



Toxicity from Agricultural Chemicals

- Toxicity from pesticides
- Organochlorine compounds
- Organophosphorus compounds
- Accidental toxicity
- Prevention
- Toxicity from fertilizers

Toxicity from Agricultural Chemicals

- Several agricultural chemicals are intentionally applied to increase yield of field crops
- Contamination may occur in the field during growth and harvesting, or during transportation, distribution, storage, processing or even preparation
- Fertilizers provide necessary nourishment to the plants
- Fungicides prevent the growth of pathogenic fungi

- ⦿ Weed killers eradicate unwanted plants
- ⦿ Insecticides and rodenticides help to control insect and rodent-infestations
- ⦿ Toxicity of all agricultural chemicals for man and most domestic animals ranges from none to extremely toxic
- ⦿ To ensure consumer safety, the safe doses of these compounds must be applied and at a stage that when harvested crops transported to market, most residues would have disappeared

- Care is taken by food processors to reduce any such residues to the safe limits

- Sometimes, traces of agricultural chemicals e.g.

- Pesticides remain on plants or inside plants and animal tissues and enter the human body when such contaminated foods are eaten



Toxicity from pesticides

- In Pakistan more than 70% pesticides are applied on cotton crop that leave residues in the cotton seed used for oil extraction
- The remaining cake is an ingredient for animal feed
- Heavy and indiscriminate use leaves residues both in oil and cake which are responsible for toxicity in animals and humans
- **Exposure to pesticides causes infertility in males, increased rate of abortions, still births, neonatal death and congenital defects in females**

Toxicity from pesticides

- **Organochlorine compounds** have been detected in foods of animal origin such as meat, milk, butter, fish and eggs
- Chronic exposure to **Organophosphorus insecticides** inhibits the Acetylcholinesterase activity- causes excessive accumulation of acetylcholine that leads to neuromuscular paralysis (interminable muscle contraction in the entire body, leading to death by asphyxiation)

Organochlorine compounds

- These compounds are widely used in pesticides
- Have been detected in man and animals
- **Benzene hexachloride (BHC), and dichlorodiphenyl trichloroethane (DDT),** two common compounds remain in the top layers of soil and continue to be ingested by livestock and ultimately accumulate in the tissues
- Have tendency and stability to accumulate in fatty tissues of man and animals
- Continued consumption results in chronic dyspepsia, vomiting and diarrhea

Organophosphorus compounds

- ◉ Most commonly employed Organophosphorus compounds are malathion and parathion
- ◉ **Parathion**- very toxic insecticide and retained by plants during and after their growth, it is lethal to pests and hazardous to man

Accidental toxicity

- ~~Acute toxicity by agricultural chemicals occur when the uptake is through skin or by inhalation or when these chemicals are swallowed~~
- **World health organization (WHO)** estimates that 1,00,000 people annually die from accidental poisoning by a wide range of agricultural chemicals
- Pakistan mercury poisoning in 1963 affected 34 people and 4 died after eating grains treated with mercury

Accidental toxicity

- **Sodium fluoride**- organic pesticide (white powder), closely resembles powdered milk and baking powder, it has at times been mistaken for these commodities and consumed
- **Barium carbonate**- rat poison (white tasteless and odorless powder), it often consumed mistakenly and caused gastroenteritis (tingling sensation in mouth)- the illness leads to tendon reflexes and various degree of paralysis

Accidental toxicity

- ⦿ **Paraquat**- a cheap and effective herbicide, is a deadly poison with no known antidote
- ⦿ Swallowing less than a teaspoon causes vomiting, attacks the liver, kidneys and lungs, leaving most victims to die

Prevention

- ⦿ Regulations on the use of agricultural chemicals prescribe the maximum permissible levels in foodstuff meant for human consumption
- ⦿ **BHC, DDT, malathion (3 parts per million)**
- ⦿ The accidental consumption of the dangerous chemicals can be avoided by properly labeling the containers or by the manufacture of colored chemicals
- ⦿ These chemicals should not be stored in kitchen or in food store nor should be repacked without labeling

Toxicity from fertilizers

- ⦿ Application of fertilizers is essential to provide the plants with essential nutrients
- ⦿ In Pakistan, fertilizers primarily provide three nutrients e.g. nitrogen, phosphorus and potassium
- ⦿ Quite often used in excess to the plant requirements
- ⦿ Excess of **nitric nitrogen (nitrates)** leads to an accumulation of nitric ions in the plants

Toxicity from fertilizers

- ~~Kale, spinach, celery are often high in nitrates~~
- **Nitrates** are converted to nitrites which result in stomach cancer
- Excessive nitrogen fertilizers in cabbage increases the content of antithyroid factor causes serious repercussions of the thyroid
- **Nitric oxide** causes irritation of the lower respiratory tract
- **Heavy metals** occur in phosphate fertilizers that originate from phosphate rocks