These compounds are lipophilic and very stable compounds.

Absorbed from the skin, mucous membrane and gastrointestinal tract. Accumulated or sequestrated in adipose tissues. Metabolism takes place in the liver by MFOs. Their metabolites are more toxic than the parent compounds.
Interferer with sodium and potassium exchange in the nervous system. Partial depolarization followed by permanent depolarization is the net effect of such interference. This depolarization leads to intense stimulation of the nervous system and seizures which are the most prominent clinical signs.

Reproductive dysfunction in both birds and animals are also recorded.
There are some toxicological terms that should be studied in relation to organochlorine compounds:

* **Bioaccumulation, Bioconcentration and Biomagnifications.**

* **Eggshell thinning phenomena.**

* **Enzyme induction.**

* **Decontamination or application of Phenobarbital and charcoal.**
Diagnosis and differential diagnosis:

- It depends on chemical analysis of fat and other animal tissues.

- It should be differentiated from viral encephalomalacia, rabies, brain abscesses and BSE in cattle.

- It should be differentiated from lead, strychnine, fluoroacetate and food poisoning in cases of cattle, dogs and cats.
Treatment

* Light anesthesia to control convulsive seizures and other hyperactivity.
* Sodium Phenobarbital has been recommended as an antidote.
* Diazepam is also used to control convulsions.
* Activated charcoal in cases of oral toxicity is highly recommended.
Organophosphorus insecticides:

Examples:

- DFP.
- Parathion (Ethyl and methyl).
- TEPP.
- Malathion (Ethyl and methyl).
- Diazinon.
- Ethyl Azinophos and methyl Azinophos.
- Dimethoate.
- Nuracron.
- Cyolene.
- Phosvel.
Metabolism and Mode of Action

1-Activative metabolism.

2-Inactivative metabolism.

Firm binding to AChE leading to the accumulation of ACh in the nervous system. This accumulation leads to the muscarinic, nicotinic and CNS affection caused by organophosphorous toxicity.
Delayed Neurotoxicity (DNT)

It means paralysis of the legs in man and birds or of the hind limbs in quadrupeds.

This paralysis is two weeks after poisoning by OP and treatment. DNT takes place to the damage of myelin sheath surrounding axons of the nerves or demyelination.
Diagnosis and Treatment

* Isolation and identification of the toxic agent is crucial in diagnosis.

* Atropine sulphate is the specific antidote.

* Oxime therapy is also recommended.
Carbamate Insecticides:

Examples:

- Carbofuran
- Carbaryl (sevin)
- Baygon (propoxur)
- Zectran
- Mabam
- Zineb
- Aldicarb (Temik)
- Pirimor
Metabolism and Mode of Action

- Reversible inhibition of AChE by carbamylation.
- Used as heavy duty insecticides for soil against insects that do not respond to or are resistant to organophosphorus insecticides.
- IT differs in treatment.
Pyrethroid Insecticides:

Examples:

- Allethrin
- Cypermethrin
- Cyfluthrin
- Deltamethrin
- Flumethrin
- Cyhalothrin
- Tetramethrin
- Resmethrin
- Permethrin
- Cyhalothrin
Metabolism and mode of action:

They have irritant and sensitizing properties. They have neurotoxic and immunotoxic effects. Pyrethroids interfere with the ionic conductance of nerve membranes by prolonging the sodium current causing hyperexcitability in poisoned animals. Induction of liver microsomal enzymes has been observed.
Concerning selective toxicity, pyrethroids are extremely toxic to insects and they are of low toxicity or even harmless to mammals.

They break down most quickly and have no environmental persistence.

Rapid detoxification in mammals due to the presence of MFOs.

The have no cumulative toxicity in the animal body.
Rodenticides
I-Inorganic rodenticides:

Examples:

- Zinc phosphide ($\text{Zn}_3\text{P}_2$)
- Arsenic trioxide ($\text{As}_2\text{O}_3$)
- Barium carbonate ($\text{BaCO}_3$)
- Inorganic phosphorus (P)
II- Organic rodenticides:

Examples:

- Anticoagulant rodenticides.
- Alphanaphthyl Thiourea (ANTU)
- Sodium fluoroacetate.
- Strychnine.
- Endrin.
Forms of Rodenticides:

1- Dust baits:
   Contaminate the rodent's fur and while they are cleaning themselves, they will ingest the poison.

2- Grain baits:
   Rodents eat the contaminated grains as food and get poisoned. Sheep, goats and poultry are liable to ingest the grain baits.

3- Meat baits:
   Dogs and cats can be affected by meat baits or by ingestion of the cadavers of poisoned rats.
Metabolism and Mode of Action:

It differs according to the type of rodenticide:

-Zinc phosphide reacts with water or hydrochloric acid producing phosphine gas which is extremely toxic.

-Anticoagulant rodenticides impairs prothrombin synthesis in the liver and disrupts the blood clotting mechanisms. It also causes damage to the blood capillaries.
Diagnosis and treatment:

Diagnosis depends on the circumstantial evidence, clinical signs and chemical analysis.

Treatment depends on the presence of specific antidote such as copper sulphate in zinc phosphide poisoning and vit. K in cases of anticoagulant rodenticide poisoning.
Herbicides
These compounds are formulated to be toxic to plant biochemical systems that are absent in mammals. They are generally considered to be weakly toxic to man and animals.

**Examples:**

**I-Selective herbicides:** Such as 2, 4-D and 2, 4, 5-T. They select the broad leaved plants.

**II-General herbicide:** They are non-selective such as arsenicals and chlorates.

The triazine herbicides are also included as they are photosynthesis inhibitors.
According to chemical structure, herbicides are classified into:

I-Inorganic herbicides such as arsenical compounds and sodium chlorates.

II-Organic herbicides which subgrouped into:

A-Chlorophenoxy herbicides which includes 2, 4-D; 2, 4, 5-T; MCPA and 2, 4-DB.

B-Carbamates: They are carbamic acid derivatives such as IPC (Isopropyl N-phenyl carbamate)

C-Triazine herbicides such as atrazine and simazine.

D-The dipyridyl quaternary salts which contains diquat and paraquat.
Some Major Herbicides in Use to Day

1- 2, 4-D and 2, 4, 5-T are broadleaf herbicides from the phenoxy group.

2- Paraquat and diquat are non-selective contact herbicides used in the destruction of unwanted weeds.

3- Atrazine herbicide used in corn and sorghum for control of grasses. Still used because of its low cost and can be used mixed with other herbicides.

4- Agent orange is a mixture of 2, 4-D and 2, 4, 5-T. It is a source for TCDD in the environment.
-In case of sodium chlorate, it causes hemolysis of RBCs, methemoglobinemia syndrome, anoxia, cyanosis, dyspnea and difficult respiration. Chocolate-colored blood with brownish discoloration of tissues and organs.

-Paraquat produces lung toxicity in affected animals. Degeneration of alveolar cells followed by extensive cell damage. Severe pulmonary fibrosis develops very fast.
Treatment

The treatment of acute poisoning consists of:

1- Maintain vital functions: using symptomatic treatment to restore and maintain adequate circulating blood volume and hemoglobin. Vit. K is also used and blood substitutes. Artificial respiration is not indicated in paraquat toxicity.

2- Delay absorption of the ingested herbicide using activated charcoal of fuller's earth.

3- Give supportive treatment.
Fungicides

They are chemical compounds used to prevent or treat fungal infections in plants or plant products. They cause adverse effects in man and animals. The most tragic poisoning occurred due to the consumption of grains treated with organic mercury as fungicide. Minamata tragedy in Japan was a result of fungicides use.
Fungicides are classified into:

I-Inorganic fungicides:

- Copper fungicides such as copper oxychloride.
- Cadmium fungicides.
- Mixtures or complexes of Cd, Ca, Cu, and As oxides.
- Copper-arsenic compounds as Paris green.
Nowadays, organic fungicides are extensively used because of their low toxicity to mammals. Anvil, Tilt 100, trimiltox, Ridomil, Rubigan, Formaldehyde and Dithane are examples. Organomercury compounds as methyl mercury is also used.
Toxicity and Mode of Action

Inorganic fungicides are more toxic than organic ones due to the presence of metals such as Hg, Cu, Cd, and As. Mode of action, clinical sings and line of treatment is the same as in metallic poisons.

For example is cases of copper-containing fungicides; hemolysis of RBCs, necrosis of hepatocytes and toxemic jaundice are prominent. Liver enzymes and chemical analysis for copper estimation are also indicative.
All the various groups of fungicides have potential for causing allergic reactions. Asthma, contact dermatitis and skin irritation have been reported.

Organic metal fungicides are highly irritating and produce variable general toxicity. Organic mercury fungicides produce injury to the nervous system with possible permanent nerve damage.
Line of Treatment

1. Skin decontamination by washing.
2. Gastrointestinal decontamination through GIT emptying.
3. Fixation of the ingested fungicide using activated charcoal.
4. Supportive treatment such as fluid therapy using glucose and electrolytes.
5. Anticorrosive agents and diluents are also indicated.
6. Chelating agents such as BAL and penicillamine