

Pesticide Hazards: Monitoring and Control

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Abstract

Pesticides are any substance or a mixture of substances used for preventing, destroying repelling, or mitigation of any pest. They may be bio pesticides, antimicrobials, and pest control devices. Pests may be insects, bacteria, fungi, and viruses. The process of chemical crop-protection is profit-induced poisoning of the environment. The Poisoning action of pesticides can be divided into four modes namely; (a) physical Poisons, (b) Nerve Poisons, (c) Protoplasmic Poisons, and (d) Respiratory Poisons, Thus the pesticides affect every one i.e. they affect your health, your family's health and your community's health. A detailed description of pesticide hazards, monitoring and control is described in this paper.

Keywords: Pesticides, Hazards, Monitoring, Prevention, Control

1. Causes of Pesticides Hazards

2. Pesticide Stockpile: It is a Common phenomenon around the world. Stockpiles are obsolete pesticides/chemicals that can no longer be used for the desired purpose and so it requires disposal. The risk of contamination due to container leakage poses serious dangers to the community living in the area as well as to the passersby.

3. Pesticides Exposure: Farmers and workers are regularly exposed to pesticides. Children are also exposed. Non target objects are exposed in three ways;

- (a) **Exposure through the Skin:** It is through spills on clothing or directly on the skin by touching the treated flora and fauna by mixing pesticides etc.
- (b) **Exposure through Breathing:** It is very common for workers who spray pesticides or for people as well as other animals stay nearby when the spray is carried out. Hence it is important to note that some pesticides have no distinguished smell.
- (c) **Exposure through Swallowing:** It occurs by eating or drinking contaminated food or water, by eating food without washing hands or without changing clothes and by inhaling contaminated air.

In most cases, workers are not aware of hazards of pesticides and they handle them without proper precautions. Pesticides are poisons which enter our body through different pathways and once it is in, there is a very little chance of getting the pesticide out of the body system.

2. Hazards Based Classification of Pesticides

1. The World Health Organization (WHO) has classified the pesticides as follows:

- Ia. Extremely Hazardous – colour code is RED
- Ib. Highly Hazardous-colour code is RED
- II. Moderately Hazardous-colour code is YELLOW
- III. Slightly Hazardous-colour code is BLUE

IV. Not Hazardous- colour code is GREEN

This Classification does not say anything about long-term chronic effects? For Example, endosulfan is classified as "MODERATELY HAZARDOUS". It can cause severe long-term health effects such as cancer, mental disorders and endocrine disruption.

The Food and Agriculture Organization of the United Nations (FAO) recommends that WHO Ia and Ib pesticides should not be used in developing countries, and if possible II should also be avoided.

2. Lethal Dose of Pesticides

Class I: 2-3 Drops or one pinch

Class II: One tea spoon

Class III: Two tea spoons

Class IV: One cup or one glass

3. Acute Health Effects of Pesticides

1. **Acute Toxicity:** It is also known as acute poisoning. It occurs when the poisonous effects of pesticides are realized within a short time.
2. **Chronic Toxicity:** These are the Poisonous effects which are realized after a long period of time say after months or some times after years of exposure to the pesticide.
3. Some acute health effects are headache, dizziness, nausea, chest pain, vomiting, skin rash muscle pain, excessive sweating, cramp, diarrhea, difficulty in breathing, blurred vision, and ultimate death.
 - a) **Local Acute Effects:** These are effects which affect the part of the body that is in direct touch of pesticide. For example, dryness, burning, redness and itching of eyes, throat and skin, watering of eyes and cough. The skin problems such as redness, itching burning, rashes, blisters and discoloration. If fingernails and toenails turn black or blue the pesticide poisoning is confirmed. In the case of acute poisoning the nails will even fall off.
 - b) **Systemic Acute Effects:** These effects occur by getting the pesticides in the body in turn affects the whole body. Since the pesticide contaminates blood, all the sophisticated organs such as eyes, heart lungs, stomach, intestines, liver, kidneys, muscles brain and nerves are affected.
 - c) The symptoms of systemic poisoning and the quickness of poisoning depend on the period of exposure to the pesticide and the degree of acuteness of toxicity of the pesticide.
 - d) Some well-known pesticides which are causing acute skin diseases are given below:

Fungicides: Benomyl, Captafol, Captan, chlorothalonil, Copper Sulphate, Dicloran (DCNA), Dinobuton, Dinocap,

Ditalimfos, Dithanon, Dyrene, Folpet, HCB, Maneb, Mancozeb, Organotins, PCNB, PCB sulfur, Thiophanate, Thiram, Triphenyltin, and Zineb.

Herbicides: 2, 4-D Alachlor, Allidochlor, Amotrole, Atrazine, BarbanDique, Glyphosate, MCPA, Nitratin, Paraquate, Phemedipham, Propachlor and Pyrazon.

Insecticides: Arsenic, Cryolite, Dienochlor, Dinitrophenol, Naled, Parthion and Pyrethrins.

Fungicides: Dazomet, Dichloropropene, Ethylene oxide, Metam Sodium and Methyl bromide.

Note: If rash appears on exposure to pesticide and it disappears on removing, it confirms that it is due to pesticide.

4. Chronic Effects of Pesticides

1. **Neurotoxic Pesticides:** The pesticides which harm the nervous system are called neurotoxins; some pesticides are very harmful to the brain and nerves. Commonly known symptoms of organic brain diseases are memory problems, difficulty in concentration, changes in personality, paralysis, seizures, unconsciousness and coma.
2. **Liver Defects:** Liver breaks down the toxic chemicals into less harmful substances. The pesticides harm the liver than can lead to toxic hepatitis.
3. **Stomach Disorders:** The pesticides poisoning is causing vomiting, stomach aches and diarrhea. Long exposure to pesticides is causing serious stomach problems such as loss of appetite. If one swallows the pesticide there will be terrible damage to the stomach. It is due to the damage of stomach walls.
4. **Immune System Defects:** Some pesticides have been found to disturb the immune system of our body. So the body enables to protect us from illness including cancer and infectious diseases such as HIV, AIDS, tuberculosis, cough and cold etc. allergic reactions etc.
5. **Hormones Disbalance:** Hormones are chemicals produced by organs such as the brain, thyroid, parathyroid, kidneys, adrenals, testes and ovary. These chemicals control the important body functions. Some pesticides affect reproductive hormones causing decreased sperm production in the male and abnormal egg development in the female. Some pesticides can cause thyroid enlargement which could lead to thyroid cancer.
6. **Pesticides Exposure causes miscarriage:** Mother's exposure to some pesticides during the first month of pregnancy can cause a miscarriage.
7. **Pesticides Exposure Causes Stillbirth:** Mother's exposure to pesticides during pregnancy is related to the occurrence of stillbirth. Parents' exposure to pesticides before a baby is conceived can cause a stillbirth.
8. **Pesticides Exposure causes sterility in Men:** Some pesticides are known to cause sterility in man. Pesticides that harm sperm cells are called spermatotoxins or reproductive toxins.
9. **A Husband working with Pesticides Affects His Pregnant Wife who is Not Dealing with Pesticides.**
10. **Babies Are Exposed To Pesticides By Breastfeeding.**
11. **Pesticides Cause Birth Defects:** The U.S. Environmental Protection Agency has the following list of some

commonly used pesticides which are known or suspected to cause birth defects:

- (a) **Herbicides:** Acrolein, Bentazone, Cyanazine, Bromoxynil, 2,4-D, Dinocap, Dinoseb, Diquat, Nitrofen, Picloram and 2,4,5,-T.
 - (b) **Fungicides:** Benomyl, Captan, Folpet, HCB, Mancozeb, Maneb, Tributyltin Oxide, Tributyltin fluoride and Triphenyltin acetate.
 - (c) **Insecticides:** Atrazine, Chlordane, Endosulfan, Ethion, Phosmet, Methyl parathion, Mirex and Trichlorfon.
12. **Pesticides Cause Cancer:** There are some carcinogenic pesticides which are called Carcinogens. The chances of getting cancer are more if one is exposed to cancer pesticides than those who are not exposed to pesticides, U.S. Environmental Protection Agency (EPA) as published the following list of the pesticides which are known or suspected to cause cancer.
- (a) **Insecticides:** Arsenic pentoxide, Cadmium, Chlordane, Chlordimeform, DDT, Dieldrin, DDVP, Heptachlor, Dipropylscoincarbonate, Ethoprop, Fonoxycarb, Lindane, Oxythioquinox, Paradichlorobenzene, Propargite, Propoxur, Pyrethrins, Thiodicarb and Trichlorfon.
 - (b) **Fungicides:** Captan, Captan, Chlorothalonil, Folpet, HCB, Maneb, Mancozeb, Iprodione, Metiram, Silica aerogel, Thiophanate-methyl and Vinclozolin.
 - (c) **Herbicides:** Acetochlor, Acifluorfen, Alachlor, Amotrole, Oxadiazon, Arsenic Acid, Cacodylic acid, Diuron and Proflumicarb.
 - (d) **Fumigants:** DBCP, EDB, Dichloropropane, Dichloropropene, Ethylene sulfide, Metam Sodium and Propylene Oxide.
 - (e) **Others:** Arsenic trioxide, Chromic Acid, Cresote, Daminozide, Formaldehyde, Ortho-phenylphenol, Pentachlorophenol, Potassium dichromate.
13. **Malnutrition enhances the toxicity of the Pesticides:** People who have insufficient food intake are prone to have higher risk pesticides exposure. In rats, that were short on proteins the pesticide poisoning became much more:
- a. DDT-4 times as toxic
 - b. Lindane-12 times as toxic
 - c. Endosulfan-20 times as toxic
 - d. Carbaryl-8 times as toxic
 - e. Captan-21000 times as toxic
14. Some mixtures of pesticides are more dangerous than their parent pesticides.
15. The following pesticides which are similar to nerve gas are more acutely toxic because they attack cholinesterase, a substance responsible for the proper functioning of our nervous system:
- (a) **Organophosphates:** Azinphosmethyl, Demeton methyl, Dichlorvos (DDVP), Disulfoton, Ethion, Ethyl parathion (Parathion), Fenamiphos, Fenitrothion, Methamidophos, Methidathion, Methyl parathion,
 - (b) **Methylocarbamates:** Aldicarb, Carbofuran, Fomethion, Methomyl, Oxamyl and Propoxur.

5. Motitiroing of Pesticide Poisoning

1. Symptoms of Mild Poisoning by Nerve Gas Type Pesticides: (i) Abdominal Pain, (ii) Blurry Vision, (iii) Chest pain, (iv) Diarrhea, (v) Dizziness, (vi) Excessive sweating (vii) Headache (viii) Muscle pain and cramp, (ix) Nausea and vomiting and (x) Increased secretion from the eyes, nose and mouth.
2. Symptoms, of Moderate Poisoning by Nerve Gas Type Pesticides: (i) Confusion (ii) Problem in walking, (iii) Problems in concentration, (iv) General weakness, (v) Muscle twitching and (vi) Small pupils.
3. If the gradual increase in poisoning, symptoms will be as follows (i) Sleeping trouble (ii) Nightmares and (iii) Restlessness.
4. Symptoms of Severe poisoning by nerve gas type pesticides: (i) Unconsciousness (ii) Involuntary urination and defecation, (iii) Coma, (iv) Small pupils (marked miosis) (v) Blue color of lips and nailbeds (cyanosis), (vi) Difficulty in breathing, (vii) Convulsions and (viii) Death if severe poisoning is not recognized and treated in time.
5. Symptoms of Poisoning by Methyl Bromide. (i) Headache, (ii) Dizziness, (iii) Nausea, (iv) vomiting, (v) Shakiness, (vi) Walking problem and (vii) Convulsion.
6. Symptoms of Poisoning by Organ chlorines. (i) Symptoms of Acute Poisoning (i) Nausea, (ii) vomiting, (iii) Headache, (iv) Dizziness, (v) Agitation/Confusion, (vi) Muscle spasms, (vii) Muscle weakness and, (viii) Convulsion (b) Symptoms of Chronic Poisoning: (i) All above, (ii) Pallor, (iii) Skin lesions, (iv) Sterility, (v) Heart problems, (vi) Liver problems and (vii) Loss of consciousness.
7. Symptoms of Poisoning by paracetamol: (i) Irritation and injury to eyes, skin, nose and throat, (ii) Skin and throat ulcers, (iii) Nose Bleeding (iv) Failure of liver and kidney and (v) Scarring of lungs causing death from suffocation.
8. Symptoms of poisoning by endosulfan: (i) Damage of red blood cells, thyroid, kidneys, liver muscles, and the developing foetus, (ii) Hepatotoxic, (iii) Genotoxic, (iv) Mutagenic, (v) Clastogenic, (vi) Tumour promoter and
9. Cholinesterase test: The level of cholinesterase goes down by poisoning of organophosphate or carbamate pesticides i.e. nerve gas type pesticides. There are two tests one for cholinesterase in red blood cells and another for cholinesterase in plasma. The results are as follows: (i) 75% of base line – Mild poisoning – may have symptoms. (ii) 100% of base line-normal for your (iii) 50% of base line-Moderate poisoning – May have symptoms (iv) 25% of base line –severe poison – Usually has headache, dizziness nausea, vomiting, sweating etc. (v) 0% of base line- Unconscious – Can die if treatment is not given.

6. Control of Pesticides Hazards

1. Take Caution

- (a) Don't handle pesticides with our bare hands
- (b) Don't smoke when handle pesticides
- (c) Don't face the wind when spraying pesticides
- (d) Don't consume pesticides- treated fruits/food
- (e) Don't eat anything before washing your hands

- (f) Don't store pesticides in home especially in places where foodstuffs are stored.
- (g) Don't use pesticides for your own treatment such as treatment of head lice.

2. If you feel that you are poisoned by Pesticide

- (a) Stop working with the pesticide immediately.
- (b) Change your clothes and remove the pesticides by washing with water and soap
- (c) Inform your family members, co-workers etc. to take you for medical care
- (d) Consult the trained technical manpower in this area
- (e) Follow the occupational health and safety regulation for pesticides exposure in agricultural workers etc.

3. If pesticide splashes in eyes

- (a) Open eyelids with your fingers and rinse eye/eyes immediately with running water at least for 30 minutes.
- (b) Never use eye drops because it is not an antidote.
- (c) Consult health worker as soon as possible. Take container of the pesticide with you to show it to the health worker.

4. If Pesticide spills on the skin

- (a) Remove contaminated dresses.
- (b) Wash off the pesticide with soap immediately.
- (c) Consult the health worker; keep the pesticides container with you to show the health worker.

5. If someone swallows pesticide

- (a) Lay down the person with the head lower than body. Turned to one side to prevent aspiration in case of vomiting.
- (b) Clean the mouth and eyes or bathe the patient if possible.
- (c) Help the person to vomit by tickling the back of the patient's throat. Vomiting is dangerous for unconscious or convulsing or the patient suffering by heart disease.
- (d) If patient wants water give him lot of water, avoid milk alcohol or any other foodstuffs.
- (e) Take the patient to the health worker, don't forget to take pesticide container.

6. The best control is to make available the well trained health worker, round the clock.

7. Drugs that can be used are atropine

It is an antidote for the treatment of poisoning by organophosphate and methylcarbamate. It is a drug that counteracts the effects of a poison. Another drug is pralidoxime (2-PAM) that is recommended as an antidote for some organophosphates' poisoning. It is effective only if it is given soon after the poisoning occurs. Drugs should be given by the trained Health worker in the prescribed procedure.

8. Improve the economics conditions of the farmers

- (a) Offer the farmers "something extra" through government – supported prices or subsidies for their commodities.
- (b) Provide the increase in net farm income from free trade in which they have the highest prices and lowest cost.
- (c) In India Just after independence, cooperative agricultural farms were developed to give training and demonstrations to the farmers. The farmers were also paid to compensate their loss of time in training. This process may be revived again to provide training for the proper use of pesticides.

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