GENERAL DIAGNOSIS AND TREATMENT OF TOXICITY

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Diagnosis of poisoning is based on:

1. **History** - Complete history is important to make an accurate diagnosis and begin appropriate treatment. You should have the following information available: 1) sex, age, weight, and number of exposed or sick animals; 2) a list of signs of illness in the order they appeared; 3) any prior disease conditions; 4) any medications the animal is receiving; 5) possible related events, for example, change in diet or water source, other medications, feed additives, or pesticide applications; 6) description of the environment, including access to garbage, machinery, or vehicles; and 7) recent past locations and when moved (if applicable), determine the type and position of livestock barn, existence of weeds and trees, the source of feeds given, timing of change of feeds if it was done, state of feed storage, feed contamination, existence of spoilage, use of agricultural chemicals or not, etc
2. **Clinical Signs**
3. **Tissue changes**

   Pathological evidences- The necropsy of an animal should be carried out when it is found dead or died suddenly, so a suspicion of poisoning may be considered as a real hypothesis. Necropsy should be made as soon as possible in order to avoid that the onset of the cadaveric phenomena of autolytic nature may damage organs and tissues to withdraw for laboratory investigations and compromise an objective assessment of histopathologic lesions.

   Lesions- red-colored mucosa, petechial haemorrhages on the serosa, acute congestive and degenerative condition in kidneys and liver, hyperaemic and haemorrhagic phenomena on gastric and enteric mucosa on the meninges as well, edema of the lung, associated with the hypothesis of a suspected poisoning, the finding of bilateral yellowish discolouration of the inner part of the renal medulla with deposit of green yellowish uroliths in the medulla and renal pelvis, diffuse thickening of the urinary bladder, and ulceration of the gastro-enteric mucosa could show a melamine poisoning. the presence of bleeding or hemothorax and/or hemoperitoneum should suggest a poisoning by anticoagulant rodenticides, whereas, the presence of black necrotic areas on the gastrointestinal mucosa leads to the suspicion of arsenic poisoning. Lesions localized on oral mucosa could be due to plants rich in oxalates,

4. **Laboratory Examinations -** In all poisonous cases, chemical analysis of the biological specimen is essential to know the cause of death or illness. The veterinarian should know the cause of death or illness. The veterinarian should know the salient points in collection and dispatch of toxicological specimen to a laboratory.
5. **Tissue required for analysis**
   - ❖ Blood : Collect contamination free blood sample from the animal. Prefer heart blood but peripheral blood is also acceptable. Usually 100 ml of sample is sufficient for routine studies.
   - ❖ Brain: Collect 50 g of brain tissue. It is useful in the demonstration of alcohol, volatile and lipid soluble poisons.
   - ❖ Liver : A sample of 100 g is a minimal requirement. Majority of toxicants are found in the liver tissue.
   - ❖ Kidney : Take the equivalent of one kidney for analysis. This is the tissue of choice for most metals and sulphonamides.
   - ❖ Lung: Take atleast 100 g of lung. This tissue will be useful in fatalities due to substance by inhalation.
   - ❖ Bone : Collect 100 g of bone if there is any indication that poisoning is due to any pesticide or metal. In case of chronic poisoning by fluorine compounds, send affected parts of bones and teeth.
   - ❖ Hair and Finger nails : These specimens are taken if chronic metal poisoning is suspected, especially chronic arsenic poisoning.
   - ❖ Adipose tissue : Take a minimum sample of 50 g. It is suitable for pesticide and drugs like Thiopental, Glutathemide , etc.
   - ❖ Urine : Collect all the available urine (0.5 liter) and if bladder is empty submit it as such (intact). Urine often provides a concentrated relatively unadulterated form of a poison and its metabolites. It is applicable to a variety of preliminary screening tests.
   - ❖ Bile : Do not open the gall bladder at the time of necropsy but, rather, remove it intact and place into a separate container.
   - ❖ Stomach and its contents : Ligate the stomach at both ends and send it undisturbed to the laboratory. Drugs and chemicals may be found intact in cases of over dosage.
   - ❖ In addition to above it is also necessary to send for analysis the vomitus, faeces, urine and milk if the poison is via the mammary gland.
   - ❖ Materials other than tissue : Retain all the material assumed to have caused the poisoning besides the cadavers and parts of organs. These are remains of fodder in

the trough and around it, suspicious litter, samples of admixtures and salt (about 100 g), about 2 liters of water from the trough and drinkers, samples of wall paints, disinfectants, fertilizers, insecticides etc.

Dispatch of material

Send each organ in a separate container clearly labelled with date, name and address of sender, particulars of organ, species and details of any preservative used. A full report of the clinical and post-mortem finding and also suspected poisons should accompany the samples. Always treat the parcel as infectious material so mark it with a black cross indicating that the content is infectious. Label the parcel " "Handle with care" and "keep away from food stuffs" Seal and dispatch the jars/parcels in such a way that they cannot be tampered en-route.

Diagnostic methods used in Veterinary Toxicology:

With the progress of scientific research, analytical instrumentations have become increasingly sensitive and accurate.

1. Chromatographic techniques – Chromatography (gas chromatography - GC, high performance liquid chromatography - HPLC, thin layer chromatography TLC)
2. Spectroscopic techniques
3. Screening methods for quantitative determination of toxic substances in biological samples

Suspected Poisons and Required Materials

Suspected Poison	**Required material in order of importance**
Antimony	Liver, thyroid, kidneys, urine, stomach and gut contents, milk.
Arsenic (acute)	Liver, Kidneys, stomach and gut contents, urine feed
Arsenic (chronic)	Hair, liver, urine, spleen.
Alkaloids	Liver, urine, brain, stomach and gut contents.
Ammonia	Whole blood or serum, urine, rumen contents.
Babiturates	Blood, brain, liver, adipose tissue
Cadmium	Kidney, liver, hair
Copper	Liver, Blood, kidney, faeces, urine.
Cyanide (HCN)	Stomach and gut contents, liver, muscles, oxalated blood, brain, suspected feed.
Fluorides	Altered parts of bone, teeth, urine, stomach contents, liver, kidney, feed and/or drinking water.
Insecticides (chlorinated)	Fat, liver, stomach contents brain.

Insecticides (Organophosphorus)	Oxalated blood, whole blood, liver, stomach and gut contents.
Lead (Chornic)	Hair, liver, kidneys, bone faeces, urine.
Molybdenum	Feed, liver, altered organs (bone), hair.
Nitrate and nitrite	Stomach and gut contents, whole blood, urine, suspected feed.
Oxalates	Fresh forage, kidneys
Phenol and cresol	Liver, stomach and gut contents, kidneys
Phosphide	Stomach and gut contents, suspected material (grain, flour etc)
Phosphorous	Stomach and gut contents, liver, kidney and brain.
Urea	Feed, stomach contents
Warfarin (also other anticoagulants	Whole blood, liver, feed.
Zinc	Liver, Kidney, pancreas, faeces, bone (humerus)
Zinc phosphide	Liver, gastric contents, feed.

GENERAL PRINCIPLES OF TREATMENT OF POISONING

The following measures should be taken without delay, when a case of poisoning is suspected:

1. **Removal of the poison from stomach:**

a) Gastric Lavage: It is the process of washing of ingesta and intestine. In this process the solution is drenched by stomach tube/pipe and is \ pumped out again by suction pressure.It includes: Normal Saline, Tannic acid,Potassium permanganate (1:2000), Tincture iodine (1:250v of 5 % solution),Sodium bicarbonate solution

The above-mentioned agents are used as 1% solution and drenched at the rate of 10 ml/kg body weight to wash the intestine and remove ingesta. Gastric lavage should be performed in unconscious/anaesthetized animals.

b) Emetics: These are the drugs which cause vomition in monogastric animals. In dogs, cats and swine, vomition may be induced to empty the stomach.

i. Apomorphine HCI- Vomition occur within 2-10 min. Dose: Dogs 0.04 mg/kg, I/V; 0.07 mg/kg, I/M; 3.0 mg/kg, S/C, 6.0 mg/kg, oral It is contraindicated in cats and pigs.

ii. Xylazine- Induces emesis within 10-20 min in dogs and cats.Dose : 1 mg/kg, i/m.

iii. Copper sulphate-Dose: 1% Solution@ 50 ml, orally

iv. Zinc sulphate - 50 ml of 1% solution, orally

v. Sodium chloride - Half t.s.f. crystals on the back of tongue. t.s.f. in ½ cup of luke warm water administer orally.

vi. Mustard Powder- ½- 1 t.s.f. in ½ cup of luke warm water administer orally.

vii. Hydrogen peroxide (3%)-1-5 ml/kg, orally.

2. Prevent more absorption of poison being taken:

a) Thorough washing with soap and water can usually prevent further absorption of poisons on the skin.

b) If the animal has a long or dense coat, the hair may need to be clipped.

c) For some poisons that have been ingested, vomiting may be induced in dogs and cats. However, vomiting is *not* recommended if the suspected poison could damage the stomach or esophagus on its way up, if more than a few hours have passed, if the swallowing reflex is absent, if the animal is convulsing, or if there is a risk of aspiration pneumonia (vomited material being inhaled into the lungs).

d) If the animal is unconscious, the stomach may be flushed with a stomach tube, or surgery on the stomach may be needed.

e) Laxatives/Purgatives(Cathartices) are used to empty the bowels may be recommended in some instances to help remove the poison from the gastrointestinal tract. Purgatives are used to increase the elimination of unabsorbant toxicant from gastrointestinal Tract .

- ❖ Sodium Sulphate- Dose :250 mg/kg, orally
- ❖ Magnesium sulphate -Dose : 1 gm/kg.
- ❖ Liquid Paraffin - Dose : Dogs : 5&15 ml; Cattle/Horses : 0.5- 1 Litre
  Sheep/Goat : 250-500 ml.
- ❖ Sorbitol (70%) : 3 ml/kg, orally. Oil based purgatives should not be used in poisoning cases as they may increase the absorption of toxicants.

f) If the poison cannot be physically removed, sometimes activated charcoal can be administered by mouth to prevent further absorption from the gastrointestinal tract. Adsorption is the physical binding of a toxicant to an unabsorvable ca rrier which is eliminated in the faeces. Activated charcoal: 2.5 gm/kg, orally(To prevent constipation that can occur after charcoal administration, a purgative can be administered.)

g) Supportive treatment is often necessary until the poison can be metabolized and eliminated. The type of support required depends on the animal's condition and may include controlling seizures, maintaining breathing, treating shock, controlling heart problems (for example, irregular heart beats), and treating pain.

3. Promote more excretion of poison already taken:

a) Diuretics- Diuretics can be used to increase the rapid renal filtration of absorbed toxicants. Mannitol (5-25%): 1 gm/kg. I/V; Furosemide : 2-4 mg/kg. Twoce daily, I?V or I/M.

b) Changing pH of the urine by either using Urinary acidifiers(ascorbic acid,ammonium chloride) or alkalizers (Sodium bi carbonate).

4. Increase threshold of the animal to toxicity:

a) Specific antidotal therapy- Antidote is an agent which antagonizes the effect of toxicant.

1. Universal antidote - This can be used non-specifically in cases where the exact cause of poisoning is not known. It contains :

Charcoal	-	2 Parts (Adsorption)
Magnesium Oxide	-	1 Part (Catharsis)
Tannic acid	-	1 Part (Precipitation)

2. Specific antidote- These can be used specifically in cases where the exact causes of poisoning is known

Poisoning	**Antidote**	**Remarks**
Organophosphate,	Atropine,2 PAM	Receptor Antagonism
Carbamate	Atropine	Receptor Antagonism
Lead, mercury, Arsenic	BAL/Dimercaprol	Chelation
Lead, Zinc	Calcium Disodium EDTA	Chelation
Cyanide	Sodium nitrite, Sodium thiosulfate	Chemical neutralization
Alkaloids	Tannic acid	Precipitation
Nitrate, Nitrite, Chlorate	Methylene blue	Oxidative reduction
Warfarine (Caumarin Anticoagulants)	Vitamin K	Antagonism
Morphine	Nalorphine, Naloxone	Receptor Antagonism
Copper	D-Penicillamine	Chelation
Barbirurates	Bemegride	Receptor antagonism
Fluorides, Oxalates	Calcium gluconate	Complex formation

Iron	Deferoxamine	Complex formation
Benzodiazepines	Flumazenil	Receptar antagonism
Silver nitrate	Sodium Chloride	Complex formation
Strychnine, Nicotine	Potassium permanganate	Complex formation
Curare	Neostigmine	Receptor antagonism
Carbon Monoxide	Oxygen	Antagonism
Venom	Anti-venom	Complex formation

Miscellaneous drugs

a) Coramine b) Doxapram

c) Adrenaline HCI d) Calcium borogluconate

e) Mannitol / Glucose (10%) f) Pentazocin

g) Atropine sulphate h) Paracetamol

Standard Chart for spot test of metals

S.No	**Metal salt**	**Ammonium carbonate (10%)**	**Ammonium Sulphide (20%)**	**Pot. Iodide (15%)**
1.	Copper	Blue	Dark brown	Brown
2.	Cobalt	Purple	Black	No reaction
3.	Ferrous	Dirty green	Black	No reaction
4.	Ferric	Reddish brown	Black	Brown
5.	Lead	White	Dark brown	Yellow
6.	Zinc	White	White	No reaction
7.	Mercurous	White	Greenish black	Black
8.	Mercuric	White	Yellow	Red