What Should I Feed My Child with ADHD?

by Marianne Glanzman, MD

RECENTLY, THERE HAS BEEN RENEWED INTEREST in the question of whether dietary interventions can be useful for children with ADHD. This article is not intended to be a review of the relative merits of different approaches, but rather a roadmap for how to implement approaches for which there is some positive evidence, safely and effectively. ADHD is not caused by your child's diet, but increasing evidence suggests that some symptoms, particularly mood and self-control, may be affected by what she or he eats.

Eating and nutrition in children

The US Department of Agriculture provides Dietary Guidelines for Americans about every five years. In 2005, the familiar Food Guide Pyramid, showing the recommended number of servings per day for each food group, was modified and replaced by the first of two icons. MyPyramid showed portion sizes in cups and ounces instead of number of servings, with tables of specific recommendations for different age groups. MyPyramid was replaced by MyPlate in June 2011.

MyPlate is a simple guide showing that for each meal, one-half of the plate should consist of fruits and vegetables, one-quarter of protein, and one-quarter of carbohydrates, along with a serving of dairy or calcium-rich substitute. Highlights include:

- Emphasis is placed on vegetables, fruit, whole grains, and low-fat dairy products.
- At least half of grain intake should come from whole, not processed, grains.
- Daily protein should come from a variety of lean meats and poultry, fish, cooked dry beans, eggs and nuts.
- Some oil is important for health, and should ideally come from fish, nuts, and liquid oils.
- Saturated and trans fats, cholesterol, salt and added sugars should be minimized.

The Food and Nutrition Board establishes the recommended daily allowance (RDA) for each nutrient for each age group. The RDA is the amount of a given nutrient that meets the needs of over ninety-seven percent of the population. Some nutrients do not have an RDA because insufficient information is available. RDAs are shown on labels of supplements and supplemented foods. Will eating according to these guidelines help ADHD? Possibly.

A recent study in teens suggests that a "Western" diet—high in total fat, saturated fat, refined sugars, and sodium—is associated with double the likelihood of a person's having ADHD compared with eating a "healthy" diet, higher in omega-3 fatty acids, fiber, and folate and low in total fat, saturated fat, and refined sugars. This study certainly doesn't prove that the Western diet "causes" ADHD, but in the meantime, aiming to follow the guidelines is an important goal for health in general. Let's look at some specifics.

Protein and carbohydrates

Protein, made from chains of amino acids, comes from meats, fish, eggs, dairy, beans, nuts and seeds. Proteins are structural components of cells and catalysts (enzymes) for the chemical reactions. Amino acids are also precursors for the synthesis of neurotransmitters, the chemicals brain cells use to communicate. Starches and sugars are carbohydrates, our main energy source. Glucose, the simplest sugar, is essentially the only energy source for the brain.

Children who eat a substantial breakfast spend more time on task later in the morning than those who eat minimal or no breakfast. The inclusion of protein with carbohydrate is best for sustained cognitive performance over several hours. Studies looking at the effects of sugar in a meal or in the diet in the short term show little effect on cognitive performance or behavior in children with or without ADHD. A sugar drink can actually improve attention, memory, reaction time and mood, but these tend to be short-term effects when glucose levels are rising.

The best overall cognitive effects throughout the morning are achieved with a protein-rich or balanced protein-carbohydrate breakfast. A high-carbohydrate breakfast, especially one consisting of high-glycemic carbohydrates

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Conflict of Interest:The author has no financial interests related to this material. The author maintains a membership in The Feingold Association.

(sweets and refined, rather than whole grains which break down into glucose quickly) is more likely to be followed by a rapid rise and then a rapid fall in glucose level. A rapid fall in glucose level can be associated with adverse symptoms. Over the long term, repeated high-carbohydrate meals can lead to poor glucose utilization (the ability to get glucose into the cells where it is needed), which is associated with poorer performance on a variety of cognitive tasks.

So, how much protein is enough? There isn't a clear answer. In general, the RDA for protein in children is about forty grams per day, which can be divided into about ten grams per meal and five grams in each of two snacks. There is roughly seven grams of protein in a cup of yogurt, a hot dog, or an egg.

To see if more protein would be helpful, try the following experiment. When your child has an even number of days off from school in a row, alternate a high-protein, low-carbohydrate breakfast one morning (such as eggs, meat, cheese, milk; no juice or fruit) with a high-carbohydrate, low-protein meal the next (pancakes or waffles, syrup, juice; no milk or meat). Give your child some tasks to do that require attention, effort, and self-control later in the morning so you are more likely to be able to tell if there is a difference.

If you see an improvement with the high-protein breakfast, it does not mean that your child must only eat protein for breakfast; some carbohydrate is best for immediate energy. A high-protein meal, if helpful, is meant for breakfast only; go back to MyPlate recommendations for other meals and snacks.

Vitamins and minerals

Vitamins and minerals facilitate chemical reactions throughout the brain and body. Several individual nutrients have been associated with ADHD. These include iron, zinc, magnesium, and polyunsaturated fatty acids. Reports of supplementation with these nutrients or multi-nutrient products suggest that cognitive, mood, and antisocial behavior symptoms may be improved with supplementation, but this seems to be true primarily for individuals who are deficient to start with.

It can be difficult to assess nutritional adequacy because we don't absorb all of the nutrients we ingest, and, while functional levels of some nutrients can be reliably measured (such as ferritin level to check for iron stores), for others, it is not

certain that blood or blood cell levels accurately reflect tissue levels. If your child eats a varied, balanced diet, a broad spectrum multivitamin-multimineral supplement containing less than fifty percent of the RDA may make sense because it is very difficult for children to eat enough food to consistently supply one hundred percent of the RDA. For a child with a poor diet, more may be needed, but it would be wise to consult a nutritionist in this situation.

A "typical" multivitamin-multimineral supplement will include vitamins A, B1 (thiamine), B2 (niacin), B3 (riboflavin), B5 (pantothenic acid), B6 (pyridoxine), B12 (cyanocobalamin), C, D, E and zinc, calcium, magnesium, copper, and manganese. Some will include additional nutrients such as biotin, vitamin K, iodine, selenium, trace minerals, choline, inositol, and antioxidants. Fortified breads and breakfast cereals are importance sources of vitamins and minerals for many children. Calcium and magnesium are utilized in a 2:1 ratio in the teeth, bones, and nerves. Children who consume the recommended servings of dairy products may be getting sufficient calcium, but relatively less magnesium, and multivitamin-multimineral supplements don't usually contain much magnesium. You may need to add some, but not more than twenty-five percent of the RDA.

Minerals and fat-soluble vitamins (A, E, D, K) can accumulate in the body if taken in excess over the long term, with potential negative consequences. Megadoses (several times the RDA) of single or combined nutrients should not be used. They can adversely affect the nervous system or liver, as well as compete with other nutrients for absorption. Since supplements aren't regulated, it is best to purchase from a company that reports independent testing for quality control. Before using supplements, check with your doctor to insure that they don't contain anything that may interact with medications, and bring all of your supplements when you visit the doctor.

Omega-3s and omega-6s: polyunsaturated fatty acids (PUFAs)

Fatty acids are structural components of brain cell membranes and precursors for cell-to-cell communication molecules in the brain, immune, and endocrine systems. They have a carbon "backbone" that is from eleven to twenty-seven carbon molecules long. "Polyunsaturated" means they contain several double bonds.

The carbon location of the first double bond determines the name omega-3, 5, 6, 7, or 9. Shorter carbon chains are elongated by enzymes that require zinc as a cofactor. Because the same enzymes are used to elongate fatty acids in each number group, an excess in one can limit elongation of others. The 18-carbon omega-6, linoleic acid and the 18-carbon omega-3, linolenic acid are considered "essential" fatty acids because they can't be made by the body; they must be ingested. From these, the longer carbon chain fatty acids are synthesized.

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Omega-3s are found in algae, seeds (flax, hemp, sunflower, and chia), walnuts, leafy greens, and fatty fish such as salmon. Omega-6s (particularly arachidonic acid) are found in meat, dairy, eggs, and several vegetable oils. A dietary ratio of 4:1 (omega-6 to omega-3) is ideal, but the standard "Western" diet is closer to 20:1, so it is presumed that many individuals are relatively omega-3 deficient.

The omega-3's DHA (docosahexaenoic acid) and EPA (eicosapentaenoic acid), and the omega-6 GLA (gamma-linoleic acid) are most important for brain function. Children with ADHD have lower levels of these compared with children without ADHD. Studies using single supplements (either an omega-6 or DHA alone) have not shown positive treatment effects on ADHD symptoms, but studies using a combination of DHA, EPA, and GLA with a predominance of EPA have shown somewhat more promising results. Fish oil is the primary source of EPA and DHA together, and evening primrose or borage oil are sources of GLA.

Although RDAs for omega-3s do not yet exist, the Food and Nutrition Board determined Recommended Adequate Intakes for total omega-3 fatty acids in 2002. These range from 700–1600 mgs per day in children and teens. This should be given with about 50 mg of GLA. It takes about three to four months in order to replete deficient levels in cell membranes, so effects are not seen quickly, are likely to be subtle, and may be more prominent for mood or anxiety than core ADHD symptoms.

Though generally felt to be safe, PUFAs, like any supplement, should be treated like a medication, with monitoring of positive and negative effects, and without other simultaneous changes. I am aware of one child who became aggressive after starting an omega-3 supplement, and was later found to have relatively high omega-3 levels and relatively low omega-6 levels. There are also anecdotal reports of behavioral deterioration in children taking 4000-5000 mg per day over several years. Red blood cell fatty acid levels are becoming easier to obtain and may help to guide treatment. If using fish oil, it is important to use a brand that reports independent testing to document the absence of mercury and other toxins.

Elimination diets

There are two broad elimination strategies: the Feingold Program (elimination of artificial colors, flavors, certain preservatives, and salicylates) and elimination of specific foods.

To test the Feingold Program, all artificial colors, all artificial flavors, the preservatives BHT (butylated hydroxytoluene), BHA (butylated hydroxyanisole), and TBHQ (tertiary butylhydroxyquinone), aspirin and other non-steroidal anti-inflammatory medications, synthetic sweeteners, and naturally occurring salicylates are entirely eliminated from the diet for six weeks. Naturally occurring salicylates include oranges, tangerines, clementines, apples, grapes, raisins, berries, cherries, peaches, nectarines, apricots, plums, prunes, currants, tomatoes, cucumbers, chili and bell peppers, pickles, almonds, oil of wintergreen, birch, cloves, rose hips, chili powder, paprika, cider and cider vinegar, coffee, and tea. Allowed fruits include all melons, pineapple, banana, grapefruit, lemons, limes, all tropical fruits, such as mangoes, papaya, guava, and passionfruit. All other vegetables, nuts, spices, seeds, oils, and all meats, dairy products and grains without eliminated additives are allowed.

If an improvement is seen, the naturally occurring salicylate foods are added back one at a time to see which, if any, provoke re-occurrence of symptoms. If an improvement is not seen, guidance through the Feingold Association can be provided about other food additives, inhaled additives, or foods that may be contributing. An adequate trial requires use of the materials from the Feingold Association that delineate acceptable and non-acceptable prepared products, since some of the eliminated items do not need to be listed on labels, and even a small amount can provoke a reaction.

Parents of children who respond typically report improvements in adaptability/flexibility, mood, and quality of sleep, and bedwetting or

other physical symptoms in addition to core ADHD symptoms. Although the additives and salicylates eliminated on the Feingold Program are widely believed to affect only a small percentage of children, studies are commonly flawed in several ways that would minimize positive results. For example, one flaw is that the majority of studies evaluate the effects of dyes alone. (A British version eliminates dyes and sodium benzoate). The Feingold Program is most likely to be useful in preschoolers with sleep, irritability/mood issues, and allergic or other symptoms because they are both most likely to respond and most difficult to medicate without adverse effects.

The oligoantigenic (or "few foods") diet has been used to identify children whose neurobehavioral symptoms might be triggered by specific foods. For up to two weeks, only a limited number of low-allergen foods are allowed (for example: two meats, two starches, two fruits, certain green vegetables, oil, and vitamin/calcium supplements). If improvements are seen, foods are reintroduced singly to identify those which triggered behavior deterioration.

In one study, offending foods were eliminated again, and the subject was challenged in a blinded fashion with either a placebo or the disguised suspect food. Behavior deteriorations occurred more often with the food than placebo challenge. All children who reacted to foods reacted to more than one, and all who reacted to foods also reacted to tartrazine (yellow #5) and sodium benzoate (a preservative). The most common offending foods identified in twenty percent or more of subjects were (in decreasing order) tartrazine/benzoate, soy, cow milk, chocolate, grapes, wheat, oranges, cheese, eggs, peanuts, corn, fish, oats, melons, tomatoes, and ham/bacon. Interestingly, these are predominantly the foods that cause most classic food allergies (dairy, wheat, soy, eggs, nuts, fish) or Feingold's high-salicylate foods (grapes, oranges, tomatoes).

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Unfortunately, there is no test to identify foods that might cause behavior symptoms short of an oligoantigenic diet trial, although it may not need to be as extreme as the form used in research. The top offenders listed above may be sufficient. Neither the type of immediate-reaction IgE allergy tests typically done in the allergist's office nor IgG-mediated ELISA blood tests can reliably identify provoking foods.

When your child won't eat a healthy diet

If your child has a very limited diet, if you are considering supplementing with more than fifty percent of the RDA of several nutrients, if you are using an oligoantigenic diet, or if you have any other concerns about your child's nutritional intake, it is best to seek the advice of a nutrition professional, either a nutritionist or nutritionally knowledgeable physician. A careful diet history can be analyzed to determine deficiencies or excesses.

If your child also has gastrointestinal symptoms, such as gagging, difficulty swallowing, persistent reflux or vomiting, loose stools or constipation, abdominal pain, or blood in the stool, or if he or she is not gaining weight or growing as expected, a pediatric gastroenterologist should be consulted for a thorough evaluation. An evaluation may reveal a structural, mechanical, infectious, inflammatory, metabolic, or allergic cause for poor movement of food through the GI tract or poor digestion. Children sometimes show limited food choices as their most obvious symptom of one of these conditions.

A speech or occupational therapist with feeding expertise can determine whether the skills for chewing and the oral sensory motor system are intact. If not, treatment may help; however, this does not preclude an underlying medical condition.

When the presence of a medical condition has been eliminated, a structured, repeated exposure plan using positive reinforcement can help to introduce new foods into the diet. This kind of feeding behavior management is best done during the summer without the added stress of school, and with the assistance of a psychologist or other clinician with expertise in this area.

Sometimes, nutritional or diet changes can be part of a comprehensive treatment plan to help your child with ADHD experience success. As with other interventions, a clinician who will help you evaluate the positive and negative effects is an invaluable ally.

Resources and Further Reading

DIETARY GUIDELINES

MyPlate.gov and ChooseMyPlate.gov., dietaryguidelines.gov

Dietary Reference Intakes (RDAs)
http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=3&tax_subject=256&topic_id=1342&level3_id=5140 *(accessed 4/24/2012)*

THE FEINGOLD ASSOCIATION

feingold.org

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