



“The thyroid gland produces several hormones essential for regulating our body’s metabolism. These hormones are absolutely critical to the development of the fetal brain and nervous system. Fetal brain development begins within the

first several weeks of gestation. The fetus’ thyroid gland does not begin to work until the third trimester of pregnancy. Thus, it is essential that the mother produce adequate amounts of these hormones so that the fetus will have the levels it needs. Even a small disruption in a mother’s hormone level at critical stages in brain development can have long-term, and sometimes devastating, impacts on a child’s health.

Perchlorate is a chemical that occurs in nature but is also man-made. It is used in explosives and rocket propellants as well as in air bags, certain types of fertilizers, and other products. Perchlorate residues are also found with increasing frequency in water, soils, and food.

Perchlorate can impact thyroid hormone production. It prevents iodide uptake into the thyroid gland, resulting in a reduced production of thyroid hormones. This article explains ways to reduce the risks of perchlorate exposure. The best prevention, however, is to be sure that a woman who is pregnant or who might become pregnant not be in a low-thyroid, or hypothyroid, condition. For this reason, I recommend that any woman have a thyroid function test done before a planned pregnancy or as soon as she realizes she is pregnant. Preventing a hypothyroid condition will minimize or prevent any impacts on fetal brain development. Please read this article for more information.”

- Larry B. Silver, MD

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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,¹ as well as in tanning and leather finishing, rubber manufacture and paint and enamel production.²

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.^{1,3} 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.⁴ Please see our related columns on “The Thyroid Gland” and “Iodine and Thyroid Function” for more information.

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.³

Perchlorate prevents iodide uptake into the thyroid gland, interfering with its production of hormones.⁵ 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.^{6,7} A study published by the Centers for Disease Control (CDC) in 2006 found that even very low levels of perchlorate in a woman's body are related to low thyroid hormone production.⁸

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.⁹

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.¹ 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.⁶

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.⁵

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 Sciences,⁶ 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,¹⁰ 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 pregnant women, babies and young children. In 2006 Massachusetts adopted a standard of two parts per billion in drinking water,¹¹ based on the 2006 CDC report.⁸

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.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.

