

Effect of pesticides on human health, especially in children

Posted on September 13, 2018

Pesticides are substances or biological agents used to prevent, destroy, repel, or control organisms considered pests. They include insecticides, herbicides, fungicides, rodenticides, disinfectants, and products used in homes, farms, schools, gardens, and public-health programs. Pesticides can protect crops, reduce disease vectors, preserve buildings, and support food production, but they are designed to affect living systems and can cause harm when toxicity and exposure are not adequately controlled. The original essay is therefore correct that children require special protection, although it is inaccurate to imply that every pesticide kills all species without selectivity.

Human-health risk depends on both hazard and exposure. A highly toxic pesticide poses little practical risk if no person can contact it, while repeated or intense exposure can make even a less acutely toxic product harmful. The U.S. Environmental Protection Agency summarizes this relationship as risk equaling toxicity multiplied by exposure. Children may receive a larger dose relative to body weight, engage in more hand-to-mouth behavior, spend time close to floors and soil, and pass through developmental stages in which the brain, lungs, endocrine system, and other organs are changing rapidly. Prevention must therefore consider the product, route, dose, timing, and child's individual circumstances. (U.S. Environmental Protection Agency, 2026a)

Why Pesticides Are Used

Pesticides are not used only for agricultural profit. They can control mosquitoes that transmit disease, cockroaches that worsen asthma, rodents that contaminate food, weeds that compete with crops, fungi that destroy harvests, and organisms that damage structures. Eliminating every pesticide immediately could create public-health, food-security, and economic problems. The policy objective is to obtain necessary benefits while reducing avoidable exposure and selecting the least hazardous effective method.

Integrated pest management supports this balance. It begins with prevention, monitoring, sanitation, maintenance, physical barriers, biological controls, and targeted treatment. Chemical pesticides are used when necessary and applied in a manner matched to the pest and setting. This approach can reduce routine spraying without allowing infestation to become severe.

How Children Are Exposed

Children can encounter pesticides through food, drinking water, household dust, soil, air, treated pets, school grounds, gardens, agricultural drift, and products stored in the home. Exposure can occur by swallowing residues, breathing droplets or vapors, or absorbing substances through skin. A child may touch a treated floor and place fingers in the mouth, play near recently sprayed plants, or enter a room before the re-entry period has passed.

Children living or studying near agricultural areas may face additional pathways. Farmworkers can carry residues on shoes, clothing, vehicles, tools, and skin, creating take-home exposure. Housing may be located near treated fields, and spray drift can move beyond the intended target. These risks are shaped by poverty, housing quality, work protections, language access, and the ability to obtain medical care.

Prenatal Exposure

Exposure can begin before birth. Some pesticides or metabolites may cross the placenta, and pregnant workers or residents can encounter products through occupation, food, air, and household use. The timing of exposure matters because fetal organs develop through sensitive windows. A dose that produces limited observable effects in an adult may have different consequences during early neurological or reproductive development.

Research has associated some prenatal pesticide exposures, particularly certain organophosphates, with adverse neurodevelopmental outcomes. Association does not establish that every exposure causes an individual child's condition, and studies must account for other environmental and social factors. The evidence nevertheless supports precaution, occupational protection, and regulatory safety margins for pregnant people and children.

Why Children Are More Vulnerable

Children breathe more air, eat more food, and drink more water per unit of body weight than adults. Their metabolic systems may process chemicals differently, and protective barriers and organs continue developing. Young children crawl, play on the ground, explore objects orally, and may not understand warning labels. These behaviors increase contact with dust, soil, and improperly stored products. (U.S. Environmental Protection Agency, 2026b)

Vulnerability also varies among children. Asthma, skin disease, malnutrition, disability, genetics, previous exposure, and access to healthcare can affect risk. A child who works in agriculture, lives in crowded housing with pest infestation, or attends a poorly maintained school may experience multiple environmental hazards simultaneously.

Acute Pesticide Poisoning

Acute poisoning results from a relatively high exposure over a short time. Symptoms depend on the pesticide and route but can include headache, dizziness, nausea, vomiting, sweating, excessive saliva, breathing difficulty, weakness, confusion, skin or eye irritation, muscle twitching, seizures, and loss of consciousness. Some symptoms resemble influenza, heat illness, or food poisoning, causing delay in recognition. (World Health Organization, 2020)

Suspected poisoning requires immediate professional guidance. Emergency services or a poison-control center should be contacted according to the person's condition and local system. The product label and container can help clinicians identify active ingredients, but no one should induce vomiting or give a home remedy unless specifically directed. Contaminated clothing may need removal and exposed skin may require rinsing, while rescuers must avoid becoming exposed themselves.

Neurological Effects

The nervous system is a major concern because several pesticide classes interfere with neural signaling. Organophosphate and carbamate insecticides inhibit acetylcholinesterase, causing excessive accumulation of acetylcholine during acute poisoning. Pyrethroids affect sodium channels and can produce sensory or neurological symptoms at sufficient exposure. Other products act through different mechanisms.

The original essay lists memory loss, poor coordination, visual changes, mood alteration, slow response, and reduced motor skill. Such effects can occur with particular exposures, but the list should not be presented as the inevitable outcome of pesticide contact. Chronic low-level neurodevelopmental effects are difficult to study because exposure mixtures, timing, genetics, and social conditions vary. Strongest conclusions should be linked with named pesticide classes and measured exposure rather than the word pesticide as one uniform substance.

Respiratory Health

Pesticide sprays, vapors, and dusts can irritate the respiratory tract. Some products or formulations may trigger coughing, wheezing, chest tightness, or asthma symptoms. Children with existing asthma can be particularly affected by poor indoor application, aerosol products, or entry into treated areas too soon.

At the same time, uncontrolled cockroach and rodent infestations also worsen asthma. This example demonstrates why pest management should not be reduced to "chemical versus no chemical." Integrated pest management removes food and water sources, closes entry points, uses traps or baits strategically, and avoids unnecessary broadcast spraying.

Skin and Eye Effects

Direct contact may cause irritation, burns, dermatitis, or allergic reactions. Children can be exposed when they touch treated plants, wet surfaces, animal flea products, spills, or contaminated clothing. Eyes are especially vulnerable to splashes and airborne droplets.

Protective equipment must match the label and task. Adults should not assume ordinary clothing is sufficient for concentrated agricultural products. Children should never mix or apply restricted products and should remain away during application and the stated re-entry period.

Endocrine and Reproductive Concerns

Some pesticide ingredients can interfere with hormonal pathways in laboratory or wildlife studies, and researchers continue examining potential effects on puberty, fertility, thyroid function, and fetal development. Evidence differs greatly among chemicals. The broad statement that pesticides cause hormone disruption should therefore be qualified: particular substances may have endocrine activity at relevant doses, while others do not show the same profile.

Regulatory evaluation considers reproductive and developmental toxicity, exposure estimates, and uncertainty factors. Testing and regulation are not perfect, especially for mixtures and long-term low-dose exposure, but health claims should identify the product rather than treat all registered pesticides as equivalent.

Cancer

Some pesticide active ingredients have been classified as carcinogenic, probably carcinogenic, possibly carcinogenic, or not classifiable according to the evidence and evaluating organization. Cancer risk depends on dose, duration, route, and the chemical involved. A child's one-time contact with a household product does not establish that cancer will result.

Occupational and long-term epidemiological studies can identify patterns, but they face challenges such as changing formulations, incomplete exposure records, and simultaneous contact with several agents. Prevention remains appropriate where a substance has credible carcinogenic evidence, yet communication should avoid frightening families with unsupported certainty.

Active and Other Ingredients

A pesticide product contains one or more active ingredients responsible for controlling the pest and other ingredients that support formulation, stability, application, or delivery. Older writing frequently

calls these “inert ingredients,” but the word inert does not mean biologically harmless. Solvents, surfactants, carriers, fragrances, and propellants may contribute to irritation or toxicity.

Disclosure rules differ, and not every other ingredient is listed by chemical name on a consumer label. Regulators evaluate the complete product to varying degrees, but transparency remains important for clinicians, workers, and people with allergies. Users should follow the product label rather than assume an unlisted ingredient has no effect.

Food Residues

Pesticide residues may remain on or in food after lawful application. Regulators establish tolerances or maximum residue levels using toxicology, dietary exposure, and safety factors. In the United States, pesticide law provides additional consideration for infants and children, including an extra safety factor where needed. Monitoring programs commonly find most tested foods within legal limits, though compliance does not eliminate the value of continuing oversight.

Families can wash produce under running water, remove damaged outer leaves, eat a varied diet, and follow food-safety guidance. Washing does not remove every systemic pesticide, and soap or bleach should not be applied to food unless a trusted authority specifically directs it. Avoiding fruits and vegetables out of fear can create nutritional harm. The goal is risk reduction, not rejection of healthy food.

Drinking Water

Pesticides can reach surface water or groundwater through runoff, leaching, spills, and improper disposal. Risk depends on local agriculture, soil, rainfall, chemical persistence, treatment, and well construction. Public water systems monitor regulated contaminants according to applicable rules, while private-well owners may need targeted testing based on local conditions.

Boiling water does not reliably remove pesticide contamination and can concentrate some chemicals as water evaporates. Families concerned about a spill or local advisory should follow instructions from environmental and public-health authorities rather than select a filter without knowing whether it removes the specific contaminant.

Household Storage

Many childhood poisonings occur because products are stored within reach or transferred into beverage and food containers. Pesticides should remain in their original labeled containers, locked away from children and pets, and separated from food, medicine, and animal feed. The cap should be closed immediately after measuring. (U.S. Environmental Protection Agency, 2026c)

Adults should never describe pesticide as medicine or use a soft-drink bottle for storage. Even a brief transfer can lead to fatal confusion. Obsolete or unwanted products should be disposed of through label instructions and local hazardous-waste programs rather than poured into drains or onto soil.

Application in Homes

Before applying a product, the user should identify the pest and confirm that chemical treatment is necessary. More pesticide is not more effective and can increase residues. The label specifies site, dose, protective equipment, ventilation, re-entry, and disposal; using the product in a manner inconsistent with the label may be dangerous and unlawful.

Children's toys, bedding, food, dishes, and pet items should be removed or protected according to instructions. Baits and traps should be placed where children cannot reach them. Foggers and broad indoor sprays often create more exposure than targeted methods and should not substitute for sanitation and repair.

Schools and Child-Care Centers

Schools and child-care centers should use integrated pest management, maintain buildings, respond to leaks, seal cracks, manage waste, and communicate planned applications. Treatments should occur when children are absent where possible, and re-entry instructions must be respected. Staff need training to recognize pests and report problems rather than applying personal products without authorization.

Parents should have access to the institution's pest-management policy and notification process. Children with asthma or chemical sensitivity may require individualized precautions. Pest-free learning environments and low exposure are complementary goals.

Agricultural Worker Protection

Agricultural employers must provide training, protective equipment, decontamination supplies, application restrictions, and other protections required by law. Workers should understand labels in a language and form they can use. Children should not be placed in treated fields or assigned hazardous pesticide tasks.

Take-home exposure can be reduced by changing clothing and shoes before entering living areas, washing work clothing separately where recommended, showering promptly, and keeping equipment away from children. Responsibility must not rest only on workers; employers and regulators must create conditions in which these practices are possible.

Spray Drift

Spray drift occurs when droplets or particles move away from the intended target during or after application. Wind, temperature, nozzle size, equipment height, formulation, and operator practice affect movement. Drift can expose neighboring homes, schools, workers, waterways, and non-target plants.

Applicators should follow label restrictions and weather conditions, maintain buffer zones where required, and stop when conditions are unsuitable. Communities need clear reporting and investigation processes. A child observing a spray machine from nearby, like the image discussed in the original essay, represents a legitimate concern when distance and controls are inadequate.

Environmental Justice

Pesticide risk is not distributed equally. Farmworker families, low-income households, migrant communities, and residents near intensive agriculture may experience greater exposure while having less access to healthcare, legal assistance, and political influence. Housing infestations can force families to choose between pests and poorly applied chemicals.

Environmental justice requires enforcement, accessible information, language support, safe housing, worker protection, community monitoring, and participation in regulatory decisions. Advising families to “use pesticides carefully” is insufficient when employers, landlords, or institutions control exposure conditions.

Recognizing the Limits of Old Statistics

The original essay cites an estimate of three million poisonings and 220,000 deaths annually in developing countries. Similar figures have circulated for decades, but methods, definitions, product use, and reporting have changed. They should not be repeated as current global facts without a recent authoritative source. Pesticide poisoning remains a major health concern, and intentional self-poisoning contributes substantially in some regions, but current estimates vary.

Underreporting is common because rural cases may not reach hospitals, symptoms may be nonspecific, and surveillance systems differ. Strong policy should improve poison-center data, clinical recognition, laboratory capacity, and reporting rather than rely indefinitely on one historical estimate.

Prevention for Families

Families can reduce exposure by choosing nonchemical controls first, reading labels completely, using

only the required amount, keeping children and pets away, washing hands, removing shoes after outdoor work, and storing products securely. Produce should be washed under running water, and floors or windowsills may require regular cleaning in high-exposure settings.

Parents should ask schools and landlords about pest-management practices and should not combine products or use agricultural chemicals inside homes. If a child may have swallowed, inhaled, or been soaked with pesticide, immediate professional advice is required even before symptoms become severe.

Regulation and Research

Regulators evaluate toxicity, exposure, environmental fate, residues, occupational use, and risks to children before approving and reevaluating products. The EPA notes that additional safety factors may be applied to protect infants and children. Registration does not mean a pesticide is harmless under every condition; it means uses are authorized subject to specified restrictions and risk conclusions.

Research priorities include mixture effects, prenatal timing, endocrine pathways, developmental neurotoxicity, real-world exposure, and the health of farmworker communities. Biomonitoring and geographic data can improve understanding, but privacy and community participation must be protected.

Conclusion

Pesticides can protect crops, homes, public health, and food supplies, but they are biologically active products that require careful control. Human-health risk depends on the toxicity of a particular pesticide and the amount, route, duration, and timing of exposure. Children are often more vulnerable because of their body size, behavior, diet, developing organs, and limited ability to recognize danger.

Possible harms include acute poisoning, respiratory and skin irritation, neurological effects, and, for particular chemicals and exposure patterns, developmental, reproductive, endocrine, or cancer concerns. These outcomes should not be attributed equally to every pesticide. Accurate communication names the chemical class, evidence, and exposure rather than making universal claims.

The best protection combines strong regulation, worker safeguards, secure storage, integrated pest management, precise application, drift prevention, food and water monitoring, and prompt response to suspected poisoning. Children should not become the unseen victims of pest control. Effective policy must control the pest while treating child health as a central design requirement rather than an afterthought.

References

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