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Harmful Effects of Pesticides in Banswara District of Rajasthan

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ABSTRACT: Synthetic pesticides are extensively used in agriculture to control harmful pests and prevent crop yield losses or product damage. Because of high biological activity and, in certain cases, long persistence in the environment, pesticides may cause undesirable effects to human health and to the environment in Banswara district of Rajasthan. Farmers are routinely exposed to high levels of pesticides, usually much greater than those of consumers. Farmers' exposure mainly occurs during the preparation and application of the pesticide spray solutions and during the cleaning-up of spraying equipment. Farmers who mix, load, and spray pesticides can be exposed to these chemicals due to spills and splashes, direct spray contact as a result of faulty or missing protective equipment, or even drift. However, farmers can be also exposed to pesticides even when performing activities not directly related to pesticide use in Banswara district of Rajasthan. Farmers who perform manual labor in areas treated with pesticides can face major exposure from direct spray, drift from neighboring fields, or by contact with pesticide residues on the crop or soil in Banswara district of Rajasthan. This kind of exposure is often underestimated. The dermal and inhalation routes of entry are typically the most common routes of farmers' exposure to pesticides. Dermal exposure during usual pesticide handling takes place in body areas that remain uncovered by protective clothing, such as the face and the hands. Farmers' exposure to pesticides can be reduced through less use of pesticides and through the correct use of the appropriate type of personal protective equipment in all stages of pesticide handling in Banswara district of Rajasthan.

KEYWORDS: pesticides, farmers, Banswara, crop, fields, handling, management, toxicity, stages

I. INTRODUCTION

Pesticides can cause short-term adverse health effects, called acute effects, as well as chronic adverse effects that can occur months or years after exposure. Examples of acute health effects include stinging eyes, rashes, blisters, blindness, nausea, dizziness, diarrhea and death. Examples of known chronic effects are cancers, birth defects, reproductive harm, immunotoxicity, neurological and developmental toxicity, and disruption of the endocrine system.[1]

Some people are more vulnerable than others to pesticide impacts in Banswara district of Rajasthan. For example, infants and young children are known to be more susceptible than adults to the toxic effects of pesticides. Farm workers and pesticide applicators are also more vulnerable because they receive greater exposures in Banswara district of Rajasthan.

Immediate health effects from pesticide exposure includes irritation of the nose, throat, and skin causing burning, stinging and itching as well as rashes and blisters. Nausea, dizziness and diarrhea are also common. People with asthma may have very severe reactions to some pesticides, particularly pyrethrin/pyrethroid, organophosphate and carbamate pesticides. In many cases, symptoms of pesticide poisoning mimic symptoms of colds or the flu. Since pesticide-related illnesses appear similar or identical to other illnesses, pesticide poisonings are often misdiagnosed and under-reported. Immediate symptoms may not be severe enough to prompt an individual to seek medical attention, or a doctor might not even think to ask about pesticide exposure in Banswara district of Rajasthan. Chronic health effects include cancer and other tumors; brain and nervous system damage; birth defects; infertility and other reproductive problems; and damage to the liver, kidneys, lungs and other body organs. Chronic effects may not appear for weeks, months or even years after exposure, making it difficult to link health impacts to pesticides in Banswara district of Rajasthan.

Pesticides have been implicated in human studies of leukemia, lymphoma and cancers of the brain, breasts, prostate, testes and ovaries. Reproductive harm from pesticides includes birth defects, still birth, spontaneous abortion, sterility and infertility.

Endocrine disruptors are chemicals that — often at extremely low doses — interfere with important bodily functions by mimicking or blocking hormones (the chemical messengers that circulate in blood and regulate many body processes including metabolism, brain development, the sleep cycle and stress response) in Banswara district of Rajasthan. Some pesticides act as endocrine disruptors and have been shown to cause serious harm to animals, including cancer, sterility



and developmental problems. Similar impacts have been associated with human exposure to these chemicals in Banswara district of Rajasthan.[2]

Children are not simply “little adults.” Children are more vulnerable to pesticide exposure because their organs, nervous systems and immune systems are still developing. Children are also less able to detoxify and excrete pesticides. Exposure during certain early development periods can cause permanent damage.

In addition to being more vulnerable to pesticide toxicity, children’s behavior and physiology make them more likely to receive greater pesticide exposure than adults. Most pesticide exposure occurs through the skin and children have more skin surface for their size than adults. Children have a higher respiratory rate and so inhale airborne pesticides at a faster rate than adults. Children also consume proportionately more food and water — and pesticide residues — than adults. With their increased contact with floors, lawns and playgrounds, children’s behavior also increases their exposure to pesticides in Banswara district of Rajasthan.

Organophosphates & Carbamates: These pesticides are like nerve gas: they attack the brain and nervous system, interfering with nerve signal transmission. Symptoms include headaches, nausea, dizziness, vomiting, chest pain, diarrhea, muscle pain and confusion. In severe poisoning incidents, symptoms can include convulsions, difficulty breathing, involuntary urination, coma and death. Acute poisoning of the nervous system by these pesticides affects hundreds of thousands of people around the world each year.

Soil Fumigants: These pesticides are applied to soil, forming a gas that is toxic to nematodes, fungi, bacteria, insects, and plants in the soil. Because they are gases, they move from the soil into the air and expose people living or working nearby. Commonly used soil fumigants in California include 1,3-dichloropropene, chloropicrin, metam sodium, and metam potassium. Symptoms of fumigant exposure include irritation of skin, eyes, and lungs (dichloropropene and chloropicrin), and extremely irritating to eyes and lungs (metam sodium and metam potassium). [3] Dichloropropene, metam sodium, and metam potassium are all cancer causing chemicals and metam sodium causes reproductive harm. In counties where fumigant use is high, premature birth is more common than in counties with low fumigant use in Banswara district of Rajasthan.

Pyrethroids: These insecticides are synthetic chemicals that are structurally similar to botanical compounds but have been designed to be more persistent. They are toxic to the nervous system, and there is concern that during pregnancy a fetus is not able to efficiently break down these chemicals. Symptoms of pyrethroid poisoning include tremors, salivation, headache, fatigue, vomiting, stinging and itching skin, and involuntary twitching.

Many pyrethroids also cause long term health problems in Banswara district of Rajasthan. For example, resmethrin causes both cancer and reproductive harm. Cypermethrin, fenvalerate, and deltamethrin all cause genetic damage and reproductive harm. Data from the Center for Disease Control and Prevention’s national biomonitoring program links pyrethroid exposure to heart disease.

II. DISCUSSION

The environmental effects of pesticides describe the broad series of consequences of using pesticides. The unintended consequences of pesticides is one of the main drivers of the negative impact of modern industrial agriculture on the environment. Pesticides, because they are toxic chemicals meant to kill pest species, can effect non-target species, such as plants, animals and humans. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, because they are sprayed or spread across entire agricultural fields. Other agrochemicals, such as fertilizers, can also have negative effects on the environment in Banswara district of Rajasthan.[4]

The negative effects of pesticides are not just in the area of application. Runoff and pesticide drift can carry pesticides into distant aquatic environments or other fields, grazing areas, human settlements and undeveloped areas. Other problems emerge from poor production, transport, storage and disposal practices in Banswara district of Rajasthan. Over time, repeat application of pesticides increases pest resistance, while its effects on other species can facilitate the pest's resurgence. Alternatives to heavy use of pesticides, such as integrated pest management, and sustainable agriculture techniques such as polyculture mitigate these consequences, without the harmful toxic chemical application in Banswara district of Rajasthan. Environmental modelling indicates that globally over 60% of global agricultural land (~24.5 million km²) is "at risk of pesticide pollution by more than one active ingredient", and that over 30% is at "high risk" of which a third are in high-biodiversity regions, in Banswara district of Rajasthan. Each pesticide or pesticide class comes with a specific set of environmental concerns. Such undesirable effects have led many pesticides to be banned, while regulations have limited and/or reduced the use of others. The global spread of pesticide use, including



the use of older/obsolete pesticides that have been banned in some jurisdictions, has increased overall, in Banswara district of Rajasthan.[5]

Pesticide environmental effects	
Pesticide/class	Effect(s)
Organochlorine DDT/DDE	Endocrine disruptor
	Thyroid disruption properties in rodents, birds, amphibians and fish
	Acute mortality attributed to inhibition of acetylcholinesterase activity
DDT	Egg shell thinning in raptorial birds
	Carcinogen
	Endocrine disruptor
DDT/Diclofol, Dieldrin and Toxaphene	Juvenile population decline and adult mortality in wildlife reptiles
DDT/Toxaphene/Parathion	Susceptibility to fungal infection
Triazine	Earthworms became infected with monocystid gregarines
Chlordane	Interact with vertebrate immune systems
Carbamates, the phenoxy herbicide 2,4-D, and atrazine	Interact with vertebrate immune systems
Anticholinesterase	Bird poisoning
	Animal infections, disease outbreaks and higher mortality.
Organophosphate	Thyroid disruption properties in rodents, birds, amphibians and fish
	Acute mortality attributed to inhibition of acetylcholine esterase activity
	Immunotoxicity, primarily caused by the inhibition of serine hydrolases or esterases
	Oxidative damage
	Modulation of signal transduction pathways
	Impaired metabolic functions such as thermoregulation, water and/or food intake and behavior, impaired development, reduced reproduction and hatching success in vertebrates.
Carbamate	Thyroid disruption properties in rodents, birds, amphibians and fish
	Impaired metabolic functions such as thermoregulation, water and/or food intake and behavior, impaired development, reduced reproduction and hatching success in vertebrates.
	Interact with vertebrate immune systems
	Acute mortality attributed to inhibition of acetylcholine esterase activity
Phenoxy herbicide 2,4-D	Interact with vertebrate immune systems
Atrazine	Interact with vertebrate immune systems
	Reduced northern leopard frog (<i>Rana pipiens</i>) populations because atrazine killed phytoplankton, thus allowing light to penetrate the water column and periphyton to assimilate nutrients released from the plankton. Periphyton growth provided more food to grazers, increasing snail populations, which provide intermediate hosts for trematode.



Pyrethroid	Thyroid disruption properties in rodents, birds, amphibians and fish
Thiocarbamate	Thyroid disruption properties in rodents, birds, amphibians and fish
Triazine	Thyroid disruption properties in rodents, birds, amphibians and fish
Triazole	Thyroid disruption properties in rodents, birds, amphibians and fish
	Impaired metabolic functions such as thermoregulation, water and/or food intake and behavior, impaired development, reduced reproduction and hatching success in vertebrates.
Neonicotinoic/Nicotinoid	respiratory, cardiovascular, neurological, and immunological toxicity in rats and humans
	Disrupt biogenic amine signaling and cause subsequent olfactory dysfunction, as well as affecting foraging behavior, learning and memory.
Imidacloprid, Imidacloprid/pyrethroid λ -cyhalothrin	Impaired foraging, brood development, and colony success in terms of growth rate and new queen production.
Thiamethoxam	High honey bee worker mortality due to homing failure (risks for colony collapse remain controversial)
Flupyradifurone	Lethal and sublethal adverse synergistic effects in bees. Its toxicity depends on season and nutritional stress, and can reduce bee survival, food consumption, thermoregulation, flight success, and increase flight velocity. It has the same mode of action of neonicotinoids.
Spinosyns	Affect various physiological and behavioral traits of beneficial arthropods, particularly hymenopterans
Bt corn/Cry	Reduced abundance of some insect taxa, predominantly susceptible Lepidopteran herbivores as well as their predators and parasitoids.
Herbicide	Reduced food availability and adverse secondary effects on soil invertebrates and butterflies
	Decreased species abundance and diversity in small mammals.
Benomyl	Altered the patch-level floral display and later a two-thirds reduction of the total number of bee visits and in a shift in the visitors from large-bodied bees to small-bodied bees and flies
Herbicide and planting cycles	Reduced survival and reproductive rates in seed-eating or carnivorous birds

IV. RESULTS

The extensive use of pesticides in agricultural production can degrade and damage the community of microorganisms living in the soil, particularly when these chemicals are overused or misused as chemical compounds build up in the soil of Banswara. The full impact of pesticides on soil microorganisms is still not entirely understood; many studies have found deleterious effects of pesticides on soil microorganisms and biochemical processes, while others have found that the residue of some pesticides can be degraded and assimilated by microorganisms. The effect of pesticides on soil microorganisms is impacted by the persistence, concentration, and toxicity of the applied pesticide, in addition to various environmental factors, in Banswara district of Rajasthan. This complex interaction of factors makes it difficult to draw definitive conclusions about the interaction of pesticides with the soil ecosystem. In general, long-term pesticide application can disturb the biochemical processes of nutrient cycling. Many of the chemicals used in pesticides are persistent soil contaminants, whose impact may endure for decades and adversely affect soil conservation, in Banswara district of Rajasthan.[6]



The use of pesticides decreases the general biodiversity in the soil. Not using the chemicals results in higher soil quality, with the additional effect that more organic matter in the soil allows for higher water retention, in Banswara district of Rajasthan. This helps increase yields for farms in drought years, when organic farms have had yields 20-40% higher than their conventional counterparts. A smaller content of organic matter in the soil increases the amount of pesticide that will leave the area of application, because organic matter binds to and helps break down pesticides, in Banswara district of Rajasthan.

Degradation and sorption are both factors which influence the persistence of pesticides in soil. Depending on the chemical nature of the pesticide, such processes control directly the transportation from soil to water, and in turn to air and our food. Breaking down organic substances, degradation, involves interactions among microorganisms in the soil. Sorption affects bioaccumulation of pesticides which are dependent on organic matter in the soil. Weak organic acids have been shown to be weakly sorbed by soil, because of pH and mostly acidic structure. Sorbed chemicals have been shown to be less accessible to microorganisms. Aging mechanisms are poorly understood but as residence times in soil increase, pesticide residues become more resistant to degradation and extraction as they lose biological activity, in Banswara district of Rajasthan.[7]

V. CONCLUSIONS

Pesticides are designed to kill living organisms and vary in their mechanisms of action, depending on their class. The major classes of pesticides are organochlorines (OCPs) or persistent organic pollutants (POPs), organophosphates, carbamates, pyrethroids, and triazines. While all pesticides have been shown to have effects on human health, OCPs are notable for significant risk for adverse effects as they dissolve in fatty tissues and can, thus, accumulate to harmful levels in these tissues. [8] For example, some OCPs are structurally similar to estrogen and can mimic the effects of endogenous estrogen via binding to the estrogen receptors.^[5] These pesticides exhibit their toxic effects by interfering with hormonal homeostasis, resulting in hormonal dysregulation. This promotes abnormal growth and development of reproductive tissues and can lead to cancer or harmful effects on reproductive health, in Banswara. OCPs or POPs, which were used in agricultural practices in the 1950s, have now been banned in most countries. However, their breakdown products are persistent and can still be found in soil.[9]

Pesticides can also exert their adverse effects on human health by acting on cell receptors and ion channels, suppressing key signal pathways in cells, and by affecting DNA methylation and histone modifications, thus resulting in changes in gene expression and cellular function, seen in some cases in Banswara district of Rajasthan, India[10,11]

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