii. Perforation may occur in sulphuric acid poisoning with the escape of the gastric contents into the peritoneal cavity. Chemical peritonitis and corrosion of organs is seen.

**VITRIOLAGE** (Vitriol throwing)

It comes under Sec. 320 IPC (Grievous hurt/Sixth clause):

- Throwing of sulphuric acid on another individual is known as vitriolage.

- Most common agent used as vitriolage is sulphuric acid.

- Death may result from shock or toxaemia.
The burns are painless, penetrating and the acid devitalises the tissues and predispose to infection. Sometimes, corrosive alkali or juice of marking nut or calotropis is used to disfigure the face.

**Treatment**

- The affected part is washed with plenty of water and soap or sodium or potassium carbonate. Later, a thick paste of magnesium oxide or carbonate is applied.
- The eyes are washed with water and irrigated with a dilute sodium bicarbonate solution.* Later a few drops of olive oil or castor oil are put into the eyes.

**NITRIC ACID (HNO₃)**

- In concentrated form, it combines with organic matter and produces a yellow discoloration of tissue due to the production of picric acid (xanthoproteic reaction).
  - Signs and symptoms
    - They are those of poisoning by sulphuric acid.
    - It causes yellow discoloration of the tissues including the crowns of the teeth and yellow stains on the clothing.
    - Inhalation of fumes causes lacrimation, photophobia, irritation of air passages and lungs producing sneezing, coughing, dyspnoea and asphyxia.

  - **Fatal dose:** 10 to 15 ml
  - **Fatal period:** 12 to 24 hours

- **Postmortem appearance**
  1. They are those of sulphuric acid but the tissue is stained yellow, except stomach.
  2. The stomach is soft, friable and ulcerated and brownish discoloration.

  - **Perforation of stomach is not common.**

- **Treatment:** Same as for sulphuric acid.
Oxalic Acid

- In the form of oxalates, it exists as a natural constituent of many plants, e.g. *spinach*, *rhubarb*, *cabbage* etc.
- It is used as *ink-remover* solution in forgeries.*
  - Action
    i. Local-corrosive poison. Corrodes mucous membrane of the digestive tract.
    ii. Systemic
      a. Shock
      b. Hypocalcemia, *(That's why wall scrapings and chalk powder can be given as treatment)*
      c. Renal damage

Oxalates produce *tubular nephrosis* or necrosis and cause death from *uremia* in 2 to 14 days
  - **Fatal dose:** 15 to 20 gms
  - **Fatal period:** 1 to 2 hrs
  - **Signs and symptoms**
    - Vomitus usually contains altered blood and mucus and has a *'coffee ground' appearance*.
    - In oxalic acid poisoning, pulse is feeble and rapid.
    - If the patient survives for a few hours, hypocalcemia and digestive upset occurs.
    - The urine may be scanty or suppressed and may contain traces of blood, albumin and calcium oxalate crystals.

- **Treatment**
  1. The stomach is washed out carefully using *calcium lactate* or *gluconate*.
  2. The antidote for oxalate poisoning is *calcium gluconate 10%*, *10 ml i.v. at frequent intervals.*
  3. For oxalate poisoning, any preparation of calcium which converts the poison into insoluble calcium oxalate are used e.g. lime water, calcium lactate calcium gluconate, calcium chloride, a suspension of chalk in water or milk.
4. 1.5 gm of chalk will neutralise about one gram of oxalic acid.
5. Parathyroid extract.*
6. Demulcent drinks.

- Postmortem appearance
  - Stomach is reddened or eroded or almost black.*
  - The stomach contents are gelatinous and brownish due to acid haematin* formation.

CARBOLIC ACID
- Carbolic acid is also known as phenol.
- Phenol is converted into hydroquinone and pyrocatechol* in the body before being excreted in the urine.
  - **Fatal dose:** 1 to 2 gm.
  - **Fatal period:** 3 to 4 hrs.
  - **Signs and Symptoms:** Poisoning by carbolic acid is known as carbolism.

Local
- **Skin**
  - It causes burning and numbness due to damage to nerve endings.
  - It precipitates protein and coagulates cell contents.
  - Produces white opaque eschar.
  - Necrosis and gangrene of the tissue, which becomes green white or brown white.
- **Digestive tract**
  - Hot burning pain extends from the mouth to the stomach followed by tingling and later anaesthesia.
- **Respiratory tract**
  - Pulmonary and laryngeal oedema develops due to irritation.

Systemic effects
- In phenol poisoning, pupils are contracted*.
- Breathing is stertorous.
- Convulsions and lock-jaw occurs.
- Depressant of nervous system, especially the respiratory centre*.
- Headache, giddiness, tinnitus, muscular spasm and later collapse, unconsciousness and coma occur.
- Urine is scanty and contains albumin and free haemoglobin; suppression may follow.

**Carboluria:** In the body phenol is partially oxidised to hydroquinone and pyrocatechol and are excreted in urine along with unchanged phenol. The further oxidation of hydroquinone and pyrocatechol in the urine is the cause of green* coloration. This is known as Carboluria.

The hydroquinone and pyrocatechol may cause pigmentation in the cornea and various cartilages—a condition called Ochronosis.

**NB—Liquid gold** is a term associated with Amphetamine Abuse and not Barbiturate Reason: The metabolite of Amphetamine are themselves addictive so people used to sell their urine in weekly market and used to fetch high prices that's how the term liquid gold came!! Remember its liquid gold and not golden urine).

**Causes of death**
1. Syncope
2. Asphyxia due to
   i. Failure of respiration
   ii. Oedema of glottis
   iii. Complication e.g. bronchopneumonia.

**Treatment**
1. The stomach should be washed with plenty of lukewarm water* containing animal charcoal, olive oil, castor oil, magnesium or sodium sulphate or, saccharated lime with which phenol combines and forms harmless products.
   ii. Magnesium sulphate or medicinal liquid paraffins should be left in the stomach.