

# PRACTICE PREVENTION

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## Perchlorate Can Interfere with Healthy Brain Development

### ***What is perchlorate?***

Perchlorate is a chemical that occurs in nature but is also manufactured for industrial products and processes. It is used mostly in explosives and rocket propellants for munitions (mortars, grenades, flares and solid rocket fuel).

Perchlorate is also used in smaller quantities in fireworks, blasting agents, matches, lubricating oils, nuclear reactors, air bags and certain types of fertilizers,<sup>1</sup> as well as in tanning and leather finishing, rubber manufacture and paint and enamel production.<sup>2</sup>

Perchlorate residues are being found with increasing frequency in water, soils and even foods. Perchlorate is known as a persistent toxicant and can remain in water and soils for long periods.

### ***How does perchlorate interfere with the development of a child's brain and nervous system?***

The thyroid gland produces hormones that regulate metabolism in adults. These hormones also help control the growth and development of a child's body, including the brain and nervous system. If a pregnant woman's thyroid gland isn't producing enough thyroid hormone, her child may show changes in behavior, delayed development and difficulty in learning.<sup>1,3</sup> Pregnant women with low thyroid function also have a much higher risk of medical problems during pregnancy and premature birth, further putting their children's health and development at risk.<sup>4</sup>

One study tested the children of women who had low levels of thyroid hormone and did not receive thyroid treatment during pregnancy. When the children were seven to eight years old, they were given 15 tests of intelligence, attention, language, reading ability, school performance, and visual-motor performance. These children scored slightly lower on all tests, and their IQ scores were seven points

lower on average compared to children of women with normal hormone levels.<sup>3</sup>

Perchlorate prevents iodide uptake into the thyroid gland, interfering with its production of hormones.<sup>5</sup> While there is no evidence that very low levels of perchlorate are harmful to women with healthy thyroid functioning, the effects on women with pre-existing thyroid dysfunction is less well known.

About 2.5% of women have a low thyroid hormone condition in which the thyroid gland produces less hormone than normal. When severe, this condition is known as *hypothyroidism*. Because there may be no symptoms with mild hypothyroidism (called *subclinical hypothyroidism*), most women with this condition are not aware of it and do not receive any treatment. There are also some women who do not receive the recommended daily amounts of iodine in their diets. Without enough iodine, the thyroid gland cannot make an adequate supply of thyroid hormone. The effects of exposure to perchlorate in these women with hypothyroidism or iodide deficiency is of special concern.<sup>6,7</sup>

Young children, whose thyroid glands are still developing, may also be at greater risk from perchlorate exposures. Because the brain continues to grow and develop through adolescence, a child's healthy thyroid function is important. Only minimal research on the effects of perchlorate exposure on young children has been conducted, but because of its effects in animal studies, perchlorate is a concern and warrants further study.<sup>8</sup>

### ***How are children exposed to perchlorate?***

Most exposures to perchlorate come from drinking contaminated water. Water can be contaminated during perchlorate manufacture or through improper storage or disposal of materials containing perchlorate.<sup>1</sup>

Environmental releases of perchlorate have been discovered in at least 35 states throughout the United States, and more than 11 million people have perchlorate in their drinking water at concentrations of 4 parts per billion or higher.

Food can also contain perchlorate if it was grown in contaminated soil or irrigated or processed with contaminated water. Various levels of perchlorate have been found in lettuce, milk, and bottled water, and more foods are being tested for perchlorate.<sup>5</sup>

### **What can you do to reduce your child's risk?**

**Ask your doctor for a thyroid test.** Pregnant women, or those who are likely to become pregnant, are highly encouraged to be screened for thyroid functioning. Since a thyroid test is not automatically ordered by most doctors, women need to ask for testing and for treatment if needed. Once detected, hypothyroidism can easily be corrected with low-cost, daily medication.

**Ask government authorities** to install a treatment system for your community or purchase a home treatment system. Water treatment systems, either for whole cities or for home use, can remove perchlorate from water supplies. Based on a report by the National Academy of Science,<sup>6</sup> the Environmental Protection Agency has concluded that exposure of 0.0007 milligrams of perchlorate per kilogram of body weight should not threaten the health of even the most sensitive populations. This translates to 24.5 parts per billion in drinking water for adults. However, this level does not consider additional daily perchlorate exposures from other sources such as food,<sup>9</sup> nor does it consider that babies consume six times the amount of fluid as adults for their weight, so the level in water may need to be lowered substantially for babies and young children.

**Avoid food grown in contaminated areas.** Unfortunately, there is no easy way to tell if food is contaminated with perchlorate. Even organically grown produce may have perchlorate levels above those recommended by the EPA. Parents can avoid purchasing food from areas that are known to be irrigated by perchlorate-contaminated water, such as central California or areas that use Colorado River water.<sup>10</sup>

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

<sup>1</sup> US Environmental Protection Agency. Federal Facilities Restoration and Reuse: Perchlorate. [www.epa.gov/fedfac/documents/perchlorate.htm](http://www.epa.gov/fedfac/documents/perchlorate.htm), viewed 4/21/2005.

<sup>2</sup> US Food and Drug Administration. Exploratory Data on Perchlorate in Food. <http://www.cfsan.fda.gov/~dms/clo4data.html>, viewed 4/21/2005.

<sup>3</sup> Haddow JE, Palomaki GE, Allan WC, Williams JR, Knight GJ, Gagnon J, O'Heir CE, Mitchell ML, Hermos RJ, Waisbren SE, Faix JD, Klein RZ. Maternal thyroid deficiency during pregnancy and subsequent neuropsychological development of the child. *New England Journal of Medicine*. 1999 Aug 19;341(8):549-55.

<sup>4</sup> Casey BM, Dashe JS, Wells CE, McIntire DD, Byrd W, Leveno KJ, Cunningham FG. Subclinical hypothyroidism and pregnancy outcomes. *Obstetrics and Gynecology*. 2005 Feb;105(2):239-45.

<sup>5</sup> US Food and Drug Administration Center for Food Safety and Applied Nutrition. Perchlorate Questions and Answers. [www.cfsan.fda.gov/~dms/clo4qa.html](http://www.cfsan.fda.gov/~dms/clo4qa.html), viewed 4/21/2005.

<sup>6</sup> The National Academies. News: Report Assesses Health Implications of Perchlorate Exposure. January 10, 2005. [www4.nationalacademies.org/news.nsf/isbn/0309095689?OpenDocument](http://www4.nationalacademies.org/news.nsf/isbn/0309095689?OpenDocument), viewed 5/9/2005.

<sup>7</sup> Madsen T, Kucher Y, Olle T. Growing Up Toxic: Chemical Exposures and Increases in Developmental Disease. June 2004. [www.environmentalcalifornia.org/reports/GrowingUpToxic2004.pdf](http://www.environmentalcalifornia.org/reports/GrowingUpToxic2004.pdf), viewed 6/3/2005.

<sup>8</sup> The American Thyroid Association. ATA Public Health Committee Statement: The Question of Perchlorate Exposure and Potential Effects on the Thyroid. [www.thyroid.org/professionals/publications/statements/04\\_02\\_03\\_perchlorate.html](http://www.thyroid.org/professionals/publications/statements/04_02_03_perchlorate.html), viewed 5/9/2005.

<sup>9</sup> Walker B. Rocket Fuel in Drinking Water. [www.faultline.org/news/2003/03/perc.htm](http://www.faultline.org/news/2003/03/perc.htm), viewed 6/3/2005.

<sup>10</sup> Perchlorate contamination of U.S. lettuce crop. [www.freedrinkingwater.com/water-pollution-perchlorate-lettuce.htm](http://www.freedrinkingwater.com/water-pollution-perchlorate-lettuce.htm), viewed 6/3/2005.