CYANIDE

CYANIDE
TOXICITY

INGESTION

LETHAL DOSES

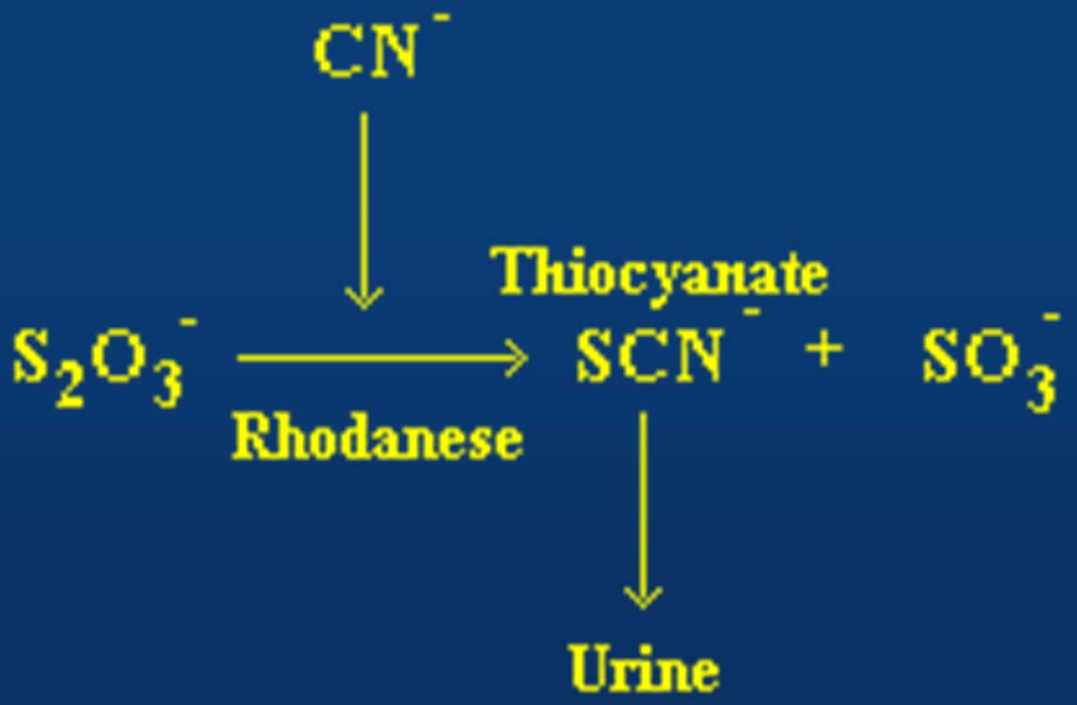
60- 90 mg	**Hydrogen Cyanide (HCN)**
200 mg	**Potassium Cyanide (KCN)**

CYANIDE
TOXICITY

INHALATION

Concentration ($mg.m^{-3}$)	Effect
300	immediately lethal
200	lethal after 10 minutes
150	lethal after 30 minutes
120-150	lethal after 30-60 minutes
50-60	20 minutes to 1 hour without effect
20-40	light symptoms after several hours

CYANIDE
METABOLISM



CYANIDE

CYANIDE
PLANTS

Almonds

250 mg CN/100g plant tissue

Cassava

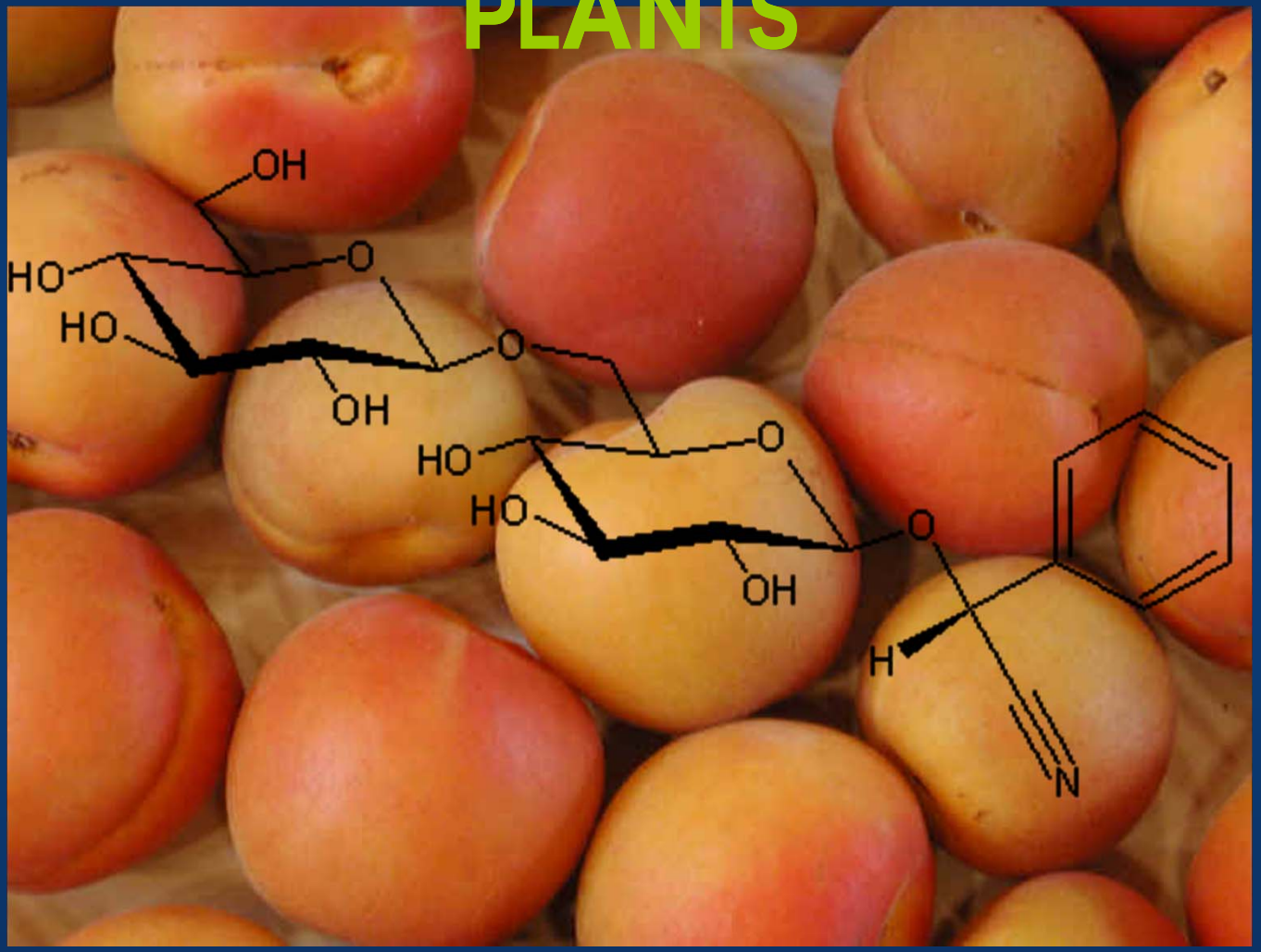
104 mg CN/ 100 g plant tissue

Wild Cherries

140-370 mg CN/ 100 g plant material

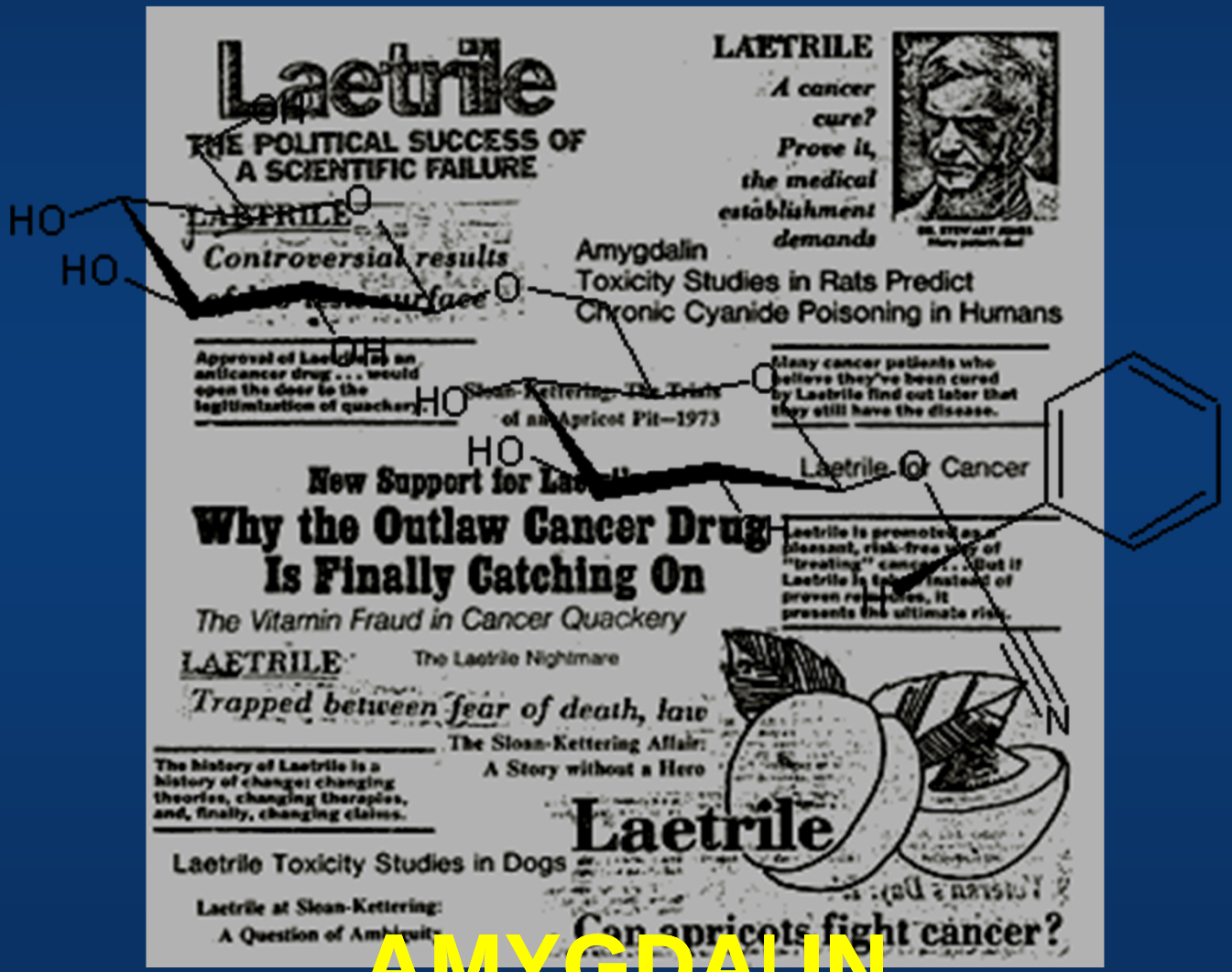
CYANIDE

PLANTS



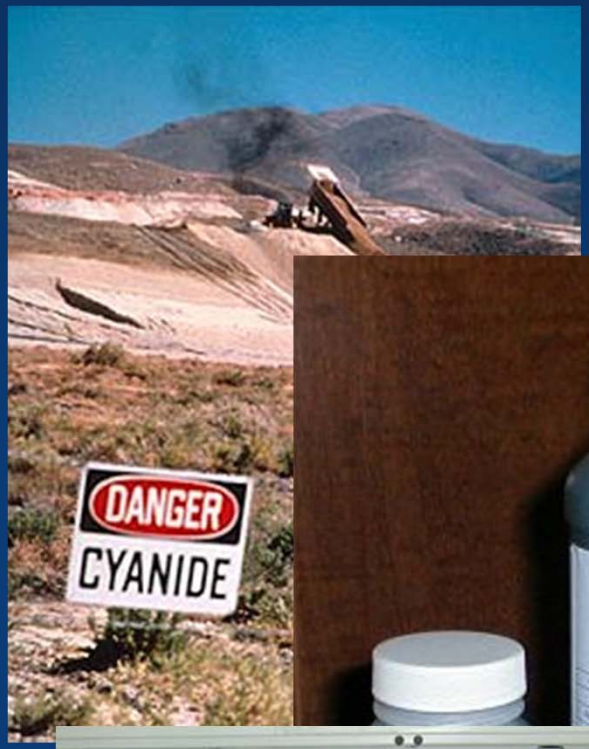
AMYGDALIN

CYANIDE
"DRUGS"



AMYGDALIN

CYANIDE
INDUSTRY



ELECTROPLATING

HARDENING METALS

GOLD EXTRACTION

LABORATORIES

CYANIDE

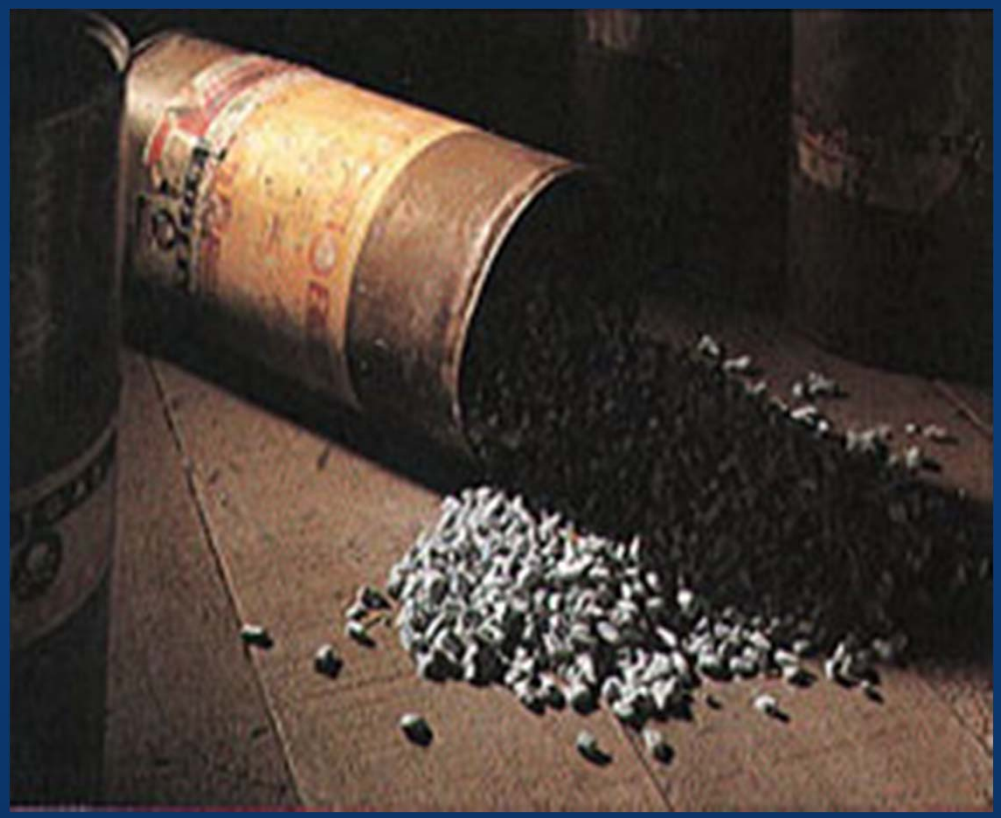
FIRE

CYANIDE/CARBON MONOXIDE

CYANIDE
RODENTICIDE/FUMIGANT

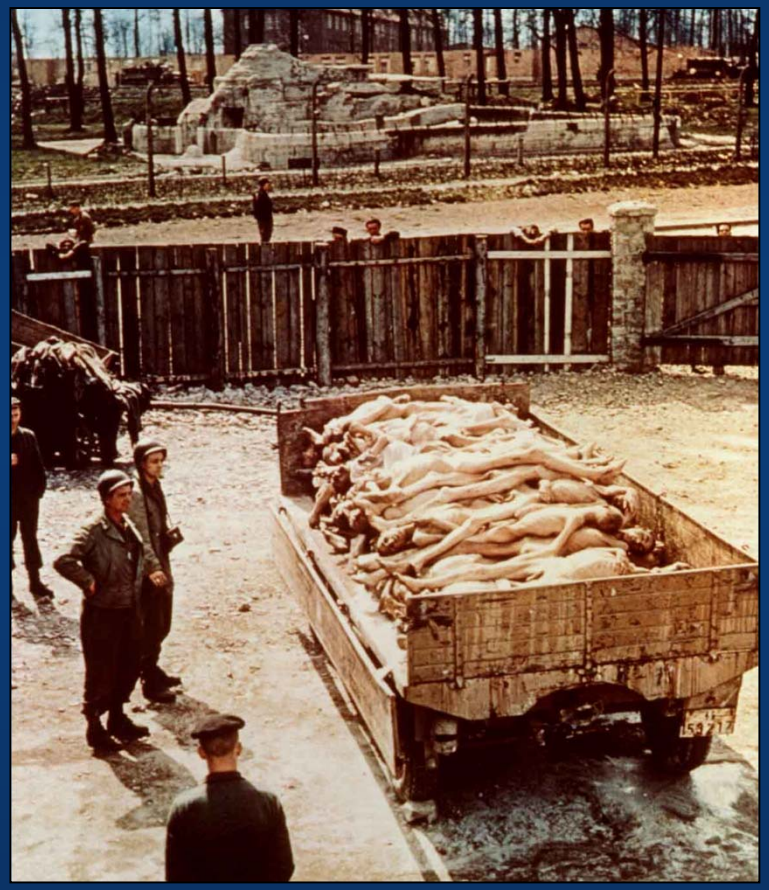
FERATOX/CYANIDE PASTE

CYANIDE
RODENTICIDE/FUMIGANT



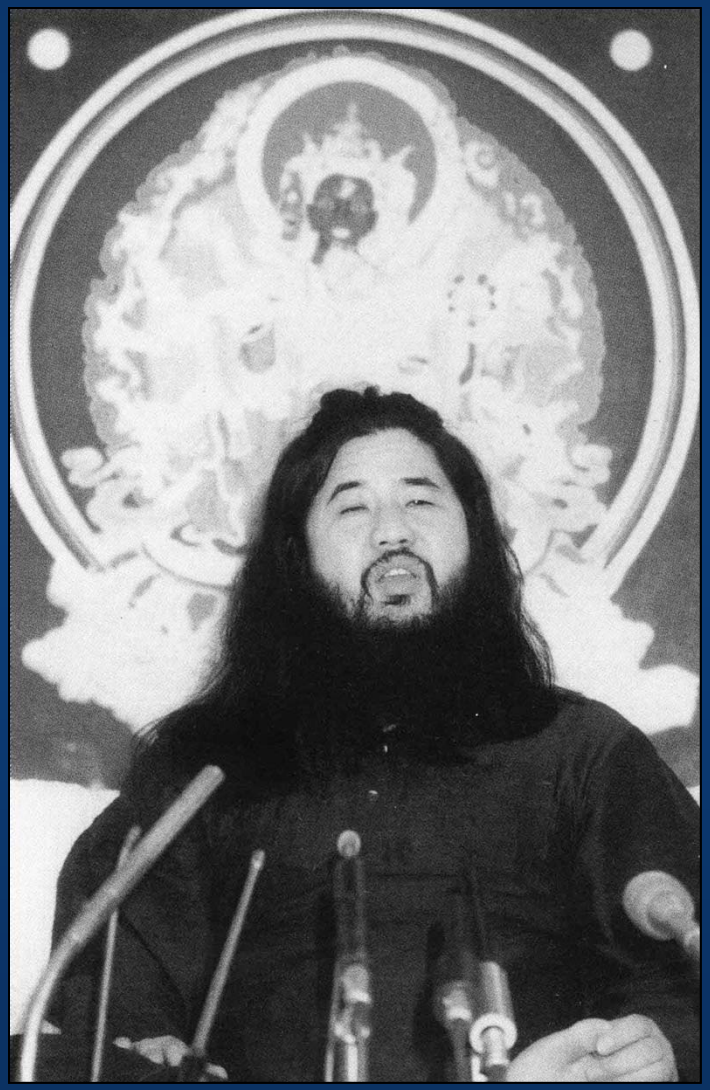
ZYCLON B

CYANIDE
RODENTICIDE/FUMIGANT



ZYCLON B

CYANIDE
CHEMICAL WEAPON

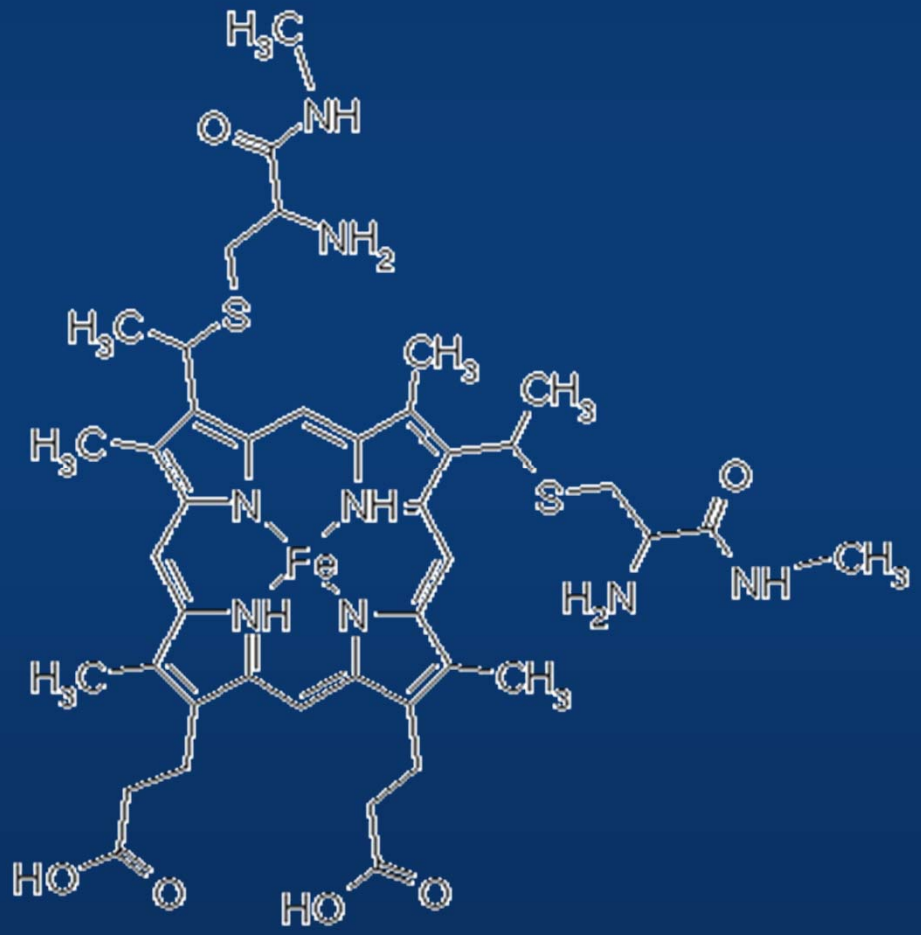


CYANIDE

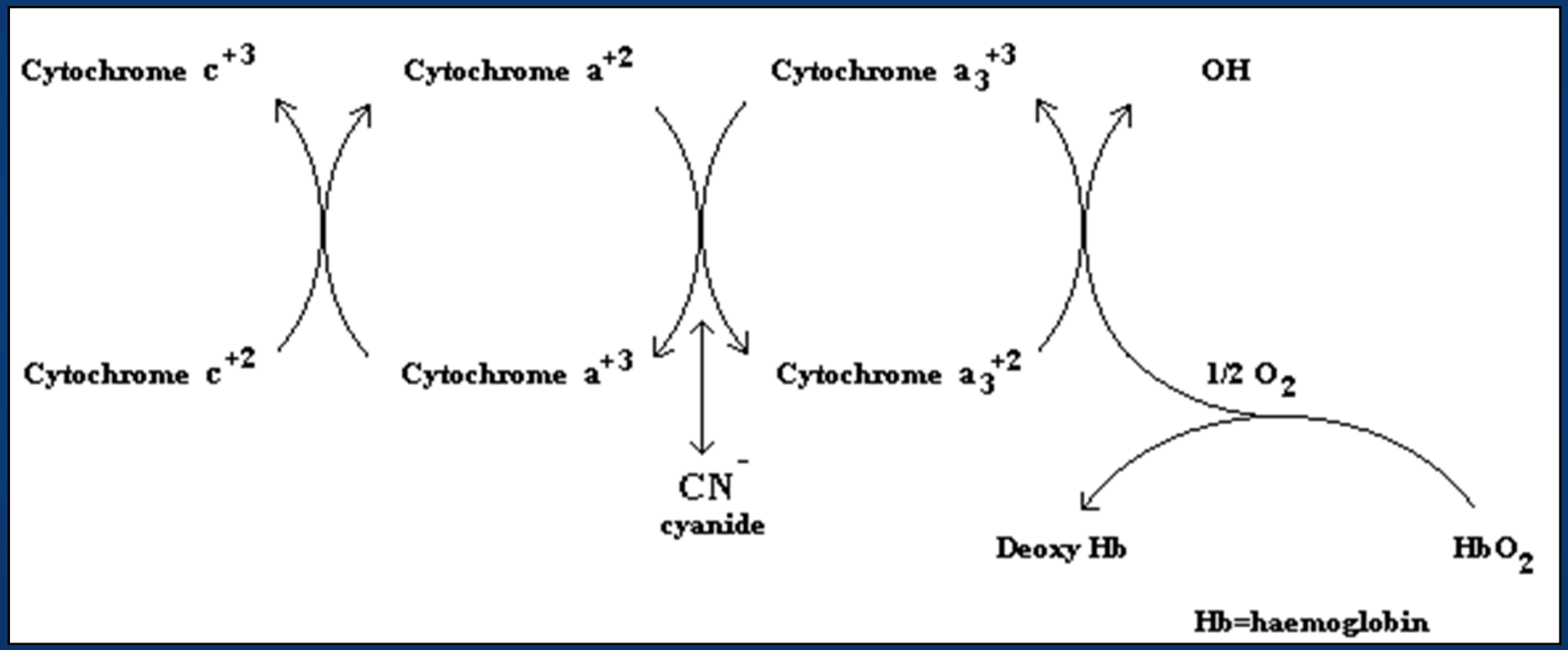
SUICIDE

CYANIDE
TOXIC MECHANISM

Heme group of mitochondrial cytochrome

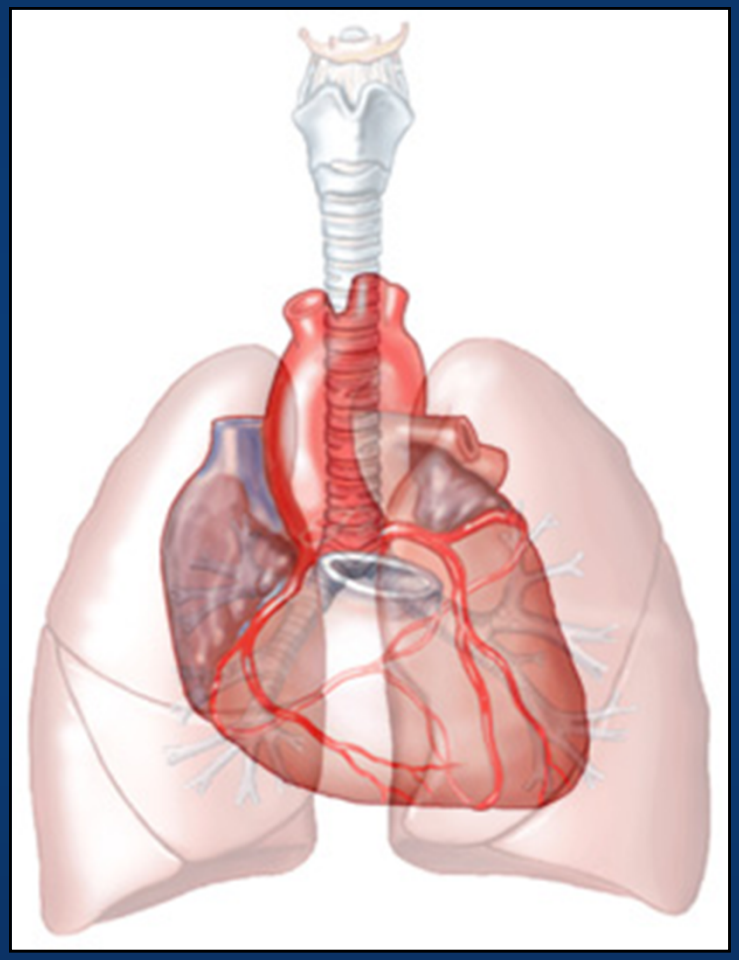


CYANIDE
TOXIC MECHANISM



"HISTIOTOXIC ANOXIA"

CYANIDE
TOXIC MECHANISM



VASOSPASM

CYANIDE
SIGNS AND SYMPTOMS

Mild Toxicity
- Nausea
- Dizziness
- Drowsiness

Moderate Toxicity
- Loss of consciousness for a short period
- Convulsion
- Vomiting
- Cyanosis

Severe Toxicity
- Deep coma
- Dilated non-reactive pupils
- Deteriorating cardio-respiratory function

CYANIDE
INVESTIGATIONS

History

- Occupation, access to cyanide

Smell

- Bitter almonds

ECG

- Sinus tachycardia/bradycardia
- Ischaemic changes

Pulse oximetry

- Normal

CYANIDE
INVESTIGATIONS

ABG

Metabolic acidosis, normal oxygen

Anion gap (Na^+ – [Cl^- + HCO_3^-])

Elevated

Serum lactate

Elevated

Blood cyanide level

Elevated – difficult to rapidly determine

CYANIDE
MANAGEMENT

HAZARD ASSESSMENT

ABC's

TOXICOKINETICS

- ABSORPTION
- DISTRIBUTION
- METABOLISM
- ELIMINATION

TOXICODYNAMICS

- SUPPORTIVE CARE

CYANIDE MANAGEMENT

HAZARD ASSESSMENT

Cyanide is hazardous by:

- Ingestion
- Respiratory exposure
- Dermal exposure

CYANIDE
MANAGEMENT

ABC's

Avoid:

mouth to mouth, or
mouth to nose artificial ventilation

CYANIDE
MANAGEMENT

DECONTAMINATION (absorption)

- Nasogastric aspiration
- Activated charcoal
- Gastric lavage
- Emesis

CYANIDE
MANAGEMENT

ANTIDOTES (distribution/metabolism)

Enhanced cyanide metabolism

Cyanide ion binding

CYANIDE
ANTIDOTES

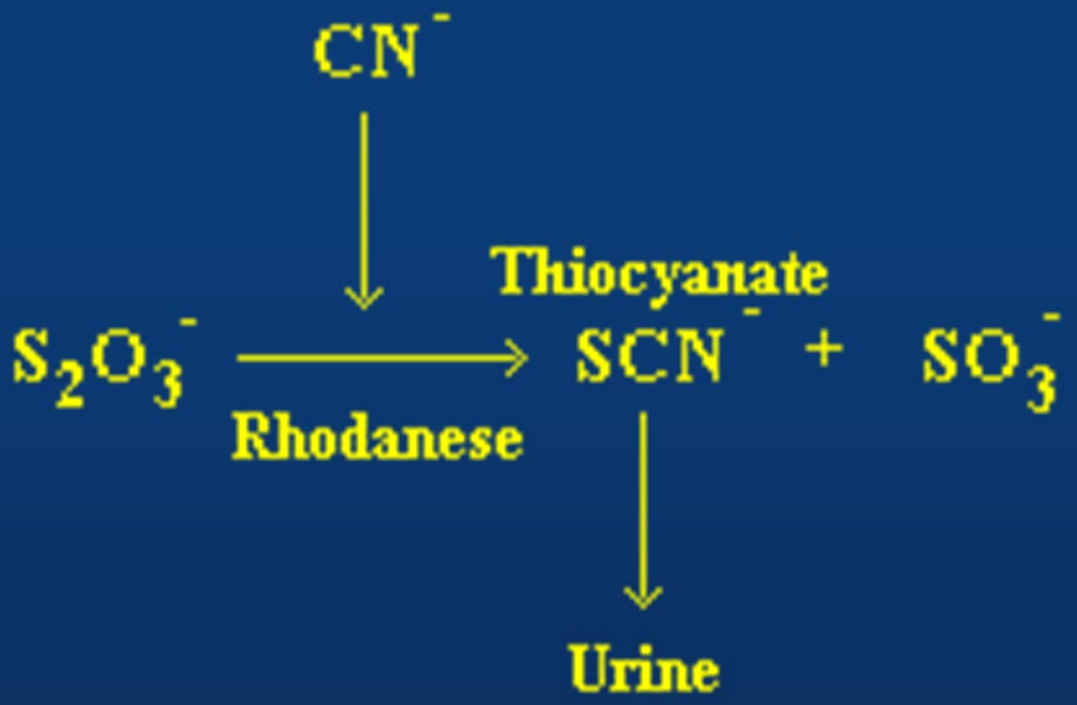
Enhanced cyanide metabolism

Enhancement of body's natural mechanisms for dealing with cyanide:

i. oxygen
ii. Sodium thiosulphate

CYANIDE
ANTIDOTES

Enhanced cyanide metabolism



CYANIDE
ANTIDOTES

Cyanide ion binding

Cobalt containing drugs

Methaemoglobin forming drugs

CYANIDE
ANTIDOTES

Cyanide ion binding

<u>Cobalt containing drugs</u>:

Cyanide ions will bind to cobalt which can be supplied in the form of either;

i. **Hydroxocobalamin, or**
ii. **Dicobalt edetate.**

CYANIDE
ANTIDOTES

Cyanide ion binding

<u>Methaemoglobin forming drugs</u>:

Cyanide will also bind to methaemoglobin formed after administration of:

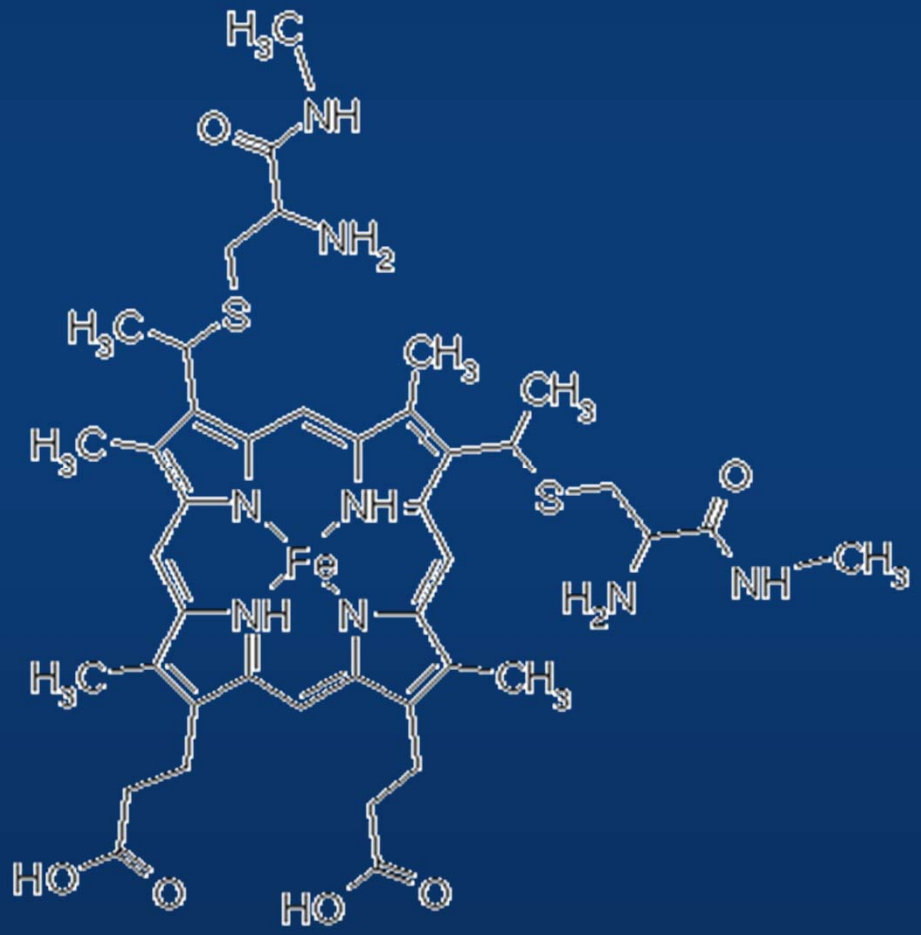
i. Amyl nitrite;
ii. Sodium nitrite, or;
iii. 4-dimethylaminophenol (4-DMAP)

CYANIDE
ANTIDOTES

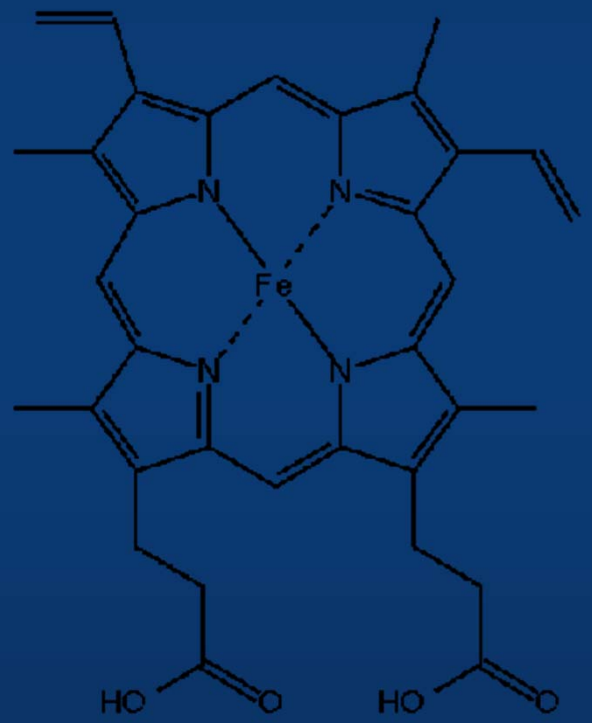
Cyanide ion binding

CYANIDE
TOXIC MECHANISM

Heme group of mitochondrial cytochrome



CYANIDE
TOXIC MECHANISM

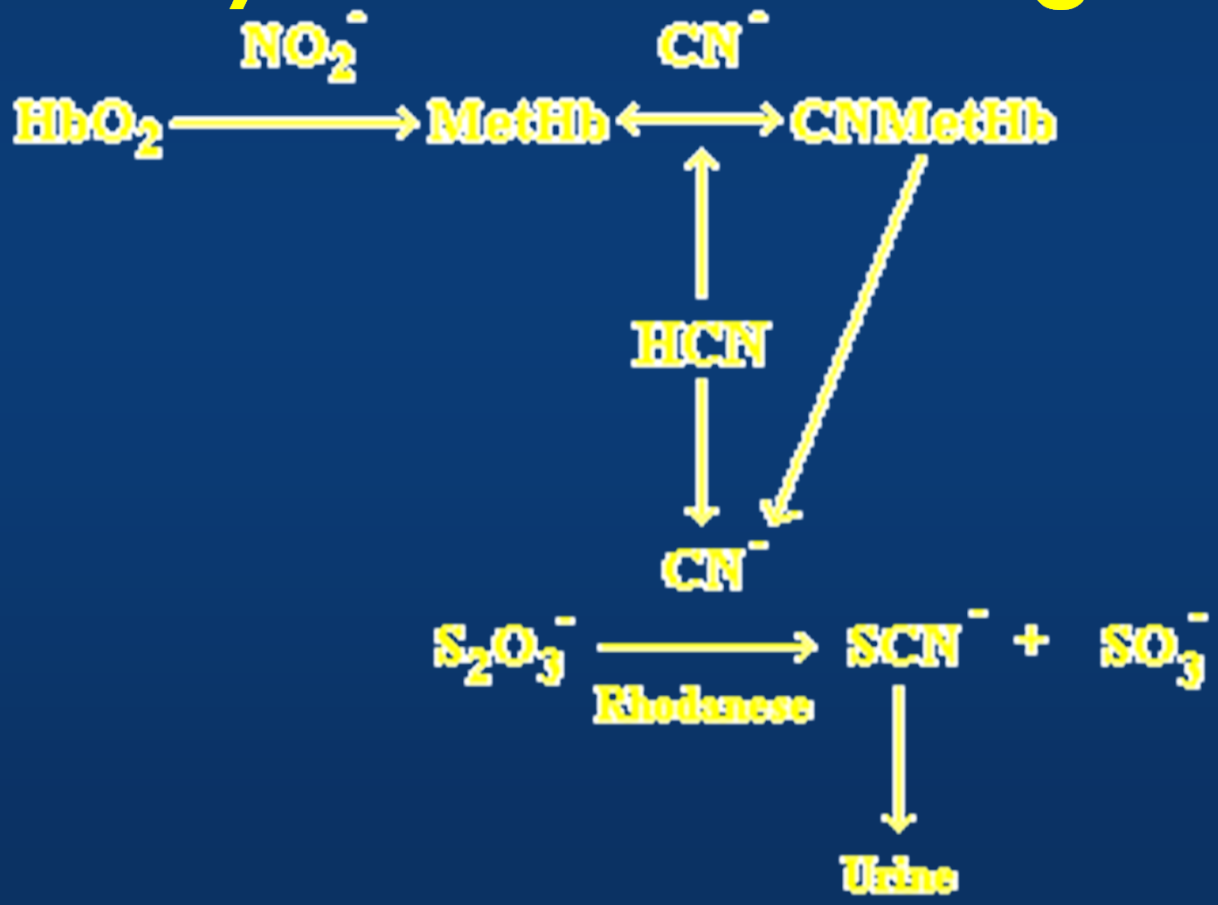


CYANIDE
ANTIDOTES

Cyanide ion binding

CYANIDE
ANTIDOTES

Cyanide ion binding



CYANIDE
FIRST AID

If the patient is unconscious:

Commence forced artificial ventilation with 100% oxygen using a mask and bag with a “non-return” valve (to prevent inspiration of inhaled gases)

Amyl nitrite may be administered via the ambu bag 0.2 - 0.4 mL for adults and 0.1 mL for children

NOTE:
Amyl nitrite forms a flammable mixture when combined with oxygen. It must therefore not be used in situations where it may be ignited.

CYANIDE
MILD POISONING

In those circumstances where an individual exposed to hydrogen cyanide by inhalation is conscious five minutes after exposure has ceased, and complains only of nausea, dizziness, drowsiness or other mild symptoms:

- **Oxygen**
- **Reassurance**
- **Bed rest**

CYANIDE
MODERATE POISONING

Those patients who have been observed to have lost consciousness for a short period, or are suffering convulsions, vomiting and/or cyanosis:

CYANIDE
MODERATE POISONING

Oxygen 100%: but for no longer than 12-24 hours

Amyl nitrite: 0.2 - 0.4 mL for adults and 0.1 mL for children via “ambu bag” (if there is delay in administering sodium thiosulphate)

CYANIDE
MODERATE POISONING

Then

<u>Sodium thiosulphate:</u> 50 mL of 25% solution (12.5g) IV over 10 minutes. In children the dose is 300 to 500 mg/kg

CYANIDE
MODERATE POISONING

Oxygen 100%: but for no longer than 12-24 hours

Amyl nitrite: 0.2 - 0.4 mL for adults and 0.1 mL for children via "ambu bag" (if there is delay in administering IV antidote)

CYANIDE
SEVERE POISONING

And either

Hydroxocobalamin: 5 g (70 mg/kg for children) by rapid IV infusion. This dose may be repeated once or twice, depending upon response, with IV infusions over 30 minutes to 2 hours

Sodium nitrite: 10 ml of 3% solution (300mg) IV for 5 - 20 minutes. May be repeated at half initial dose

Dicobalt edetate: 20 ml of 1.5% solution (300mg) IV over 1 minute followed immediately by 50 ml of hypertonic glucose solution. May be repeated twice

CYANIDE
SEVERE POISONING

Then

<u>Sodium thiosulphate:</u> 50 mL of 25% solution (12.5g) IV over 10 minutes. In children the dose is 300 to 500 mg/kg

CYANIDE