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“Lindane is a pesticide that was used in agriculture, with livestock and in homes. While the U.S. banned its use in agriculture in 2006, it may take years to disappear from our air, food and water. Of great concern is that lindane continues to be used on humans for lice and scabies treatment. In fact, this is the most frequent way your child might be exposed to it.

Exposure might also occur through the air, by ingesting soil or grass exposed to this product, or even through breast milk. This article reviews these potential sources of exposure and the many harmful effects lindane might cause, even at very low doses of exposure.

Most critically, information is provided on how to reduce or prevent exposure to lindane. This information is essential for all parents. As with other toxics, parents are urged to become proactive by supporting a full ban on lindane.”

- Larry B. Silver, MD

What is lindane?

Lindane is a pesticide, used primarily to kill lice and scabies in human hair and skin. Other uses have included

- as a pesticide in agriculture to protect seeds from infestation
- to treat livestock
- as a broad insecticide in some countries outside the US
- in home and commercial applications on lawns, in pet products and on wood products.

Lindane has been found to be

persistent (remaining in the human body and environment for long periods), and it can travel long distances. It has been found many hundreds of miles away from any place where it was manufactured or used.¹

Due to concerns about lindane's toxic effects on humans, the U.S. banned all use of lindane in agriculture in 2006. However, it continues to be used on humans and other animals for lice and scabies treatments.

How does lindane impact children's health?

When lindane is used on children and small adults at doses higher than recommended, it can cause seizures -- lindane acts directly on the central nervous system. In a tragic example from India, when lindane intended for preservation of seed grains was instead mixed with food grains and was eaten, many people were poisoned. The signs of poisoning were sudden and included different types of seizures, as well as tremors, memory impairment, irritability and aggression. Even when seizures didn't occur, there was evidence that lower exposures to lindane interfered with people's ability to learn.³

At low exposures, it is linked to liver, kidney, nervous system and immune system damage, birth defects, seizures, cancer, death and hormone disruption.⁴ Lindane is one of a group of organochlorines, which have been linked to harm of motor,

sensory or cognitive (thinking) functions in animal studies.²

In one study, teachers working in day care centers in Germany where wood was treated with lindane and pentachlorophenol were found to be significantly more likely to give birth to smaller (lower birth weight and length) infants.⁵ Low birth weight is associated with infant illness and death, as well as increased risk in adulthood for diabetes, high blood pressure and heart disease.⁶ Both of these pesticides are known to off-gas from wood for years and to persist in air or dust particles.

Lindane has been linked to a five-fold increased risk of brain tumors.⁷ Brain cancers are the second most common form of cancer in children⁸ and are the third leading cause of cancer death in young adults ages 20-39.⁹

Why are children more vulnerable to pesticide exposures?

Children are particularly vulnerable to pesticide exposures for a number of reasons.

Proportionately, children breathe, drink and eat far more than adults, meaning they may be more at risk when exposed to chemicals. Children are also playing on the floor, grass and dirt more frequently than adults, and more often have their hands in their mouths. Schools also use a mix of pesticides

to deal with infestations, and children may be exposed there as well as at home. Finally, even small exposures to harmful chemicals at critical developmental windows of child development may be linked to learning and developmental disabilities as well as some cancers and reproductive problems.¹⁰

How are children exposed to lindane?

The most likely way your child would be exposed is through skin application to rid him or her of lice and scabies. However, lindane is pervasive and other ways your child may be exposed are less direct.

For example, while lindane was recently removed from all agricultural use in the United States, this pesticide will long continue to be found in our soils, waterways, food, seeds and animal fat. Children can also breathe lindane from the air where agricultural dust is blowing or where lindane-treated wood is releasing fumes. They may ingest it by putting dirty hands in their mouths in areas where soils and grass have been treated with lindane. Lindane passes from a mother's body to a developing baby both through the placenta and through breast milk.¹¹ Though it is best to breastfeed for many good reasons, the fact that lindane can be passed through breast milk to a

baby is another important reason it needs to be removed from our environment entirely.

Some indigenous populations eating a subsistence diet, even far from where lindane has been manufactured or applied, may also be exposed. Lindane tends to accumulate in colder climates and concentrate in the food chain and has been found in the bodies of Alaskan walrus, seals and whales.¹

In the Total Diet Study, a Food and Drug Administration project published in September 2000, lindane was found in dozens of foods, such as evaporated milk, ground beef, pork chops, chicken, lima beans, peanuts, popcorn and breads. The FDA claims that the levels of contamination aren't sufficient to cause health problems, but little information exists on how lindane may interact with the dozen or more other chemicals typically associated with growing food.¹²

How can parents reduce or prevent exposure to lindane?

Use safer options. While the FDA still considers lindane acceptable when used according to instructions (small dosages, no reapplication, no use on people under 110 pounds), they have classified it as a "second line" (not the best first choice) treatment.¹³ The National Pediculosis (headlice) Association suggests a nontoxic alternative that involves using a special comb and carefully wet combing the head section by section, with no chemicals needed (for more information visit www.headlice.org/downloads/tipsremoval.htm).

Support a full ban on lindane as well as other toxic pesticides. Encouraging your representatives to act on this is probably one of the most important actions you can take. You can refer them to places where effective bans are already in place. For example, in 2002, the state of California banned the use of lindane for treatment on humans and also banned use of it for broad agricultural applications. This action was taken in response to concern for children's health risks from direct application and also concern for public drinking water supplies. Research in the Los Angeles basin in 1999

revealed that, when lindane shampoos were rinsed down the drain, the pesticide readily contaminated the effluent and eventually the downstream waterways. The Los Angeles County Sanitation District found that cutting down on lindane use through educational campaigns conducted prior to approval of the ban reduced contamination by an average of 50%.¹² Plus, in 2000, the European Commission banned use of lindane in agriculture (although it still may be used for household purposes), mostly because of concern for the health of farm workers.¹²

Footnoted resources

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For more information or for other Practice Prevention columns, visit the Institute for Children's Environmental Health (ICEH) online at www.iceh.org/resources.html or call 360-331-7904.



ICEH serves as the national coordinator for the Collaborative on Health and the Environment's Learning and Developmental Disabilities Initiative.



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