

Reducing the Risk of Neurodevelopmental Harm from Excess Manganese in Infant Formula and Breast Milk Substitutes

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Description:

Exposure to excess manganese (Mn) is associated with neurodevelopmental harm in children, including impaired cognitive development, lower intelligence quotient (IQ) scores, impaired memory function, lower academic skills or achievement, impaired executive function, lower visual-spatial ability, impaired motor function, impaired olfactory function, atypical brain structure or function, and relatively high manganese exposures are suspected of increasing the risk of attention deficits, hyperactivity, or attention deficit hyperactivity disorder (ADHD), and other behavior and attention problems¹.

Infant, follow-on, toddler, and pediatric formulas sold in the United States (U.S.) contain 24 to 780 times the average manganese concentration of breast milk^{1,2}. The manganese intakes from these products for 3-week-old infants are between 28 to 110 times the average manganese intake from breast milk². These intakes exceed the World Health Organization (WHO) tolerable daily intake (TDI) for manganese exposure³. Manganese intakes are further increased if the formula is prepared with water containing high concentrations of manganese².

Infants have a greater sensitivity to manganese toxicity due to increased gastrointestinal absorption and decreased excretion capacity relative to adults⁴. Due to lack of adequate support for breastfeeding, lower-income parents tend to rely more on formula feeding⁵. This increased reliance likely leads to a disproportionate risk of excess manganese exposure for their infants and young children.

Policy Statement: The VtPHA will help educate parents, the pediatric community, and other stakeholders about how to avoid exposing infants to excess manganese by making careful feeding choices.

Supported Actions: The VtPHA:

- Recommends parents to follow the recommendations of the American Academy of Pediatrics (AAP), breastfeeding for two years or longer, if possible, and introducing complementary foods at about six months⁶.
- Urges parents and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) to use a low manganese content “infant formula” if formula feeding is necessary. Avoid products containing soy, rice, chocolate, or supplemental manganese

since they typically have a higher manganese content than unsupplemented cow or goat milk-based products¹.

- Urges parents to use low manganese water to reconstitute formulas and any other beverages. The WHO has established an 80 micrograms per liter (µg/L) drinking water guideline to protect bottle-fed infants³.
- Urges parents and health providers to avoid formula products for children older than 12 months, such as “toddler formulas,” “toddler powders,” and “follow-up formulas.” These are not regulated as “infant formulas” by the U.S. Food and Drug Administration (FDA) and do not provide appropriate nutrition for infants under 12 months. Children older than 12 months can consume ordinary dairy products, which contain lower manganese content and are less expensive than formula products^{1,2,7-9}.
- Urges health providers to recommend pediatric nutritional formulas, if needed, that have a low manganese content. Pediatric nutritional formulas are often very high in manganese and can lead to exceedances of tolerable manganese intakes when prepared and used as directed⁷.
- Calls on health providers and employers to support breastfeeding for all⁵.
- Urges health providers to help parents determine the manganese concentration of the water that they use to reconstitute infant formula by calling the phone number on their water bill or by ordering a test kit from an accredited drinking water testing laboratory.
- Urges state representatives to call for an update of national infant formula regulations, prohibiting the addition of supplemental manganese, lowering the minimum manganese content, and establishing a maximum manganese content for infant formula^{1,2,7}.
- Urges state representatives to follow the recommendations of the WHO by calling for a national ban on the marketing of toddler or follow-on formulas. These are unnecessary, unregulated, expensive, and a needless source of excess manganese^{8,9}.

Potential Barriers:

- The current maximum allowable concentrations of manganese in drinking water in the U.S. and in Vermont are scientifically out of date. These regulatory limits do not consider the special vulnerabilities of infants; the current WHO drinking water guideline for manganese recognizes bottle-fed infants as the most vulnerable population^{3,4}.
- The risks of neurodevelopmental harm from excess manganese exposures are not yet familiar to many regulators in the U.S., even though these risks are now recognized by the scientific community, the World Health Organization, and some national and regional governments^{1,2,7-9}.
- VtPHA recognizes that breastfeeding may not be obtainable for many⁵. Reasons include:
 - Some parents do not have a supportive work or home environment conducive to breastfeeding.
 - Some parents are not able to produce enough breast milk.
 - Some parents may take medications or need a medical treatment that is not compatible with breastfeeding.
- Parents may be misled into believing that formula feeding is necessary for children beyond 12 months by the marketing of toddler or follow-on formulas or by their similarity in packaging to infant formulas^{8,9}.
- Infant formula manufacturers and soy producers have vested financial interests in promoting consumption of infant formula rather than breast milk and toddler formulas rather than dairy products¹⁰. Soy-based formulas tend to have very high manganese

content; the use of soy-based formulas is exceptionally high in the U.S. compared to other countries, where it is actively discouraged by health advisory agencies¹¹⁻¹³.

- Producers of soy-based formulas are likely to oppose establishing a maximum content level for manganese in infant formulas because it may require creating new processes to reduce or remove manganese from their products¹⁰. However, manufacturers of all formulas could realize cost-savings through ceasing the supplementation of their products with manganese.

Related Policies:

- APHA Policy Statement 8022(PP): Infant Feeding in the United States
- APHA Policy Statement 20132: An Update to A Call to Action to Support Breastfeeding: A Fundamental Public Health Issue
- APHA Policy Statement: The Precautionary Principle and Children's Health
- APHA Policy Statement 201710: Protecting Children's Environmental Health: A Comprehensive Framework

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