Diseases caused by inorganic and farm chemicals

Toxicology:

Is the study of the harmful effects of chemical compounds on biological systems, including their properties, actions and effects.

Toxic agents:

Is referred to a toxicant or poison.

Toxin:

Refers to poisons produced by a biological source (e.g. venoms, plant toxins).Toxicosis, poisoning and intoxication are synonymous terms for the disease produced by a toxicant.

Toxicity (sometimes in correctly used instead of poisoning) refers to the amount of a toxicant necessary to produce a determined effect.

Synergism:

Is the implication of the combined actions of two or more agents having the same biological effects.

Antagonism:

Is the inhibition or elimination of the effect of one agent by another, it may be chemical or functional.

Toxicant accumulation and biomagnifications occurs when absorption exceeds the capacity of the body to destroy or excrete a xenobiotic (foreign) compound.

Tolerance:

Is the ability of an organism to show less response to a specific dose of a chemical than it demonstrated on prior occasion. It refers to acquired, not innate resistance.

Metabolism of poisons:

Absorption occurs by way of the alimentary tract, skin, lungs, or via the eyes, mammary gland, or uterus, as well as from sites of injection.

Toxic effects may be local, but the poison must be dissolved and absorbed to some extent to affect the cell .the primary factor affecting absorption is solubility.

Insoluble salts and ionize compounds are poorly absorbed , while lipid soluble substances are generally readily absorbed , even through intact skin , for example barium is toxic , but barium sulfate can be used for intestinal contrast radiography because of low absorption.

Distribution or translocation of the toxicant follows via the blood stream to reactive sires, including storage depots.

The liver receives the portal circulation and is the organ most commonly involved with intoxication (and detoxification).

The selective deposit of foreign chemicals in various tissues depends on receptor sites.

The ease of chemical distribution depends largely on its water solubility.

Polar or aqueous soluble agents tend to be excreted by the kidneys. Lipid soluble chemicals are more likely to be excreted via the bile and accumulate in fat depots,

There are two phases of metabolism:

Phase I: includes oxidation, reduction, and hydrolysis mechanisms. These reactions, catalyzed by hepatic enzymes, generally converted foreign compounds to derivatives for phase II reactions.

Phase II principally involves conjugation, or synthesis reactions. Commonly (common conjugates) include glucuronides, acetylation products, and combination with glycine.

Metabolism of xenobiotic agents seldom follows a single pathway. Usually, a fraction is excreted unchanged and the rest is excreted or stored as metabolites.

Excretion of most toxicants and their metabolites is by way of the kidneys .many polar and high molecular weight compound are excreted by way of the bile.

An entertohepatic cycle occurs when these products are excreted from the liver via bile, reabsorbed from the intestine and returned to liver.

Milk is also an excretion pathway for some toxicants.

Suspicion of poisoning is aroused when illness occurs in a number of:

* Previously healthy animals.
* All affected at the same time.
* And showing the same signs and necropsy findings.
* To the same degree of severity.

These conditions, of course, may also apply to some infections, metabolic and nutritional deficiency disease.

Poisonous plants often show geographical limitation in distribution; particular industrial enterprises may create poison hazards in local areas.

Certain agricultural practices, including the spraying of orchards, the dipping or spraying of cattle for ectoparasites and the use of prepared concentrated feed for pigs and cattle, may also lead to poisoning in groups of animals.

The appearance of clinical illness soon after feeding, after a change of ration, after medication or spraying, or after change to new pasture is a common history in many outbreaks of disease caused by chemical agents.

Diagnosis:

Diagnosis is based on:

History, clinical signs, lesions, laboratory examinations, and in all cases, bioassay procedures.

The report which accompanies material for toxicological analysis should include a full record of history, clinical signs and necropsy findings and particularly the results of a search of the environment for access to a poison.

If the animal has been treated, the drugs that were used and the dates of administration should be given as they may create difficulties for the analyst.

The poison or a group of poisons suspected should be defined.

Specimens for analysis should include a sample of the suspected source material.

Next most important is a specimen of alimentary tract contents, so that ingestion of the material can be proven.

And sample of tissue, usually liver to prove that absorption of poison has occurred.

Most toxic chemicals are ingested but percuyaneous adsorption and inhalation must be considered as possible portals of enter.

Additional specimens required, other than liver and alimentartry tract and contents, vary with the poison and the following list is suggested for the common chemicals:

* Arsenic – kidney, skin, and hair.
* Lead – kidney, bones and blood.
* Phosphorus – kidney and muscle.
* Mercury – kidney.
* Copper – kidney and blood.
* Sodium chloride – alimentary tract and ci=ontent only.
* Fluorine – bones, teeth and urine.
* Hydrocyanic acid – ingesta in a filled and air tight containers, blood and muscle.
* Nitrate and nitrite – ingesta ( plus chloroform or formalin ) in an airtight filled container , blood
* Strychnine – blood, kidney and urine.

Careful packing of specimens is necessary to avoid loss of some poisons by escape as gas or conversion by bacterial fermentation, and to prevent contamination.

No preservative should be added except in the case of suspected nitrite poisoning.

If preservative is necessary because of distance from the laboratory packing in dry ice or ethyl alcohol (1 ml / g of tissue) is advisable, in this instance a specimen of the alcohol; should also be sent.

Specimens should be packed in glass or plastic to prevent contamination by lead in soldered joints of cans.

A suitable amount of material should be submitted for analysis, 1 kg of ingestra, 1kg of liver, and proportionate amount of other viscera are suggested to cover all contingencies.

Some of the factors which affect susceptibility to plant poisoning are

* Hungary, ravenous animals are more likely to be affected.
* Curious , excited animals are likely to sample the plants they would not otherwise eat,
* Young animals are less discerning and are less easily put off.
* Plants that are different in texture, e.g. sprayed weeds, lopped foliage, often appear to be attractive.
* Pica due to other cause.

Poisoning is in most instances accidental.

Principles of treatment in cases of poisoning:

There are certain principles which apply to all cases of poisoning.

Treatment for poisoning includes three basic principles.

The two main principles are:

* Removal of the residual poison from the alimentary tract or skin.
* Provision of chemical and physiological antidotes to the poison that has been absorbed

1. Prevention of further absorption.
2. Supportive / symptomatic treatment.
3. Specific antidotes/

Prevention of further absorption:

Topically applied toxicants usually can be removed by thorough washing with soap and water, clipping the hair or wool may be necessary. However, emesis is of value in dogs, cats and pigs if done within a few hours of ingestion

In farm animals gastric ravage and emetics are of little or no practical value and the removal of residual poison from the alimentary tract dependents largely upon the use if adsorbents and purgative. The only effective adsorbent is activated charcoal. The dose rate is 1-3 g /kg B.Wt. repeated as necessary. It adsorbs chlorinated hydrocarbon, organophosphoryus compounds, and myxcotixins and plant alkaloids.

Emesis is contraindicated when the swallowing reflex is absent, the animal is convulsing, corrosive agents, volatile hydrocarbons, or petroleum distillates are involved, or a risk of aspiration pneumonia is imminent.

Oral emetics include syrup of ipecac (10-20 ml) PO in dogs and hydrogen peroxide (2 ml /kg PO).

Apomorphine can be used in dogs parenterally at a dose of 0.05- 0.1 mg / kg.

Gastric lavge using an endotracheal tube and the largest bore stomach tube possible, is done on the unconscious or anaestrhized animal. The head is lowered to a 30 angle and 10 ml of lavage fluid (water or saline per kg body weight is gently pushed into the stomach, then removed. this proce I s repeated until returned fluid is clear.

Purgative is necessary to remove the combined adsorbent and poison. It can be administered simultaneously with the adsorbent.

The use of irritant purgative is not advisable when the poison is an irritant and has already caused gastroenteritis, and oily purgatives are preferable in these cases saline purgatives are of value in the treatment of non – irritant poisons such as cyanogebnetc glycosides.

Cathartics and laxatives may be indicated in some instances for more rapid elimination of the toxicant from gastrointestinal tract.

When the poison can not physically remove, certain agents administered orally can adsorb it and prevent its absorption from the alimentary tract. Activated charcoal (1-2 g/kg) is effective in adsorbing a wide variety pof compounds and usually is the adsorpant and detoxicant of choice when poisoning suspected.

Neutralization of residual poison in the alimentary tract can be effect in some cases. for example oxidizing agents por tannic acid preparations are effective in precipitating alkaloids , proteins , including milk and eggs , are effective chemical antidotes for poisons that coagulate proteins , lead is precipitated by the addition of sulfated to the alimentary tract contents .

Poison that has already been absorbed can in some instances be inactivated or its excretion facilitated by the provision of chemical antidotes .for instances. Sodium nitrite and sodium thiosulfate are effective systemic antidotes to hydrocyanic acid, and calcium versenate is an effective antidote against lead.

Treatment of the effects of a poison includes:

Provision of physiological antidote e.g. the injection of calcium salt in cases of overdosing with magnesium salts.

Ancillary treatment /Supportive therapy:

The type of supportive therapy depends on the animal's clinical condition and may include control of convulsive seizures, maintenance of respiration, treatment of shock, correction of electrolytes and fluid loss, control of cardiac dysfunction, and alleviation of pain.

Provision of fluid in dehydration, due to diarrhea, demulcents in gastroenteritis, sedatives in excitements, stimulants in case of central nervous system depression.