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Parental Influence on Eating Behavior:

Conception to Adolescence

Jennifer S. Savage, Jennifer Orlet Fisher, and Leann L. Birch

is a research assistant in the Center for Childhood Obesity Research at the Pennsylvania State University. Jennifer Orlet Fisher, Ph.D., is Assistant Professor of Pediatrics at Baylor College of Medicine in Houston, Texas, and is also a research scientist at the U.S.D.A. Children's Nutrition Research Center where her research focuses on modifiable aspects of food intake regulation in early development. Leann Birch, Ph.D., is Distinguished Professor of Human Development and Nutritional Sciences at the Pennsylvania State University and director of the Center for Childhood Obesity Research.

Introduction

Eating behaviors evolve during the first years of life as biological and behavioral processes directed towards meeting requirements for health and growth. For the vast majority of human history, food scarcity has constituted a major threat to survival, and human eating behavior and child feeding practices have evolved in response to this threat. Because infants are born into a wide variety of cultures and cuisines, they come equipped as young omnivores with a set of behavioral predispositions that allow them to learn to accept the foods made available to them. During historical conditions of scarcity, family life and resources were devoted to the procurement and preparation of foods, which are often low in energy, nutrients, and palatability. In sharp contrast, today in non-Third World countries children's eating habits develop under unprecedented conditions of dietary abundance, where palatable, inexpensive, ready-to-eat foods are readily available.

In this review, we describe factors shaping the development of children's food preferences and eating behaviors during the first years of life, in order to provide insight into how growing up in current conditions of dietary abundance can promote patterns of food intake which contribute to accelerated weight gain and overweight. In particular, we focus on describing children's predispositions and parents' child feeding practices. We will see that the feeding practices that evolved across human history as effective parental responses to the threat of food scarcity, can, when combined with infants' unlearned preferences and predispositions, actually promote overeating and overweight in our current eating environments. In addition to the relatively recent changes in our eating environments, concurrent reductions in opportunities for physical activity undoubtedly also contribute to positive energy balance and obesity, but are outside the scope of this article.

The first five years of life are a time of rapid physical growth and change, and are the years when eating behaviors that can serve as a foundation for future eating patterns develop. During these early years, children are learning what, when, and how much to eat based on the transmission of cultural and familial beliefs, attitudes, and practices surrounding food and eating. Throughout, we focus on the vital role parents and caregivers play in structuring children's early experiences with food and eating, and describe how these experiences are linked to children's eating behavior and their weight status.

The Current Eating Environment

These days, food and drink are available in most venues of everyday life. As of 2002, there were 514,085 food-service establishments in the United States and an additional 152,582 stores where food and beverages could be purchased.¹ In addition, a growing variety of inexpensive and energy-dense foods have become available in increasingly larger portions. A typical American supermarket carries 45,000 items² and consumer portions served by restaurants and fast-food establishments are often double the size of current recommended USDA serving size.³

In most families, women still have primary responsibility for feeding children.⁴ Changes in employment patterns and family structure, however, leave women with less time to devote to this activity. From 1975 to 2004, labor force participation among mothers with children under eighteen years of age increased from forty-seven to seventy-one percent.⁵ Moreover, both parents work in sixty-one percent of two-parent families with children under eighteen years of age.⁶ Among single mothers, seventy-two percent are employed. Additionally, more women than men parent and feed their children without the assistance of a spouse: twenty-three percent of children under eighteen years of age live with their mother only.⁷

One consequence of these trends is that young children are routinely fed by someone other than a parent. In fact, thirty-one percent of preschool-age children receive out-of-home childcare which includes mealtime care from a grandparent or other relative, and forty-one percent participate in organized childcare.⁸ In addition, families spend less time eating meals together. Only fifty-five percent of married parents and forty-seven percent of single parents eat breakfast daily with their preschool-age child.⁹ Finally, an increasing proportion of food that children eat is prepared and consumed away from home.¹⁰ About forty percent of family food dollars are now spent on food away from the home.¹¹ In these contexts children may be served particularly large portions¹² and consume more energy and fat than when eating at home.¹³ Collectively, these trends suggest that today's young children spend less time eating at the family table and have routine exposure to large portions of palatable, energy dense foods than in previous generations.

Early Taste and Experience with Food Flavors in Amniotic Fluid

A growing body of evidence suggests that the food choices a mother makes during her pregnancy may set the stage for an infant's later acceptance of solid foods. Amniotic fluid surrounds the fetus, maintaining fetal temperature, and is a rich source of sensory exposure for infants. Many flavors in the maternal diet appear to be present in amniotic fluid. Adult sensory panels have detected odors and compounds of garlic,¹⁴ cumin, and curry¹⁵ in the amniotic fluid of pregnant women ingesting oil of garlic capsules and spicy foods, respectively. Because taste and smell are already functional during fetal life, and because the fetus regularly swallows amniotic fluid, the first experiences with flavor occur prior to birth. Exposure to these “transmittable” flavors influences the acceptance of these flavors by the infant postnatally.¹⁶ Julie Mennella and colleagues examined the influence of repeated prenatal exposure to carrot juice and found that women who consumed carrot juice for three consecutive weeks during their third trimester of pregnancy had infants who exhibited fewer negative facial expressions when first introduced to carrot-flavored cereal as compared to plain cereal.¹⁷ These findings reveal that experience with dietary flavors begins as the fetus is exposed to flavors from the maternal diet in utero, and that this early experience can provide a “flavor bridge” that can begin to familiarize the infant with flavors of the maternal diet. As we will see, familiarity plays a key role in the acquisition of food and flavor preferences.

The Impact of Breast Milk Feeding

Breastfeeding is recommended as the optimal feeding method for the first six months of life, followed by the introduction of solids and continued breastfeeding for a minimum of one year.¹⁸ These recommendations are largely based on evidence that breast milk supports normal growth and also has immunological properties that provide some early protection from infection, and is associated with creating a lower risk of infant morbidity and mortality.¹⁹ A growing body of literature also suggests that breastfeeding affords a small, yet consistent, protective effect against obesity. Specifically, Christopher Owen and colleagues conducted a systematic review of sixty-one studies, of which twenty-eight provided odds ratios to examine the influence of breastfeeding on obesity from infancy to adulthood. They found that breastfeeding was associated with a reduced risk of obesity among infants, young children, older children, and adults with an unadjusted odds ratio of 0.50, 0.90, 0.66 and 0.80, respectively.²⁰ Moreover, Stephan Arenz and colleagues reviewed twenty-eight studies investigating the association between breastfeeding and childhood obesity that met the following inclusion criteria: relative risk had to be reported, age at last follow-up had to be between five and eighteen years, feeding mode had to be reported, and obesity had to be defined using BMI. Of these twenty-eight studies, nine studies comprising more than 69,000 children were eligible for the meta-analysis. They found a significant adjusted odds ratio (AOR) for “ever breastfed” of 0.78, 95% CI (0.71-0.85) in the fixed model.²¹ These odds ratios, which are significantly lower than 1.0, indicate a significantly lower risk for subsequent obesity among those who were breastfed, even when adjusting for other factors.

In one review of twenty-two high quality studies, fifteen found protective effects to be more consistently noted among school-aged children and adolescents than among younger children.²² One possible explanation is that the impact of breastfeeding on subsequent weight status may be an example of metabolic or behavioral programming, in which the impact of breastfeeding on weight status only emerges later in development, and in this case, may not be clearly manifested until adolescence or adulthood. However, at this point, the mechanism(s) by which breastfeeding exerts protective effects are not understood. Specifically, breastfeeding is the ideal feeding method for the human infant and influences the developing anatomy and physiology of the gastrointestinal tract in ways that differ from formula feeding, such that breast-fed and formula-fed individuals may differ in the absorption and utilization of nutrients later in life.²³ In addition, there is some evidence for two complementary behavioral mechanisms that may explain the protective effects of breastfeeding. The first involves the effects of breastfeeding on food acceptance and the second involves the developing controls of energy intake.

The sensory properties of breast milk may facilitate the transition to the modified adult diet. Many flavors of the maternal diet appear in breast milk. For example, adult sensory panels can detect odors of garlic,²⁴ alcohol,²⁵ and vanilla²⁶ in milk samples of lactating women who ingested those flavors prior to providing milk samples. Flavors in human milk influence infant consumption. For example, breast milk flavored with garlic²⁷ and vanilla²⁸ increased infant sucking time at the breast compared to breast milk without garlic or vanilla flavor. Mennella and colleagues also tested the hypothesis that experience with flavor in breast milk modifies the infants' acceptance and enjoyment of those foods in a sample of forty-five mothers and their babies that were randomly assigned to one of three groups. The first group drank carrot juice during pregnancy and water during lactation; group two drank water during pregnancy and carrot juice during lactation, and the control drank water during both conditions.²⁹ Results revealed that repeated postnatal exposure to carrot flavors increased acceptance and enjoyment of carrot flavor in infant cereal. These findings indicate that flavors in breast milk, which vary with the maternal diet, provide the infant with a changing flavor environment. This early flavor experience appears to facilitate the infant's acceptance of foods of the modified adult diet,

