

## NON-ACUTE PESTICIDE EXPOSURE & CHILD HEALTH

A pesticide is any substance or mixture of substances intended for preventing, destroying, or mitigating any pest. Children and pregnant women are uniquely vulnerable to toxic effects from exposure to pesticides. Some of the widely used pesticides of concern in the United States include the herbicide glyphosate, organophosphate insecticides (e.g., chlorpyrifos, malathion), carbamate insecticides (e.g., carbaryl, propoxur), neonicotinoid insecticides (e.g., imidacloprid, thiamethoxam), and pyrethroid insecticides (e.g., permethrin, cypermethrin). Chronic or repeated low-dose exposures are common. There is growing evidence on the relationship between this non-acute pesticide exposure in early life and adverse neurocognitive and neurobehavioral outcomes (ADHD, autism) in children. Additional associated morbidities include cancer (brain tumors, leukemia) and adverse birth outcomes (reduced intrauterine growth, preterm birth, congenital anomalies, fetal death).

### Risk Identification as Part of Routine History Taking

Questions about pesticide use can inform potential for risk

01

Do you use or store pesticides anywhere in or around your home?

02

Does anyone in your home work with pesticides?

03

Do you live near an area frequently treated with pesticides?

### Risk Reduction Based on Patient Risk & Concerns

Primary care providers are well-positioned to provide anticipatory guidance so that patients and families can limit pesticide exposure to prevent adverse health outcomes.

Many states require health care providers to report confirmed and suspected pesticide exposure. Find out if this is a requirement in your state -- and who to report to -- [here](#).

After reporting, consider contacting your local [PEHSU](#) for consultation on pediatric pesticide exposure cases.

**FROM DIET**

- The AAP recommends choosing organic produce as a way to reduce childhood pesticide exposure, but emphasizes that a diet high in fruits & vegetables (either conventionally or organically grown) is most important for children's health when cost & availability are factors.
- Organic diets are associated with significant reductions in urinary excretion of several pesticide metabolites and parent compounds in children and adults.

- Choose organic when possible, but not at the expense of a diet rich in a variety of fresh produce.
- Wash produce under running water – don't soak or dunk.
- Scrub firm fruits & vegetables.
- Throw away outer layers of leafy vegetables.
- Trim skin and fat from poultry, fish & meats.
- Here are links to the Environmental Working Group's (EWG) lists that may help consumers decide which organic produce to consider purchasing.
  - [Clean Fifteen](#)
  - [Dirty Dozen](#)

**IN HOMES, SCHOOLS & DAYCARES**

- Most U.S. homes have measurable levels of insecticides on the floors which may serve as a source of exposure to occupants, particularly young children.
- Results achieved by using chemical pesticides alone are generally temporary, and repeated treatments are usually required.
- Nontoxic or low-toxicity pest control methods are available for all common pest problems.
- Many exposures result from inappropriate pesticide use. The label is the law. Reading pesticide product labels can help consumers choose the appropriate product and use it safely.

- Learn about the basics of Integrated Pest Management (IPM) on the EPA's [Citizen's Guide to Pest Control and Pesticide Safety](#). Information on pest-specific problem management can be found at the [University of California IPM](#) site.
- Keep pesticides out of reach and/or in a locked cabinet/shed, keep in original containers with labels intact, never reuse or repurpose old containers.
- Remove children, pets, and toys prior to indoor application, and do not return until the amount of time specified on label.
- Keep children away from pets after applying flea-control medication until dried, or as advised on label.
- If hiring a pest control company, only hire one that is state licensed. Ask for the name, ingredients, and toxicity of products they may use.

**AMONG AGRICULTURAL WORKERS & COMMUNITIES**

- Children living in close proximity to agricultural areas, living with someone who works in agriculture, or working in agricultural settings themselves are at risk of higher exposures.
- State and federal labor laws limit the age at which children can begin agricultural work and what duties they may be tasked with.
- Studies have observed adverse neurobehavioral outcomes in adolescent agricultural workers.
- State pesticide regulatory agencies address concerns regarding pesticide drift. If a patient/family comes to you with this concern, notify your state agency so they can help.

- Close windows and stay indoors if pesticides are being sprayed on adjacent fields.
- Know the name, associated warnings, and instruction for use for pesticides you may work with, and know where to find this information at work.
- Change out of work clothes and shoes before getting into the car and/or entering the home.
- Wash contaminated work clothes separately from the rest of the laundry.
- Do not take children into fields where pesticides have been applied.
- Under [federal youth employment laws](#), children and teens ≤ 16 years of age (may be older in certain states) are prohibited from handling, mixing, loading, and applying pesticides.

**DURING PREGNANCY**

- Evidence suggests that a particularly sensitive exposure period for pesticides toxicity is during fetal development. Studies have linked higher exposures to pesticides in pregnancy with increased risk of pediatric cancer as well as adverse neurocognitive and neurobehavioral outcomes in childhood. There is also some evidence suggesting pesticides may increase adverse birth outcomes (reduced fetal growth, premature birth, birth defects, and spontaneous abortion).
- Some occupations that have a greater potential risk for exposure to pesticides include agricultural workers, veterinary workers and animal handlers, landscapers, and air crews.

- If you work with pesticides, talk to your employer about what accommodations can be made to minimize or avoid exposure.
- If you cannot completely avoid working with pesticides, avoid applying them directly, wear proper personal protective equipment (PPE), and follow pesticide label instructions and workplace safety protocols closely.
- Follow guidance outlined in previous sections on how to reduce pesticide exposure from the diet and in the home.

## References

1. Roberts JR, Karr CJ; Council on Environmental Health. Pesticide Exposure in Children. *Pediatrics*. 2012;130(6):e1765-e1788. doi: <https://doi.org/10.1542/peds.2012-2758>.
2. Forman J, Silverstein J. Organic Foods: Health and Environmental Advantages and Disadvantages. *Pediatrics*. 2012;130(5):e1406-e1415. DOI: <https://doi.org/10.1542/peds.2012-2579>
3. Hyland C, Bradman A, Gerona R, et al. Organic diet intervention significantly reduces urinary pesticide levels in U.S. children and adults. *Environ Res*. 2019;171:568-575. doi: <https://doi.org/10.1016/j.envres.2019.01.024>.
4. Stout DM 2nd, Bradham KD, Egeghy PP, et al. American Healthy Homes Survey: a national study of residential pesticides measured from floor wipes. *Environ Sci Technol*. 2009;43(12):4294-4300. doi:10.1021/es8030243.
5. Eckerman DA, Gimenes LS, de Souza RC, Galvão PR, Sarcinelli PN, Chrisman JR. Age related effects of pesticide exposure on neurobehavioral performance of adolescent farm workers in Brazil. *Neurotoxicol Teratol*. 2007;29(1):164-175. doi:10.1016/j.ntt.2006.09.028
6. Suarez-Lopez JR, Hood N, Suarez-Torres J, Gahagan S, Gunnar M, Lopez-Paredes D. Associations of acetylcholinesterase activity with depression and anxiety symptoms among adolescents growing up near pesticide spray sites. *Int J Hyg Environ Health*. 2019;222(7):981-990. <https://doi.org/10.1016/j.ijheh.2019.06.001>
7. Roberts JR, Dawley EH, Reigart JR. Children's low-level pesticide exposure and associations with autism and ADHD: a review. *Pediatr Res*. 2019;(85)234-241. <https://doi-org.offcampus.lib.washington.edu/10.1038/s41390-018-0200-z>.
8. Reproductive health and the workplace. cdc.gov. <https://www.cdc.gov/niosh/topics/repro/pesticides.html#:~:text=Exposure%20to%20pesticides%20could%20increase,exposure%20for%20a%20healthier%20pregnancy>. Updated October 28, 2019. Accessed November 3, 2020.

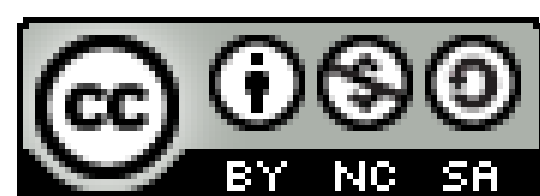
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