

# Routine iron fortification of infant formula linked to poorer development

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A 10-year follow-up study examining iron-fortified vs. low-iron infant formula suggests that infants with high hemoglobin levels who received iron fortified infant formula have poorer long-term developmental outcomes.

The study, conducted in Santiago, Chile, was published online today ahead of print in the *Archives of Pediatrics & Adolescent Medicine* and raises questions about the optimal amount of iron in infant formula.

"The high prevalence of [iron deficiency](#) in infancy has led to routine iron fortification of infant formula and foods in many countries," says lead study author Betsy Lozoff, M.D., a behavioral pediatrician at the University of Michigan Health System and research professor at the University of Michigan Center for Human Growth and Development.

"These interventions help reduce iron-deficiency anemia and iron deficiency without anemia. However, the optimal amount of iron in such products, especially infant formula, is debated," she says.

Iron deficiency affects roughly 25 percent of the world's babies. Some also have iron deficiency anemia in which a lack of iron causes problems with hemoglobin -- the compound that red blood cells use to transport oxygen through the bloodstream.

Lozoff has conducted award-winning research on functional development and iron deficiencies for more than 25 years in India, Costa

Rica and Chile. Iron deficiency is the world's single most common nutrient deficiency.

The recent study provides a 10-year follow-up on 835 healthy, full-term infants living in urban areas around Santiago. They were randomized in the trial at 6 months of age to receive formula with or without iron.

The follow-up assessment included 473 children and researchers measured IQ, spatial memory, arithmetic achievement, visual-motor integration, visual perception and motor functioning.

Compared to the low-iron group, the iron-fortified group scored lower on every 10-year outcome measured.

Of the seven tests administered at the 10-year follow-up, two (spatial memory and VMI) showed statistically significant lower scores in the iron-fortified group compared to the low-iron group, and four (IQ, visual perception, motor coordination and arithmetic achievement) showed suggestive trends that did not reach statistical significance.

No statistically significant differences were found in iron status at 10 years, and only one child had iron-deficiency anemia. Less than 10 percent of infants in the iron-fortified group met criteria for iron deficiency.

The authors also found that children with the highest hemoglobin levels at 6 months of age had lower 10-year scores if they had received the iron-fortified formula, but those with the lowest 6-month hemoglobin levels had higher scores.

"In conclusion, this study indicates poorer long-term developmental outcome in infants with high hemoglobin concentrations who received formula fortified with iron at levels currently used in the United States,"

the study authors write. "Optimal amounts of iron in [infant formula](#) warrant further study."

In an accompanying editorial, Parul Christian, Dr.P.H., M.Sc., of the Johns Hopkins Bloomberg School of Public Health, in Baltimore, writes that the importance of the study "lies in its evaluation of the long-term [developmental outcomes](#) of an early-infancy iron intervention."

He notes, however, that, "Caution is needed in generalizing the results of the follow-up study by Lozoff et al, which stands, as yet, alone in showing small-sized negative consequences on developmental outcomes among iron-sufficient children exposed to iron-fortified vs. low-iron formula during infancy.

"Whether iron deficiency in infancy, manifest largely due to deficiency in utero, can be overcome with supplementation during infancy for improving central nervous system development and function needs to be further examined in rigorous studies of short and long duration," he writes.

**More information:** *Archives of Pediatrics & Adolescent Medicine*, Nov. 7, 2011, [doi:10.1001/archpediatrics.2011.203](https://doi.org/10.1001/archpediatrics.2011.203)

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