



Out of Harm's Way:

Preventing Toxic Threats to Child Development

Health Care Provider Fact Sheet

Your patients are exposed regularly to a wide variety of household and environmental chemicals - in the food they eat, the water they drink and the air they breathe. Many of these chemicals, such as lead, mercury, PCBs (polychlorinated biphenyls), dioxin, pesticides, and solvents are known neurotoxicants. Exposures to these chemicals during critical periods of early brain development can have life-long adverse effects and contribute to learning, behavioral and developmental disabilities. Health care providers can help prevent unnecessary risks to child development by offering simple, common sense guidelines for reducing potentially harmful exposures to known and suspected developmental neurotoxicants. This fact sheet provides busy clinicians with essential information on key toxicants and their effects. It also provides suggestions for routine patient advice and a strategy to help patients identify and reduce potentially harmful exposures.

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Taking an Environmental History

Frequently Asked Questions from Providers

Q: Do I need to be an expert in environmental health to take an environmental history?

A: No, many of the routine questions and advice regarding the environment and exposures to toxic chemicals are common sense. For example, an introductory question to a pregnant woman about workplace exposures might ask if there are any persistent, strong odors that might indicate chemical use nearby, from a copy machine or a manufacturing operation, for example. If the answer is yes, the provider can suggest ways to further identify the source of the odor, such as inquiring about previous air monitoring tests at the facility. Employees can also request Material Safety Data Sheets (MSDS). These describe the toxic chemicals used in a workplace, and, by law, must be provided to employees upon request. Even if such information is not available, as is often the case, the provider can help the patient strategize about how to avoid the exposure. For example, a woman who works near a copy machine might move her desk to another room or near a window or vent. Inquiring about exposures and exploring ways to reduce them can and should be a patient-sensitive, supportive discussion.

Q: How much time does an environmental history take?

A: Most environmental questions can be easily incorporated into a standard history. You don't really need to factor in a lot more time for this.

Q: What if I can't answer the questions the patient asks?

A: Again, most routine advice is common sense, such as suggesting a person use personal protective devices (such as mask or gloves) to avoid chemical exposure during hobby work, limit intake of fatty foods (high in PCBs and dioxins), or ensure that children are not exposed to lead paint. In many cases, there is no one "right way" to reduce an exposure, but rather a variety of options from which the patient can choose. Basic provider responses may be drawn from "Creating a Healthy Environment for Your Child's Development." More detailed information is available from the references provided in the accompanying resource list. Occasionally, patients may be identified with unavoidable exposures of concern that warrant further work up and/or referral.

Sample Advice

The Risks of Eating Tuna During Pregnancy

The Environmental Protection Agency, the Food and Drug Administration and the National Academy of Sciences agree that fetal exposures to mercury can cause lasting impairment of language, attention and memory. In order to protect the developing brain of the fetus, pregnant women should be counseled not to eat fish known to be high in mercury such as swordfish, shark, king mackerel, tilefish, fresh tuna, and many freshwater fish (over 40 states have posted freshwater fish advisories). They should also limit consumption of other fish containing lower but significant levels of mercury, such as canned tuna, which should be limited to less than 7oz./week (about 1 small can).

Some women rely on canned tuna as a low-cost, convenient source of high-quality protein. It is therefore important to suggest affordable alternatives, such as beans, lean chicken and turkey, and eggs (removing part/all of the yolk). More expensive high-quality protein sources include fresh fish such as cod, haddock and pollock.

Suggested Routine Questions to Ask Patients

Clinicians *without expertise* in environmental and occupational health can screen for exposures of concern and provide common sense responses to most identified exposures. Environmental questions are readily incorporated into a standard history. "CH2OP" provides a framework for inquiring about potentially harmful exposures, (Community, Home/Hobbies, Occupational, Personal. For children, school should also be included). The questions below address each of these areas. Providers can select areas of inquiry that are relevant to a particular patient.

- What is your occupation? What are your hobbies? Do you know if you are exposed at work, home or school to any of these substances of concern:
 - glues, strong cleaning/degreasing agents, paint strippers, paint, varnishes, sealants, art materials, gasoline (likely to contain solvents)
 - fumes, vapors, dusts, strong odors (solvents, metals, particulates)
 - pesticides
 - lead, mercury (metals)

(A patient may need to collect information from an employer about chemicals used at work and report back. Positive responses will require follow-up inquiry about use of personal protective equipment and availability of workplace monitoring results.)

- What are the occupation and hobbies of your spouse or others in the home? (Toxicants can be brought home on clothing.)
- Dietary questions—What are your sources of protein? How much/what kind of fish do you eat? Do you take vitamins, or herbal supplements? Do you tend to eat foods high in animal fat (fast food, ice cream, cheese, whole milk, fatty meats and/or fish)?
- Do you smoke, or use alcohol or drugs? (Usually covered in the general history.)
- Was your house built before 1978? If so, has it been tested for lead paint? If your home does have lead paint, is it flaking? Do you grow your own vegetables? (Lead uptake from soil is highest for root crops, then stem crops followed by leafy vegetables, which have the lowest uptake.)
- Do you know of any hazardous waste sites, facilities of concern (auto repair shops, dry cleaners) or major industrial emissions in your neighborhood? Are there any chemical odors at home or common in the community?
- What is the source of your drinking water? If it is municipal, do you have a recent water quality report? If it is a private well, has the water been tested?
- What type of personal care/cosmetic products do you or your children use? (some contain lead/mercury/solvents—see next page)
- Do you have a mercury fever thermometer in the house? (If yes, advise the patient to consider exchanging it for a digital one.)

Key Points

Developmental Health Outcomes

- Nearly 12 million children (17%) in the U.S. under age 18 suffer from one or more learning, behavioral or developmental disabilities.
- Neurologists are increasingly concerned that degenerative neurological diseases that develop in later adult life may be associated with much earlier exposure to neurotoxic chemicals. For example, most cases of Parkinson's disease are not explained by genetic factors. Several studies show an association of Parkinson's with pesticide exposure.

Routine Advice for Patients

Products to Avoid

Pesticides

Many pesticides commonly used in the home, garden, and on pets are neurotoxic. Pesticides are also contained in some head lice treatments.

ADVICE: Explore non-chemical alternatives to pesticides for home, garden and pets. If pesticide use is absolutely necessary, use the least toxic alternative. Pregnant women and children should leave and not return until treatment is complete and the house well ventilated. Baits and crack and crevice treatment are preferable to liquids, sprays, powders and dusts. Keep all pesticides out of reach of children and pets. Ask your veterinarian for non-pesticide alternatives for treating fleas and ticks on pets. Head lice can be effectively treated with nit combs, and do not require the use of potentially neurotoxic pesticides. For information on how to treat head lice without chemicals, see, for example, <http://www.pesticide.org/factsheets.html#alternatives>.

Lead

Lead paint is still a threat in older housing, in pipes with lead solder, and in consumer products such as some candle wicks, pottery with lead glaze, some jewelry, and some personal care products such as hair dyes and lipsticks. Lead may be present in garden soil. This can contaminate garden plants, and can also be tracked into the house. **ADVICE:** Lead paint should be removed by trained personnel. When it cannot be removed, surfaces and floors should be wiped regularly with a damp cloth. Wash children's hands regularly to remove lead dust. If possible, cover leaded surfaces with tile, wallpaper or paneling. Avoid the use of products that contain lead. Run tap water for a minute or two in the morning to discharge water that may be contaminated from lead solder. Have your soil tested for lead. Don't grow vegetables in lead contaminated soil. If you do grow vegetables, remove at least the first 6-inches of soil and replace

with uncontaminated soil, or plant in raised beds. Remove shoes before entering the house helps keep outdoor contaminants (lead and pesticides) from entering the home.

Mercury

In addition to dietary routes, mercury exposures can occur through occupations, hobbies, and consumer products, such as mercury thermometers. When a mercury thermometer breaks, spilled mercury evaporates and is readily inhaled and absorbed. If disposed of into the waste stream, thermometers become a source of environmental mercury, further contributing to fish-mercury contamination. Fluorescent lamps, some types of batteries, and some skin whitening agents also contain mercury. **ADVICE:** Avoid products that contain mercury. Many communities are organizing mercury thermometer exchanges, where old mercury thermometers can be exchanged for new digital ones. Try to recycle button batteries and fluorescent lamps—check with your community hazardous waste collection, community recycling department, or Department of Public Works.

Solvents

Alcoholic beverages, gasoline, most furniture strippers, glues, adhesives, sealants, paint thinners, and some paint, cleaning solutions and cosmetics contain solvents. Most dry cleaning is done with a toxic solvent (perchloroethylene). **ADVICE:** Forego all alcohol while trying to conceive and throughout pregnancy. Avoid using cleaning and cosmetic products that may contain solvents, such as nail polish, perfumes, scented soaps and lotions. Avoid home renovations during pregnancy. Avoid installing new carpets that may off-gas solvents (check manufacturing specifications). Try to buy clothes that don't need to be dry-cleaned. If you must dry-clean clothes, remove the plastic when you pick them up, transport them in your car trunk, and air them outdoors before storing indoors or wearing.

Plastics

Some plastics contain chemicals that may be toxic to the developing fetus. The developing reproductive system is particularly vulnerable. Chemicals in plastic containers and wraps can leach into food products. Plastics that end up in the waste stream can contribute to air pollution and ground contamination. **ADVICE:** Food should not be stored or microwaved in plastic containers or wraps. Ceramic, glass or paper products should be substituted whenever possible.

Dietary Advice

Eating more beans, grains, fruits, vegetables, and low-fat animal products provides high-quality nutrition and reduces body burdens of toxic chemicals. Since many neurotoxic chemicals concentrate in animal fat, and build up in the body over years or even decades, it is best to reduce animal fat intake beginning in early life, (after 2 years of age). To reduce animal fat, eat fewer animal products in general, and/or choose nonfat or low-fat varieties of animal foods such as skimmed milk and cheese, and lean poultry, beef and fish. It is especially helpful to avoid processed foods made from ground meat and animal parts such as sausage, bologna, hot dogs, and canned, ground lunch-meats which are very high in animal fats.

1. Mercury / Fish

Fish is the major dietary source of mercury, which is stored in fish muscle. **ADVICE:** Pregnant women, women of reproductive age, and young children should avoid high-mercury fish including swordfish, shark, king mackerel, tilefish, fresh tuna, and fresh water fish in contaminated regions commonly found throughout the US. (see state advisories www.epa.gov/ost/fish). Canned tuna have moderate mercury levels and should be limited to less than 7 oz./week, (about 1 small can). To meet

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Windows of Vulnerability

- Normal brain development depends on an integrated, carefully timed sequence of events. Even temporary disruption of any stage of this process can cause lifelong disabilities.
- Brain development is particularly susceptible to disruption by even low-level exposures to neurotoxicants during windows of vulnerability, which occur throughout fetal life, infancy, childhood and adolescence.

Childhood Exposures

- Pound for pound, children often have higher exposures to toxic chemicals than adults because they eat, drink and breathe more per unit of body weight, due to their faster metabolism. This increases exposure to contaminants in air, food and water. They live closer to floor level, where indoor toxicants can concentrate.
- During puberty/adolescence, the brain is still developing. In addition, chemicals that bioaccumulate during this time can

later be passed to the fetus during pregnancy, and to the infant during breast-feeding. Therefore, reducing toxic exposures can benefit both current and future generations.

- A metabolite of one of the most commonly used organophosphate pesticides is present in the urine of over 80% of adults and 90% of children from population samples.
- Over a million children in the U.S. exceed the currently accepted threshold for blood lead level exposure that affects I.Q.

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Routine Advice continued

EPA's mercury exposure guidelines, maximum tuna consumption can be calculated by the formula: maximum tuna (in ounces/week)=person's weight/20. For example, a child weighing 40 pounds can consume 2 oz. (about 2 level tablespoons) per week. Low mercury fish, such as cod, haddock and pollock provide healthy alternatives. Some fatty ocean fish also have low mercury levels, but may contain relatively high levels of PCBs. Pending further testing, frequent consumption of high fat fish (salmon, herring, sardines) may not be advisable.

2. Dioxin, PCBs

Fatty meats (beef, pork, poultry, fish) and dairy products are responsible for over 95% of human exposure to dioxin and polychlorinated biphenyls (PCBs). **ADVICE:** Eat lower on the food chain (more vegetables, fruits, grains, beans); choose low or non-fat animal products (lean beef, fish, poultry; minimize high fat cheese; drink low-fat or skimmed milk.) See dietary advice above.

3. Lead

Bioaccumulated lead stored in bones can remobilize during pregnancy. **ADVICE:** During gestation and lactation, pregnant women and nursing mothers should maintain sufficient calcium intake to reduce mobilization of bone lead.

4. Manganese

Infant formulas contain 10-50 times as much manganese as breast milk, with the largest amounts present in soy formulas. Although some dietary manganese is essential, excessive amounts can be harmful. **ADVICE:** Breast-feeding is best.

5. Pesticides

Many foods contain pesticide residues. **ADVICE:** Peeling and/or washing can remove some surface residues. Buy organic fruits and vegetables if possible. Eat a diverse array of fruits and vegetables to provide a variety of nutrients and to avoid high exposure to pesticides on any one type of fruit or vegetable.

6. Alcohol

ADVICE: Avoid alcoholic beverages while trying to conceive, throughout pregnancy and while breast-feeding.

Habits

Smoking

ADVICE: Pregnant women should not smoke or be near others who are smoking.

Drugs

ADVICE: During pregnancy avoid drug use. Use pharmaceuticals only if advised to do so by a health care professional.

Resources

MEDLINE: Internet accessible at <http://www.nlm.nih.gov>. 888-346-3656.

REPROTOX: Provides summaries of reproductive and developmental data to health care providers. <http://www.reprotox.org>.

Pesticide Hotline: 800-858-7378 – Internet accessible at <http://www.ace.orst.edu/info/nptn>.

Pregnancy/Environmental Hotlines:

Organization of Teratology and Information Services - <http://www.otispregnancy.org/> for state hot line numbers.

Association of Occupational and Environmental Clinics : 202-347-4976

<http://www.aoc.org> – Provides list of clinics and specialists around the country and has an extensive lending library including case studies.

References for Key Points can be found in the report **In Harm's Way: Toxic Threats to Child Development**, GBPSR, May 2000. The report can be downloaded for free or ordered at <http://www.igc.org/psr>.

References for Routine Advice to Patients can be found in **Generations at Risk: Reproductive Health and the Environment**. MIT Press, 1999. Authors Ted Schettler MD MPH, Gina Solomon MD MPH, Maria Valenti and Annette Huddle MES, and "Creating a Healthy Environment for Your Child's Development," GBPSR, 2001 (a companion fact sheet in the In Harm's Way series).

Keypoints, continued

Parental Exposures

- Lead stored in the bones of pregnant women from earlier exposures may leach into the bloodstream during pregnancy resulting in fetal exposures.
- Although chemical contaminants are contained in breast milk, breast-feeding is still recommended as most beneficial to the developing child.
- About 6 million women in the U.S. in their childbearing years eat sufficient amounts of mercury-contaminated fish to put their children at risk for learning and attention problems.

Chemicals and Testing

- Most pesticides have not been subjected to neurodevelopmental testing.
- Over a billion pounds of registered pesticides are applied commercially each year.
- About 3000 of a total of 80,000 chemicals in commerce are produced in very high volumes (more than one million pounds per year). Only a small fraction of the 3000 have been adequately tested for their toxicity to humans and far fewer for neurotoxicity. A proposed voluntary testing program would not require that such chemicals be tested for effects on the developing brain and nervous system.

This fact sheet has been written as a companion to the report **In Harm's Way: Toxic Threats to Child Development**, issued by Greater Boston Physicians for Social Responsibility (GBPSR) in May, 2000. The 140-page report can be viewed, downloaded, or ordered at <http://www.igc.org/psr/>. It is part of a series of fact sheets developed by GBPSR in collaboration with the JSI Center for Environmental Health Studies, for the project **In Harm's Way Training Materials for Health Professionals**.

For more information on this and other fact sheets in the series, contact: Greater Boston Physicians for Social Responsibility, 11 Garden St., Cambridge, MA 02138. 617-497-7440. psrmabo@igc.org.

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