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Dr. Leann Birch Shares Insights That Can Lead to Healthy Eating in Children

By Laurie Lindsay Aomari, RD, LD*



Dr. Leann Birch earned her Ph.D. in psychology from the University of Michigan. Dr. Birch has been Professor and Head of the Department of Human Development and Family Studies in the College of Health and Human Development at Penn State since 1992. Prior to that time, she was a faculty member at the University of Illinois. Her research interests are in the developing controls of food intake in young children, including the acquisition of food preferences and aversions, the development of individual differences in styles of intake control, and risk and protective factors for problems of energy balance. Her current funded research explores the antecedents of dieting in girls during middle childhood. Dr. Birch is internationally recognized for her work in this area, and is the author of more than 131 publications.

"I've learned over the years that if you work at it you can get most kids to eat almost anything," says Dr. Leann Birch. "Parents throw up their hands trying to get kids to eat healthy diets, but food preferences are learned and if we know how they're formed and where they come from, we can get kids to eat healthier diets."

Dr. Birch is an expert in the way controls of food intake develop in young children. She acknowledges that guiding a child to eat in a healthy way, and have a preference for nutritious foods, is a long-term project. She notes evidence that food preferences may begin *before* the infant starts on solid foods.

According to Birch, the varied diet of a lactating mother leads to a variety of flavors in her milk. Infant formula, on the other hand, does not have flavor variation. "Infants who are breast fed have wider preferences than bottle fed infants," suggests Birch. Referring to her research with Sullivan in 1994¹, she adds, "Breast fed babies showed more ready acceptance of pureed vegetables than bottle fed babies. This is consistent with animal studies showing that early exposure to variety leads to more acceptance of variety later on."

Greater success is likely when parents start varying their child's diet during the weaning period. "Before the terrible twos, children are quite willing to try new foods. They may grimace but they are willing to try. So, this is a great time to get kids to try new things." Dr. Birch encourages exposing infants to a variety of foods during the second half of the first year of life but recommends that, at the same time, parents should watch for food allergies.

Dr. Birch concedes that succeeding with a child eating vegetables is more difficult than succeeding with fruits because fruits are sweet and infants innately prefer sweet flavors. Offering a variety of vegetables will help, as will persistence of the parent. It may take repeated exposures to a new food before the infant will consume it more readily. As many as 5 to 10 occasions may be necessary to have success.

During the toddler period other issues start to surface. Dr. Birch explains, "Many of the struggles of that period don't have much to do with food but have more to do with power struggles. Power struggles with food can backfire." Birch adds, "Kids learn early on that one of the areas of control in life is gastrointestinal control—at both ends. At this age, it's toilet

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training and what they eat. They use this effectively to control situations.” Dr. Birch cautions, “Don’t wait until two years old to introduce vegetables! Use the window before age two to help children enjoy vegetables.”

“Parents need to understand that neophobia, or the reluctance to try new foods, is normal and adaptive,” emphasizes Dr. Birch. She says the initial rejection of a new food does not mean that the child will reject that food for a lifetime. With repeated opportunities to try the new food, the child may begin to accept—and eventually enjoy—that food.

From Dr. Birch’s perspective, those giving dietary guidance to parents should understand that omnivores, including humans, need to eat a variety of foods. Historically, putting new foods in the gastrointestinal tract was risky business. As adaptive as humans are, they are still reluctant to try new things. “We see this in infants and young children and in other omnivore species,” says Dr. Birch. “We find that where the child is in his or her development affects the experience. We worked with infants just starting to take pureed solids and found that with just a couple of exposures the children accepted new fruits and vegetables. But getting three and four year olds to accept new vegetables takes much more tasting. Putting a new food on the plate and allowing the child to see it or smell it is not enough to achieve changes in acceptance. Even with eight to ten tries, the child may still not accept everything.” Dr. Birch believes that this makes sense. Becoming more neophobic at age three or four is adaptive since, in earlier times, that is when children began to learn more about hunting and gathering food.²

Having children try new foods is especially important at the beginning of the second half of the first year. Dr. Birch advises, “They understand that they should try new food on the plate but they shouldn’t be coerced to eat it. If they don’t like the food, they should have the option to spit it out.” She believes that repeated exposures can overcome the dislike as long as the child is not forced to eat the new food.

Interestingly, research has shown that newborn infants will model adult facial expressions, for example, opening the mouth.³ Dr. Birch says this is seen early in infancy but she counters that researchers are not sure how modeling behavior influences infant acceptance of foods. Typically, babies faced with a new situation will look at their mother’s expression while deciding how to react. Dr. Birch says they expected to see this pattern with feeding but they did not. “I suspect that we might see modeling if we tried feeding a baby the foods that they see their adult caregivers eating. No one has done that work.”

Dr. Birch reports that peers are effective models with preschoolers. “If you want to get kids to eat vegetables, then let the kids observe other children who do eat vegetables. Let them see those kids selecting and eating.” In one study, Dr. Birch and her colleagues seated children who did not like peas with those who did like peas. “At the end of a week, the kids who would not eat peas were eating like the ones they sat with.⁴ While adults can be powerful

models, in order to transfer the behavior, it is important to have other models that are very like oneself,” says Birch. “Parents may not be the best models.”

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“As we examine what’s going on,” explains Dr. Birch, “we see that, in general, kids’ early experience is very important in shaping food preferences. We live in a food context described as *obesigenic*, i.e., many high energy, low cost foods are readily available; eating is now compatible with every aspect of life; and, at the same time, it is easy to be sedentary. Kids are likely to learn patterns of preference that will put them at risk of becoming overweight.”

“As a psychologist, I tend to think about individual level solutions,” says Birch. “You see each child and try to find ways to help promote healthy eating habits. However, we need to look at the environment too.” Dr. Birch believes attention should be given to factors beyond the responsibility of pediatricians, dietitians, and psychologists.

How children learn to regulate food consumption is a key research area for Dr. Birch. She is concerned about high levels of parental control with eating. “This goes back to what Ellyn Satter says; that is, kids need to be given the responsibility of what and how much they eat. It’s the parent’s responsibility to provide healthy foods from among which the child can select.”⁵ Dr. Birch says it is very hard for parents to keep this advice in mind. “This is one of the things we have studied over time. Most of our work shows that a lot of the effects are not what parents intend.⁶ Pressuring children leads them to avoid and dislike the very foods the parent pressures them to eat.”

She continues, “Restricting foods that kids like leads them to be more interested in those foods. It generally leads kids to disregulated eating.” In this situation, a child has had food restricted and the child no longer recognizes when he or she is hungry or satisfied. “Food restricted kids will eat in a situation where they’ve just told us they’re not hungry,” says Birch. “Rather than focusing on their own hunger and satiety, they figure ‘I should get this food while I can’. We’re trying to understand how these feeding practices have an impact on the development of food preferences and acceptance patterns.”

When asked how health professionals can convince parents to not restrict their children’s intake, Dr. Birch replies, “Most women who diet understand that restricting food intake often leads to binges. Whether imposed from within, or from the parent on the child, restriction is not an effective approach to the problem.”

Dr. Birch quotes Dr. Helen Guthrie who, years ago, said, “There’s no such thing as junk foods, only junk diets.” Dr. Birch says this is still relevant. “You really should not evaluate whether one food is bad but look at the context of the entire diet. This gives a different view on the need for restriction.”

Dr. Birch is fascinated by the issue of portion size. In her view, this is another area where parents and care providers have inappropriate ideas of what children should be eating. “If, for example, the parent thinks the two year old should consume one-half cup of



peas, that will probably lead to problem. A couple of tablespoons for a two year old is a more appropriate serving size. If a parent serves a larger portion and the child won't eat it, this is likely to make the parent more anxious. The parent may slip into coerciveness."

"Changes in portion size over time are shocking," declares Dr. Birch. She says serving sizes are increasing and she feels parents and children need help in understanding how much is appropriate. "A fast food, super size portion of French fries is very different than the U.S. Department of Agriculture reference portion size. It's important to understand this in context and then realize that children need even smaller portions."

Now with her colleague Jennifer Fisher, Leann Birch is evaluating how children learn about portion size and how exposure to large portion sizes alters the self-selected intake of children. Their recent research indicates that children exposed to larger portions eat more than children allowed to self select or children who are given more standard portion sizes. Dr. Birch says that over time this may be a contributing factor in elevating weight.

Dr. Birch's work has been carried out with white, middle class children. She realizes this is a major limitation. Dr. Birch reports that other studies are in progress with other races and other socioeconomic groups but, so far, there are no results. She adds this caveat: "What parents are doing will have an impact on the outcome with the child. However, what parents are doing may be different in other groups."

Summary recommendations:

- ✓ Include lots of variety, particularly with vegetables
- ✓ Give small serving sizes, e.g., one tablespoon of a food for each year of age
- ✓ Encourage early exposure to many different tastes and textures, especially between the ages of 6 and 18 months

References

1. Sullivan, S.A. and Birch, L.L. Infant dietary experience and acceptance of solid foods. *Pediatrics* 1994; 93:271-277.
2. Birch, L.L., McPhee, L., Shoba, B.C., Pirok, E., and Steinberg, L. What kind of exposure reduces children's food neophobia? *Appetite* 1987; 9: 171-178.
3. Meltzoff, A.N. and Moore, J.K. Imitation of facial and manual gestures by human neonates. *Science* 1977; 198: 75-78.
4. Birch, L.L. Effects of peer models' food choices and eating behaviors on preschoolers' food preferences. *Child Development* 1980; 51:489-496.
5. Satter, E. *Child of Mine: Feeding with Love and Good Sense*. Palo Alto, CA: Bull Publishing Company; 2000.
6. Birch L.L., Fisher J.O. Development of eating behaviors among children and adolescents. *Pediatrics* 1998; 101:539-549.

Recommended reading:

Birch L.L., Fisher J.O. Development of eating behaviors among children and adolescents. *Pediatrics* 1998; 101:539-549. Dr. Birch also recommends the other articles in this supplement to *Pediatrics*.

Satter, E. *How to Get Your Kid to Eat...But Not Too Much*. Palo Alto, CA: Bull Publishing Company; 1987.

Satter, E. *Child of Mine: Feeding with Love and Good Sense*. Palo Alto, CA: Bull Publishing Company; 2000.

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Dietary Reference Intakes: B Complex Vitamins and Choline

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Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B₆, Folate, Vitamin B₁₂, Pantothenic Acid, Biotin and Choline released by the Institute of Medicine, is the second report in a series on comprehensive values for nutrient intakes for health for U.S. and Canadian populations¹. Among the innovations in this report is the use of dietary folate equivalents (DFEs). DFEs adjust for the greater degree of absorption of folic acid compared to folate naturally found in foods. The conversion factors are: 1.0 µg of food folate equals 0.6 µg added to foods or taken with foods or 0.5 µg of folate supplements taken on an empty stomach. In addition, for the first time, the committee made a dietary recommendation for choline, as well as suggested maximum intakes of niacin, vitamin B₆, folate and choline.

Infants 0 to 12 months

As shown in Table 1, Adequate Intakes were set for infants 0-12 months for thiamin, riboflavin, niacin, vitamin B₆, folate, vitamin B₁₂, pantothenic acid, biotin, and choline. Adequate Intakes for infants aged 0-6 months were calculated from the average concentration of the nutrient from two to six months of lactation using consensus values and an average volume of milk intake of 780 mL/day¹. Note that the AI for niacin does not take into account the tryptophan content of human milk. The authors reasoned that the standard method for estimating niacin equivalents (NEs) would overestimate the contribution from tryptophan due to the high rate of protein turnover and net positive nitrogen retention in this age group. For infants aged 7-12 months, the Adequate Intakes for riboflavin, vitamin B₆, folate, pantothenic acid and choline were extrapolated from values for younger infants as well as from estimates of adult requirements. Thiamin and niacin Adequate Intakes were extrapolated from estimates of adult requirements only. Vitamin B₁₂ and biotin Adequate Intakes were extrapolated from the values of younger infants only. The authors made a special note that infants (0-12 months) of vegan mothers be supplemented with vitamin B₁₂ at the AI level from birth.

Tolerable Upper Intake Levels (ULs) were not set for infants 0-12 months for any of the nutrients in this report. There have been no reports of adverse effects of thiamin, riboflavin, and vitamin B₁₂ from foods or supplements, no adverse reports on oral pantothenic acid, and no reported adverse effects of biotin. Data were therefore inadequate for quantitative risk assessment for these nutrients. Although ULs were not set for niacin, folate, vitamin B₆, and choline, the authors cautioned that the only sources for these nutrients should be from formula and food, not supplements. This course of action reflected the lack of data on adverse effects in this age group as well as concern about the infant's ability to handle excess amounts.



Children 1 to 3 years

EARs and RDAs for thiamin, riboflavin, niacin, vitamin B₆, folate, and vitamin B₁₂ for children aged 1 to 3 years were extrapolated from adult values. Because no data were found on which to base an EAR and therefore an RDA, AIs were set for pantothenic acid, biotin and choline. The AI for biotin was extrapolated from values from infants, and the AIs for pantothenic acid and choline were extrapolated from adult values.

ULs were not set for thiamin, riboflavin, vitamin B₁₂, pantothenic acid, or biotin. Even though there is no evidence of adverse effects from naturally occurring niacin in foods, negative effects have been observed from niacin intake as a supplement, food fortificant or pharmacologic agent. The UL for niacin was adjusted from the adult value that was derived from the amount of nicotinic acid that causes flushing, an effect usually observed at lower doses than other effects. Although nicotinamide is not associated with flushing, basing the UL on the effect of nicotinic acid was considered prudent. For vitamin B₆, sensory neuropathy was the critical endpoint on which the adult UL was based. ULs for children 1 to 3 years were calculated from adult values based on pyridoxine intake. The UL for folate for children aged 1 to 3 years was also adjusted from the adult value based on limited but suggestive evidence that excessive folate intake (as a supplement) may precipitate or exacerbate neuropathy in vitamin B₁₂-deficient persons. Hypotension was selected as the critical effect for deriving the UL for adults for choline, with fishy body odor as a secondary consideration. Values for children aged 1 to 3 years were derived from adult values.

Reference

1. Standing Committee on Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine. *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B₆, Folate, Vitamin B₁₂, Pantothenic Acid, Biotin, and Choline*. Washington, DC: National Academy Press, 1998

The Heinz Infant Nutrition Institute (HINI) bids a fond farewell to Helen A. Guthrie, PhD, RD, who has been a long-standing member of the HINI Advisory Council. She was also the vice president of the Heinz Institute of Nutritional Sciences (HINS). Dr. Guthrie is Professor Emerita, Department of Nutrition, Penn State University. Her knowledge of infant nutrition and insight on infant feeding behaviors were invaluable contributions to the HINI newsletter In-Touch and to the HINS symposia in Russia and China. We appreciated her guidance during her years of service and her contributions to infant nutrition. We wish her well in her retirement!

Table 1. Summary of Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B₆, Folate, Vitamin B₁₂, Pantothenic Acid, Biotin, and Choline¹

NUTRIENT	0-6 MONTHS	7-12 MONTHS	1-3 YEARS
Thiamin			
AI	0.2 mg/day	0.3 mg/day	—
EAR	—	—	0.4 mg/day
RDA	—	—	0.5 mg/day
UL	Not Set	Not Set	Not Set
Riboflavin			
AI	0.3 mg/day	0.4 mg/day	—
EAR	—	—	0.4 mg/day
RDA	—	—	0.5 mg/day
UL	Not Set	Not Set	Not Set
Niacin			
AI	2 mg/day ^a	4 mg/day NE ^b	—
EAR	—	—	5 mg/day NE
RDA	—	—	6 mg/day NE
UL	Not Set ^c	Not Set ^c	10 mg/day niacin
Vitamin B₆			
AI	0.1 mg/day	0.3 mg/day	—
EAR	—	—	0.4 mg/day
RDA	—	—	0.5 mg/day
UL	Not Set ^c	Not Set ^c	30 mg/day of B ₆ as pyridoxine
Folate			
AI	65 µg/day DFE	80 µg/day DFE	—
EAR	—	—	120 µg/day DFE
RDA	—	—	150 µg/day DFE
UL	Not Set ^c	Not Set ^c	300 µg/day from fortified foods or supplements
Vitamin B₁₂			
AI	0.4 µg/day	0.5 µg/day	—
EAR	—	—	0.7 µg/day
RDA	—	—	0.9 µg/day
UL	Not Set	Not Set	Not Set
Pantothenic Acid			
AI	1.7 mg/day	1.8 mg/day	2.0 mg/day
UL	Not Set	Not Set	Not Set
Biotin			
AI	5 µg/day	6 µg/day	8 µg/day
UL	Not Set	Not Set	Not Set
Choline			
AI	125 mg/day	150 mg/day	200 mg/day
UL	Not Set ^c	Not Set ^c	1 g/day

^a Preformed niacin

^b NE = niacin equivalents. Allows for some conversion of tryptophan to niacin: 60 mg tryptophan = 1 mg niacin = 1 mg NE

^c Sources of intake should be from formula and food only

^d DFE = dietary folate equivalents. 1 µg food folate = 0.6 µg added to or taken with food = 0.5 µg folate supplements taken on an empty stomach

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