

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



# Pesticides

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**Dr. Doha Yahia Ahmed**  
Professor of forensic medicine and toxicology

# GOALS

- 1- Rodenticides.**
- 2- Fungicides.**
- 3- Herbicides.**
- 4- Dioxins.**

# RODENTICIDES (KILL RODENTS)



**Def:- Chemicals used for combating rodents (mice and rats).**

# 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.

# Rodenticides

- Rodenticides are classified into:

## Organic

- **Anticoagulants**  
(Coumarin preparations)
- **Alpha naphthyl thio urea (ANTU).**
- **Sodium fluoroacetate**
- **Strychnine.**

## In organic

- **Zinc phosphide** ( $Zn_3P_2$ )
- **Aluminum phosphide**
- **Arsenic trioxide** ( $As_2O_3$ )
- **Barium carbonate** ( $BaCO_3$ )
- **Phosphorus element** (P)

# Anticoagulant rodenticides

## 1- First generation:

(multiple doses to cause intoxication):

Ex. : Warfarin and dicoumarol (coumarin derivatives)

## 2- Second generation:

- More potent, single dose to cause intoxication
- Have median lethal doses (LD50) that are 2.5 – 200 times **lower** than the first generation.
- Not easily excreted from the body, and they can be stored in the liver.

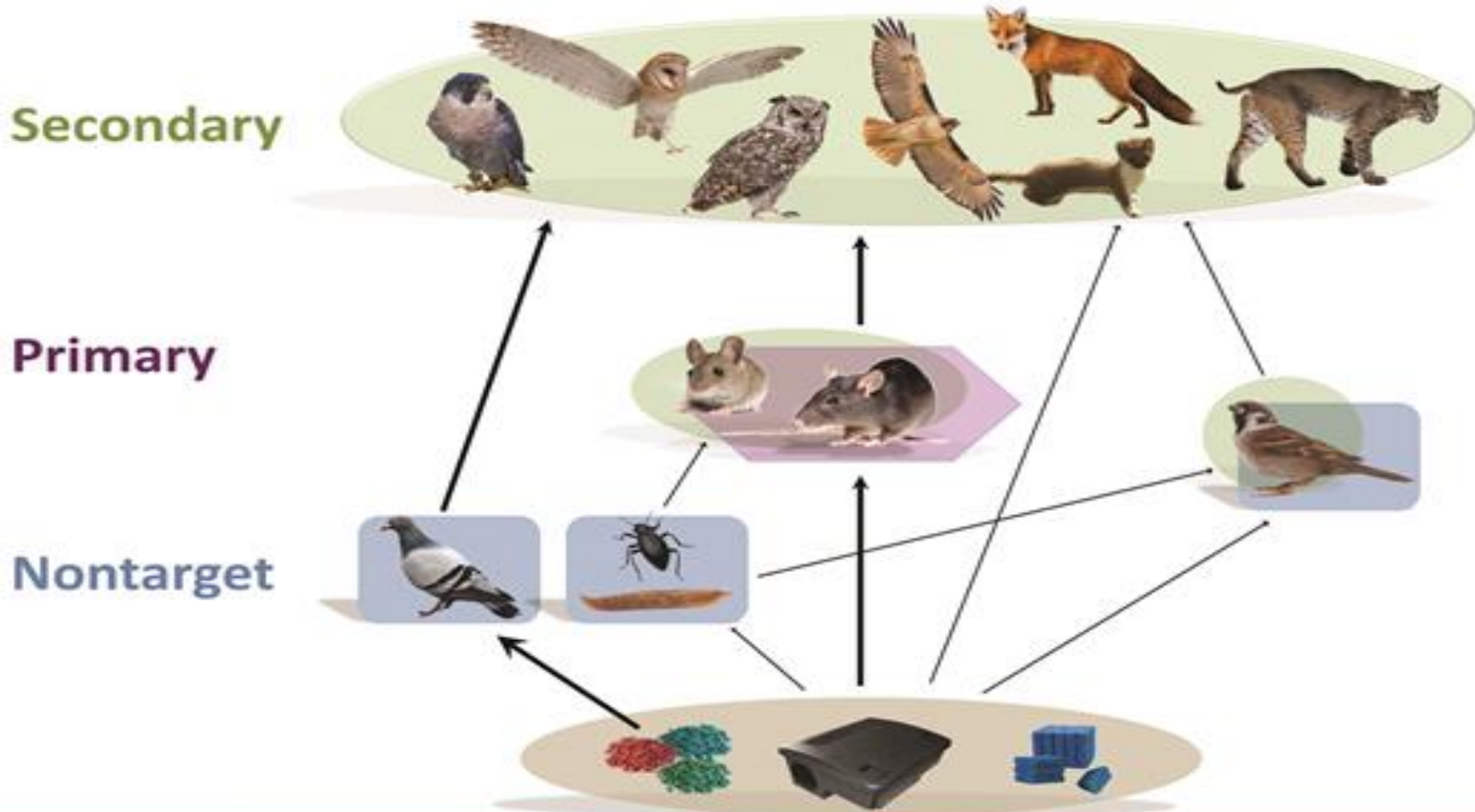
Ex. : Super warfarins, Difenacoum, Bromodiolone, Racumin, Rattak.....



- Colored pellets are attractive for birds.



# *Exposure to rodenticides*

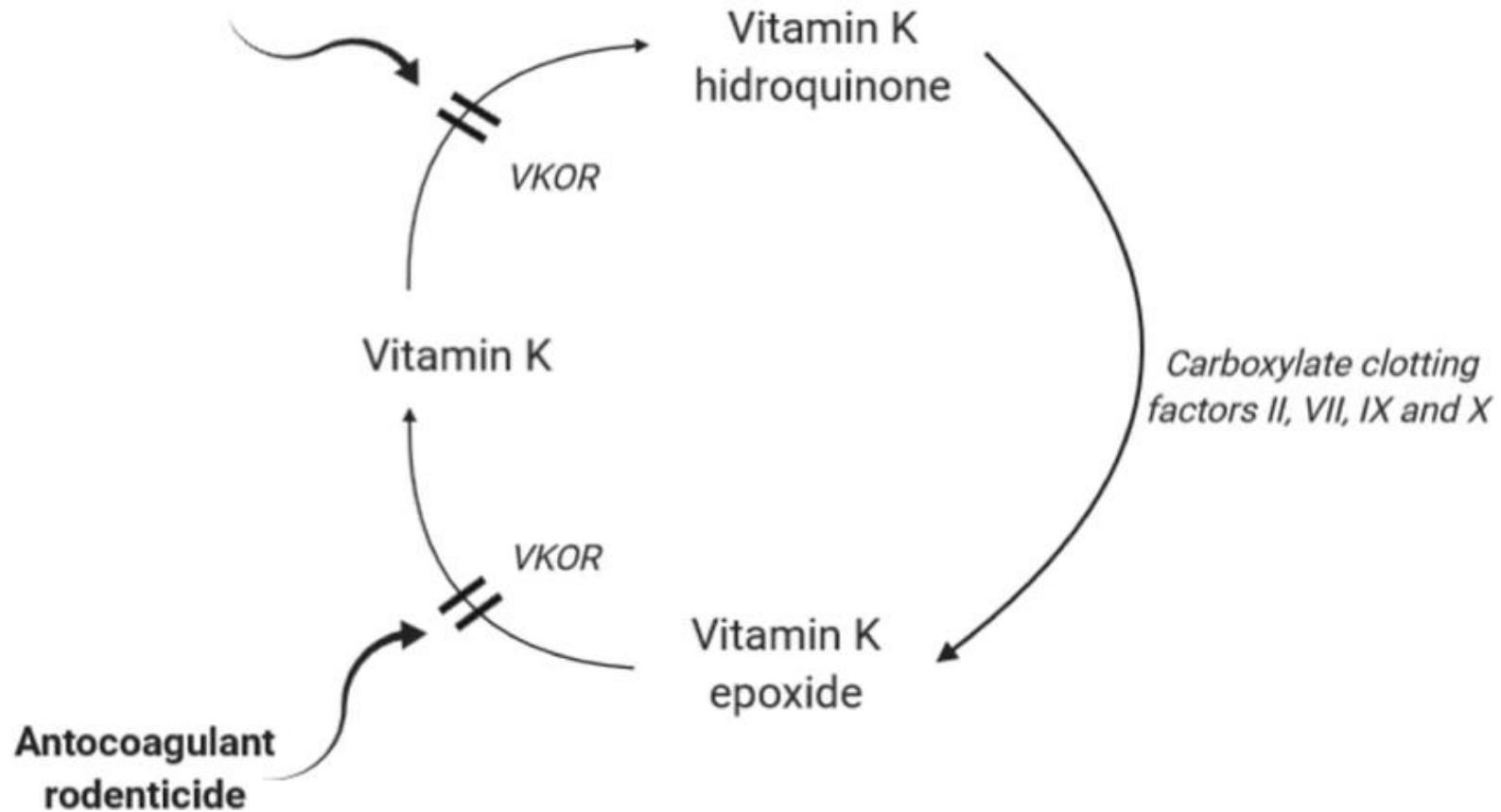


## ▪ Mode of action:-

- ✓ Anticoagulant rodenticides disrupt the normal blood clotting mechanisms through:
  - 1- Inhibition of vitamin K epoxide reductase, which is crucial in the recycling and production of vitamin K, a necessary component for clotting factors II, VII, IX, and X.
  - 2- **Inhibition of formation of prothrombin from Vit. K in the liver**, resulting in increased tendency to bleed and profuse hemorrhage.
  - 3- Prolonged clotting times.
  - 4- Damage to the blood capillaries.



Essential for the synthesis of functional prothrombin and related blood-clotting factors.



- **Factors that enhance the action of anticoagulants:**
  - **Vit. K deficiency,**
  - **liver diseases.**



# **Clinical Signs :-**

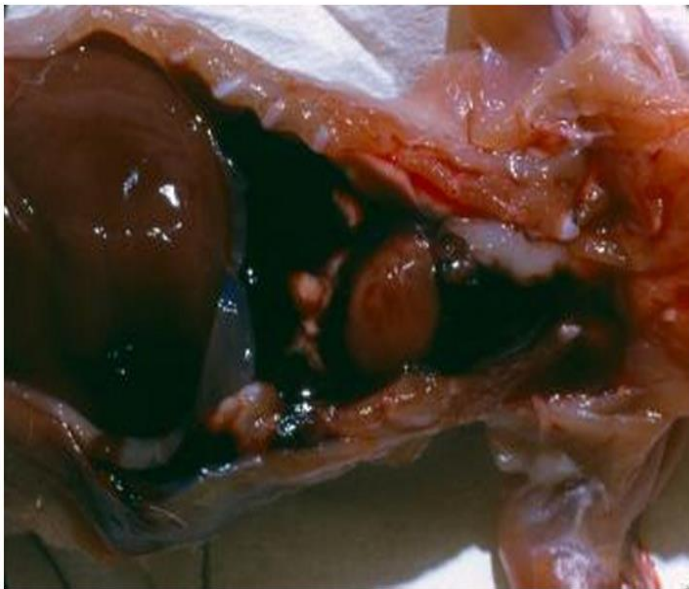
## **-Bleeding :-**

- 1) Nose bleeding (epistaxis)**
  - 2) Bloody diarrhea.**
  - 3) Bleeding Gums.**
  - 4) Bloody vomit & urine (hematuria).**
  - 5) Bruises due to ruptured blood vessels.**
  - 6) Pale mucous membranes due to anemia.**
  - 7) General exhaustion and general weakness**
- NB: warfarin is **teratogenic** if pregnant animal exposed to it.**

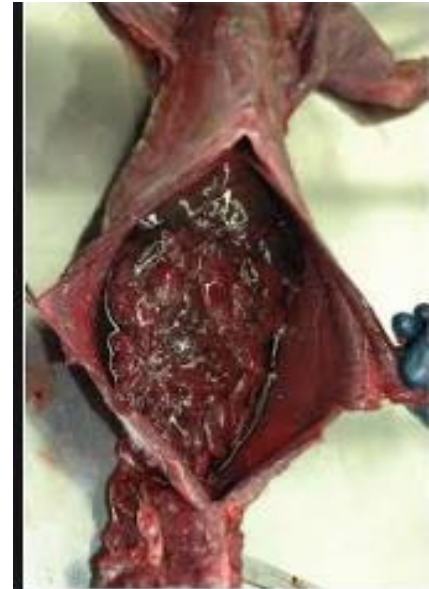
# PM:-

- Hemorrhages in the internal organs as well as the eyes, mouth and other organs.
- Pale mucous membranes.
- Collected liquid blood in the body cavities.

Thoracic hemorrhage, anticoagulant rodenticide poisoning



Mesenteric hemorrhage, anticoagulant rodenticide poisoning



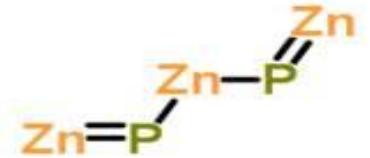
# ✓ TREATMENT

- The poisoned animal should be kept quite and avoid traumas.
- **Vit. K injection (specific antidote)** in a dose of 1 mg/kg I/V followed by I/M for 5 days.
- **Blood transfusion if possible.**
- **Blood substitutes (fluid therapy):**  
as glucose or saline solution.



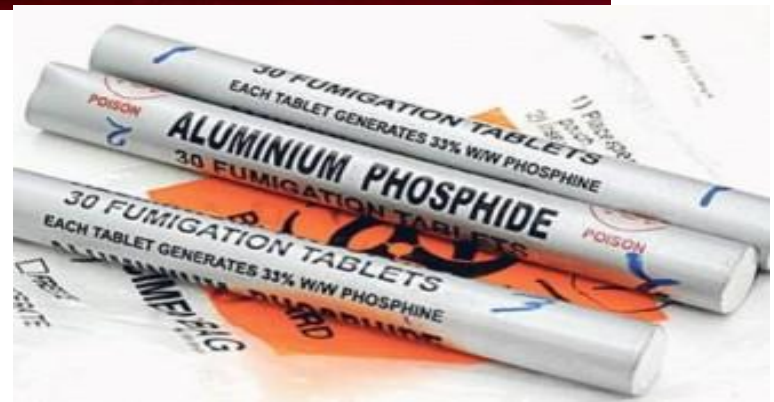
# Inorganic rodenticides

## 1- Zinc phosphide



## 2- Aluminum phosphide

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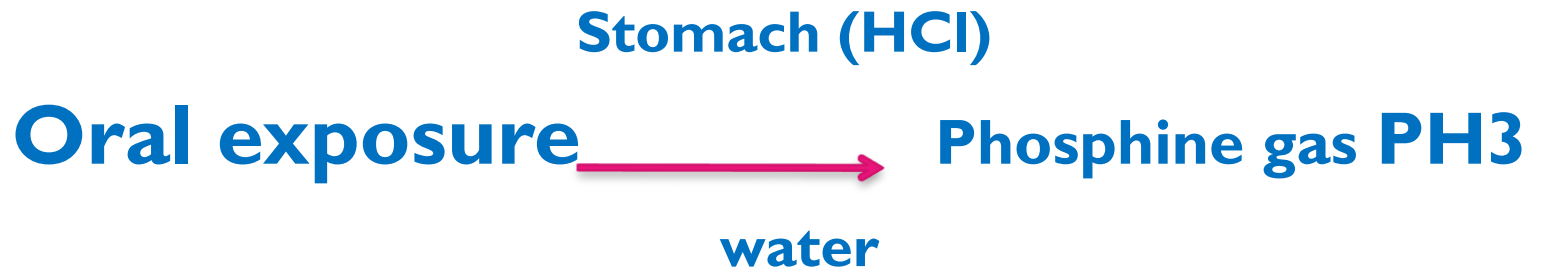


- Zinc phosphide bait used around farms while Aluminum phosphide used to fumigate grain.
- They used to protect grain in stores and during its transportation



# Zinc phosphide

- **Dark grey powder**, dangerous to animals and birds due to its high toxicity and **lack of selectivity**.



- **Phosphine gas** is very toxic and causes death in poultry within 24 hours and in farm animals within 48-72 hours.
- Pulmonary edema.

## ➤ MECHANISM OF ACTION OF ALUMINUM PHOSPHIDE:

- It generates phosphine gas according to the following hydrolysis equation.



- Synonyms of phosphine include **hydrogen phosphide**, **phosphorus hydride**.
- Hydrogen phosphide affects all cells (**cellular hypoxia**), but targets cells in the heart, lungs, and liver.
- **Phosphine** interferes with enzymes and protein synthesis, primarily in the mitochondria of heart and lung cells.



# - **Clinical signs:-**

- **GIT irritation.**

✓ **Vomiting (black)**

- **Garlic odor on the breath of intoxicated animals**

- **Abdominal pain**

- **Convulsions.**

- **Respiratory failure and death.**

## **PM:-**

Gastroenteritis (black stomach contents ) ,  
Congestion of heart, Lung, Liver and Kidney.

Lung edema.

Odor of phosphine gas and zinc phosphide.

# *Treatment (Symptomatic)*

- There is no specific treatment or **specific antidote**.
- Gastric lavage using **sodium bicarbonate**.
- **Paraffin oil**
- **Fluid therapy**.
- **Symptomatic treatment**.

# ➤ Fungicides

- Fungicides are used to prevent or treat **fungal infections**.



- They are used for **seed protection**, on **cereal crops**, fruits, vegetables and flowers, wood preservatives and in paint and plastics.



- **Poisoning in poultry and farm animals**

usually has resulted from the incorporation of treated seeds or feed stuffs into poultry or animal feed.

# Fungicides

- Initially, fungicides consisted of **sulfur, copper sulfate, mercury-** based compounds and other **metal-containing compounds**.
- Chemical fungicides are now available for both **medical treatment** of human fungal disease and agricultural applications.
- ✓ **Control of plant** fungus is important not only because they can **damage** the plant but also because some **fungi produce toxic** chemicals (mycotoxins).
- One of the more interesting fungi, **Aspergillus flavus**, can contaminate nuts (e.g. peanuts) and grains (e.g. corn). This fungus produces aflatoxin, which can cause liver disease and in some situations **liver cancer**.
- **These chemicals caused tragic human suffering when the treated seed was consumed instead of being planted.**

# Fungicides are classified into:

## I-Inorganic fungicides:

- Copper fungicides such as **copper oxychloride**.
- Cadmium fungicides as cadmium carbonate.
- Mixtures or complexes of Cd, Ca, Cu, and As oxides and other metal-based fungicides.
- Copper-arsenic compounds as **Paris green**.
- **Mode of action**, clinical signs and line of treatment is the same as in metallic poisons.





# 1- Copper oxochloride:

- Toxicity of copper oxochloride is due to the presence of **copper** and characterized by:

- Hemolysis of RBCs.      -Diarrhea. jaundice .

- Treatment:

- **Penicillamine** is the specific antidote given orally in a dose of 15-50 mg/kg body weight as chelating therapy.

- **Molybdenum** (antagonists to copper) in the form of molybdate given orally.

- supportive treatment and fluid therapy is also recommended.

## II-Organic fungicides:

- Nowadays, organic fungicides are extensively used because of their **low toxicity** to mammals.

### Examples:

- Anvil, mancozeb, Tilt 100, trimiltox, Ridomil, Rubigan, Formaldehyde and Dithane are examples.
- **Organic mercury** compounds as methyl mercury is also used.

- **The 1971 Iraq poison grain disaster** :
- It was **a mass methyl mercury poisoning** incident that began in late 1971.
- Grains treated with a methylmercury fungicide and never intended for human consumption was imported into **Iraq** as seed grain from Mexico and the United States.
- People suffered from paresthesia (numbness of skin), ataxia (lack of coordination of muscle movements) and vision loss.
- 10,000 people died and 100,000 were severely and permanently brain damaged.



# Line of Treatment

- 1-Skin decontamination by washing.**
- 2-Gastrointestinal decontamination through GIT emptying.**
- 3-activated charcoal.**
- 4-Supportive treatment such as fluid therapy using glucose and electrolytes.**
- 5- Chelating agents such as BAL and penicillamine (In case of metal based fungicides).**

# Herbicides (weed killer)

- **herbicide**, a chemical used for killing or inhibiting the growth of unwanted plants (Chemicals used for **weed control**).
- 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.
- **Animal exposure:**
- Most health problems in animals result from exposure to excessive quantities of herbicides because of improper or careless use or disposal of containers.
- when animals gain direct access to the product, the acute poisoning occurs.

# Classification of herbicides

## 1- According to the effect:-

**A- Selective (weeds) :**Such as 2, 4-D and 2, 4, 5-T.

They **select the broad leaved** plants. They act as growth regulators induce plants grow faster than available nutrients and die.

**B- Non selective (weeds + plants):**

photosynthesis inhibitors as triazine herbicides.

## 2- According to application:

**A -Foliar:** 2,4-D – Paraquat and Diquat

**B - Soil:** Triazines, Bromacil.

## 3- According to the **chemical configuration:**

- Inorganic
- Organic

# Herbicides

- The most famous herbicides are the **chlorophenoxy** compounds that include **2,4-D**, and **2,4,5-T**
- This herbicide mixture, sometimes called **Agent Orange**, was widely used to kill broad-leaved plants in agriculture fields, along roadsides, and right of ways for power lines.
- It was also extensively used as a **chemical warfare** agent to kill unwanted vegetation.
- The mechanism of action of this class of chemicals is **poorly understood** but they appear to interact with **plant growth hormones**.
- **Paraquat** and the related chemical diquat are nonselective herbicides that are also toxic to mammals.
- There are many other herbicides in widespread use with a range of actions including alachlor, **glyphosate**, and atrazine.

# Herbicides:

## 1- **The chlorphenoxy acid-type herbicides:**

2, 4-D (2, 4-Dichlorophenoxy acetic acid),

2, 4, 5-T (2, 4, 5-Trichlorophenoxy acetic acid), and

Silvex [2- (2, 4, 5-Trichloropenoxy) propionic acid].

**2- The triazine herbicides:** atrazine, cyanazine, prometryn, metribuzin and simazine.

**3- The carbamate and thiocarbamate compounds .**

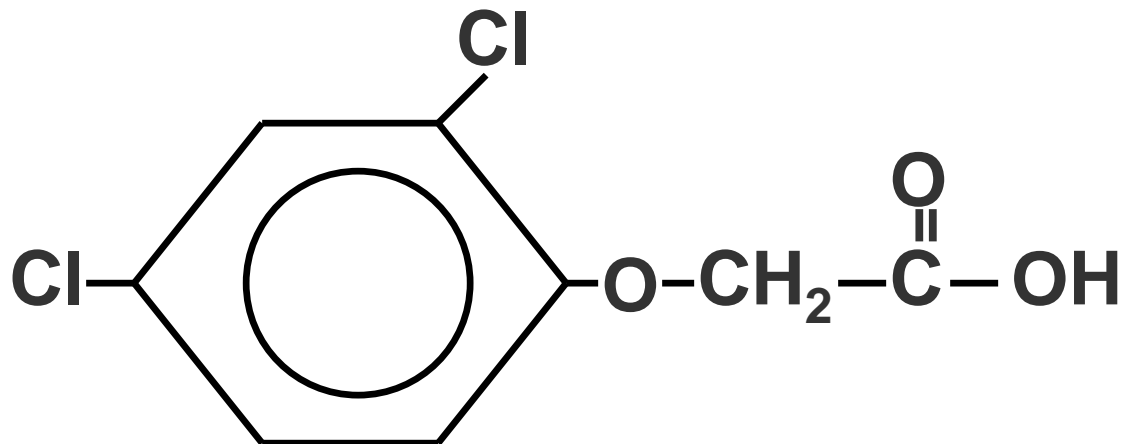
**4- The bipyridyl compounds: **paraquat** and **diquat****

**5- Sodium and potassium chlorates.**



# Herbicides 2,4-D

(2,4-dichlorophenoxyacetic acid).



One of the most widely used herbicides

## **2,4-D** (Dichlorophenoxy acetic acid)

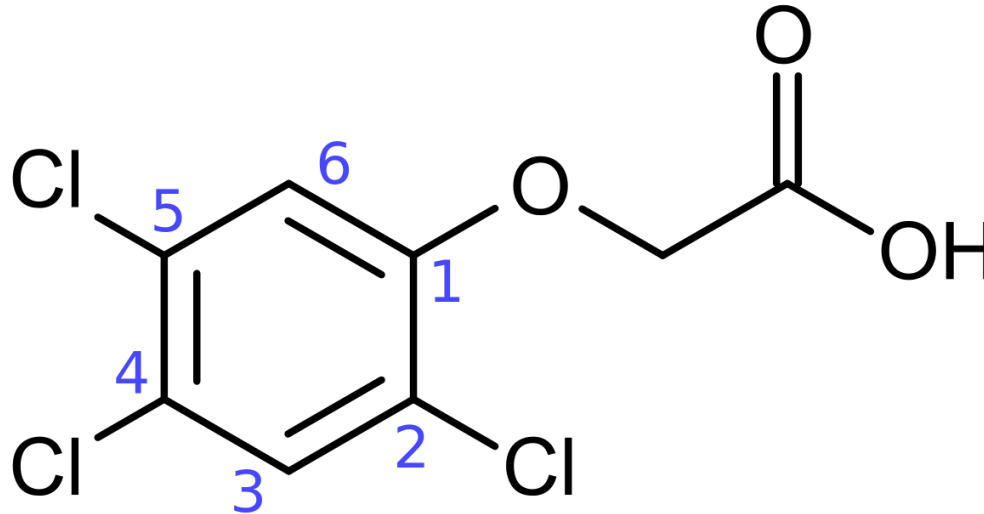
- It is a systemic herbicide which kills most broadleaf weeds by causing **uncontrolled growth and death of plants.**
- **Effect on animals:**
  - Loss of appetite and weight
  - Muscular weakness , paralysis of hind limbs
  - Stiffness & paralysis
  - Abortion, Dermatitis (cattle) dermal exposure

### **Treatment:**

- Symptomatic treatment

# Herbicides 2, 4, 5-T

## 2,4,5-Trichlorophenoxyacetic acid



**2,4,5-Trichlorophenoxyacetic acid** (also known as **2,4,5-T**) is a **chlorophenoxy acetic acid** herbicide used to defoliate broad-leaved plants.

It was developed in the late 1940s and was widely used in the agricultural industry until being phased out, starting in the late 1970s due to toxicity concerns.

# Agent Orange

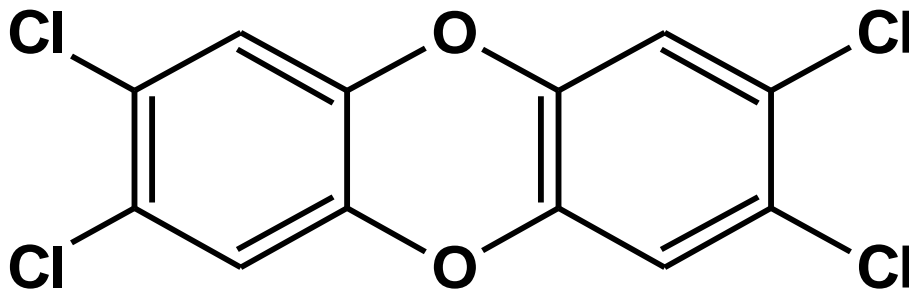


- **Agent Orange**, is a chemical herbicide and defoliant that composed of equal parts of **2,4,5-T + 2,4-D**.
- **Agent Orange** was a herbicide mixture used by the U.S. military during the Vietnam War. Much of it contained a dangerous **chemical contaminant** called dioxin.
- Production of Agent Orange ended in the 1970s and is no longer in use.
- **The dioxin contaminant** however continues to have harmful impact today???????

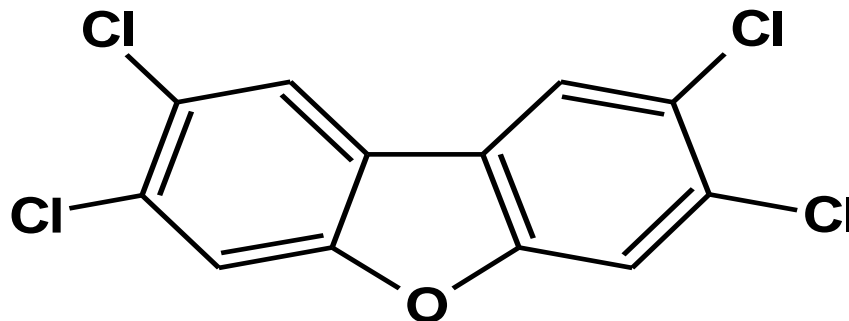


# *Dioxins (TCDD) and dioxin like compounds (TCDF)*

- **TCDD (2,3,7,8-Tetrachlorodibenzo-p-dioxin)** is formed mainly during the manufacture of the herbicides 2,4-D and 2,4,5-T.



TCDD



TCDF

**They are a class of substances **never intentionally** (not produced commercially) released to the environment which are formed as a result of contamination of commercial chemical products.**

- They occur in very low concentrations in the environment.**
- Highly toxic substances.**
- TCDD is formed in the manufacture of the herbicide 2, 4, 5-T (2, 4, 5-Trichlorophenol).**
- In Italy 2,4,5-T plant accident (reactor exploded) resulted in contamination of surrounding area with TCDD (166 ppm) and caused mortalities of domestic (mostly poultry and rabbits) & wild animals and effects on human health (chloracne).**

- **Dioxins are persistent environmental pollutants**

(POPs) and therefore accumulate within the food chain.

- lipophilic properties, the chemicals are readily absorbed into fatty tissue, and thus they have a tendency to accumulate in animals.
- fish exposed as a result of the chemicals' presence in aquatic environments, and cattle and other livestock, as a result of the chemicals' release into terrestrial environments.
- Consumption of potentially contaminated foods, such as **beef and dairy products**, is the primary route for dioxin entry into the human body.
- The half-life of dioxin in humans has been estimated to be between 7 and 11 years.

## ✓ Sources of dioxins

- As **by-product** in chlorinated compounds and herbicide production.
- **Leaded Gasoline combustion.**
- **Medical tools and hazardous waste and plastics incineration.**
- **Chlorine Bleaching of Paper and Pulp Products.**
- **Open Burning of Household Waste.**
- **Uncontrolled Combustion:**
  - **Forest Fires and Volcanoes.**
- **Metal Refining.**



## Sources of dioxins

- **Burning** vegetation treated with 2,4- D and 2,4,5-T.
- Emitted **into air** and undergo atmospheric transport and deposition on land or water.
- Emitted **into water** and bind to sediment.
- **Accumulation** up the food chain.
- **Resistance** to physical, chemical, and biological degradation.

# Toxicity of Dioxins and Furans

- Through initial binding to/and activation of the aryl hydrocarbon (Ah) receptor causes disruption of biochemical pathways involved in development and homeostasis.
- Dioxins also have **endocrine disruptor** effects, and exposure may result in reproductive and developmental defects.
- Toxic effects:
  - **Teratogenic or developmental toxicity.**
    - ✓ **wasting syndrome.**
      - Hematopoietic failure.
      - Reproductive toxicity.
      - Endocrinopathy.
    - \*\* Hepatotoxicity.
    - \*\* Immunosuppression.
    - \*\* Neuropathy.
  - ✓ **Chloracne:** which is a severe skin disease with acne-like lesions that occur mainly on the face and upper body.
  - ✓ **Carcinogenic effect:** Human exposure leads to an overall increase in the rates of all cancers in exposed individuals.

## **Prevention and control of dioxin exposure:**

- **Proper incineration of contaminated material is the best available method of preventing and controlling exposure to dioxins.**
- **Prevention or reduction of human exposure.**
- **protecting the food supply is critical.**
- **Food and feed contamination monitoring systems must be in place to ensure that tolerance levels are not exceeded.**
- **Trimming fat from meat and consuming low fat dairy products may decrease the exposure to dioxin compounds.**

# Paraquat

- Paraquat and diquat are **non-selective contact** herbicides, used in the destruction of **unwanted weeds**.
- **Paraquat** produces lung toxicity in affected animals.
- It causes serious toxicity following accumulation in lungs.
- It produces free radicals.
- It induces degeneration of alveolar cells followed by extensive cell damage.
- Severe pulmonary fibrosis develops very fast.
- Death due to respiratory failure.

# Round up (glyphosate) herbicide

a systemic, broad-spectrum glyphosate based herbicide.

<https://www.youtube.com/watch?v=cG0G0JvmIHM>

<https://www.youtube.com/watch?v=o8QLR2SizJs>

**August 14 /2018**

**Monsanto Roundup Weed killer Case of Cancer  
(lymphoma).**

**The judge ordered Monsanto co. to pay  
289 million dollar.**



**Thank you**

