FORENSIC MEDICINE

CARBON-MONOXIDE (CO) POISONING

(20) Discuss carbon-monoxide (CO) poisoning

SOURCES of CARBON MONOXIDE (CO) / METHOD of EXPOSURE

- **CO is formed**
  - during **incomplete combustion of carbon-containing material** (e.g. organic material)

- **CO poisoning - causes**

  (1) **accidental** (2) **suicide** (common) (3) also **homicide**

- **CO poisoning - sources**

  (i) **Domestic**
  - Open fires in rooms with insufficient oxygen supply
  - (gas cylinders / fires in enclosed spaces)

  (ii) **Transport**
  - Vehicles produce CO (Petrol engines produce more CO than diesel engines)

  (iii) **Industrial**
  - Such as smelting-works

  (iv) **General**
  - Incomplete fermentation can produce CO (Wine-tanks)

- **CO poisoning - consequences**

  (i) Temporary confusion & amnesia
  - encountered in persons recovering from CO poisoning

  (ii) Temporary or permanent paralysis or deformity

  (iii) Death

PHARMACOLOGY

CO ➢ colourless ➢ odourless ➢ tasteless ➢ non-irritating gasslightly ➢ lighter than air

- **Effects** of CO poisoning are **usually not recognised** by victim himself
- **Alcohol involvement** will increase RISK of **CO** poisoning

Discuss effects of CO on physiological functions of human body?

(i) **CO gas absorbed via lungs & has following effects**

- CO binds with haemoglobin in red blood cells
- oxygen transport limited & results in **anaemic hypoxia***

  (***Anaemic hypoxia**: is hypoxia resulting from a decreased concentration of functional hemoglobin or a reduced number of erythrocytes).

  (***Hypoxia:** represents the deficiency in the amount of oxygen reaching the tissues).

(ii) **CO has direct suppressant effect on brain**

- identical to anaesthetic agent
- depresses respiration

(iii) **CO binds with enzyme system in cells involved with cell metabolism**

- has further detrimental effect

Differentiated susceptibility and effect

- **Underlying diseases** (heart disease) - make person more susceptible to CO poisoning
- **Young children** more susceptible to CO poisoning due to more rapid respiration rate
- **Low atmospheric pressure** increase effect of even low levels of carbon monoxide

TOXICOLOGICAL ANALYSIS

COHb Carboxyhemoglobin is a stable complex of carbon monoxide and hemoglobin that forms in red blood cells upon contact with carbon monoxide. **Large quantities of CO, hinders the ability of Hb to deliver oxygen to the body.** produces carbon monoxide haemoglobin or carboxyhaemoglobin (COHb). The bond between carbon monoxide and haemoglobin is 250 x stronger than the bond between oxygen and haemoglobin to form oxy-haemoglobin or O2Hb.

INVESTIGATION

To make finding of CO poisoning

- There must be evidence of abnormally high COHb level in the blood
- Any blood (arterial or venous) sample can be used
- COHb of more than 5% in non-smokers & more than 10% in smokers is significant
- Decomposition may affect COHb levels → specimen needs special preservation
- (Same preservative used for alcohol analysis)

POST-MORTEM SIGNS

(i) **Body & muscles** has **characteristic cherry-red** appearance

(ii) Evidential **damage to brain & heart**

COLOUR of HYPOSTASIS CAN BE INDICATION of POSSIBLE CAUSES of DEATH (Part of (18)

Cherry Red	**Carbon monoxide poisoning**
Bright rose colour	**Cyanide poisoning** Cold temperature (body in refrigerator/cold water or hypothermic death)
Green	**Hydrogen sulphide**
Rust brown / choco-late brown	**Potassium chlorate** poisoning **Nitrite** poisoning
Grey bronze (with bad odour)	**Clostridium perfringes** septicaemia / Clostridium perfringens is a Gram-positive, rod-shaped, anaerobic, spore-forming bacterium of the genus Clostridium.

Post-mortem examination

MUST NOTE **degree** of burn wounds + **% of body surface** involved

IMPORTANT (6) - to **establishing whether person was alive when fire occurred-(concealment)**

a) **Carbon monoxide level in body**

» **level of < 5% in non-smoker & <10% in smoker** indicates that person was alive when fire started

b) **Soot** & **ash** in airways / stomach / oesophagus

c) Also mentioned is the **presence of fat embolism in pulmonary vessels**
