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Effect of Pesticides on Human and Animal Health

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Chemicals called pesticides are used in agriculture and public health to manage pests. Although they shield plants from pests and disease-carrying mosquitoes, they also seriously endanger the health of people, other animals, and ecosystems. Acute health impacts from pesticides include skin irritation, nausea, and respiratory problems; chronic health effects include cancer, reproductive damage, and endocrine disruption. Children, farmworkers, and pesticide applicators are among the categories particularly susceptible to these effects. Particularly hazardous substances include organophosphates, pyrethroids, and soil fumigants, which can cause serious neurological, pulmonary, and reproductive problems. Exposure to pesticides ruins aquatic life, contaminates food chains, and harms wildlife. This article emphasises the delicate balance that exists between the advantages of using pesticides to control pests and the serious concerns that they bring to people.

Keywords: Pesticides, Agriculture, Public health, Toxicity, Chemicals

Introduction

According to the Environmental Protection Agency (EPA), pesticides are chemical substances used to manage and ward off pest infestations. This category includes chemicals, or mixtures, used mainly in public health and agricultural projects. Their function is to protect plants against diseases, pests, and weeds. They also shield plants from diseases carried by vectors, such as schistosomiasis, malaria, and dengue fever. There are many different kinds of pesticides, such as plant growth regulators, herbicides, insecticides, fungicides, and rodenticides.

Pesticides can have both acute, or short-term, harmful health impacts, and chronic, or long-term, health consequences, which can happen months or years after exposure. Acute health effects can include blindness, nausea, dizziness, diarrhoea, blisters, rashes, stinging eyes, and even death. Cancers, birth abnormalities, reproductive injury, immunotoxicity, toxicity to the nervous system and development, and endocrine system disruption are

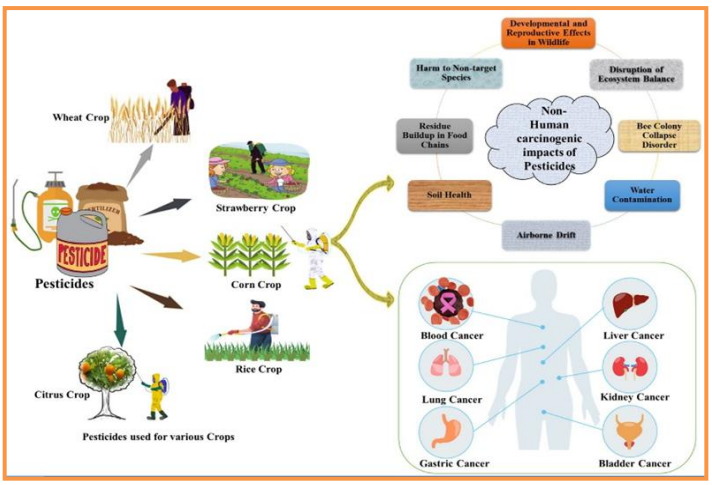

Image source: https://www.tandfonline.com/doi/full/10.1080/23311932.2024.2334096#graphical-abstract

a few examples of recognised chronic consequences (Damalas and Koutroubas, 2016).

Certain persons are more susceptible to the effects of pesticides than others (Kim *et al.*, 2017). For instance, it is well known that newborns and early children are more vulnerable to the harmful effects of pesticides than adults are. Due to increased exposure, farm labourers and pesticide applicators are also more susceptible.

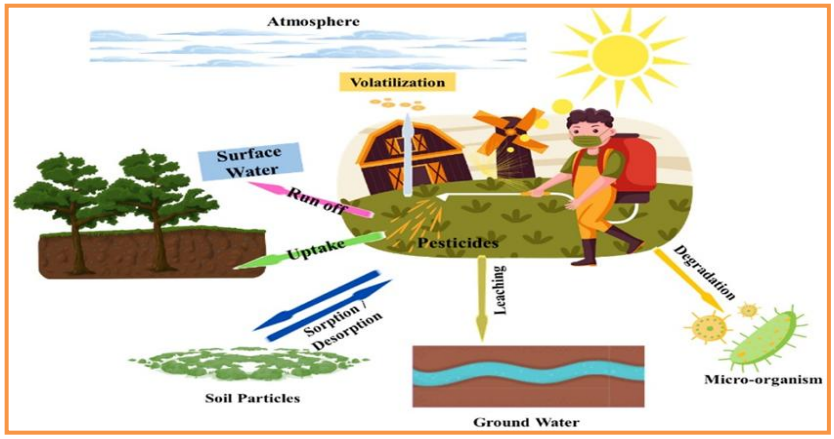

Figure 1 Image source: https://www.tandfonline.com/doi/full/10.1080/23311932.2024.2334096#graphical-abstract

Pesticides fulfil several important functions, such as:

- **Increased Productivity:** By controlling insect populations and reducing crop losses, pesticides help to increase agricultural output overall.
- **Protecting Crop Yields:** Pesticides are essential for protecting crops from pest-induced yield reduction, which leads to maximum harvests.
- **Vector-Borne Disease Management:** To stop the spread of diseases like dengue fever, malaria, and other vector-borne illnesses, pesticides are essential for managing the vectors that transport these illnesses.
- **Many Uses:** Pesticides are useful in a variety of fields, including:

➢ Sports Facilities: To keep the turf on athletic fields, cricket pitches, and golf courses in good condition, herbicides and insecticides are used.

➢ Structural Protection: To prevent termites and other woodboring insects from causing damage to buildings and wooden structures, insecticides are used (Lee and Choi, 2020).

Acute (Immediate) Health Effects

Pesticide exposure can have immediate negative health impacts, such as skin irritation, rashes, and blisters, as well as irritation of the nose, throat, and skin that burns, stings, and itches. Additionally typical are diarrhoea, vertigo, and nausea. Certain pesticides, especially those that contain carbamate, organophosphate, and pyrethrin/pyrethroid, can cause extremely serious allergic reactions in people who have asthma. Symptoms of pesticide poisoning frequently resemble those of the flu or cold. Pesticide poisonings are frequently misdiagnosed and underreported because symptoms linked to pesticides might look similar to or identical to other ailments. It's possible that someone's symptoms are not severe enough to warrant seeking medical assistance, or that a doctor might not even consider enquiring about chemical exposure. Nevertheless, if you believe you may have become poisoned by pesticides, get medical help right away (Kim *et al.*, 2017).

Chronic (Long-term) Health Effects

Cancer and other tumours, damage to the brain and nervous system, birth defects, infertility and other reproductive issues, and harm to the liver, kidneys, lungs, and other body organs are examples of chronic health impacts. It can be challenging to establish a connection between pesticide exposure and negative health effects since chronic effects may not manifest for weeks, months, or even years. In human research, pesticides have been linked to lymphoma, leukaemia, and malignancies of the brain, breasts, prostate, testes, and ovaries. Pesticides can cause birth abnormalities, stillbirths, spontaneous abortions, sterility, and infertility, among other reproductive harms. Endocrine disruptors are substances that, frequently at very low concentrations, obstruct or mimic hormones, which are chemical messengers that circulate in the blood and regulate a variety of bodily processes, including

metabolism, brain development, the sleep cycle, and the stress response. Certain pesticides have been demonstrated to seriously affect animals, causing cancer, sterility, and developmental issues. These pesticides function as endocrine disruptors. Human exposure to these substances has been linked to similar effects (Kim *et al.*, 2017).

Health Effects of Certain Classes of Pesticides

Organophosphates and carbamates are pesticides that act on the brain and nervous system, obstructing the passage of nerve signals. They are similar to nerve gas. Headaches, nausea, light-headedness, vomiting, diarrhoea, cramping in the muscles, and disorientation are some of the symptoms. Serious poisoning episodes can cause convulsions, respiratory difficulties, involuntary urination, coma, and even death. Each year, these herbicides cause acute nervous system poisoning in hundreds of thousands of people worldwide.

Pyrethroids: These pesticides are man-made substances that resemble botanical compounds structurally but are made to last longer. They are hazardous to the neurological system, and it is thought that a fetus's ability to effectively metabolise these substances is compromised during pregnancy. Pyrethroid poisoning symptoms include tremors, drooling, headaches, exhaustion, vomiting, itching skin, and involuntary twitching and stinging.

Pesticides known as soil fumigants are sprayed on the soil and produce a gas that is poisonous to nematodes, fungi, bacteria, insects, and plants. Since they are gases, they can travel from the soil into the air, exposing neighbouring residents and workers. Fumigants such as dichloropropene and chloropicrin can irritate the skin, eyes, and lungs, while metam sodium and metam potassium can cause acute irritation to these organs. Chemicals that cause cancer include dichloropropene, metam sodium, and metam potassium. Metam sodium also has negative effects on reproduction. Premature birth is more likely in counties with high fumigant use than in counties with low use (Terziev and Petkova-Georgieva, 2019).

Impact on human health

Pesticides can enter the body in a number of ways, including direct skin contact, ingestion through food and drink, and inhalation of aerosols, dust, and vapour. The effects of pesticides on human health are contingent upon the chemical's toxicity as well as the length and degree of exposure. Children are more susceptible to the effects of pesticides than adults because of their developing bodies and weakened immune systems. Adverse health consequences include a variety of symptoms, including but not limited to headaches, exhaustion, respiratory conditions, cardiovascular problems, gastroenteritis, and skin irritation. Developmental abnormalities have also been connected to pesticides. Exposure can have a range of effects, from minor skin irritation to birth defects, tumours, genetic changes, blood and nerve diseases, endocrine system disruptions, and even extreme outcomes like coma or fatality (Bernardes *et al.*, 2015).

Impact on animal health

As pesticide residues pass through the food chain, they can contaminate animals. Because of the use of pesticides, some animals may lose important food sources, which could force them to relocate, change their diet, or risk hunger. Exposure to pesticides can lead to neurological and endocrine disturbances, and impaired immune system responses, and reproductive implications include lower conception rates and birth weights. Fish and other aquatic creatures may suffer damage if they come into contact with pesticide-contaminated water. Fish that are repeatedly exposed to sub-lethal concentrations of some pesticides may have changes in their physiology and behaviour, which may result in population decreases, nest and offspring abandonment, decreased resistance to disease, and impaired ability to elude predators. Pesticides can build up in bodies of water to the point that they eradicate zooplankton, which is the main food supply for young fish.

Conclusion

To sum up, although pesticides are essential for controlling pests and raising agricultural yield, their extensive application has serious dangers for the environment, animal and human

health, and both. The risks of exposure are highlighted by both acute and long-term health impacts, which can range from nausea and skin irritation to serious brain damage and cancer. These effects are especially dangerous for vulnerable populations including children and farmworkers. The devastation of species and ecosystems, particularly in aquatic situations, underlines the necessity of cautious management even more. Stricter laws, better substitutes, and heightened public knowledge of pesticide exposure are necessary to reduce these hazards. A sensible and balanced approach to pesticide use is essential for the long-term health of people, animals, and ecosystems.

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