Complete Summary

GUIDELINE TITLE

Infant methemoglobinemia: the role of dietary nitrate in food and water.

BIBLIOGRAPHIC SOURCE(S)

Greer FR, Shannon M. Infant methemoglobinemia: the role of dietary nitrate in food and water. Pediatrics 2005 Sep;116(3):784-6. [23 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

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COMPLETE SUMMARY CONTENT

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SCOPE

DISEASE/CONDITION(S)

Infant methemoglobinemia

GUIDELINE CATEGORY

Prevention
Treatment

CLINICAL SPECIALTY

Emergency Medicine
Family Practice
Pediatrics
Preventive Medicine

INTENDED USERS

Health Care Providers
Physicians

GUIDELINE OBJECTIVE(S)

- To provide guidance to the clinician in recognizing the role of dietary nitrate in the pathophysiology of infant methemoglobinemia
- To reinforce the need for testing of well water for nitrate content for the prevention of infant methemoglobinemia

TARGET POPULATION

Infants

INTERVENTIONS AND PRACTICES CONSIDERED

Treatment

1. Consultation with local poison control center or toxicologist
2. Identifying and eliminating source of exposure (asymptomatic infant with cyanosis who has a methemoglobin level <20%)

Prevention

1. Assessment of potential nitrate exposure
2. Recommendations for testing well water for nitrate contamination during prenatal and newborn care for patients with private wells
3. Use of alternative sources of water including deeper well water, public water supplies, or bottled water free of nitrate when well water is determined to have high levels of nitrates
4. Effective in-home systems for nitrate removal:
    - Ion-exchange resins
    - Reverse osmosis
5. Avoidance of home-prepared infant foods from vegetables until infants are 3 months or older

MAJOR OUTCOMES CONSIDERED

Not stated

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Treatment and Prevention

Health care professionals who suspect that an infant has methemoglobinemia are advised to consult with the local poison control center or a toxicologist to help guide management. An asymptomatic infant with cyanosis who has a methemoglobin concentration of <20% usually requires no treatment other than identifying and eliminating the source of exposure (assuming a normal hematocrit). Anemic children will display toxicity at lower methemoglobin concentrations. More detailed information on diagnosis and treatment has been reviewed elsewhere.

Clinical diagnosis and treatment for methemoglobinemia is not sufficient. Preventive strategies are needed to identify and eliminate the sources of exposure. Assessment of potential nitrate exposure includes questions about the family residence, parental occupations, drinking water, foods ingested, topical medications, and folk remedies. Prenatal and newborn care for patients with private wells should include recommendation for testing well water for nitrate contamination. Water with high nitrate concentrations should not be ingested by the infant or used for preparation of infant formulas or infant foods. Use of alternative sources of water should be advised, including deeper wells, public water supplies, or bottled water free of nitrate. Boiling water with nitrate nitrogen concentrations of <10 ppm for 1 minute generally is sufficient to kill microorganisms without over concentrating nitrate.

Effective in-home systems for nitrate removal include ion-exchange resins and reverse osmosis; however, these systems can be expensive. Ordinary water softeners used in the home do not remove nitrates. Water testing for nitrate can be obtained from any reference or public health laboratory using laboratory methods approved by the US Environmental Protection Agency. Most state health departments have listings of these certified laboratories.

There is limited information on the nitrate content of commercial infant foods, although the highest concentrations (>100 ppm of nitrate nitrogen) are found in beets, carrots, spinach, squash, and green beans. Preventive strategy would be not to introduce home preparations of these vegetables to infants before 3 months of age, although there is no nutritional indication to add complementary foods to the diet of the healthy term infant before 4 to 6 months of age. Infants fed commercially prepared infant foods after 3 months of age generally are not at risk of nitrate poisoning, although the containers should be refrigerated after first use and discarded within 24 hours of opening.

Summary

1. The greatest risk of nitrate poisoning (methemoglobinemia) occurs in infants fed well water contaminated with nitrates. All prenatal and well-infant visits should include questions about the home water supply. If the source is a private well, the water should be tested for nitrate. The nitrate nitrogen concentration of the water should be <10 ppm.
2. Infants fed commercially prepared infant foods generally are not at risk of nitrate poisoning. However, home-prepared infant foods from vegetables (e.g., spinach, beets, green beans, squash, carrots) should be avoided until infants are 3 months or older, although there is no nutritional indication to add complementary foods to the diet of the healthy term infant before 4 to 6 months of age.
3. Breastfed infants are not at risk of nitrate poisoning from mothers who ingest water with high nitrate content (up to 100 ppm nitrate nitrogen), because nitrate concentration does not increase significantly in the milk.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is not specifically stated.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Effective prevention and appropriate treatment of infant methemoglobinemia

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

The guidance in this report does not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

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ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2005 Sep

GUIDELINE DEVELOPER(S)

American Academy of Pediatrics - Medical Specialty Society

SOURCE(S) OF FUNDING

American Academy of Pediatrics

GUIDELINE COMMITTEE

Committee on Nutrition
Committee on Environmental Health

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Committee on Nutrition, 2003-2004: Nancy F. Krebs, MD, MS, *Chairperson*; Robert D. Baker, Jr, MD, PhD; Jatinder J. S. Bhatia, MD; *Frank R. Greer, MD; Melvin B. Heyman, MD; Fima Lifshitz, MD

Liaisons: Donna Blum-Kemelor, MS, RD, US Department of Agriculture; Margaret P. Boland, MD, Canadian Paediatric Society; William Dietz, MD, PhD, Centers for

Disease Control and Prevention; Capt Van Saxton Hubbard, MD, PhD, National Institutes of Health; Benson M Silverman, MD, US Food and Drug Administration

Staff: Pamela T. Kanda, MPH

Committee on Environmental Health, 2003-2004: *Michael W. Shannon, MD, MPH, *Chairperson*; Dana Best, MD, MPH; Helen J. Binns, MD, MPH; Christine L. Johnson, MD; Janice J. Kim, MD, PhD, MPH; Lynnette J. Mazur, MD, MPH; James R. Roberts, MD, MPH; William B. Weil, Jr, MD

Liaisons: Elizabeth Blackburn, RN, US Environmental Protection Agency; Robert H. Johnson, MD, Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry; Martha Linet, MD, National Cancer Institute; Walter Rogan, MD, National Institute of Environmental Health Sciences

Staff: Paul Spire

*Lead Authors

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

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GUIDELINE AVAILABILITY

Electronic copies: Available from the American Academy of Pediatrics (AAP) Policy Web site.

Print copies: Available from American Academy of Pediatrics, 141 Northwest Point Blvd., P.O. Box 927, Elk Grove Village, IL 60009-0927.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on September 20, 2005. The information was verified by the guideline developer on October 24, 2005.

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Date Modified: 11/3/2008

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