

# BASIC PRINCIPLES OF TOXICOLOGY

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## Introduction to Toxicology

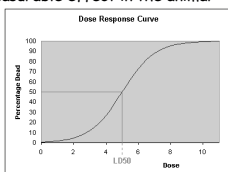
- ∞ Toxicology
- ∞ The study of harmful interactions between chemicals and biological systems.
- ∞ "The dose makes the poison"

## Introduction to Toxicology

- ∞ What factors affect toxicity?
- ∞ What is a  $LD_{50}$ ?
  - ∞ dose that is lethal to 50% of animals
- ∞ What is a dose-response relationship?
  - ∞ the effect of the poison is proportional to dose of poison

## Introduction to Toxicology

- The dose-response
  - The quantity of the poison is related to a measurable effect in the animal



## Introduction to Toxicology

- ∞ **What is a toxicity rating?**
  - ∞ Extremely toxic  $LD_{50} = < 1\text{mg/kg}$   
to
  - ∞ Relatively harmless  $LD_{50} = > 15\text{gm/kg}$
  - ∞ NOAEL - No Observable Adverse Effect  
Level

## Introduction to Toxicology

- ∞ **How does the exposure alter the toxicity?**
  - ∞ acute vs chronic
- ∞ **How does the route of exposure impact on toxicity?**
  - ∞ e.g. oral vs dermal

## Introduction to Toxicology

- ∞ **Why do poisons have different effects on animals?**
  - ∞ Selective toxicity
  - ∞ Breed toxicity
  - ∞ Sex
  - ∞ Age
  - ∞ Health

## PRINCIPLES OF TOXICOLOGY

- Stabilise the animal
- Limit Exposure
- Limit absorption
- Promote elimination
- Identify the poison

## PRINCIPLES OF TOXICOLOGY

### Treatment

Successful treatment - the four principles:

- Prevent absorption of poison
- Treat the clinical signs

"TREAT THE PATIENT NOT THE POISON"

- Identify the poison
- Give antidotes when available

## LIMIT EXPOSURE

Oral Route of Exposure

Emetic?

Activated Charcoal?

Gastric lavage?

Dilution?

Dilution (caustic or corrosive)



## LIMIT EXPOSURE

Emetics

Contraindications:

- Caustic or Corrosive?
- Petroleum?
- CNS depression?
- CNS seizures?

## LIMIT EXPOSURE

- Emetics

In The Home:

- Washing soda (Na Carbonate)
- Hydrogen Peroxide (3%)
- Dishwashing liquid in water
- Ipecac
- Table salt ??



## LIMIT EXPOSURE

- Emetics

In the Veterinary Clinic:

- Apomorphine
- Xylazine



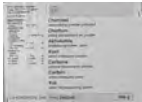
## LIMIT EXPOSURE

- Gastric Lavage:
- Intubate to prevent aspiration
- Right lateral recumbency
- Body inclined 20 degrees (head down)
- Warm water or saline flushes

## LIMIT ABSORPTION

Activated Charcoal

- Black powder slightly soluble in water
- Activated charcoal is made by pyrolysis of organic matter such as wood pulp and exposure to steam or oxygen
- Surface area is 1,000 M<sup>2</sup> per gram



## LIMIT ABSORPTION

### Activated Charcoal

- Constipating effect
- Binding to poison is reversible
- Laxative (e.g. sorbitol) to aid elimination

Adsorbs materials from water and air

Do not mix and allow to stand



## LIMIT ABSORPTION

### Activated Charcoal (Carbosorb)

- Exceptions to efficacy:
- Acids and alkalis
- Alcohol and ethanol
- Petroleum
- Metals like iron, mercury



## LIMIT ABSORPTION

### Activated Charcoal (Carbosorb)

#### Contraindications:

- No bowel sounds
- Corrosive ingestion
- Abdominal trauma
- Hypotension, dehydration (with Sorbitol)

## LIMIT ABSORPTION

### Activated Charcoal (Carbosorb)

#### Adverse effects:

- Black Stools
- Constipation
- Diarrhoea (sorbitol)
- Electrolyte imbalance (sorbitol)



## LIMIT ABSORPTION

Ion Exchange Resins



- Cholestyramine (Questran)
- Efficacy:
  - Antibiotics, phenobarbital
  - Digoxin, thyroxine, pesticides
  - E. coli enterotoxin, warfarin

## LIMIT ABSORPTION

Cholestyramine (Questran)

•Contraindications:

- Dehydration
- Constipation



## DECONTAMINATION

EYES

- Copious amounts of physiologic saline
- OR warm water
- Flush for 15 minutes

## DECONTAMINATION

DERMAL

NON-OILY COMPOUNDS



- Wash with copious amounts of water
- Mild detergent as needed, rinse well

## DECONTAMINATION

### DERMAL - OILY COMPOUNDS

- Cooking oil or liquid paraffin
- Wash with mild detergent
- Rinse with warm water



## DECONTAMINATION

### "ANTIDOTES"

- Atropine (or glycopyrrolate) (OPs)
- Acetyl cysteine (Parvolex) (paracetamol)
- Acetamide (1080)
- Ethanol (ethylene glycol)
- 4- methylpyrazole (ethylene glycol-dogs)
- Vitamin K



## DECONTAMINATION

### CHELATORS

- British Anti-Lewisite (BAL) (lead, arsenic)
- Calcium EDTA (lead, zinc)
- d-Penicillamine (lead, zinc, copper, iron )
- Dimercaptosuccinic acid (DMSA) (arsenic, copper, lead)

Poison Information:

New Zealand Poison Centre

Urgent only 0800 764 766

Non-urgent 03 479 7248 (9-5)

USA - National Animal Poison  
Control Center

[www.apcc.aspc.org](http://www.apcc.aspc.org)

## DECONTAMINATION

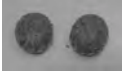
### SUMMARY

- THOROUGHLY DECONTAMINATE
- Emetics (apomorphine, xylazine)
- Activated Charcoal and sorbitol
- "Treat the Patient not the Poison."

### Case example of a "poisoned" dog:

Owner thinks the dog has eaten a  
rodenticide.

- ∞ What questions do you need to ask?
- ∞ If the dog ate 4 blocks of Talon, what  
do you need to know?



### Introduction to Toxicology

- ∞ Prevalence of poisonings in  
vet practice?
- ∞ What issues or questions  
arise in cases of poisoning?