General Management/Trearment Approaches of the Poisoned Animal

Refer lecturer for course updated notes.

Students are oblidged to follow the courses for evaluation process and presented notes are preliminary drafts for the whole evaluation process.

Important points

- Clinicians should be aware of the importance of history, triage, decontamination, and emergency management of the poisoned patient.
- Knowledge of the underlying mechanism of action, the pharmacokinetics, and the toxic dose of the toxicant are imperative in determining appropriate decontamination and therapy for the patient.
- Particular attention to the cardiorespiratory system, central nervous system, and gastrointestinal tract are important in the poisoned patient.

Before any treatment or decontamination process

- Remove the toxin from the animal
  - Incase of contact exposure
    - Remove the toxicant (wipe out), wash with water (cold water as hot water opens pores for more absorption), soap may be contraindicated as it may increase absorption of some chemicals
  - Incase of inhaled exposure
    - Remove the animal from the area to receive fresh air, avoid 100% oxygen as it may increase oxidative stress mechanisms involved in cytotoxic or other detrimental outcomes.
- Check for ABC!!!(Airway, breathing, circulation)

ABC

Monitor

- Continuous ECG (cECG)
- Blood pressure monitoring (BP)
- Central venous pressure (CVP)
- Urine output (UOP)
- Pulse oximetry
- End - tidal carbon dioxide (ETCO 2)
- Blood gas analysis

- Airway
  - comatose, unconscious, neurologically impaired (e.g.,decreased or absent gag refl ex), or with severe respiratory distress or dyspneashould be intubated with an endotracheal tube (ETT), connected to an oxygen source, and treated with positive pressure ventilation (PPV) or manual delivery of breaths
- Breathing
  - Apnetic-mechanic ventilation
- Circulation
  - mentation, mucous membrane color, CRT, heart rate, pulse quality and pressure, and body temperature.

Obtain appropriate history

- Knowledge of the underlying mechanism of action, the pharmacokinetics (including absorption, distribution, metabolism, and excretion), and the toxic dose of the toxicant are imperative in determining appropriate decontamination and therapy for the patient.

Decontamination

- inhibit or minimize further toxicant absorption
- promote excretion or elimination of the toxicant from the body.
- Pet owners and veterinary staff be protected from the toxic agent (e.g., pyrethrin, organophosphate, corrosive or caustic chemical, etc.). Appropriate protection should be used (e.g.,rubber gloves, waterproof apron, face shield, etc.).

Inhibition of absorption

Ocular decontamination

- Difficult-restain animal/Elizabethan collar
- Decontamination/Inhibit secondary injury to the cornea (prevent corneal abrasion/ulceration)
- Corrosive irritant
  - Flush the eye at with physiological saline (e.g., contact lens solution *without* any cleaners, soaps, etc.) or tap water for 15 –20 minutes
- Noncorrosive irritant
  - Flush the eye at with physiological saline (e.g., contact lens solution *without* any cleaners, soaps, etc.) or tap water for 10-15 minutes
- Do not directly use ophthalmic ointments or medications incase not needed (blepharospasm, pupil size change, pruritis, ocular discharge)

Inhibition of absorption

Dermal decontamination

- Prevent oral reexposure from the pet grooming itself and to prevent transdermal absorption
- Clipping of the hair- particularly in long haired pets or patients that cannot be bathed.
- Oil - based toxicities (e.g., pyrethrins)
  - Tap water and a liquid dish degreasing detergent multiple times. No pet shampoos (containing insecticides, coal tar, antibiotics, or antifungals)
- Caustic, acidic, or alkaline exposure- gentle decontamination
  - Flush with tap water for 15 –20 minutes, making sure not to traumatize the area with abrasive scrubbing or high -pressure water sprays.
- Do not use “ neutralizing ” agents on the skin (e.g., an acid for an alkaline exposure)- a chemical reaction that results in more serious dermal injury.

Inhibition of absorption

Inhalant decontamination

- Remove the patient from source of exposure
- humidified oxygen source, monitoring of oxygenation and ventilation (e.g., via arterial blood gas analysis, pulse oximetry, co -oximetry, etc.) and rarely, mechanical ventilation
- The area should be adequately ventilated to prevent reexposure by persistent toxic fumes.

Inhibition of absorption

Injection Decontamination

- Remove stinger or venom sac gently-use tweezer using magnifier if required
- Do not make incision or suck the venom from bite wound for snake bites- Detailed information would be provided in the venomous animal section

Inhibition of absorption

Gastrointestinal decontamination

- Emesis is contraindicated incase
  - 1. Species
    - Horses, rats, rabbits, guinea pigs, and japanese quail cannot vomit
    - Cattle (extremely rare)- do not induce emesis!!!!
  - 2. Time frame
    - If several hours have passed, toxic contents may have moved out of the stomach
    - 1 hour following ingestion (salicylates, opioids, anticholinergics, and TCA antidepressants can delay gastric emptying)
  - 3. Underlying medical problem
    - Brachycephalic syndrome (e.g., stenotic nares, everted saccules, hypoplastic trachea, and elongated soft palate) may be at higher risk for aspiration
    - Dogs with a prior history of laryngeal paralysis, megaesophagus, aspiration pneumonia, upper airway disease,

Inhibition of absorption
Gastrointestinal decontamination

- Emesis is contraindicated incase
  - 4. CNS deppressed
    - Excessive sedation, CNS deppression- decreased gag reflex, lower seizure treshold- unable to protect airway-aspiration penumonia
  - 5. Corrosive or caustic agent
    - Damage to the esophagus, oropharynx, and GIT when these agents are
    - expelled.
  - 6. Hydrocarbons
    - Low - viscosity liquids can be easily aspirated into the respiratory system, resulting in severe aspiration pneumonia. Examples include gasoline, kerosene, motor oil, transmission fl uid, tiki torch oil, citronella, etc.

Emetics

- 3% hydrogen peroxide. Others that have been previously recommended include table salt (sodium chloride, or NaCl), liquid dishwashing detergent, or 7% syrup of ipecac
- Apomorphine (tablets, capsules, or injectable)
- Alpha 2 - adrenergic agonist agents like xylazine

- Gastric Lavage- Cattle (Warm tap water)
- Whole bowel irrigation- large amounts of polyethylene glycol electrolyte solution (PEG -ES, or PEG; e.g., Golytely) until effluent (e.g., stool) is clear.

Binding Compounds

- Activated charcoal
- Universal antidote

Contraindications for Administration of AC	
Central nervous system depression (decreased level of consciousness)	Diminished gag reflex or compromised airway (increased risk of aspiration pneumonia)
Time frame for benefits of AC are exceeded (eg, late stage presenting with clinical signs already present)	Toxicants that do not reliably bind, including ethylene glycol, xylitol, and heavy metals
Ingestion of corrosive/caustic agents	Ingestion of hydrocarbons
Dehydration or hypovolemia	Ingestions of salt (eg, paintballs, homemade play dough, ocean water, table salt)
GI obstruction or perforation	Ileus/GI stasis
Imminent endoscopy or surgery	Hyperosmolar states (eg, renal disease, diabetes mellitus, psychogenic polydipsia, diabetes insipidus)
Hypernatremia	Underlying medical condition predisposing to aspiration pneumonia (eg, laryngeal paralysis, megaesophagus, upper airway disease)

- Compounds that bind AC

Acetaminophen
Amphetamines
Antibiotics
Anticoagulant rodenticides
Anthelminthics
Aspirin
Atropine
Barbiturates
Camphor
Cantharides
Carbamates
Carbamazepine
Chlordane
Chloroquine
Chlorpheniramine
Cocaine
Diazepam
2,4-D (dichlorophenoxy acetic acid)
Digitalis
Digitoxin
Ethylene glycol
Fungicides
Hexachlorophene
Ipecac
Isoniazid
Mefenamic acid
Meprobamate
Methyl salicylate
Methylene blue
Morphine
Muscarine
Narcotics
Nicotine
Nortriptyline
Organic iodine
Organic metal compounds
Organochlorine insecticides
Organophosphorus insecticides
Phenobarbital
Phenothiazine
Phenylbutazone
Phenylpropanolamine hydrochloride
Phenytoin
Quinacrine hydrochloride
Quinidine
Quinine
Salicylamide
Salicylates
Strychnine
Sulfonamides
Theophylline
Tricyclic antidepressants

Cathartics

- increase the speed and transit time of the GIT, promoting fecal excretion of the toxin; more importantly, carthartics decrease the time allowed for toxin absorption through the GIT.
- Saccharide cathartics (e.g., sorbitol)
- Saline cathartics (e.g., magnesium citrate, magnesium sulfate, sodium sulfate)
- Oil based-contraindicated- as it may increase absorption of lipophilic toxicants (organophosphates etc)
- Mineral oil is *no* longer recommended as a cathartic due to the high risks of aspiration.
- Do not use in dehydrated patient

Fluid therapy

- Correct dehydration
- Increase renal excretion of toxicants by forced diuresis (Phenobarbital, Amphetamines, Salicylate, Lithium, Bromide)
  - Highly protein -bound toxins are not cleared by diuresis (e.g., NSAIDs).
- Maintain perfusion at a cellular level
- Diurese (particularly with nephrotoxic agents like NSAIDs, lilies, etc.)
- Treat hypotension (particularly with drugs like beta -blockers, calcium channel blockers, ACE -inhibitors, etc.)

Surgical Decontamination

- Radiographic confirmation (not all foreign bodies are radioopaque)

  * caustic or corrosive (e.g., batteries)

  * bezoar that cannot be removed by gastric lavage (e.g., iron tablets, bone meal),

  * results in foreign body obstruction (e.g., Gorilla glue),

  * or continues to leach their toxic effect (e.g., Amitraz collars, zinc pennies, fentanyl or nicotine patches, etc.).

Metabolism Modulators

- CYP Inducers- toxicants biodegraded (barbiturates etc)
- CYP Inhibitors- toxicants bioactivated

Supportive Therapy

- Cardiovascular support (Dopamine, doputamine, norephedrine, ephedrine, vasopressin, digoxin)
- Gastrointestinal support (H2 antagonists, proton pump inhibitors, sucralfate, antiemetix therapy)
- Neurologic support (Methocarbamol, Diazepam, Phenobarbital, Pentobarbital, Propofol)
- Analgesics/Sedatives (acepromazine, chlorpromazine)
- Nutritional support
- Other (Seratonin antagonists for seratonin syndrome, N – acetylcysteine for acetominophen toxicity, S - adenosyl - methionine (SAMe) can be used as a hepatoprotectant and antioxidant, help with glutathione production and maintenance; Ascorbic acid (vitamin C) can be used as an antioxidant and to help reduce MetHb to Hb)

Antidotes

- *Chemical or causal antidotes*
  - work directly on the toxicant.
  - bind with the toxicant to yield an innocuous compound that is excreted from the body.
- *Functional antidotes*
  - have no chemical or physical interaction with toxicants
  - but work to lessen the clinical signs associated with intoxication.
- *Pharmacological or physiological antidotes*
  - Competitive/non-competitive
  - prevent the formation of toxic metabolites, facilitate a more rapid elimination of a toxicant

Chemical antidotes

- Antivenom (spider, snake)
- Chelating agents
  - Calcium disodium ethylenediaminetetraacetic acid or CaNa 2 EDTA
  - D - penicillamine (Cuprimine)
  - Deferoxamine
  - Dimercaprol (BAL)
  - Dimercaptosuccinic acid (DMSA)
- Digoxin immune Fab fragments
- Pralidoxime (2 - PAM — Protopam)

Functional antidotes

- Acetylcysteine
- Bisphosphonates
- Calcitonin
- Cyproheptadine
- Intravenous fat emulsion
- Phytonadione

Skeletal muscle relaxants

- Methocarbamol
- Dantrolene

Pharmacological or Physiological Antidotes

- Atipamezole, yohimbine
- Atropine
- Ethanol
- Fomepizole or 4 –MP
- Flumazenil
- Naloxone