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Breastfeeding May Help Prevent Childhood Overweight

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PRIOR TO PUBLICATION OF THE STUDIES BY HEDIGER ET AL¹ and Gillman et al² in this issue of THE JOURNAL, only reducing the number of hours children watched television qualified as a potentially effective preventive³ and therapeutic strategy for childhood obesity.^{4,5} These articles^{1,2} in this issue examine the effect of early breastfeeding experience on the development of later obesity and suggest that breastfeeding may be added as a preventive intervention. Both studies use the same definitions of overweight. Children whose body mass index (BMI) on the new Centers for Disease Control and Prevention growth charts was between the 85th and at the 95th percentiles for age and sex were considered at risk of overweight, and children whose BMI was at the 95th percentile or greater were considered overweight. In young adults, these percentiles are roughly equivalent to a BMI of 25 to 30 kg/m², which identifies overweight in adults, and to a BMI of 30 kg/m² or higher, which identifies obesity. However, important differences exist between the 2 studies with respect to sample size, age, and results.

Hediger et al¹ examined data collected in the Third National Health and Nutrition Examination Survey (NHANES III) from a sample of 2685 children aged 3 to 5 years. The sample was ethnically diverse, with approximately equal numbers of black, Mexican American, and white children. Children's heights and weights were measured directly. Breastfeeding history was collected as part of a history of infant feeding that also identified the length of time children were exclusively breastfed, when they completely stopped breastfeeding, and when solid foods were first introduced. Analyses were controlled for maternal obesity. Although breastfeeding appeared to protect against the development of a BMI between the 85th and 95th percentiles, there was no statistically significant association between history of breastfeeding and reduced risk of development of overweight.

In the second article, Gillman et al² analyzed a cohort of approximately 15 000 children and young adolescents aged 9 to 14 years who were children of participants in the Nurses' Health Study II. Height and weight were self-reported by chil-

dren, and their mothers reported infant feeding practices, such as the duration of breastfeeding, the exclusivity of breastfeeding, and the time that solid foods were introduced. Analyses were adjusted for a number of potential confounding variables, such as the amount of time spent watching television, weekly physical activity, dietary intake, and maternal BMI. In contrast to the study by Hediger et al, Gillman et al found that for the first 6 months of life, children who were exclusively or mostly fed breast milk had a significantly lower risk of overweight than children who were exclusively or mostly fed formula. Furthermore, the risk of overweight was lower among children who were breastfed at least 7 months than among children who were breastfed 3 months or less.

One difference that might account for the disparity in the 2 studies is the age of the participants. At least 1 animal study has suggested that the age at which the consequences of infant feeding practices become apparent may account for the lack of significant effects in studies with relatively short periods of follow-up.⁶ This study found that the weights of adolescent baboons who were underfed, normally fed, or overfed as infants varied as expected during infancy based on their energy intake and that their weights normalized at weaning. However, after about 2 years of age, female baboons who were overfed as infants gained weight more rapidly than females who were either underfed or normally fed as infants. At 5 years of age, overfed female baboons, but not males, had significantly greater fat stores.

Most previously published human studies that examined the relationship of breastfeeding to subsequent obesity failed to find a significant effect.⁷ However, all but 1 of these studies included small samples, most failed to control for a variety of potentially confounding variables, and none examined children older than 7 years. Although the 2 articles published in this issue appear to leave the question of the potential benefits of breastfeeding unresolved, their results are not as contradictory as they first appear. The article by Hediger et al failed to find a significant protective effect of breastfeeding against childhood overweight in infants who were breastfed; the reported adjusted odds ratio (OR) of 0.84 (95% confidence interval [CI], 0.62-1.13) was close to the adjusted OR

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of 0.78 (95% CI, 0.66-0.91) reported by Gillman et al for infants who were either exclusively or mostly breastfed in the first 6 months of life. Likewise, Hediger et al reported that the adjusted OR for childhood overweight in infants who were fully breastfed for 6 to 8 months was 0.65 (95% CI, 0.34-1.24), and it was 0.75 (95% CI, 0.29-1.95) for infants fully breastfed for more than 9 months. Although these ORs were not statistically significant, they do not appear markedly different than the adjusted OR of 0.80 (95% CI, 0.67-0.96) that Gillman et al observed when they compared the risk of overweight in children who were breastfed at least 7 months with the risk of those who were breastfed for 3 months or less. The absence of a statistically significant effect of breastfeeding in the NHANES III sample may be attributable to the small sample size; approximately 300 children were overweight by age 3 to 5 years, whereas in the study by Gillman et al, more than 1000 children aged 9 to 14 years were overweight.

The findings in the 2 current studies are consistent with another recently published study that also demonstrated a protective effect of breastfeeding. In a sample of almost 10000 German children aged 5 to 6 years, von Kries and colleagues⁸ found a reduced prevalence of obesity (defined as a BMI >97th percentile of a German population) among children who were breastfed as well as a dose-response effect of breastfeeding. The statistically significant adjusted OR for obesity among children in this study who were breastfed for 6 to 12 months was 0.57 (95% CI, 0.53-0.99).

The mechanism by which breastfeeding may protect against overweight or obesity remains uncertain. As Hediger et al and Gillman et al suggest, infants who are breastfed may have more discretion over the amount of milk they consume than those who are formula fed. The intake by formula-fed infants may in part be governed by the judgment of the person who is feeding the infant, who may prompt the infant to take more formula based on what he/she believes the infant should consume. Differential endocrine responses to formula and breast milk may also promote increased body fat deposition, although not without an energy intake that exceeds energy expenditure. A third alternative is that the food preferences subsequent to breastfeeding may be affected by the mode of infant feeding. For example, infants who were breastfed adapted to the introduction of a novel food more readily than those who were formula fed,⁹ perhaps because the taste of breast milk varies more¹⁰ than the taste of infant formula. However, no study yet has demonstrated that children who were breastfed as infants consume more varied diets or diets that contain more fruits and vegetables than children who were fed formula as infants.

The data presented by Hediger et al and by Gillman et al reflect the challenge and the promise of breastfeeding. In the study by Hediger et al, only 44% of women initiated breastfeeding, and only 31% of those who started breast-

feeding continued to breastfeed after 6 months. In contrast, Gillman et al found that 85% of the nurses in their study initiated breastfeeding, and of those who started breastfeeding, 55% continued to breastfeed after 6 months. Improved understanding of the incentives that promote the initiation and duration of breastfeeding and elimination of the barriers that lead to the early termination of breastfeeding must become high priorities. For example, the mother's return to work may represent one such barrier. Therefore, work site facilities and policies that allow mothers to continue to provide breast milk for their infants after returning to work may represent one of the policy shifts necessary to help address the obesity epidemic.

The percentage of cases of obesity preventable by breastfeeding may be small. For example, based on the unadjusted risks of overweight presented in the articles by Gillman et al for infants fed only or mostly formula and von Kreis et al for infants never fed breast milk, the population attributable risk of overweight due to formula feeding is 15% to 20%. Population attributable risks based on the fully adjusted models will be lower. Nonetheless, the rapid spread of the obesity epidemic and its implications for illness and health care costs emphasize the urgency with which potentially effective strategies, particularly those with few adverse consequences, should be implemented. Breast milk is already acknowledged as the best food for infants.¹¹ The increased initiation and duration of breastfeeding may also provide a low-cost, readily available strategy to help prevent childhood and adolescent obesity.

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REFERENCES

- Hediger ML, Overpeck MD, Kuczmarski RJ, Ruan WJ. Association between infant breastfeeding and overweight in young children. *JAMA*. 2001;285:2453-2460.
- Gillman MW, Rifas-Shiman SL, Camargo CA Jr, et al. Risk of overweight among adolescents who were breastfed as infants. *JAMA*. 2001;285:2461-2467.
- Robinson TN. Reducing children's television viewing to prevent obesity: a randomized trial. *JAMA*. 1999;282:1561-1567.
- Gortmaker SL, Peterson K, Wiecha J, et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med*. 1999;153:409-418.
- Epstein LH, Valoski AM, Vara LS, et al. Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychol*. 1995;14:109-115.
- Lewis DS, Bertrand HA, McMahan CA, McGill HC Jr, Carey KD, Masoro EJ. Prewaning food intake influences the adiposity of young adult baboons. *J Clin Invest*. 1986;78:899-906.
- Parsons TJ, Power C, Logan S, Summerbell CD. Childhood predictors of adult obesity: a systematic review. *Int J Obes*. 1999;23(suppl 8):S1-S107.
- von Kreis R, Koletzko B, Sauerwald T, et al. Breast feeding and obesity: cross sectional study. *BMJ*. 1999;319:147-150.
- Sullivan SA, Birch LL. Infant dietary experience and acceptance of solid foods. *Pediatrics*. 1994;93:271-277.
- Mennella JA, Beauchamp GK. Maternal diet alters the sensory qualities of human milk and the nurslings' behavior. *Pediatrics*. 1991;88:737-744.
- US Department of Health and Human Services. *Healthy People 2010*. Vol 2. Washington, DC: US Government Printing Office.