Does Diet Have a Connection With Asthma?

Guidelines for prevention and treatment of asthma provide few recommendations about diet. As the incidence of asthma rapidly increases, environmental factors such as lack of breast-feeding, poor diet, decreased physical activity, and obesity are being studied to determine their possible role in asthma. In the meantime, patients ask for advice. We present 3 cases with evidence-based recommendations. Nutr Today. 2012;47(2):58–62

Asthma is a chronic respiratory disease characterized by increased airway responsiveness and variable airflow obstruction. It is one of the most common chronic diseases in the world and is the most prevalent chronic illness in children. The increasing prevalence of asthma over the past several decades has been especially prominent among children. In fact, approximately one-third of infants experience at least 1 wheezing episode in the first year of life. Asthma, allergic dermatitis, and allergic rhinitis constitute the so-called “allergic triad” and represent diseases with similar pathophysiology that frequently coexist in the same patient. Risk factors for asthma include environmental tobacco smoke exposure, a parental history of atopic (allergic) disease, male sex, African American ethnicity, low socioeconomic status, and living in an urban area. The National Institutes of Health issues guidelines for the diagnosis and management of asthma and notes that environmental factors such as obesity and low intakes of antioxidants and omega-3 fatty acids are under study but their association with asthma onset is unclear. In addition, dietary intervention trials have not yielded sufficient evidence to make recommendations on diet in the management of asthma.

We present a discussion of questions voiced by patients about their concerns between diet and asthma in light of the available evidence.

CASE 1: THE WELL-INTENTIONED MOTHER-TO-BE

Mrs. G. is a 24-year-old woman who just learned she is pregnant with her first child. She has dedicated herself to doing all she can to ensure an uncomplicated pregnancy and delivery of a healthy baby. Whereas Mrs. G. has never had problems with wheezing, her younger brother has had asthma since early childhood, and she does not want her child to have the same experience. Mrs. G. has heard that breast-feeding and restricted diets may decrease her child’s risk of asthma and asks for your opinion.

Background: Breast-feeding

Some of the most compelling data supporting a positive effect of breast-feeding on the development of asthma comes from the third National Health and Nutrition Examination Survey (NHANES III), a nationally representative cross-sectional study conducted from 1988 to 1994. Although the reduction in risk for asthma and recurrent wheeze in children 2 to 71 months of age did not reach statistical significance, 2 important associations were found. First, compared with children who had never been breast-fed, children who had ever been breast-fed were significantly less likely to be diagnosed with asthma and of having recurrent wheeze before 24 months of age. And, second, among children exposed to environmental tobacco smoke, those who had ever been breast-fed had a significantly lower risk of asthma and recurrent wheeze than children who had never been breast-fed. The second point is particularly important, considering additional data from NHANES III showing that in children 2 to 24 months of age, 40% to 60% of the cases of asthma, chronic bronchitis, and recurrent wheeze were attributed to environmental tobacco smoke. Once a child is past between 2 and 4 years of age, the impact of breast-feeding appears to diminish. One study of nearly 5000 children aged 14 years found that breast-feeding neither increased nor decreased the prevalence of asthma. Analyses of breast milk composition have shown an association between higher levels of...
long-chain polyunsaturated fatty acids, particularly docosahexaenoic acid (DHA), and decreased incidence of allergic diseases in 18-month-old children who were breast-fed. Of interest to mothers who are unable or unwilling to breast-feed, a small retrospective analysis found infants who were fed formula supplemented with DHA and arachidonic acid (ARA) through their first year had a reduced incidence of wheezing or asthma during that time, when compared with infants fed formula without DHA/ARA supplementation. Most commonly available brands of cow’s mild formula now contain DHA/ARA.

Food antigens have been detected in breast milk, leading to past recommendations from the American Academy of Pediatrics that advised lactating mothers with infants at high risk of developing allergy to avoid peanuts and tree nuts and to consider eliminating eggs, cow milk, and fish from their diets while nursing. However, more recent studies, including a 2006 Cochrane Systematic Review, have concluded that there is insufficient evidence that antigen avoidance during lactation is beneficial in preventing atopic disease in the breast-fed infant. A 2007 Agency for Healthcare Research and Quality Evidence Report concluded that the studies evaluating the impact of breast-feeding on asthma remain equivocal. However, their meta-analysis is overall supportive. It showed that breast-feeding for at least 3 months was associated with a 27% reduction in the risk of asthma in those subjects without a family history of asthma compared with those who were not breast-fed. For those with a family history of asthma, there was a 40% reduction in the risk of asthma in children younger than 10 years who were breast-fed for at least 3 months compared with those who were not breast-fed.

Case 1 Revisited: The Well-Intentioned Mother-to-Be
You discuss with Mrs G. that exclusive breast-feeding is associated with a lower risk of recurrent wheeze and asthma in children up to age 2 to 4 years. If she is unable to successfully breast-feed, limited data support the use of formula with DHA/ARA supplementation to decrease the incidence of wheezing or asthma during the first year of life and so she might select a brand that includes it. Finally, you reassure her that there is not sufficient evidence that avoidance of specific foods while nursing will decrease her child’s risk of allergic disease. If she chooses to avoid foods, her diet should be analyzed for nutrient adequacy. Mrs G. eagerly plans to breast-feed her infant.

### CASE 2: THE WELL-INTENTIONED MOTHER-TO-BE RETURNS—PRENATAL AND EARLY CHILDHOOD NUTRITION

Mrs G. returns to see you in the 20th week of her pregnancy. Her weight gain has been appropriate in both rate and amount. She remains committed to breast-feeding her infant. Her younger brother was recently hospitalized with a severe asthma exacerbation, again making her wonder if she is doing all she can to minimize her child’s risk of developing asthma. She is following a self-described “healthy diet” but has not been able to tolerate prenatal vitamins and wonders if another dietary supplement would be helpful. Mrs G. says she likes to plan ahead and asks your advice on feeding her child once solid food is introduced.

### Background

Dietary Interventions From Pregnancy to Early Childhood

Studies investigating the influence of dietary patterns during pregnancy on the development of asthma and allergic disease offer mixed results. Prenatal deficiency of vitamin D may affect fetal lung development. A Japanese study of 763 mother-child pairs found children whose mothers had consumed more than 172 IU of vitamin D daily during pregnancy were 64% less likely to have wheezing at 16 to 24 months. A similar association was seen in a UK study, but the benefit was most pronounced in 5-year-olds rather than 2-year-olds. The same Japanese study found that those women reporting higher prenatal dairy product intake also reported less wheezing in their children when reassessed at 16 to 24 months. Interestingly, these findings may not apply to all dairy products. Data presented at the European Respiratory Society 2011 Annual Congress indicate that, compared with pregnant women who reported no intake of low-fat yogurt, women who ate low-fat yogurt at least once a day during pregnancy had children with an increased risk for asthma (1.61; 95% confidence interval, 1.22–2.12), as assessed by data from the Danish National Patient Registry. It is unclear whether these findings relate to conjugated linoleic acid content of low-fat yogurt or some other aspect of the participants’ lifestyle.

Early childhood nutrition may also have an impact on asthma and allergic disease later in life. One Norwegian study found daily consumption of fresh fruit or vegetables during the first year of life was associated with a lower risk of asthma when those children reached school age. The researchers cited previous evidence that lower consumption of dietary vitamin C was associated with a higher risk of wheezing and nocturnal cough in young school-aged children and suggested this as a potential explanation for their findings. Other observational studies...
have shown that vitamins C and E, as well as trace elements such as magnesium and selenium, have a protective effect on asthma prevalence in children. In the majority of these studies, however, the benefit disappears by age 5 years, suggesting a short-term effect on response to viral infections. Trials investigating supplementation during pregnancy or lactation with these nutrients have shown minimal effect.14

Case 2 Revisited: The Well-Intentioned Mother-to-Be—Prenatal and Early Childhood Nutrition
You compliment Mrs. G. on her dedication to her child’s health and explain that the available evidence to address her questions is mixed. Decreased risk for wheezing and asthma has been associated with higher prenatal intake of vitamin D and dairy products. The exception may be low-fat yogurt, where daily intake may increase the risk of asthma. You recommend that she meet her vitamin D need of 600 IU per day but take no more than the upper tolerable limit of 4000 IU/d. Once her child is taking solid food, higher intake of fresh fruit and vegetables may decrease her child’s asthma risk. You emphasize that vitamin supplements do not seem to provide the same benefit as dietary sources. You ask her to keep a 3-day diet record and analyze it for nutrient adequacy and suggest foods and beverages, including those that are iron fortified to meet her increased nutrient needs during pregnancy and lactation.

CASE 3: THE AT-RISK TODDLER
Mr. and Mrs. F. and their 20-month-old son have been referred to you by their son’s pediatrician because he has plotted greater than the 98th percentile weight-for-age on the World Health Organization growth charts now recommended for use in the United States.15 At 12 months, his weight had been at the 80th percentile. The child is playful and happy. He stays with his grandparents during the weekdays so both parents can work. Despite her efforts to maintain a healthy diet at home, Mrs. F.’s overweight in-laws insist on “rewarding” their grandchild’s good behavior with snacks. You encourage the parents with the “5-3-2-1-Almost None” message: 5 or more servings of fruits and vegetables daily; 3 structured meals daily—eat breakfast, less fast food, and more meals prepared at home; 2 hours or less of TV; 1 hour or more of unstructured physical activity along with 30 minutes of structured physical activity to develop movement skills; and limit sugar sweetened beverages to almost none, including limiting juice to no more than 6 oz/d.23 You encourage them to share the diet and toddler information found at www.choosemyplate.gov with the grandparents about portion size and give them a copy of the Stop Light Food Guide, which depicts “every day,” “some days,” and “on occasion” foods and tell them you would like to follow that guide. You suggest they ask the grandparents to help them regularly plot his weight on the growth charts. You also suggest they ask the

Background: Impact of Obesity
The worldwide increase in asthma prevalence is paralleled by an increased prevalence of obesity. As a group, patients with asthma are heavier than patients without asthma.16 Analysis of data from NHANES III found that obese children and adolescents were 68% more likely to have asthma than nonobese subjects. This surprises many older healthcare professionals who associate asthma with skinny, nonoverweight kids. This association was stronger in nonatopic (nonallergic) children.17 A meta-analysis of 4 studies found that in school-aged children, body mass index (BMI) equal to or greater than the 85th percentile for age and sex was associated with a 50% increase in the risk for future asthma.18 A meta-analysis of 7 prospective studies in adults showed that overweight subjects (BMI, 25–29.9 kg/m²) had a 38% increased risk for asthma, and obese subjects (BMI ≥30 kg/m²) had a 92% increased risk of asthma.19 The mechanism for this association, however, is likely complicated and remains unclear.

Several studies have concluded that early-life childhood weight gain may have an effect on the development of asthma. A small study evaluating lung function in children at 1 and 12 months of age showed that greater weight gain in infancy was associated with a slower increase in lung function.20 Among asthmatic children enrolled in an Arkansas Head Start program, increased BMI was associated with greater asthma-related morbidity, including missed school days, emergency department visits, hospitalizations, and activity limitations.21

An interesting correlation between salty-snack eating, television/video game viewing, and the presence of asthma symptoms was seen in the PANACEA study.22 Among 10- to 12-year-olds, consumption of salty snacks (>3 times/wk vs never/rare) was associated with a 4.8-fold higher likelihood of having asthma symptoms, even after factoring out potential confounders. The association was more apparent in children who spent more than 2 hours per day viewing television/playing video games.

Case 3 Revisited: The At-Risk Toddler
You commend Mr. and Mrs. F. for their appropriate concern about their child’s weight and its potential impact on his risk for developing asthma. You discuss with them that, although the mechanism is not well understood, there is a clear association between asthma and body weight. You emphasize the importance of providing nutrient-rich foods in appropriate portion sizes and potentially restricting salty snacks. You encourage the parents with the “5-3-2-1-Almost None” message: 5 or more servings of fruits and vegetables daily; 3 structured meals daily—eat breakfast, less fast food, and more meals prepared at home; 2 hours or less of TV; 1 hour or more of unstructured physical activity along with 30 minutes of structured physical activity to develop movement skills; and limit sugar sweetened beverages to almost none, including limiting juice to no more than 6 oz/d.23 You encourage them to share the diet and toddler information found at www.choosemyplate.gov with the grandparents about portion size and give them a copy of the Stop Light Food Guide, which depicts “every day,” “some days,” and “on occasion” foods and tell them you would like to follow that guide. You suggest they ask the grandparents to help them regularly plot his weight on the growth charts. You also suggest they ask the
CASE 4: THE ADULT ASTHMATIC WANTING TO TREAT ASTHMA WITH “A BETTER DIET”

Background: Diet in Adult Asthma

Mrs F. has been so impressed with your advice regarding her son that she suggested her brother with moderate persistent asthma see you as well. Mr B. is a 19-year-old college student and does not smoke. He has no time to cook and describes a diet rich in “fast food.” Mr B. will be moving to his own apartment next month and vows to change his eating habits based on your recommendations.

Investigation of dietary patterns in relation to lung function decline in adults found that a more traditional diet (high intake of meat and potatoes and a lower intake of soy and cereal) was associated with a lower forced expiratory volume in 1 second (FEV₁), and a high intake of refined foods was associated with an accelerated longitudinal decline in FEV₁ over a 5-year period of observation. A small study investigating differences in dietary intake between an adult population with and without asthma found that asthmatic patients have a lower intake of vitamins A, C, and E. In addition, intake of omega-3 fatty acids was directly correlated with increased FEV₁. However, just as has been seen in children, studies investigating the impact of vitamin supplementation on adult asthma have shown no consistent benefit. Despite data suggesting that a diet deficient in eicosapentanoic acid—the suggested anti-inflammatory component of fish oil—may lead to worsening of asthma, fish oil supplementation has not shown any impact on asthma or respiratory function in adults.

Case 4 Revisited: The Adult Asthmatic Wanting to Treat Asthma With “a Better Diet”

You advise Mr B. that his diet of high-fat, highly refined foods has been associated with accelerated decline in lung function. You recommend he increase his dietary intake of vitamins A, C, and E and omega-3 fatty acids. You discuss specific food choices to achieve his goal rather than consuming supplements, noting that studies evaluating supplementation with vitamins and fish oil do not show the same benefit for asthma as consuming foods rich in vitamins and omega-3 fatty acids. You discuss his interest and ability to try a Mediterranean eating approach including fruits, vegetables, fish, nuts, and seeds and avoidance of trans-fats. You encourage him to keep a food diary with a breathing symptom log and suggest you would help him try eliminating any foods or beverages that show a pattern of affecting his symptoms while maintaining adequate nutrient intake. Mr B. is optimistic that he may be able to have better control over his asthma and his overall health by eating better and thanks you for your help.

SUMMARY

Evidence linking diet and risk of asthma is of limited quantity and quality. Studies evaluating the impact of breast-feeding on asthma incidence show the most consistently positive associations while obesity increases risk of asthma. Data on other associations of diet and asthma risks and exacerbations come from smaller observational studies. Low dietary intake of multiple vitamins and nutrients seems to have a negative impact on asthma, but supplementation of these compounds has consistently shown little or no benefit. As is the case with multiple other diseases, there does not appear to be a good substitute for a lifestyle that includes consuming a diet rich in fresh fruits and vegetables, regular physical activity, and maintenance of a healthy weight when trying to reduce risks for asthma.

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**NUTRITION LABELING LAW LOWERED NUTRITION, IMPROVED TASTE**

According to a new study, in the nearly 2 decades since regulations required food products to contain a “Nutrition Facts” label, the overall nutritional quality of branded food products in supermarkets has decreased, whereas the taste of these same products has improved. Among those foods that did improve their nutrition, “junk foods” or low-health products increased their nutrition more than healthier options. And among companies, those with smaller brands or fewer existing brands were more likely to make improvements to the nutrition of their products. The research was conducted through 2 studies of food products before and after the nutrition labeling regulations. The first study investigated food products in 30 product categories—some required by the Nutrition Labeling and Education Act (NLEA) of 1993 to feature nutrition labels such as foods in supermarkets, and some not required to feature nutrition labels such as similar foods in restaurants. The second study used a sample of brands from Consumer Reports to examine brand nutrition and taste for a smaller set of categories before and after the NLEA. Although the nutritional value of most foods declined in the years following the NLEA, some foods have improved nutrition. The researchers found brands in low-health categories (eg, potato chips) and small-portion categories (eg, peanut butter) improved nutrition more than brands competing in high-health categories (eg, bread) or large-portion categories (eg, frozen dinners). Likewise, smaller companies in a food category and those companies with fewer existing brands were more likely to improve nutrition. The NLEA sought to eliminate untruthful nutritional claims and to improve consumers’ ability to find nutrition information at the point of sale. Manufacturers are required to display a label of nutrition facts with standardization on all nutrients, recommended daily values, and an ingredient list. Claims of health benefits on food packaging are also regulated for truthful content. Prior to adoption of the NLEA, most food products did not commonly disclose nutrition information, which made comparisons within and across food categories difficult for consumers. The researchers note that ongoing challenge for food producers, policy makers, and public health advocates is to increase the value consumers place on nutrition and to reduce the perceived nutrition-taste tradeoff, the authors argue. 

Source: Duke University News Service


**INSURANCE BENEFIT OF REGISTERED DIETITIAN HELPS WEIGHT LOSS OUTCOMES**

Registered dietitian (RD) services as part of insurance wellness programs offer a promising potential venue for improving public health. A new study led by *Nutrition Today* Editorial Board member, Linda Snetselaar, evaluated the effectiveness of RD nutrition counseling services provided as part of an insurance benefit on body weight and associated health parameters. Eligible members could enroll to receive 6 RD visits a year for assistance with weight management, and study RDs were randomized into either usual care (UC) or lifestyle case management (LCM) groups. Body weight, waist circumference, and systolic and diastolic blood pressure measurements of program enrollees were evaluated for between-group as well as start- and end-program comparisons. There was a statistically significant difference in the number of RD follow-up visits between the 2 groups as LCM patients had more RD contact than UC patients. Weight and waist circumference changes from baseline to end of study show statistically significant changes with a trend for improvement in systolic blood pressure. Additionally, the study showed a clinically significant reduction in weight was achieved in a quarter of program enrollees. In conclusion, this study shows that through a coordinated health promotion program, RDs’ services are of value to an insured population. Snetselaar L, Smith KL, Hollinger D, Myers E, Murphy G, Qualls LG. Registered dietitian wellness insurance benefit makes a difference in adult weight management: a pre-post study. Pages 1043–1047. DOI: 10.4236/fns.2011.210139

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