CASE OF RODENTICIDE POISONING

M6 UNIT

PROF. Dr. V. SUNDARAVEL UNIT

Dr. Vasif Mayan M C

A 36 year old male was brought to the AE ward at 1:20 am on 20/07/2014 with alleged history of consuming 3 tubes of RATOL PASTE (YELLOW PHOSPHORUS) 6 hours back

Present Illness

- history of Abdominal pain
  Nausea
  Vomiting

- No h/o fever
- No h/o pedal edema
- No h/o abdominal distension
- No h/o bleeding manifestation
- No h/o altered sensorium /seizures

History of Past Illness

- No h/o Jaundice
- No h/o Prior Blood transfusions
- No h/o DM /SHTN / Alcoholism/Hepatitis
- No h/o any regular intake of drugs

EXAMINATION

On admission patient was

conscious,oriented

afebrile,not dyspnoeic

non-icteric

no cyanosis,no clubbing,no pedal edema

Vitals

PR-88/min

RR-22/min

BP-120/70mmhg

SYSTEM EXAMINATION

- CVS S1 S2 heard,no murmur
- RS NVBS heard,no crackles/Wheeze
- P/A Epigastric tenderness +
  no organomegaly
- CNS No Focal Neurological deficit

BASELINE INVESTIGATIONS

• RBS	106 mg
• Hb	15.5gm%
• PCV	46%
• Platelets	2 Lakh/mm3
• Blood group	B Positive
• ICTC	Non Reactive
• HBsAg	Negative

TREATMENT GIVEN

- Stomach wash given
- IV Fluids
- 5% Dextrose infusion 4th Hourly
- NPO – Ryles tube aspiration
- Inj Cefotaxime 1gm iv BD
- Inj Ranitidine 50mg iv BD
- Syp LACTULOSE 30ml TDS
- Lactulose Enema
- Tab Silymarin 140 mg BD
- Tab UDCA 300 mg BD

On the 3rd Day

- General condition stable/ no e/o hepatic encephalopathy
- Oral fluids started
- Clinically icteric with Altered LFT profile
- USG abdomen : Normal study
- MGE opinion obtained

- STARTED
- Inj Glutathione 600mg iv BD
- Tab Liv 52 2 tds
- 2 pints of Fresh Frozen Plasma transfused owing to an increase in the PT and INR

LIVER FUNCTION TEST

	Day 1	Day 3	Day 5	Day 6	Day 8	Day 10
TOTAL BILIRUBIN	1.3 mg	2.5	7		3.7	1.3
DIRECT BR	0.8 mg	1.5	3.2		2.2	0.9
SGOT (IU/L)		1430		1173	973	41
SGPT (IU/L)		355		196	179	37
Alk Phosphatase		46		50	55	
PT	16	26			16	
INR	1.07	2.04			1.07	
Total Protein	5.8 gm	6.7 gm	6.9 gm		7.1	
S. Albumin		3.8 gm			4.2	
S. Globulin		2.9 gm			2.9	
A:G ratio		1.31:1			1.45	

RENAL FUNCTION TESTS

	Day 1	Day 3	Day 5	Day 7	Day 10
S. Creatinine (mg/dl)	0.8	1.5	1.3	1	0.9
B. Urea (mg/dl)	28	42	42	48	40
S. Sodium (mEq/L)	139	138	134	140	141
S. Potassium (mEq/L)	4.3	4.1	3.7	3.7	4

On 5th Day

- Clinical condition worsened
- Intractable vomiting
- Inversion of sleep Pattern
- Irritablity
- Increasing icterus
- Acutely elevated Liver enzymes and Bilirubin
- No e/o malena / hematemesis
- STAGE 1 HEPATIC ENCEPHALOPATHY
- Stricter management
- Inj N- Acetyl Cysteine 10ampoules in 500ml of 10% Dextrose every 4th Hourly

LIVER FUNCTION TEST

	Day 1	Day 3	Day 5	Day 6	Day 8	Day 10
TOTAL BILIRUBIN	1.3 mg	2.5	7		3.7	1.3
DIRECT BR	0.8 mg	1.5	3.2		2.2	0.9
SGOT (IU/L)		1430		1173	973	41
SGPT (IU/L)		355		196	179	37
Alk Phosphatase		46		50	55	
PT	16 sec	26			16	
INR	1.07	2.04			1.07	
Total Protein	5.8 gm	6.7 gm	6.9 gm		7.1	
S. Albumin		3.8 gm			4.2	
S. Globulin		2.9 gm			2.9	
A:G ratio		1.31:1			1.45	

On 8th day

- With strict supportive measures, the patient improved well
- Icterus reduced
- Became stable

- LFT parameters improved
- Inj Glutathione and N-Acetyl Cysteine Stopped

Day 10

- Clinically No icterus
- General condition Stable
- Liver and renal functions normal

- Patient was discharged and advised follow up for want of evaluation of Liver and renal parameters
- Psychiatric review advised

LIVER FUNCTION TEST

	Day 1	Day 3	Day 5	Day 6	Day 8	Day 10
TOTAL BILIRUBIN	1.3 mg	2.5	7		3.7	1.3
DIRECT BR	0.8 mg	1.5	3.2		2.2	0.9
SGOT (IU/L)		1430		1173	973	41
SGPT (IU/L)		355		196	179	37
Alk Phosphatase		46		50	55	
PT	26 sec				16	
INR	2.04				1.07	
Total Protein	5.8 gm	6.7 gm	6.9 gm		7.1	
S. Albumin		3.8 gm			4.2	
S. Globulin		2.9 gm			2.9	
A:G ratio		1.31:1			1.45	

DISCUSSION

RODENTICIDE POISIONING

- ORGANIC
  - coumarins
  - warfarins and superwarfarins
  - indandiones
- INORGANIC
  - thallium sulphate
  - yellow phosphorus
  - zinc phosphide
  - aluminium phosphide
  - arsenic

COUMARINS and INANDIONES

COUMARINS and INANDIONES

- Available as powder and tablet forms
- Coumarins and indandiones depresses the hepatic synthesis of vitamin k dependent clotting factors.
- They also increase the permeabilty of capillaries predisposing to haemorrhage.
- Mostly present as epistaxis, bleeding gums, hematuria, echymoses.
- Continuous Monitoring of PT is necessary.

COUMARINS and INANDIONES …

- Vitamin k1 phytonadione 12-25mg oral or 10mg parenterally.
- Intravenous infusion of vtamin k1(aquamephyton) in saline or dextrose is recommended for continuous bleeding.
- There is no need to begin therapy unless the

INR> 2 .No data exist to prove that such therapy prevents anticoagulation, although vitamin K therapy is shown to reverse anticoagulation once it develops.

- With long-acting anticoagulants, treatment may need to be at much higher doses and for a protracted period of time

THALLIUM SULPHATE

THALLIUM SULPHATE

- Insidious onset
- Similarity to Potassium ion
- Early symptoms include nausea,vomiting, bloody diarrhoea, stomatitis,salivation
- Liver injury can occur
- Muscle weakness, paresthesia, tremor, ptosis
- ataxia
- myoclonic jerks
- Hypotension, ventricular arrythmias
- ARDS

THALLIUM SULPHATE

- Antidote : upto 20 g per day of PRUSSIAN BLUE

- Hemodialysis

PHOSPHORUS

PHOSPHORUS poisoning

- Elemental phosphorus exists in two forms—red and yellow.

- Red phosphorus is nonvolatile, insoluble, and unabsorbable, and therefore nontoxic when ingested.

- Yellow phosphorus (also referred to as white phosphorus) is a severe local and systemic toxin causing damage to gastrointestinal, hepatic, cardiovascular, and renal systems

YELLOW PHOSPHORUS

- Yellow phosphorus is used as rodenticides and in fireworks.
- The most readily available source of yellow phosphorus today is rodenticides.
- Rodenticides are available as powders or pastes containing 2 to 5% of yellow phosphorus.
- Minimum dose 15mg; lethal dose 60mg (**1mg/kg**)
- Mortality rate 27% to 48%

YELLOW PHOSPHORUS

- Yellow phosphorus emits smoke(Phosphine gas) and has very strong garlicky odour. It can get absorbed through skin, mucus membrane, respiratory and gastrointestinal epithelium.

- Bile salts are important for absorption of phosphorus. Because of water content and low oxygen tension, phosphorus remains stable in gut for longer period.

- Phosphorus is a general protoplasmic poison causing cardiac, hepatic, renal, and multiorgan failure

STAGES …

The patient with yellow phosphorus intoxication passes through three stages.

FIRST STAGE- occurs during the first 24 hours in which patient is either asymptomatic or has signs and symptoms of local gastrointestinal irritation.

SECOND STAGE- occurs between 24 to 72 hours after ingestion. It is an asymptomatic period and the patient may be discharged prematurely.

There may be mild elevation of liver enzymes and bilirubin in this stage

Third stage (advanced) occurs after 72 hours until the resolution of symptoms or death.

- Hepatomegaly and jaundice appear-acute fulminant hepatic failure mandating liver transplantation.

- Bleeding can occur due to coagulopathy and thrombocytopenia
- Some patients may develop acute tubular necrosis and present with acute renal failure.

Third stage (advanced) occurs after 72 hours until the resolution of symptoms or death…..

- Hemolysis can occur due to destruction of RBC's by phosphorus

- Central nervous system effects include changes in mental status like confusion, psychosis, hallucinations, and coma.

- Cardiac toxicity includes hypotension, tachycardia, arrhythmias, toxic myocarditis and cardiogenic shock.

CLINICAL STAGING

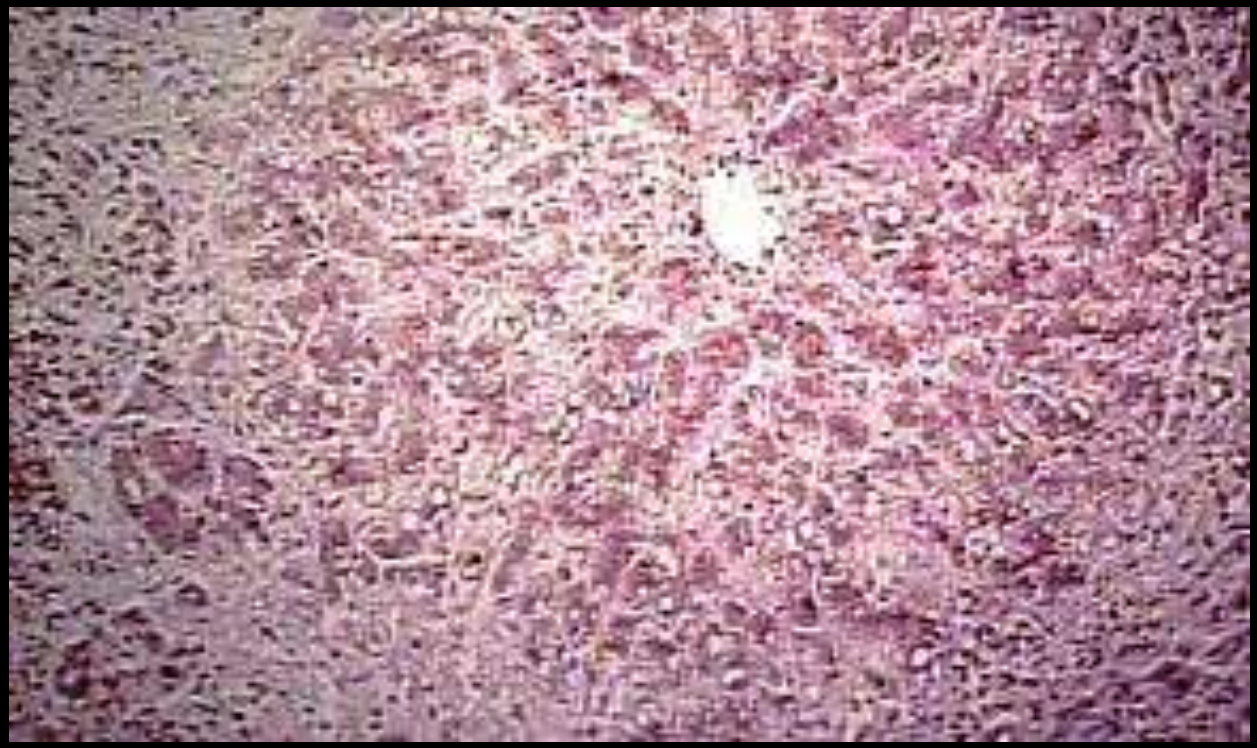
BASED ON THE DOSE

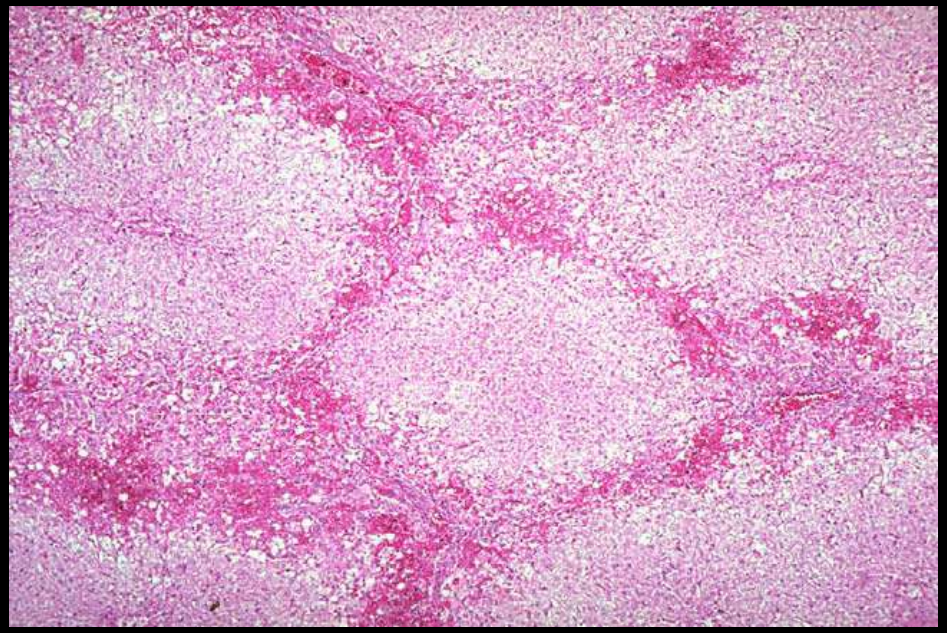
- CATEGORY 1 >/= 1mg/kg Body weight (LETHAL dose)
- CATEGORY 2 < 1 Mg/kg body weight (SUBLETHAL dose)

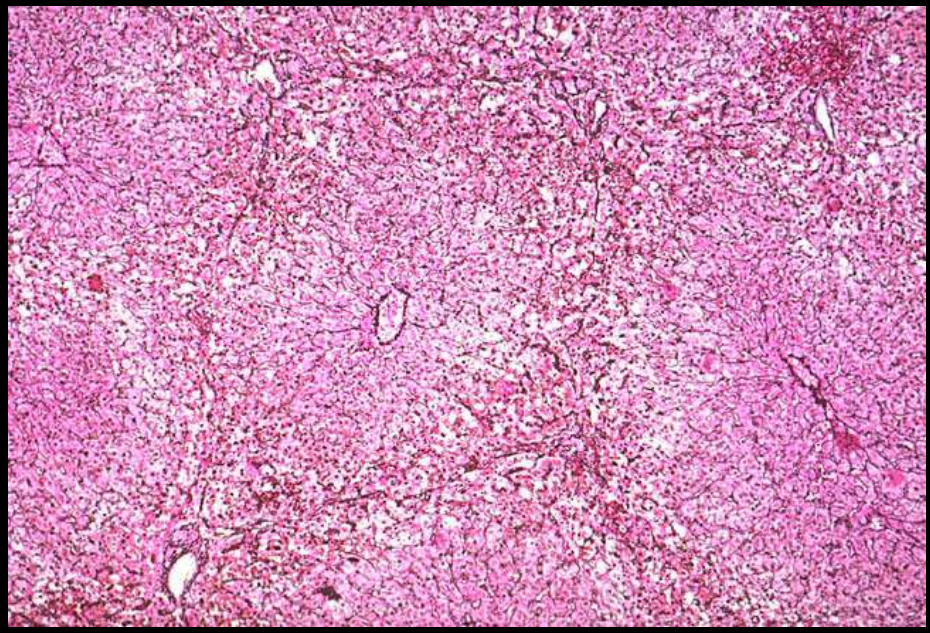
- BASED ON THE TIME DURATION

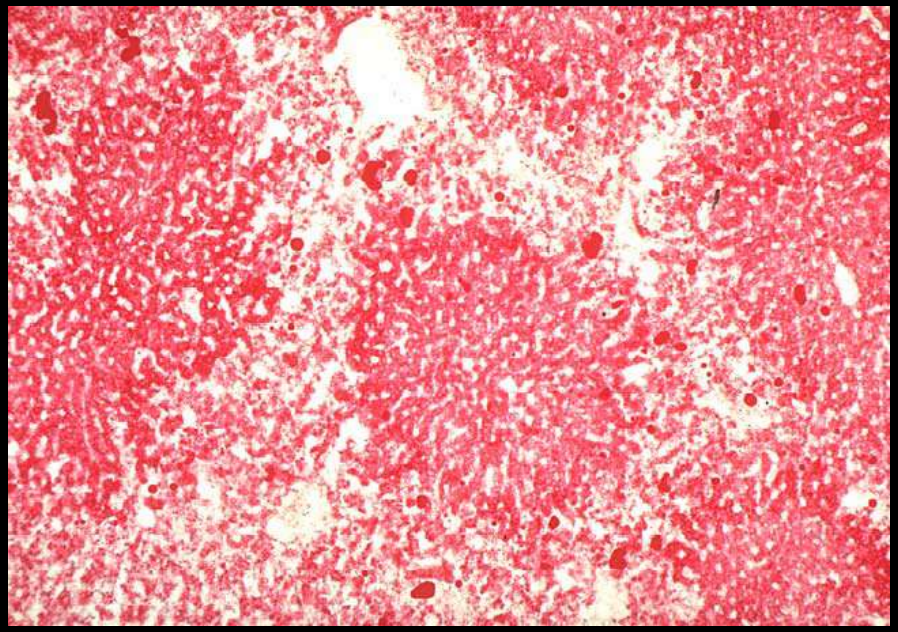
PATHOLOGY

- Liver shows extensive hepatocyte periportal necrosis with balloon degeneration.
- Acute Toxicity: Zone 1 necrosis +/-
- microvesicular steatosis.









MANAGEMENT

- There is no specific antidote for yellow phosphorus. Treatment is directed at removal of the poison and supportive therapy.
- N-acetyl cysteine can be tried if patient presents early.

N ACETYL CYSTEINE

- **IV continuous infusion**
- Acute ingestion (within 8-10 hr after ingestion)
- Administer as 3 doses
- Loading dose: 150 mg/kg IV; mix in 200 mL of D5W and infuse over 1 hr
- Dose 2: 50 mg/kg IV in 500 mL D5W over 4 hr, THEN
- Dose 3: 100 mg/kg IV in 1000 mL D5W over 16 hr

N ACETYL CYSTEINE

- **Intermittent IV administration (total treatment time 48 hr)**
- Late presenting or chronic ingestion (more than 10 h after ingestion) in patients >40 kg

- Loading dose: 140 mg/kg IV infused over 1 hr (dilute in 500 mL D5W), THEN
- Maintenance dose: 70 mg/kg IV q4h for at least 12 doses (dilute each dose in 250 mL of D5W and infuse over minimum 1 hr)

N-Acetyl Cysteine

2ml ampoule has 400mg

10 ampoules cost ~ Rs 500

Glutathione 600mg vial ~ Rs 1200

PHOSPHIDE

ZINC PHOSPHIDE

- Patients presents with same systemic toxicities encountered in yellow phosphorus poisoning jaundice,hepatic failure

- Tetany due to hypocalcemia

- Renal tubular damage
- Arrythmias ,cardiomyopathy

- Toxic dose : 500mg / 70 kg man

- Gastric lavage with potassium permanganate is recommended to convert the phosphorus to relatively harmless oxides.

- 0.1 to 0.2 % copper sulphate can be used. it will precipitate as copper sulphide and coat over phosphorus particles.it is also an effective emetic

- Charcoal can be used (1gm/kg body weight)
- Multi dose activated charcoal 0.5g/kg body weight every 6^{th} hourly

- vitamin k 10- 20mg iv in repeated dose
- Intravenous dextrose
- Fresh frozen plasma to correct coagulopathy.
- Non fatty purgatives like Magnesium Sulphate to eliminate phosphorus
- Avoid fatty foods since they promote phosphorus absorption.
- IV steroids
- exchange transfusion(for hemolysis)-but it does not prevent the onset of coma or increase survival.
- PD/HD if renal failure develops.

ARSENIC

ARSENIC

- Intrahepatic cholestasis
- Steatosis
- Zone 3 necrosis
- ↑ Mitotic activity
- Venocclusive disease

- Antidote : Dimercaprol and mercaptosuccinic acid
- Potassium supplimenatation

TAKE HOME MESSAGES..

Features of hepatotoxicity with inorganic phosphorus often develop 72 hours after ingestion of the poison.

During this time, the patient has only minor gastrointestinal symptoms or no symptoms at all.

Unless looked for specifically, clinical evidence of icterus or an abnormality in liver function tests can be missed and elevation of prothrombin time can be wrongly attributed to a warfarin containing rodenticide.

TAKE HOME MESSAGES..

- All rodenticide poisoning are not due to phosphorus derivatives
- Identifying exact component of rodenticide is mandatory before planning for discharge.
- LFT /PT should be mandatory in all cases.
- All rodenticide poisoning patients should be reviewed atleast once with LFT values in a week time.

THANK YOU