

# BASIC PRINCIPLES OF TOXICOLOGY 227.305

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# Introduction to Toxicology

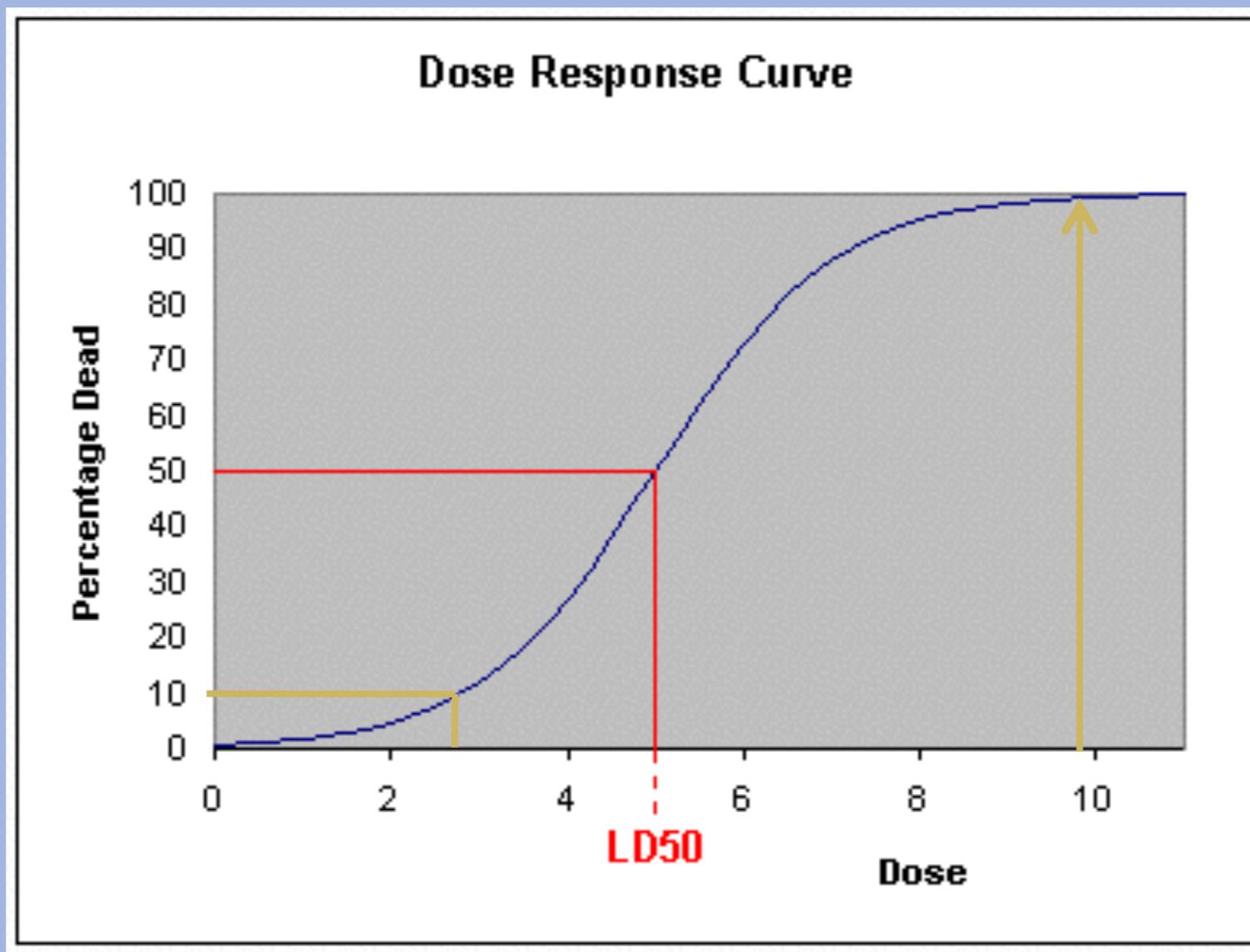
- Toxicology
  - The study of harmful interactions between chemicals and biological systems.
  - “The dose makes the poison”

# Introduction to Toxicology

- What factors affect toxicity?
- What is a LD<sub>50</sub>?
  - 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

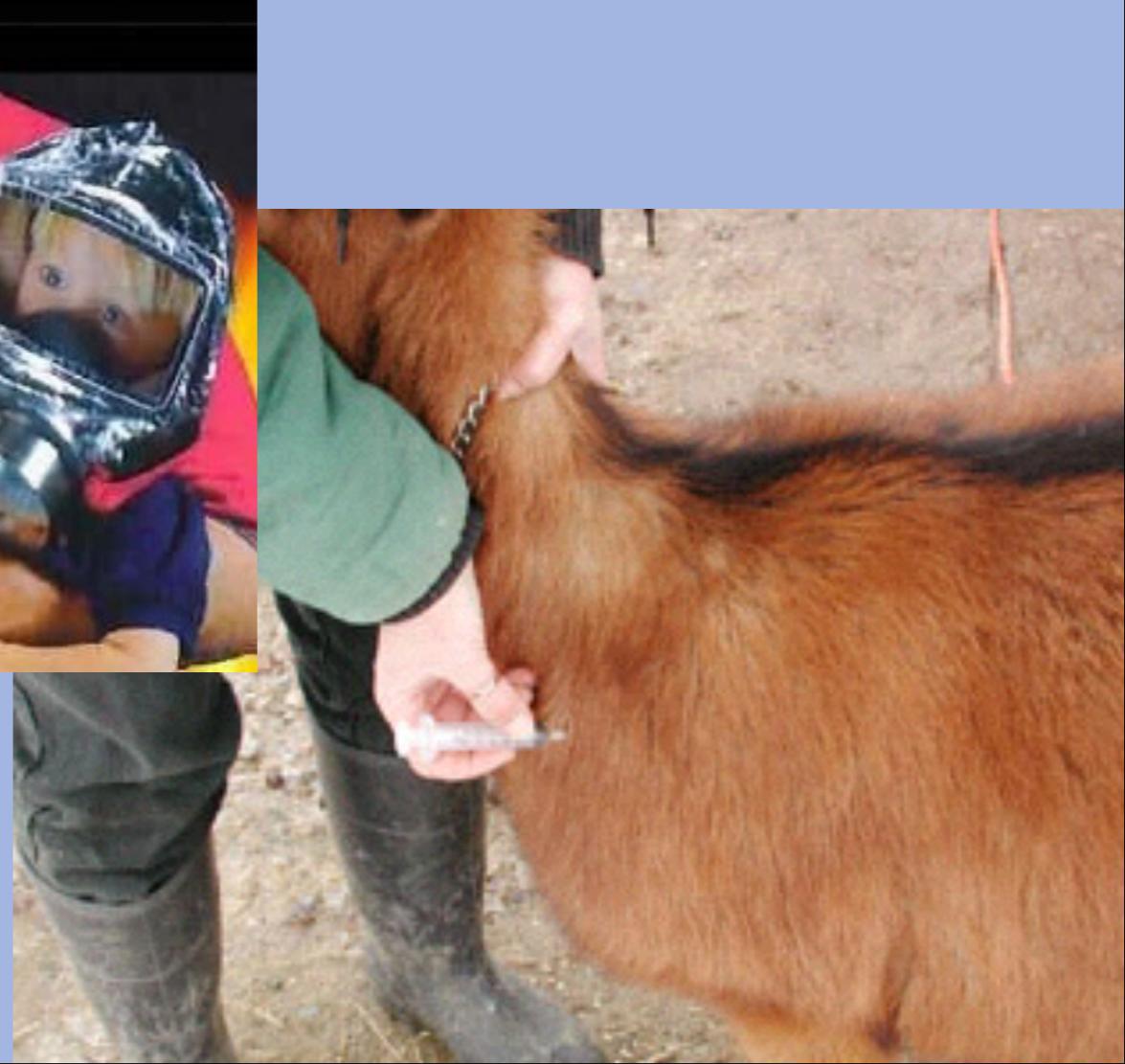
- What is a toxicity rating?
  - Extremely toxic  $LD_{50} = < 1\text{mg/kg}$  to
  - Relatively harmless  $LD_{50} = > 15 \text{ gm/kg}$
  - NOAEL - No Observable Adverse Effect Level

TOXICITY RATINGS	
CATEGORY	LD <sub>50</sub> (MG/KG) ORAL
EXTREMELY TOXIC	1 OR LESS
HIGHLY TOXIC	1 - 50
MODERATELY TOXIC	50 - 500
SLIGHTLY TOXIC	500 - 5000
	0.5 - 5 G/KG
PRACTICALLY NON TOXIC	5 - 15 G/KG
RELATIVELY HARMLESS	> 15 G/KG

# 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

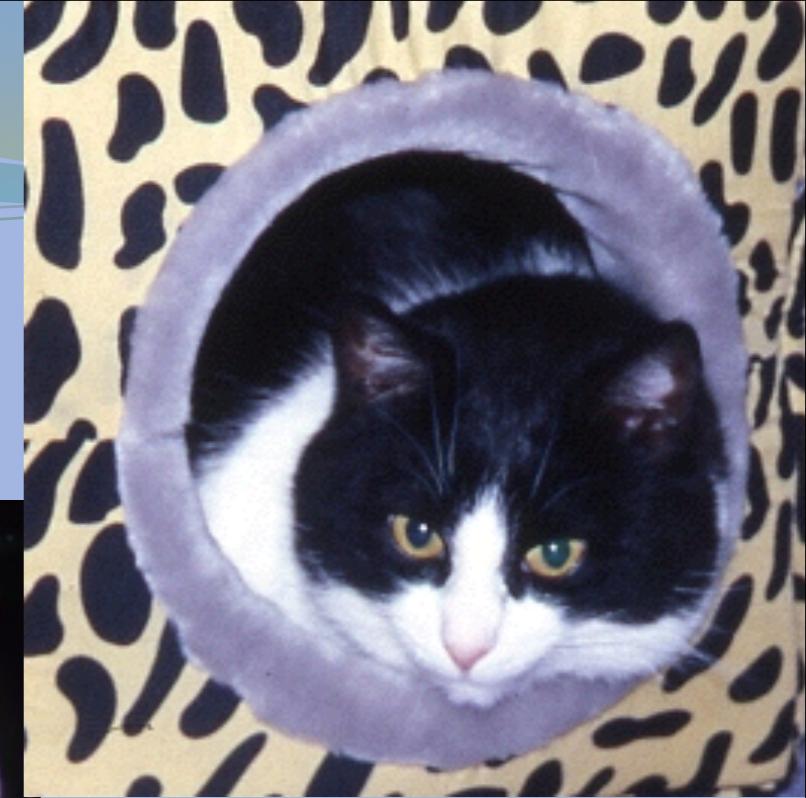
# Routes of Exposure



# TOXICOLOGY

## Animal Variation

- Species
- Breed
- 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?

Up to 4 hours post ingestion

Animal's wt

ID poison

LD50

Amount

Time frame

- Activated Charcoal?

- Gastric lavage?

- Up to 2 hours post ingestion

- Dilution?

# Dilution (caustic or corrosive)



# LIMIT EXPOSURE

## Emetics

### Contraindications:

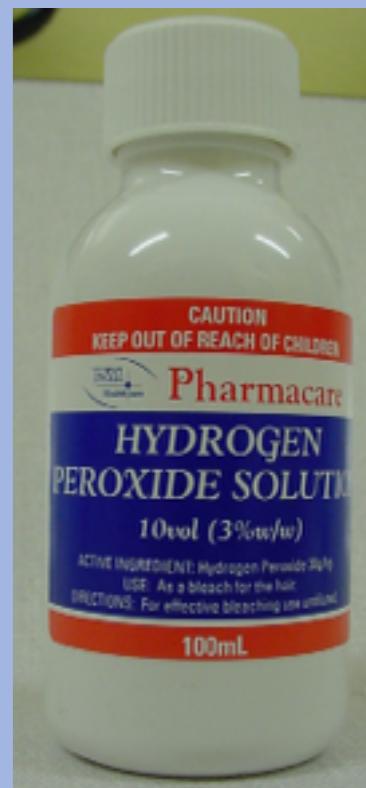
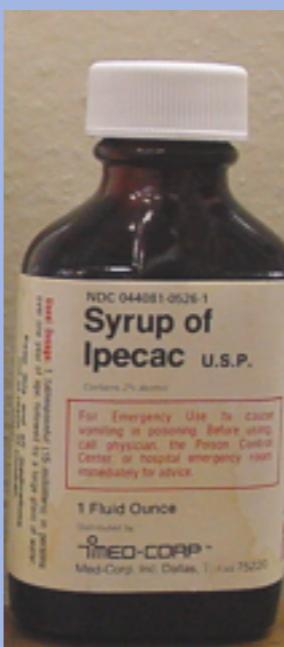
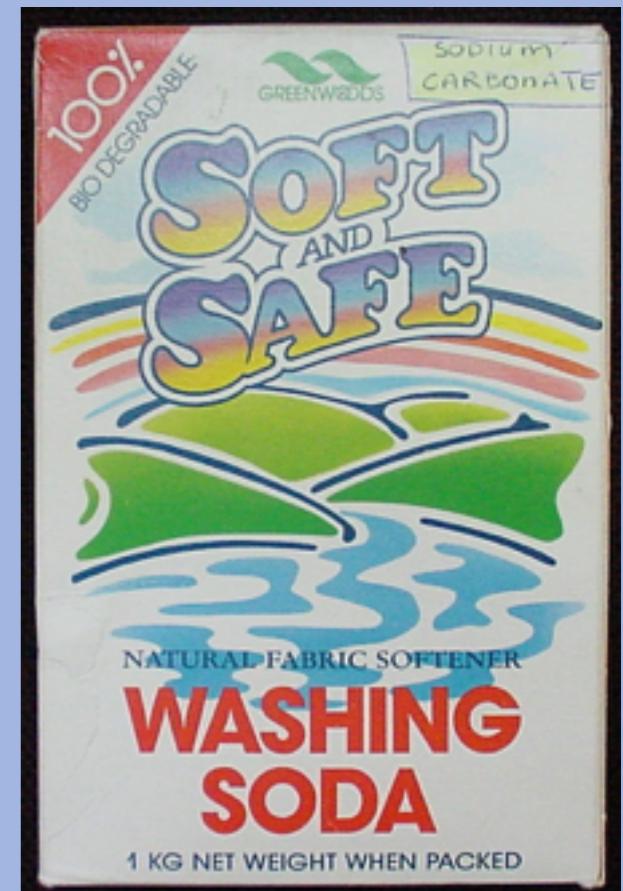
- Caustic or Corrosive?
- Petroleum?
- CNS depression?
- CNS seizures?

# 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



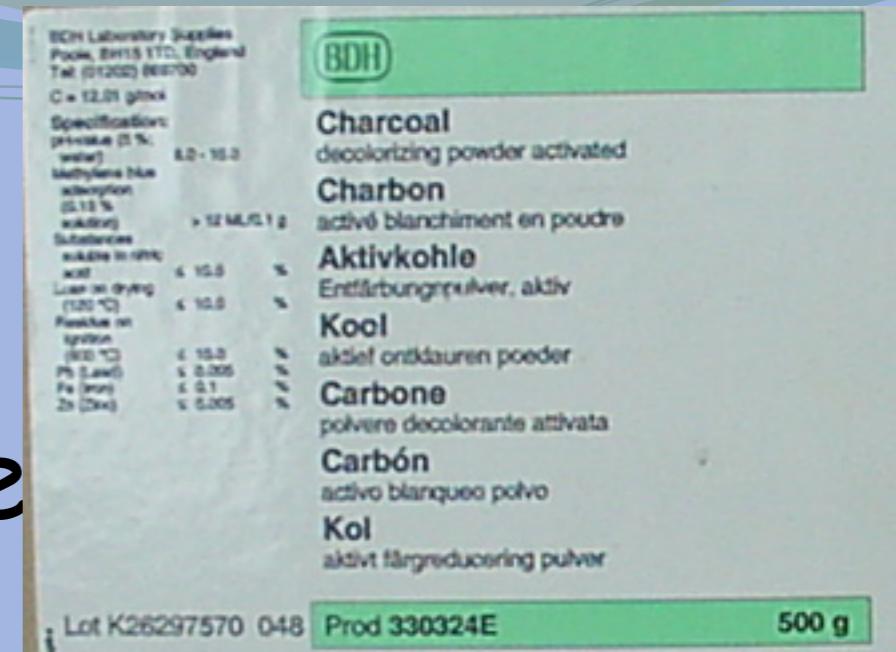
# LIMIT EXPOSURE

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

# LIMIT ABSORPTION

## Activated Charcoal

- Black powder slightly soluble water
- Activated charcoal (medical grade) is made by pyrolysis of organic matter such as wood pulp and exposure to steam or oxygen
- Surface area is  $1,000 \text{ M}^2$  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 alkalies
- 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
- Hypernatraemia
- 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

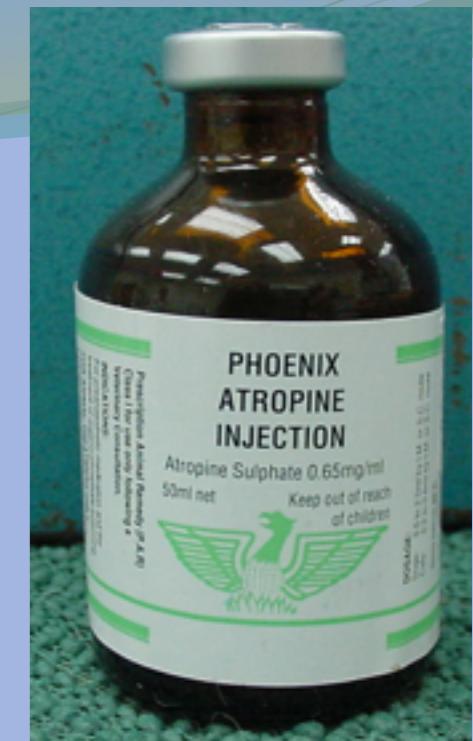
- Cooking oil or liquid paraffin
- Wash with mild detergent
- Rinse with warm water



# DECONTAMINATION

## “ANTIDOTES”

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



# DECONTAMINATION CHELATORS

Chelation therapy is the administration of chelating agents to remove heavy metals from the body.

- 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.aspca.org](http://www.apcc.aspca.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

## Issues to think about:

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