# Screening for Anemia in Children: AAP Recommendations—A Critique

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**ABSTRACT. The American Academy of Pediatrics (AAP) recommends screening for anemia between the ages of 9 to 12 months with additional screening between the ages of 1 and 5 years for patients at risk. The screening may be universal or selective depending on the prevalence of iron deficiency anemia in the population. Improved infant rearing practices—including wider availability, acceptance, and use of iron-fortified formulas; iron fortification of foods; and increased awareness of the importance of dietary iron supplementation especially early in life—have lead to significant decline in the incidence of anemia in the first year of life. However, incidence of iron deficiency and ensuing anemia in children between 1 and 2 years continues to be significant and an important issue.**

**Although iron deficiency may develop soon after cessation of or inadequate iron intake, anemia secondary to iron deficiency develops gradually over a period of several weeks to months. For children who have received/are receiving iron-fortified infant formulas and foods, hemoglobin screening at 9 to 12 months of age is inappropriate as there may not have been sufficient time to develop anemia, despite the rapid growth rate at this age. Widespread implementation of hemoglobin electrophoresis included in the neonatal metabolic screening programs in many states in the United States now has resulted in earlier diagnosis of hemoglobinopathies. Screening children at 9 to 12 months of age for hemoglobinopathies is somewhat redundant now. Screening for anemia before or around 1 year of age should continue to be important for communities and children at risk.**

**Universal screening of toddlers at a later time allows sufficient time for nutritional anemia to become evident after the child has been weaned off iron-fortified formulas, for the influence of toddler dietary fads to manifest, and for evaluation of tolerance of cow's milk protein. This may be addressed via 2 approaches. The first involves postponing the currently recommended screening or an additional screening for anemia between 15 to 18 months of age.**

**Determination of hemoglobin (or hematocrit) is not the optimal way to identify children at risk from effects of iron deficiency as it fails to identify patients who are iron-deficient but are not anemic. Long-term psychomotor, behavioral, and developmental effects secondary to iron deficiency anemia are known but sufficient data are lacking regarding the role of iron deficiency without anemia. Development and evaluation of sensitive, specific, and cost-effective screening tools to identify children at risk for iron deficiency is important. Until such methods are instituted, the AAP should emphasize and recommend universal screening for anemia during the second year of life.** *Pediatrics* **2001;108(3). URL: http://www.pediatrics.org/cgi/content/full/108/3/e56;** ***iron deficiency, iron deficiency anemia, screening, AAP recommendations.***

ABBREVIATION. AAP, American Academy of Pediatrics.

Over the last 3 decades, the American Academy of Pediatrics (AAP) has published timely recommendations regarding scheduled well-child visits for physical examination, screening, and anticipatory guidance. Screening for anemia was initiated to serve at least 2 purposes: 1) to screen and detect patients with nutritional iron deficiency and 2) to diagnose hemoglobinopathies and related disorders. The AAP currently recommends that hemoglobin (or hematocrit) be checked initially between the ages of 9 to 12 months. Additional screening between the ages of 1 and 5 years is suggested for patients at risk. The screening may be universal or selective depending on the prevalence of iron deficiency anemia in the population. Children with iron deficiency anemia in early childhood may have significant and long-lasting adverse effects on development and behavior.[1]

The guideline was originally proposed about a quarter century ago. Since then, there has been much wider availability and acceptance of the iron-fortified formulas as well as an overall increase in awareness of the importance of dietary iron supplementation. Currently the AAP recommends the use of iron-fortified infant formulas from birth until the age of 12 months for infants who are not breastfed[2]; for those exclusively breastfed, iron supplementation is recommended starting at about 4 months of age. At present, about 97% of formula sold in the United States is iron-fortified.[3] Iron fortification of infant food such as cereals has increased and has contributed to the decrease of iron deficiency anemia in early infancy.[4] However, there are still significant numbers of children over the age of 1 year who have iron deficiency with or without anemia. Recent reviews estimate that 55% to 60% of children between 1 and 2 years are not getting the 1989 recommended daily allowance for iron.[5–10] In addition, iron intake is a poor predictor of nutritional iron adequacy because several dietary and systemic factors may influence bioavailability of iron and affect its absorption. Although iron deficiency may develop soon after cessation of or inadequate iron intake, anemia sec-

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Received for publication Dec 11, 2000; accepted May 10, 2001.

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ondary to iron deficiency develops gradually over a period of several weeks to months. For children who have received/are receiving iron-fortified infant formulas, hemoglobin screening at 9 to 12 months of age is inappropriate as there may not have been sufficient time to develop anemia, despite the rapid growth rate at this age. The absence of anemia at initial screening may provide a false sense of security and a repeat hemoglobin determination may not be obtained. Many of these children are at risk to develop iron deficiency once iron-fortified formula is discontinued and adequate iron intake is not ensured.

The neonatal metabolic screening programs in many states in the United States now include hemoglobin electrophoresis. This has resulted in earlier diagnosis of hemoglobinopathies. For those missed at birth, most clinically significant homozygous disorders become manifest and are symptomatic by about 6 months of age. Screening these children at 9 to 12 months of age for hemoglobinopathies is somewhat redundant now.

Screening for anemia before or around 1 year of age should continue to be important for communities and children at risk. These include premature and low birth weight infants, infants with history of prolonged stay in the neonatal unit, use of noniron-fortified formula in the first year of life (without therapeutic iron supplementation), history of blood loss, chronic infections, recently immigrated children, select ethnic groups with a high prevalence of iron deficiency, exclusively breastfed infants with no or erratic iron supplementation, early introduction of cow's milk, and other social risk factors.

Because of changing demographics, secular trends, widespread newborn screening and improved infant-rearing practices resulting in decreased incidence of iron deficiency in the first year of life, routine hemoglobin/hematocrit determination at 9 to 12 months of age is no longer an effective and appropriate screening tool. Universal screening of toddlers at a later time (15–18 months of age), may be more logical and productive. This allows sufficient time for nutritional anemia to become evident after the child has been weaned off iron-fortified formulas, for the influence of toddler dietary fads to manifest, and for evaluation of tolerance of cow's milk protein. This may be addressed via 2 approaches. The first involves postponing the currently recommended hemoglobin/hematocrit screening until the age of 15 to 18 months (except for high-risk infants who should be screened in the first year of life as clinically appropriate). The disadvantage of this approach is a delay of lead screening as lead and anemia screening are usually done together. The second approach may be to do an additional screening for anemia at the later age of 15 to 18 months. Unfortunately this entails obtaining another capillary sample/venipuncture, an additional distress of no small proportion to a young toddler already inundated by an ever-expanding number of immunizations and injections, apart from the economic implications.

Determination of hemoglobin (or hematocrit) is not the optimal way to identify children at risk from effects of iron deficiency as it fails to identify patients who are iron-deficient but are not anemic.[8] Long-term psychomotor, behavioral, and developmental effects secondary to iron deficiency anemia are known but sufficient data are lacking regarding the role of iron deficiency without anemia.[1] Additional studies are needed to address this important question. Development and evaluation of sensitive, specific, and cost-effective screening tools to identify children at risk for iron deficiency is important.[11] Until such methods are instituted, the AAP should emphasize and recommend screening for anemia during the second year of life for all children.

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*Pediatrics* 2001;108;e56
DOI: 10.1542/peds.108.3.e56

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