



Chapter 7 Nutrition

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Introduction

Nutrition is an important factor in the prevention and treatment of lead poisoning. Certain nutrients and supplements can help minimize the absorption of ingested lead.

Children with an adequate amount of calcium, iron, vitamin C, and zinc in their diets absorb less lead than children with dietary deficiencies. In addition, a compromised nutritional state makes one more susceptible to the damaging effects that result from increased absorption of ingested lead. For example, there is evidence that dietary deficiencies of calcium, iron, and zinc enhance the effects of lead on cognitive and behavioral development. (ATSDR, 2020)

In addition, adults who simultaneously have calcium deficiency and experience a condition that would normally mobilize calcium from the bones may mobilize lead that has been stored in bone tissue into the blood. Conditions that mobilize calcium from the bones include pregnancy, lactation, menopause, broken bones, hyperthyroidism, kidney disease, and other chronic diseases. For example, a pregnant woman who has a low dietary calcium intake may release stored lead from her bones into her blood, where it becomes available to the fetus. (See CDC issued [guidelines for the identification and management of lead exposure in pregnant and lactating women](#) for more detailed information)

Children with elevated blood-lead levels are often at risk for poor nutrition, and their caregivers should receive nutritional counseling to help these children obtain a well-balanced and age-appropriate diet.

Vitamins and Minerals

Regular Meals and Snacks

Stomachs that are full are less able to absorb lead. Gastrointestinal (GI) absorption of lead is three to four times greater during periods of fasting than during periods of feeding. Infants, young children, and pregnant women should consume well-balanced meals and snacks at regular intervals during waking hours to help minimize lead absorption. Infants and young children should be fed at least every three to four hours, or six smaller meals per day, to keep stomachs full and less likely to absorb lead.

Nutrients

Adequate nutrients in a child's diet can minimize absorption of ingested lead into their body. Calcium and iron are the main nutrients that can help reduce absorption of ingested lead (see [Table 7.1](#)).

- **Calcium**

Calcium may be the most crucial nutrient to fighting off lead in the body. Lead and calcium compete for space in the body; they are absorbed in the GI tract and end up being stored in the bones.

The more calcium a child consumes, the less ingested lead is retained by their body. Lead mimics calcium in the body. Calcium and lead seem to compete for absorption in the GI tract and storage sites in the bones. Remobilization and subsequent

elevation of blood lead levels occurs most readily when dietary calcium intakes are low and/or when calcium needs are increased, as during pregnancy, periods of bone growth, lactation, and following bone fractures. A combination of calcium and phosphorus in the diet further reduces lead absorption, making plant sources of calcium especially effective in minimizing lead absorption.

- **Iron**

Iron-deficient individuals absorb two to three times more lead than individuals with adequate levels of blood iron. Iron and lead interact and compete in heme synthesis. Even slight decreases in hematocrit allow increased lead absorption. In addition, more severe anemia occurs when blood-lead levels reach approximately 40 µg/dL. However, there is strong evidence that iron supplements are not effective at reducing lead levels once exposure has occurred (Rosado J., L., et al, 2006 and Gulson, B.,L., et al., 2006). See [Chapter 5 Medical Management](#) for more information on iron deficiency.

- **Vitamin C**

Vitamin C is a water-soluble vitamin and is essential for dietary iron absorption. It can only be obtained through dietary intake of fruits and vegetables. (Abdullah M, Jamil, 2022) Vitamin C prevents the formation of insoluble and unabsorbable iron compounds and reduces ferric to ferrous iron. (Hallberg L, 1989). This helps to increase iron uptake and potentially reduce the amount of absorbed ingested lead.

Table 7.1. Adequate intake of these foods can help protect children from lead absorption and retention

Vitamin/Mineral	Food
Calcium	Milk, cheese, yogurt, kale, collards, turnip greens, canned salmon, sardines with bones
Iron	Lean meats and poultry, seafood, cereals and breads fortified with iron, peanut butter, nuts, dried beans and peas, raisins, prunes, prune juice, greens such as broccoli and spinach
Vitamin C	Tomatoes, oranges, grapefruits, juices, juices fortified with vitamin C, strawberries, kiwi, green peppers, watermelon, cantaloupe, potatoes

Iron Deficiency and Lead Poisoning

Iron deficiency often co-exists with lead poisoning and can increase lead absorption. Research indicates that iron deficiency in young children can adversely affect

neurodevelopment, as well as enhance the effects of lead poisoning on the central nervous system.

Adequate iron intake can lower lead absorption; it should be considered an essential secondary tool to protect children from absorbing ingested lead. Low iron stores promote lead absorption at any BLL, while lead alone will affect red blood cell production when the BLL is approximately 40µg/dL or higher.

Many U.S. children who are 1 to 2 years of age have daily iron intakes below recommended amounts. When exposed to lead hazards, these children may see the lasting effects on cognitive development due to both iron deficiency in infancy and the long-lasting negative effects due to lead. (ATSDR, 2020)

All children with BLLs ≥ 3.5 µg/dL should be evaluated for iron deficiency. Serum iron, iron binding capacity, and ferritin are the tests of choice, as they are the most sensitive indicators of iron status. If iron deficiency is diagnosed, treatment should begin along with eliminating the source of lead exposure. (Note: Children receiving BAL [dimercaprol] as a chelating agent should not be treated for iron deficiency until the drug therapy is completed.)

Resources

WIC provides educational materials on their webpage on how to [protect against lead exposure with WIC foods](#). WIC and local health departments can provide these resources to families by printing or linking to the materials.

A publication from the Environmental Protection Agency, [Fight Lead Poisoning with a Healthy Diet](#), can be ordered from the National Lead Information Center, 1-800-424-LEAD (5323). This pamphlet includes fun recipes that encourage healthy eating in young children.