ANTIDOTE

Antidote

- An antidote is a substance that can counteract a form of poisoning. The term antidote is a Greek word "Antididonai" meaning "given against".
- In Cambridge dictionary,

"Antidote is a chemical especially a drug that limits the effects of a poison".

OR

"A way of preventing or acting against something bad".

CLASSIFICATION OF ANTIDOTE

- According to mode of Action:
  - Mechanical
  - Chemical
  - Physiological

Mechanical Antidote

- Mechanical antidotes which prevent the absorption of poison into the body.

a) Adsorbing: The main example is activated charcol

b) Coating: A mixture of egg & milk make a coat over the mucosa.

c) Dissolving: 10% alcohol or glycine for carbolic acid

- For example, activated charcoal absorbs the poison prior to absorption across intestinal

Chemical Antidote

- Chemical antidotes are the agents which change the chemical nature of poison.
- For example, Na-thiosulphate which changes toxic cyanide to the non-toxic thiocyanate; Sodium calcium edetate chelates agents used for heavy metal poison.

- Mainly acts by two mechanism:
- Complex formation: Antidote make complex with the toxicant making it unavailable to cross the membrane or to interact with receptors.
- DMSA(dimercaprol and dimercaptosuccinic acid are sulfohydral compounds that bind metal such as arsenic acid ,lead.

➢ Metabolic conversion:

Detoxification to less toxic product:

- Nitrite interact with hemoglobin and cyanide to form cyanomethamoglobin, which is less toxic than cyanide and interfere with the cyanide access to cytochrome oxidase system.

Nitrites + oxyhemoglobin ⇒ methemoglobin
+
cyanide
⇓
cyanmethemoglobin

➢ This type of antidote may act by following some steps:

1. Interacts with the poison to form a non toxic complex that can be excreted. e.g. Chelators
2. Accelerates the detoxification of the poison: e.g. N-acetylcystine,thiosulfate
3. Decrease the rate of conversion of poison into toxic metabolite :e.g. Ethanol,Fomepizole
4. Compete the poison for certain receptors :e.g. Nalaxone
5. Block the receptor through which the toxic effect of the poison is mediated e.g.Atropine
6. Bypass the effect of Poison:O2 in the treatment of CO and cyanide toxicity
7. Antibodies to the poison : digiband and antivenoms

Mechanism of Action of Antidotes

❑ Antidotes act by different mechanism. The mechanisms of action of antidotes are given below:

1) Complex formation.

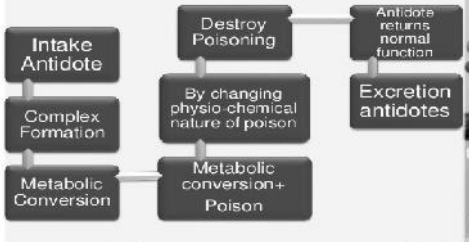
2) Metabolic conversion.

3) Prevention of toxic metabolite formation.

4) By changing the physio-chemical nature of toxicant.

5) Antidote returns to normal function by repairing a defect.

Flow chart of Mechanism



Antidotes in most common use in clinical toxicology

Poison	Antidote
Paracetamol	N-acetyl Cystxine
Iron	Desferroxamine
Heperin	Protamine Sulphate
Cyanide	Na-nitrate, Na-thiosulphate
Theophylline, Caffaine	Esmolol
Atropine	Physotigmine
Copper, gold, lead, mercury, zinc, poisoning	Penicillamine
Arsenic poisonong	Dimercaprol
Insulin reaction	Glucose (Dextrose 50%)
Narcotics	naloxone (Narcan)

Charcoal (Universal Antidote)

❑ What is activated charcoal?

➢ Activated charcoal is simply burnt wood that has had all the oxygen removed through controlled oxidation and or processing by steam.

❑ How is activated charcoal used as an antidote?

- As an antidote, activated charcoal is mainly known both for its use in drug overdoses and chemical poisonings.
- Charcoal acts to purify and cleanse the body due to its amazing ability to attract poisons to itself.
- Charcoal has a wide range of absorption. Heavy metals, viruses, bacterial and fungal toxins, etc. are all absorbed effectively.
- Activated charcoal often absorbs more than its own weight of injurious materials.

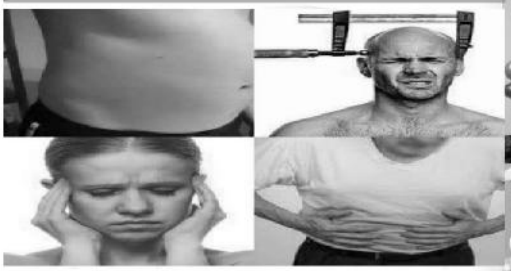
❑ How does charcoal work?

- Internally as an antidote and remedy, charcoal works by binding drugs and poisons within the gastrointestinal tract.
- This allows their transfer out of the body in a harmless form. Charcoal absorbs like a sponge, and renders poisons harmless.
- It can do varied tasks because of it's amazing ability to attract other substances to its surface and hold on to them until they exit the body.

❑ How does charcoal work with drug or aspirin poisoning?

- The most common drug poisoning is from aspirin. Charcoal should be given within the first 30 minutes of an overdose.
- Powdered charcoal reaches its maximum rate of absorption rapidly, within one minute. The sooner it is given the better the chances of successful treatment.
- Charcoal given after one hour of fast absorbing drugs, like aspirin, are usually only about 10 percent effective.

Side Effect Of Antidotes



Charcoal Effect:

❑ Common side effects of Charcoal Antidote:

- ✓ Black Stools (severe)
- ✓ Diarrhea (Less severe)
- ✓ Throwing Up (Less severe)

❑ Rare side effects of Charcoal Antidote:

- ✓ Stomach Cramps (severe)
- ✓ Swelling of the Abdomen (less severe)

Cyanide Effect:

❑ Common side effects of cyanide antidote intravenous:

- ✓ Abnormal Heart Rhythm (Severe)
- ✓ Abnormally Low Blood Pressure (Severe)
- ✓ Coma (Severe)
- ✓ Confuse (Less severe)
- ✓ Fast Heartbeat (Less Severe)
- ✓ Headache (Less severe)

❑ Rare side effect of cyanide Antidotes:

- ✓ Increased Risk of Bleeding (Severe)
- ✓ Excessive Sweating(Less Severe)
- ✓ Feeling Weak(Less Severe)
- ✓ Rapid Breathing(Less Severe)
- ✓ Taste Problems(Less Severe)

- Dimercaprol Effect:
  - Common side effects of Dimercaprol:
    - ✓ Weakness.
    - ✓ Headache.
    - ✓ fever (especially in children).
    - ✓ pain or a hard lump(swelling) where the medicine was injected.
    - ✓ Throwing up.

Future Directions and Concerns

- The evolution of antidotal therapy has been characterized by the development of new antidotes (such as monoclonal antibodies), by new applications of existing pharmaceuticals (e.g. calcium salts), by a more scientific approach to the evaluation of effectiveness and of complications that may arise from their use, and by increased cooperation at the international level.

Future Directions and Concerns

- The work of the IPCS(international programme on chemical safty) addresses international collaboration in the evaluation of new antidotes and their applications. Some concern exists regarding the possible adverse effects of antidotes used for long periods of time. For example, chronic lead exposure affecting children or pregnant mothers may necessitate repeated chelation treatments