

## Maternal & Infant Nutrition Briefs

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*A research-based newsletter prepared by the University of California for professionals interested in maternal and infant nutrition*



### **New Guidelines on Vitamin D Intake**

In the April issue of *Pediatrics*, the American Academy of Pediatrics (AAP) has published new guidelines on preventing vitamin D deficiency in infants and children.

Background Cases of rickets due to vitamin D deficiency continue to occur in the United States. The recommended adequate intake of vitamin D is 200 IU per day for infants, children, and teens. In older children and teens, most vitamin D is provided through exposure to sunlight. However, many dermatologists advise limiting exposure to sunlight and use of sunscreens to reduce risk of skin cancer. To make matters worse, sunscreens also decrease production of vitamin D in the skin.

Who is at risk? Breastfed infants who consume less than 500 ml (about 2 cups) of vitamin D-fortified milk or formula or do not receive a vitamin D supplement are at risk of vitamin D deficiency. Human milk, which is low in vitamin D, has about 25 IU per liter. Dark-skinned infants and children are also at risk of vitamin D deficiency, because they produce less vitamin D through sunlight exposure. Young infants (less than 6 months) are at particular risk, because the AAP recommends that this group avoid direct exposure to sunlight.

How much vitamin D does formula provide? All infant formulas sold in the U.S. have at least 400 IU of vitamin D per liter. Therefore, an infant who consumes at least 500 ml a day of formula will get enough vitamin D from that source.

Recommendations The AAP recommends a supplement of 200 IU of vitamin per day to the following groups of infants and children:

- All breastfed infants who are not weaned to at least 500 ml per day of vitamin D-fortified milk or formula. Supplementation should begin within the first 2 months of life.
- Nonbreastfed infants who consume less than 500 ml per day of vitamin D-fortified milk or

formula.

· Children and teens who do not drink at least 500 ml per day of vitamin D-fortified milk, do not get regular exposure to sunlight, or do not already take a daily multivitamin with at least 200 IU of vitamin D.

**Source:** Gartner LM, Greer FR, and the Section on Breastfeeding and Committee on Nutrition. Prevention of rickets and vitamin D deficiency: new guidelines for vitamin D intake. *Pediatrics* 2003; 111 (4): 908-910.

### **Prenatal Fatty Acid Supplements Increase Children's IQ**

Docosahexaenoic acid (DHA) and arachidonic acid (AA) are long-chain polyunsaturated fatty acids that play a role in development of the central nervous system. In humans, a growth spurt in the brain during the last trimester of pregnancy and the early postnatal period coincides with an increase of DHA and AA in that organ. However, the fetus and newborn apparently cannot make enough DHA and AA from linolenic acid, and amounts of DHA and AA provided by the mother during pregnancy or nursing may depend on the fatty acid content of her own diet. Since infant formula does not normally supply DHA and AA, several studies have looked at the effects of supplementing formula-fed infants with these fatty acids. Results have been mixed. The study reported in this paper is the first to examine the effect of prenatal fatty acid supplements on later measures of child mental development.

The study was carried out in Norway between 1994-96. Healthy pregnant women, 19-35 years of age, were randomly assigned at 18 weeks of pregnancy to take either 10 ml daily of cod liver oil (a source of DHA) or corn oil (a source of linoleic acid). The 341 women continued taking the supplements until 3 months postpartum. Note that in Norway, infants are routinely supplemented with cod liver oil starting at 4 weeks of age. The researchers collected plasma from the umbilical cord and breast milk samples to measure the fatty acid content. The researchers also estimated prenatal dietary intake of fatty acids at 18 and 35 weeks using a food frequency questionnaire. At four years of age, the children returned to the clinic for a battery of mental development tests that looked at sequential and simultaneous processing and nonverbal abilities. The final sample size included 48 children from the cod liver oil group and 35 from the corn oil group. According to the authors, neither the mothers nor research staff who administered the developmental tests were aware of the group assignments.

Although only 90 children were assessed, this subgroup did not differ from the larger sample in birth weight or length, gestational age, and parental educational level. The composite mental processing scores were significantly higher in the cod liver oil group, compared to the corn oil group (106 vs. 102,  $p < 0.05$ ). The authors were also able to show that the umbilical cord blood and breast milk from the cod liver oil group contained more DHA and less AA, compared to the other group. In a multivariate analysis, mother's intake of DHA was the only variable statistically related to the mental processing score, after controlling for gestational age, head circumference, maternal age, parental education, smoking, parity, and cod liver oil intake of the infant.

This longitudinal study provides some interesting evidence that fatty acid intake of the mother may have long-term implications for child development. However, the sample size was small and limited to a population of infants that routinely receives cod liver oil supplements starting at the age of 4 weeks. Therefore, more research is needed to develop

specific recommendations for different populations.

**Source:** Helland IB, Smith L, Saarem K, Saugstad OD, Drevon CA. Maternal supplementation with very long-chain n-3 fatty acids during pregnancy and lactation augments children's IQ at 4 years of age. *Pediatrics* 2003; 111: e39-e44. Accessed at <http://www.pediatrics.org/cgi/content/full/111/e39>.

### **Does Maternal Obesity Increase Risk of Breast-feeding Failure?**

Some evidence from animal studies suggests that maternal obesity may be linked to lactation problems, but studies on the topic in humans have yielded mixed results. Using national data from the Centers for Disease Control (CDC), the authors of this paper asked the following question: how does a mother's pre-pregnancy weight influence initiation and duration of breast-feeding? They also examined the impact of excessive prenatal weight gain on these breast-feeding outcomes.

To answer these questions, the authors linked two large databases: the CDC Pediatric Nutrition Surveillance System (PedNSS) and the Pregnancy Nutrition Surveillance System (PNSS). Thus, the final sample included 13, 234 low-income mothers and babies, participating in federally funded U.S. public health nutrition programs. The main variables of interest—mother's body mass index (BMI) before pregnancy and her prenatal weight gain—were based on the mother's self-report, not measured weight and height. The authors looked at the effect of mother's BMI and rate of prenatal weight gain on the initiation and duration of breastfeeding, after accounting for any effects due to birth weight, gestational age, parity, mother's age and education, marital status, race/ethnicity, income, smoking, and prenatal care.

In this population, less than half (47.6%) had a normal weight before pregnancy—37% were either overweight (BMI > 26-29) or obese (BMI > 29). Seventy-three percent did not gain recommended amounts during pregnancy (31% less than and 43% more than recommended amounts). Forty-six percent initiated breast-feeding. Median duration of breastfeeding was six weeks. Among women who were underweight or of normal weight before pregnancy, those who gained more weight were more slightly likely to breast-feed, but a similar relationship was not found for the overweight or obese women. Obese women, regardless of their prenatal weight gain, were less likely to breast-feed, compared to normal weight women ( $p < 0.01$ ). Both BMI and prenatal weight gain were related to duration of breast-feeding. Obese women, on the average, breast-fed two weeks less than normal weight mothers. Mothers who gained less or more than recommended amounts breast-fed about one week less than the other women.

Thus, this study has found small but significant negative effects of obesity on breast-feeding outcomes. Unfortunately, no clues are given as to why obese mothers breast-feed less. Some possible reasons include: hormonal problems; psychosocial factors (i.e., lack of self-confidence or social support); or large breasts interfering with early latch-on. It is also important to point out that an association between obesity and breast-feeding outcomes does not necessarily imply a cause-and-effect relationship. In other words, some other unidentified factor may be related to both obesity and breast-feeding patterns. To help mothers breast-feed more successfully, we must determine why this group of women has lower breast-feeding rates and how to provide appropriate breastfeeding support.

**Source:** Li R, Grummer-Strawn L. Maternal obesity and breast-feeding practices. *Am J Clin*

Nutr 2003; 77: 931-936.

### **Poor Fetal Growth Effects on Lean Body Mass**

A growing number of studies suggest that poor fetal growth may “program” an individual for chronic disease later in life. The mechanisms are not completely understood. In the face of prenatal undernutrition, fetal muscle growth may be sacrificed, to favor development of the brain. In particular, the small-for-gestational age infant may continue to have less muscle mass later on, which, in turn, could reduce sensitivity to insulin, lower metabolic rate, and increase risk of obesity and chronic health problems.

Using anthropometric data from two populations living in the United Kingdom, these researchers have looked for evidence that poor fetal growth has long-term effects on body composition in children and teens. Since body mass index does not clearly distinguish between fat and lean tissue, the researchers used skinfold thicknesses to estimate level of body fat in the children and in the teens, both skinfold measurements and bioelectric impedance values. Birth weight was used as an indicator of fetal growth. Birth weight had no effect on either body mass index or body fat during childhood and adolescence. However, in both groups, a lower-than-normal birth weight was associated with less lean body mass.

Thus, the authors conclude that poor fetal growth appears to have persistent effects on body composition in children and teens. Having less lean body mass, and thus a lower metabolic rate, could increase the risk of obesity later in life, particularly where high-calorie foods are abundant and physical activity is limited. Whether early interventions could reverse the effects of prenatal programming remains to be determined.

**Source:** Singhal A, Well J, Cole TJ, Fewtrell M, Lucas A. Programming of lean body mass: a link between birth weight, obesity, and cardiovascular disease? *Am J Clin Nutr* 2003; 77: 726-30.

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