

Effect of Pesticides on Human Health

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Abstract

The demand for pesticides has increased in today's world of expanding population in order to boost crop productivity and eliminate undesirable plants (weeds) that grow alongside the primary crop. Along with the various benefits, it is also used in animal farms to get rid of pests. This has an impact not only on humans but also on animals and the environment. The usage of pesticides has increased, and occasionally some of them linger in the food products they are applied to, a condition known as pesticide residue. This residue is linked to human health and can result in a variety of diseases and disorders. In the current environment, even pesticides that are marketed as benign have negative long-term effects and exacerbate issues like bio-accumulation and bio-magnification. To avoid food contamination with pesticides, different methods like crop rotation, organic farming, and integrated pest management should be used as alternatives. Today, it is essential for all pesticide users to be aware of the risk and proper handling of these pesticides. New methods of pest management should be fostered in the real me of development.

Keywords: Pesticides; Human Health; Animal Disease; Vectors

Introduction

"Pesticides are any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm, during or otherwise interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood and wood products, or animal feed-stuffs, or substances which may be admixed," according to the Food and Agricultural Organisation (FAO). According to US Environment 2007, pesticides are substances or mixtures of substances used to prevent, eliminate, repel, or mitigate the effects of pests [1].

The public was made aware of the potentially fatal effects of chemical pesticides on people and the environment by Rachel Carson in her book "Silent Spring" in 1962. Masanobu Fukuoka expertly merged spirituality and farming in his 2009 book One Straw Revolution, which offered natural farming methods and emphasised the importance of not adding any external chemicals to the agricultural system [2]. Contrarily, we can say that pesticides are substances that are used to stop the spread of pests (or any microorganism) that affect plant growth. In addition to killing pests, pesticides are also used to control plant growth and delay product ripening. According to research, pesticides have both acute and chronic health effects on people, and these effects might manifest months or years after exposure. When we discuss the acute effects, they include mortality, blindness, nausea, stinging eyes, rashes, dizziness, and diarrhoea. The chronic effects include cancer, birth defects, reproductive harm, immune toxicity, neurological damage, and endocrine system destruction. Any plants, animals, or microorganisms that affect food, health, or comfort are considered pests. The Environmental Protection Agency (EPA) defines pesticides as a class of chemicals used to prevent and control the growth of pests. These are also described as chemical and natural substances that are used to fend off or eradicate noxious pests, organisms that cause plant illnesses, common weeds, and organisms that harm people. It can be summed up as a material used in agriculture to protect the crops from pests and insects for hydration and to boost the crop's yield and output [3].

Classification of Pesticides

Pesticides can be classed based on their intended use, target organism, chemical makeup, and degree of biodegradability

On the Basis of Application

1. Agriculture (insecticides pesticides, weedicides)
2. Public health (used to kill vectors causing disease)
3. Domestic pesticides used to kill insects like cockroaches, bacteria (bactericides), mice (rodenticides) etc [3].

Based on Chemical Nature

1. The neurological system of the insect is impacted by organophosphate
2. The effects of carbamate on the neurological system are reversible
3. Organochlorine insecticides have a negative impact on both human and environmental health. Thus, several nations stopped using them (for instance, DDT and chlordane)
4. Naturally occurring pyrethroid insecticides in chrysanthemum blossoms
5. Weed-controlling herbicides that contain sulfonyl urea
6. Organically produced biopesticides [4].

Depending on How Quickly they Degrade

1. Biodegradable substances are those that can be converted into harmless compounds by microorganisms or other living things
2. Persistent these takes months or years to breakdown [4].

On the Basis of Modes of Action

Insecticides

The Insecticide Resistance Action Committee (IRAC) divided insecticides into 32 categories with known modes of action and sites of action as well as 5 additional categories with unknown modes of action or sites of actions. Different parts of the nervous system are most frequently affected by insecticides. They also focus on the same nervous system place in humans. Acetyl choline esterase is inhibited by carbamate and organophosphate, which results in over excitation. Pesticides include, for instance, dichlorvos, malathion, phorate, etc. Convulsions and hyper excitability are caused by the blockage of the gamma-amino butyric acid activated chloride channel by phenyl pyrazole and cyclodiene organochlorine insecticides. The insecticides endosulfan and fipronil are two examples. Both natural and synthetic pyrethroids maintain the sodium channel open, which leads to hyperexcitation and, in rare cases, nerve block ade. Permethrin and deltamethrin are two examples. Neonicotinoids are insecticides that bind to the nicotin acetyl choline receptor and produce a variety of symptoms, including hyper excitability, lethargy, and paralysis. Acetamiprid, clothianidin, and imidacloprid are a few examples. Another class of pesticides that affect the neurological system are those that paralyse insects by either allosterically activating nAChRs, glutamate-gated chloride channels, or allosterically inhibiting GABA-activated chloride channels [5].

Fungicides

Fungicides prevent the growth of fungi by interfering with vital biological functions. Based on the site of action, the Fungicide Resistance Action Committee (FRAC) has divided fungicides and bactericides into 50 groups. They operate on particular target areas that contain particular enzymes to which fungicides bind. Known target sites include respiration, amino acid and protein synthesis, signal transduction, lipid synthesis, transport membrane integrity or function, cell wall biosynthesis, melanin synthesis in cell walls, and host plant defence induction. Endocrine disrupting pesticides include several fungicides and herbicides [5].

Herbicides

These pesticides are used extensively in agriculture, the landscape industry, and non-crop areas for weed control. They prevent normal plant growth and development. Herbicide has been divided into 27 groups by the Herbicide Resistance Action Committee. These include cell membrane disruptors, pigment inhibitors, photosynthetic inhibitors, amino acid synthesis inhibitors, lipid synthesis inhibitors, and growth regulators. Auxin transport inhibitors and synthetic auxin are the main ingredients in growth regulator herbicide. 2, 4- Dichlorophenoxyacetic acid (2, 4-D), dicamba, quinclorac, dichlorprop, MCPA (2-methyl-4-chlorophenoxyacetic acid), mecoprop, and picloram are examples of synthetic auxins that are often employed. These mimic the auxin (indoleacetic acid) plant growth hormone. The human hormonal system is also disrupted by some synthetic auxin herbicides. Herbicides that limit photosynthetic activity frequently employ atrazine. Tyrosine, tryptophan, and phenylalanine are produced when the enzyme EPSPS, which is a derivative of an amino acid called glyphosate, is inhibited from being produced. When inhaled or swallowed, the electron diverter and respiratory inhibitor paraquat (gramoxone) poses a significant risk to people [5].

Impact of Pesticide on Environment

There are several harmful repercussions of pesticide use on the ecosystem. Because they are sprayed throughout the entire agricultural area, pesticides, which are dangerous compounds designed to eliminate pest species, can also affect non-target species like people, animals, and plants. Pesticides have negative effects on nearby farms, grazing areas, human settlements, other aquatic ecosystems, and undeveloped areas in addition to the area where they are administered. Regular application of insecticides increases pest resistance [6].

Impact of Pesticides use on Human Health

When used on humans, pesticides have both immediate and long-term negative effects on health. First, let's discuss the short-term acute effects of pesticide exposure on human health. These effects include eye stinging, blisters, rashes, skin irritation, blindness, nausea, and dizziness. When working in agricultural fields, being exposed to pesticides poses a major risk to the respiratory system, increasing the likelihood of asthma attacks and bronchitis as well as persistent cough, dyspnea, wheezing, and expectoration. All of these respiratory issues are frequently observed in employees working in Ethiopian flower fields, Brazilian coffee plantations, and Costa Rican banana plantations. The usage of pesticides during banana cultivation in Rio Grante Do Norte, Brazil, results in symptoms such as burning in the throat and lungs, congestion, cramps, skin peeling, diarrhoea, headache, chest pain, weakness, and skin irritation [5]. In terms of the long-term, chronic negative effects of pesticide exposure, these include cancer, endocrine system disruption, birth abnormalities, reproductive damage, neurological and developmental toxicity, and immune toxicity. Since these effects may not become apparent for weeks, months, or even years after exposure, it may be challenging to connect pesticide use to negative health effects. Human research on leukaemia, lymphoma, and malignancies of the brain, breast, prostate, testes, and ovaries have linked pesticides to these diseases. Pesticides can cause birth defects, stillbirths, spontaneous abortions, sterility, and infertility, among other reproductive harms. Endocrine disruptors are additional compounds that, when consumed in small concentrations, can impair vital physiological processes by imitating or obstructing hormones [7].

Preventive Measures

Farmers should utilise alternative methods including integrated pest management (IPM), crop rotation, and organic farming to eliminate the harmful effects of pesticides on human health and pesticide contamination of food.

1. The process of education and the provision of protective equipment for personal use to prevent pesticide exposure are two separate techniques to lessen health impact
2. Teaching farmers how to use less pesticides and protect the environment
3. Reduce the availability of highly dangerous insecticide by taking appropriate action. The concept of organic farming is one of the main solutions to preventing the use of pesticides in agricultural practises. As compared to conventionally grown crops or product produced utilising integrated pest management techniques, organic produce contains far fewer pesticide residues. According to studies, crops grown organically have a higher nutritious content than crops grown using any other conventional method. When compared to other conventional crops, organically cultivated crops have higher levels of ascorbic acid, lower levels of nitrate, and superior protein quality [1].

Conclusion

On human health, pesticides have major and alarming effects. Long-term interaction with these substances, ingestion of tainted food, or environmental exposure can all have negative effects on one's health. It is essential to reduce pesticide use by the adoption of alternative and more sustainable farming practises, such as organic farming and integrated pest management, in order to pro-

protect human health. A healthier and safer environment for everyone also depends on raising knowledge among farmers, consumers, and policymakers about the dangers of pesticides and the advantages of eco-friendly farming practices. To lessen the negative impacts and safeguard human wellbeing, regular monitoring, strict laws, and appropriate pesticide usage are crucial.

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