BASIC PRINCIPLES OF TOXICOLOGY

227.305

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Introduction to Toxicology

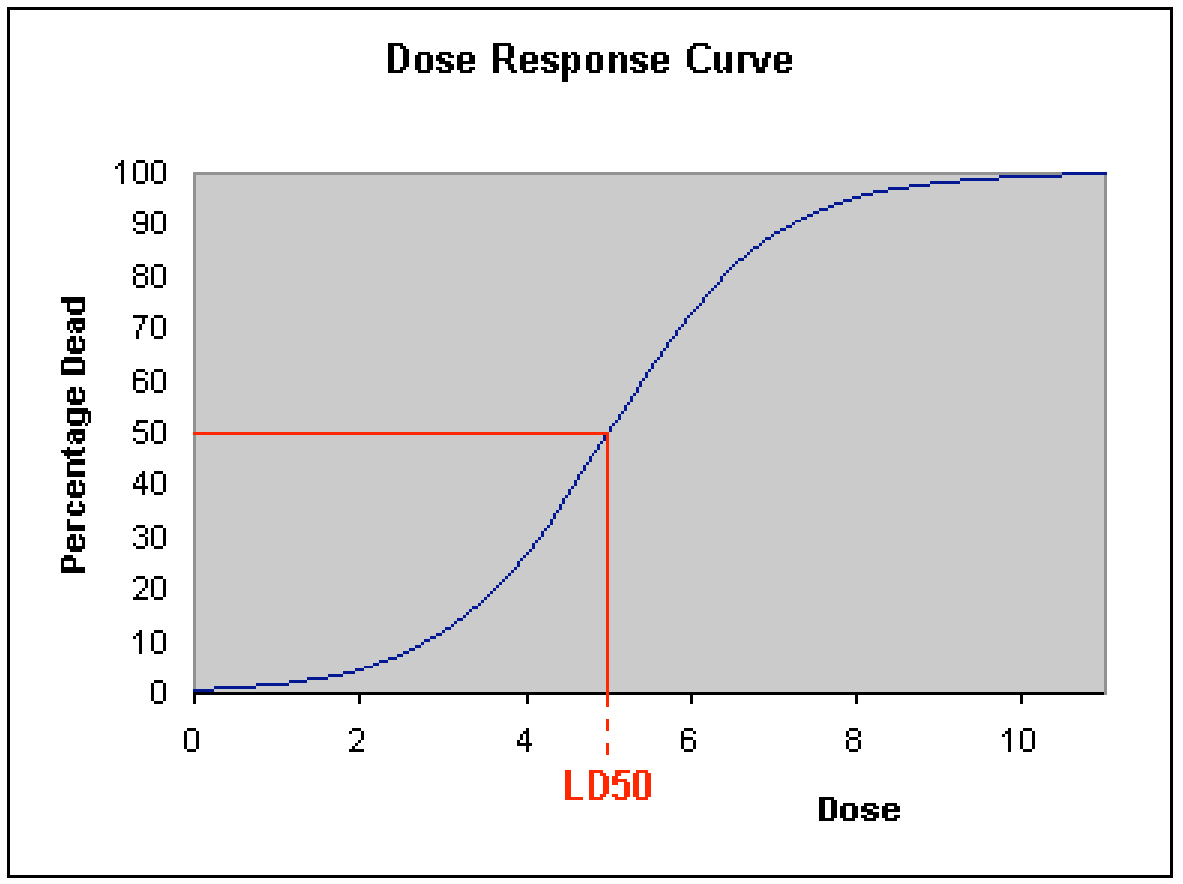
- Toxicology
  - The study of harmful interactions between chemicals and biological systems.
  - "The dose makes the poison"

Introduction to Toxicology

- What factors affect toxicity?
- What is a LD_{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} = < 1mg/kg

    to
  - Relatively harmless LD_{50} = > 15 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:

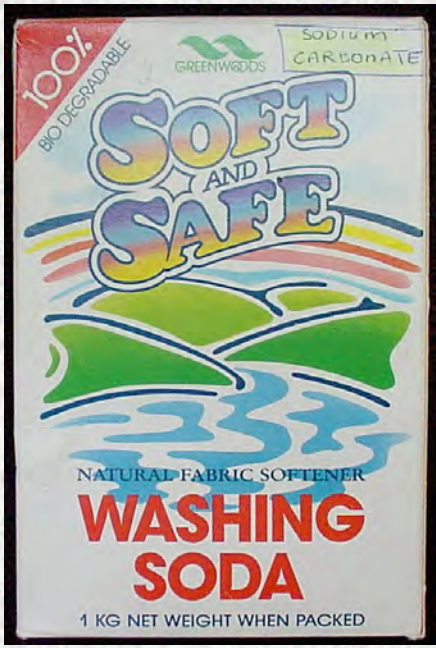
- Caustic or Corrosive?
- Petroleum?
- CNS depression?
- CNS seizures?

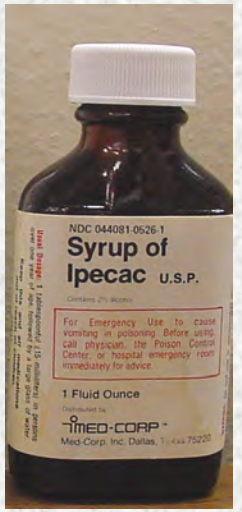
LIMIT EXPOSURE

- 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^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
- 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.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

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