

THE SCIENCE BEHIND FEEDING THE BRAIN by Dr. William Sears

New studies are confirming what parents have long observed - there is a relationship between what children eat and how they think, act, and learn. Like every other system in the body, the brain needs good food. It uses 20 to 25 percent of the total energy a person consumes, and the better you feed the brain, the better it works. While most of this section is devoted to the nutritional principles that help children's brains learn and behave, these same principles affect how adults think, learn, and feel. Everyone in the family benefits from good food for the brain.

Better eating builds better brains. There is a pecking order among the organs of the body. The most vital organs get first pick of the available nutrients in the bloodstream. Since a malfunctioning brain can take the rest of the body down with it, the brain gets VIP status when the body distributes nutrients. Here's how.

The brain is composed of trillions of nerve cells, called *neurons*. Thought, memory, actions, and many brain functions you're not even aware of depend on speed-of-light interactions of one cell with another. From each nerve cell tiny feelers called axons and dendrites reach out to connect with similar branches on other cells. The system looks kind of like a map of the interstate highway system, with many roadways connecting different cities. To facilitate the transmission of signals across the gap from one cell to the other, chemicals called neurotransmitters act like biological bridges.

Nutrition affects the brain in three ways:

1. *The cell* itself needs proper nutrition to carry on its functions just like any other cell in the body.
2. *The myelin sheath* covers the axon of the cell like insulation covering electrical wires. It speeds transmission of electrical signals along the axons, the "wires" of the brain. Deficiencies of nutrients that compose myelin, such as essential fatty acids, delay nerve-impulse transmission.
3. *The neurotransmitters*, such as serotonin, dopamine, and norepinephrine, carry messages from one cell to the other and affect mood as well as thoughts and actions. Some of the nutrients in the food we eat become part of the neurotransmitters that help us think. Neurotransmitters are probably the biological explanation for the food-mood connection.

Each one of these three parts needs specific nutrients to enable the whole circuit to function properly. If any of these areas are deficient in nutrients, the circuit, like a defective electrical wire, misfires.

NUTRITIP: BRAINY BREAKFASTS

A nutriperk in yogurt could theoretically improve school performance by perking up the brain. Yogurt is relatively high in the amino acid tyrosine (a neurostimulant) and low in the amino acid tryptophan (a neurosedative). Add yogurt to other brain foods, such as flax oil (for brain-building fatty acids) and soy foods (for protein and blood-sugar stabilization), and you have three synergistic foods that form the basic ingredients for our "School-Ade" recipe. I have personally felt the effects of this nutriperk by drinking a smoothie with these three basic ingredients each morning before I go to work.

Because fiber steadies the absorption of carbohydrates and therefore contributes to a steadier blood sugar, we suggest using rich sources of fiber, such as flaxseed meal (i.e., ground flax seeds, containing both the

oil and fiber), although flax oil has a more palatable consistency than flaxseed meal. For additional fiber if you don't mind an even grainier texture, add 1 tbsp. or more of oat bran.

BEST BRAIN FOODS: 11 WAYS FOODS CAN HELP YOU THINK

How you think, act, and learn is affected not only by the types of food you eat, but also by how the food is prepared, how and when you eat it, and what foods you eat together.

1. **Care about your carbs.** The brain is a sugar hog, a carbo-craver, utilizing 20 percent of the body's carbohydrate supply. Yet it's a smart hog, being selective about the type of sugars it craves and how it processes them. It prefers a nice steady supply. When the brain receives a steady supply of sugar for fuel, it chugs along smoothly at a steady pace. But when levels of sugar in the blood fluctuate, the brain doesn't get its steady fuel supply and behavior and learning become more erratic. Blood sugar levels depend on what kinds of food are coming into the body. Some carbohydrates calm behavior, others excite it.
2. **Beware of sugar blues.** Most scientists discount the relationship between sugar and behavior, especially when Attention Deficit Hyperactive Disorder (ADHD) is blamed on sugar in the child's diet . In a 1995 paper published in the *Journal of the American Medical Association*, researchers analyzed the results of sixteen different studies in which children were given foods containing lots of sugar and their behavior compared with a control group. The analysis concluded that **sugar had no impact** on behavior. Try explaining this to a mother whose child goes wild after eating a Twinkie. Researchers tend to discount parents' observations, believing that they have been conditioned by media reports and other parents to expect their children's behavior to deteriorate after sugary snacks.

So we're back to the "science" of common sense - and basically physiology. Different sugars affect the brain in different ways, so it is only logical to conclude that certain sugars can adversely affect the thinking and actions of some children. The sugars at fault include glucose, dextrose, and sucrose, and the highly refined, highly processed "junk sugars" found in candy, icings, syrups, packaged baked goods, and table sugar. These sugars enter the bloodstream quickly, reaching high levels in a short time. This triggers the release of large amounts of insulin, the hormone needed to escort the sugars into the body's cells. These sugars are used rapidly, and when they're all used up, the blood sugar level plunges to a sugar low, or hypoglycemia . The low blood sugar triggers the release of adrenal hormones (called a "sugar high") that squeezes stored sugar from the liver, sending blood sugar levels back up. This blood sugar roller-coaster affects moods and concentration in some children and adults, leading to "sugar highs"and "sugar blues." The ups and downs of blood sugar and adrenal hormones can also stimulate neurotransmitter imbalance, causing the child to feel fidgety, irritable, inattentive, and even sleepy.

The best sugars for the brain are complex carbohydrates, or what grandmother termed "starches" . Starches and fruit sugars (fructose) do not cause the roller-coaster mood swings that the junk sugars do. The molecules in complex carbs are long, so it takes longer for the intestines to break them down into the simple sugars the body can use. Thus, they provide a time-release source of steady energy rather than a sudden surge followed by a sudden drop.

3. **Eat brain-friendly carbs.** The rate at which sugar from a particular food enters brain cells and other cells of the body is called the "glycemic index" (GI) of a particular food. Foods with a high glycemic index stimulate the pancreas to secrete a lot of insulin , which causes the sugar to quickly empty from the blood into the cells; this produces the ups and downs of blood sugar and the roller

coaster behavior that goes with them. Foods with a low glycemic index do not push the pancreas to secrete so much insulin, so the blood sugar tends to be steadier. Feeding your child carbohydrate foods with a low glycemic index is one way of helping him control his behavior and performance in school or at play. Foods with the best brain sugars include the following:

- **Fruits:** grapefruit, apples, cherries, oranges, and grapes have a low glycemic index. Fruits have a lower G.I. than fruit juices, because the fiber in the fruit slows the absorption of the fruit sugar. A whole apple will be more brain-friendly than apple juice; a whole orange better than orange juice. Freshly-made juice containing a lot of pulp is more brain-friendly than filtered juice.
- **Cereals and grains:** oatmeal and bran have the lowest G.I. Other foods with a favorable G.I. are spaghetti and rice. Corn flakes and sugar-coated cereals have higher G.I.s.
- **Vegetables and legumes:** Legumes, such as soybeans, kidney beans, chick peas, and lentils have the lowest glycemic index of any food. Potatoes and carrots have a much higher G.I.
- **Dairy products:** Milk and yogurt have low glycemic indexes, slightly higher than legumes, but lower than fruits. Plain yogurt has a lower glycemic index than yogurt with fruit preserves or added sugar.

The company a food keeps and how it is prepared also affects the G.I., or how fast and steady the sugar enters the brain.

- A food with a high glycemic index, such as juice, candy, or a sweet treat is better consumed with or right after a meal because the company of other foods slows the entry of sugar into the bloodstream, and therefore the brain. Indulging in highly-sugared snacks between meals is likely to hinder learning and behavior.
 - Fat can slow the absorption of sugars, which is why the sugar in ice cream would have a lower glycemic index than sugar in non-fat yogurt.
 - Because salads contain mostly foods with a low glycemic index, they are an excellent school lunch, contributing to maximum mental performance. Especially good are salads containing cruciferous vegetables and beans, chickpeas, and other legumes.
 - Eating foods with a low glycemic index along with highly-sugared foods lessens the effects of the fast-acting sugars on the blood sugar.
4. **Encourage grazing.** We have noticed that children's behavior often deteriorates in the late morning and late afternoon, or three to four hours after a meal - whether the child has ADHD or not. Children simply run out of fuel. When blood-sugar levels go down, stress hormones kick in to raise it up again, but this can cause behavioral problems and diminished concentration. To smooth out the blood-sugar mood swings, try the fine art of grazing. Let your child nibble, or graze, on nutritious foods throughout the day. Make them easily accessible in a lunch pack at school. (Smart teachers allow even upper-grade children to have a mid-morning snack.) Carry snacks with you when you are away from home. While at home, keep a supply of healthy snacks readily available in the pantry or refrigerator.

Here's a trick from the Sears' family kitchen for the preschool child. Prepare a **nibble tray**. Use an ice cube tray, a muffin tin, or a compartmentalized plastic dish and fill each section with bite-size portions of colorful and nutritious foods. Give the foods fun names, such as avocado boats (a quarter of an avocado sectioned lengthwise), banana or cooked carrot wheels, broccoli trees, cheese blocks, little O's (O-shaped cereal), canoe eggs (hard-boiled eggs cut lengthwise in wedges), moons (peeled apple slices, thinly spread with peanut butter), or shells and worms (different shapes of pasta).

Don't forget that children love to dip. Reserve one or two compartments in the tray for your child's favorite dips, such as yogurt or guacamole (without the spices). Encourage the child to sit and nibble from the tray frequently throughout the day, especially late in the morning and in the mid-to-late afternoon, when the fuel from the previous meal begins to wear off. Shorten the spacing between feedings and you are less likely to have spacey children.

5. **Perk up your proteins.** Proteins in the diet affect brain performance because they provide the amino acids from which neurotransmitters are made. Think of neurotransmitters as biochemical messengers that carry signals from one brain cell to another. The better you feed these messengers, the more efficiently they deliver the goods. Some neurotransmitters are neuron turn-ons that perk up the brain. Others have a calming or sedative effect.

The two important amino acids, tryptophan and tyrosine, are *precursors* of neurotransmitters, the substances from which neurotransmitters are made. Tryptophan is an essential amino acid, meaning the body does not make tryptophan; it must be gotten from the diet. Tyrosine, on the other hand, is not an essential amino acid because the body can make it if there is not enough in the diet. So, it seems that dietary deficiency is more likely to affect tryptophan than tyrosine. These two amino acids influence the four top neurotransmitters - *serotonin*, which is made from the amino acid tryptophan, and *dopamine*, *epinephrine*, and *norepinephrine*, which are made from the amino acid tyrosine. Serotonin is the neurotransmitter that relaxes the brain, the other three, collectively known as catecholamines, are neurotransmitters that rev up the brain. Popular anti-depressant drugs called SRI's (serotonin re-uptake inhibitors), Prozac, for example, work by increasing the amounts of serotonin in the brain. Since carbohydrates favor serotonin production, perhaps carbo-cravers self-medicate to increase their own serotonin.

Two factors influence whether the brain perks up or slows down following a meal: the ratio of protein to carbohydrate, and the ratio of the amino acids tryptophan and tyrosine. High protein, low carbohydrate, high tyrosine foods that are likely to jumpstart the brain are seafood, soy, meat, eggs, and dairy. High carbohydrate, low protein, high tryptophan foods that are likely to relax the brain include: chocolate, pastries and desserts, bean burritos, nuts and seeds (e.g., almonds, filberts, sunflower and sesame seeds), and legumes. (For a detailed discussion of how different amino acids in food perk up or slow down the brain, see [Food for Sleep](#)).

6. **Pick the right carb-protein partnership.** Brain performance following a meal is also affected by the carbohydrates consumed with the protein. Carbohydrates stimulate the release of insulin, which helps more tryptophan to enter the brain where it makes more serotonin. The more simple sugars in the meal, the more serotonin is produced, and the more the brain is sedated. Complex carbohydrates - slower insulin-release sugars - on the other hand, will cause less drastic serotonin production. A high calorie meal will contribute even more to serotonin production, leading to "serotonin slump." (See related section, [Lethargic After Lunch](#)). Eating too much at any meal, regardless of the carbohydrate or protein content, seems to diminish mental performance. So, to perk up the brain, eat a meal that is:
 - o High in tyrosine-containing proteins.
 - o Moderate in the amount of sugars, containing mainly complex carbohydrates.
 - o Relatively low in calories.

To relax, or even sedate the brain, eat a meal that is:

- o High in tryptophan-containing proteins.
- o High in carbohydrates.

- High in calories.

You can plan your meals according to how you use your brain during the day. A low-calorie, high-protein meal that also contains complex carbohydrates makes you more alert and would be perfect for breakfast and lunch. A higher calorie, higher carbohydrate, lower protein meal could help you relax and fall asleep in the evening.

Skip the dessert at lunchtime if you have a lot of work or learning to do in the afternoon. If you want to be alert after the evening meal, save dessert for a before-bedtime snack.

The balance between calories, carbohydrates, and protein in a meal affects different people in different ways. This is not an exact science. You need to figure out what combinations work the best for you, giving you energy and alertness when you need it. Keeping a diary of what you eat and how you feel can help you make corrections. For parents, careful observation of your school-age child is important when you're trying to figure out what foods enhance behavior and school performance, and which foods make it worse. This is a challenging game, but one that every home nutritionist can play.

7. **Feed your brain the right fats.** There are two windows of time in which the brain is especially sensitive to nutrition: the first two years of life for a growing baby and the last couple decades of life for a senior citizen. Both growing and aging brains need nutritious fats.
 - *Feeding baby brains.* The most rapid brain growth occurs during the first year of life, with the infant's brain tripling in size by the first birthday. During this stage of rapid central nervous system growth, the brain uses sixty percent of the total energy consumed by the infant, and the brain itself is sixty percent fat. Fats are major components of the brain cell membrane and the myelin sheath around each nerve. So, it makes sense that getting enough fat and the right kinds of fat can greatly affect brain development and performance. In fact, during the first year, around fifty percent of an infant's daily calories come from fat. Mother Nature knows how important fat is for babies; she provides around fifty percent of the calories in mother's milk as fat.
 - *Best fats for growing brains.* It's not only the amount of fat that's important for growing brains, it's the type of fat. Different species provide different types of fat in their milk, fine-tuned to the needs of that particular animal. For example, mother cows provide milk that is high in saturated fats and low in brain-building fats, such as DHA. This helps their calves grow rapidly, though it may not do much for their brains. In adult cows, the brain is small compared with the body. Cows don't have to do a lot of thinking to survive. In human infants, the brain grows faster than the body. Highly developed brains are important to human beings, so human milk is low in body-building saturated fats and rich in brain-building fats, such as DHA (docosahexaenoic acid), an omega 3 fatty acid. For kid friendly supplements with DHA and Omega 3 fatty acids (see [Dr. Sears' GoFish line.](#))

DHA for Students

DHA is the primary structural component of brain tissue, so it stands to reason that a deficiency of DHA in the diet could translate into a deficiency in brain function. In fact, research is increasingly recognizing the possibility that DHA has a crucial influence on neurotransmitters in the brain, helping brain cells better communicate with each other. Asian cultures have long appreciated the brain-building effects of DHA. In Japan, DHA is considered such an important "health food" that it is used as a nutritional supplement to enrich some foods, and students frequently take DHA pills

before examinations. To increase your child's intake of DHA easily and quickly try [Dr. Sears' Soft Chews](#).

Just how important is DHA for brain development? Consider these research findings:

- Infants who have low amounts of DHA in their diet have reduced brain development and diminished visual acuity.
- The increased intelligence and academic performance of breastfed compared with formula-fed infants has been attributed in part to the increased DHA content of human milk.
- Cultures whose diet is high in omega 3 fatty acids (such as the Eskimos who eat a lot of fish) have a lower incidence of degenerative diseases of the central nervous system, such as multiple sclerosis .
- Experimental animals whose diets are low in DHA have been found to have smaller brains and delayed central-nervous-system development.
- Some children with poor school performance because of ADD, have been shown to have insufficient essential fatty acids in their diet. (See [A.D.D. - A Nutritional Deficiency](#))

For kid friendly supplements with DHA and Omega 3 fatty acids (see [Dr. Sears' GoFish line](#).)

**NUTRITIP:
Fat Food for Growing Brains**

While a baby is in the womb, the brain grows more rapidly than in any other stage of infant or child development. And during the first year after birth, the brain continues to grow rapidly, tripling in size by an infant's first birthday. So, it would make sense for a pregnant and lactating mother to supplement her diet with brain-building nutrients, primarily the omega 3 fatty acids found in fish and flax oil (one tablespoon of flax oil daily, four ounces of tuna or salmon three times a week). In fact, some nutritionists recommend that pregnant and lactating women take 200 milligrams of DHA supplements a day.

Smart fats. Besides being found in human milk, DHA appears in high levels in coldwater fish: sardines, salmon, and albacore tuna. Besides fish oils, vegetable oils (primarily flaxseed, soy, and canola) are also rich sources of omega 3 fatty acids, with flaxseed oil being the best. The two F's, fish and flax, are the top brain-building foods for growing children, and adults.

Dumb fats. Avoid factory fats, which are biochemically-altered fats recognized by the words "*hydrogenated*" or "*partially hydrogenated*" in the fine print on the package label. The hydrogenation process produces trans fatty acids which may affect brain function and health in two ways. The trans fats enter the cells of the central nervous system where they may compete with the action of natural fats, so that the nerves in the brain don't function as well as they were designed to. Also, hydrogenation turns unsaturated fats into saturated fats, in which the fat molecules pack together tightly, like lard. Brain researchers worry that the same type of packing could occur in blood vessels, compromising the blood flow to the brain. Avoiding hydrogenated fats is especially important for the growing brains of children, since children who fill up on these undesirable fats are likely to eat less of the omega-3 fatty acids that are good for the brain. (For more about the effects of hydrogenated fats on health and well-being, see [Hydrogenated Fats](#))

**NUTRITIP:
Feeding Senior Brains**

Once upon a time it was believed that the brain doesn't grow as people get older. New research, however, has shown that the brain cells continue to branch out and make connections throughout a person's life. Eating the right diet can help the brain make the right connections - at all ages.

8. **Consider vitamin supplements.** Studies indicate that schoolchildren whose diets are supplemented with vitamins and minerals to insure that they received the standard recommended dietary allowances showed improved learning and scored higher on intelligence tests. Here are some of the vitamins which have been shown to affect behavior and learning:
 - o *Vitamin C* is required by the brain to make neurotransmitters. In fact, the brain has a special vitamin C "pump" that draws extra vitamin C out of the blood and concentrates it in the brain.
 - o *Vitamin B12* is vital to maintaining healthy myelin, the tissue that covers and insulates nerve tissue.
 - o *Vitamin B6* deficiency causes hyper-irritability and fatigue.
 - o *Folic acid* deficiency seems to affect neurotransmitter function, resulting in symptoms associated with depression.

9. **Insure enough iron.** The symptoms of iron deficiency include irritability and diminished mental alertness. Studies show that when the iron level of students increases, they concentrate better and learn better. Iron is necessary for healthy brain tissue and for adequate neurotransmitter function.

10. **Care about calcium.** Calcium is not only important to growing bones, but also to growing brains. Children with calcium deficiency may show impaired behavior and learning. In his book *Feeding the Brain: How Foods Affect Children* (Plenum, 1989), Dr. C. Keith Connors reports that children who were more hyperactive had significantly lower calcium intakes than less hyperactive children. Other studies have shown that school children in the habit of skipping breakfast exhibit calmer behavior when given milk in the morning. (See [Brainy Breakfasts for Growing Brains](#))

11. **Don't forget fiber.** An apple a day may keep the A.D.D. doctor away. While fiber is not directly involved in brain function, it does influence how other nutrients affect the brain. Soluble fiber, such as fruit pectin, helps lower the glycemic index of foods, thereby having a stabilizing effect on blood sugar. As we discussed above, the more stable the blood sugar, the better the brain functions. A bowl of bran for breakfast and an apple as a mid- morning snack keep brains working at top form until lunchtime.

FOODS FOR THOUGHT: FOODS THAT BUILD AND FOODS THAT DRAIN THE BRAIN

Some foods help the brain work better, some foods drag down brain performance. Be smart and feed your children foods that will make them smart (and also eat these foods yourself, too).

BRAIN BUILDERS	BRAIN DRAINERS
<ul style="list-style-type: none"> • Avocados • Bananas 	<ul style="list-style-type: none"> • Alcohol • Artificial food colorings

<ul style="list-style-type: none"> • Beef, lean • Brewer's yeast • Broccoli • Brown rice • Brussel sprouts • Cantaloupe • Cheese • Chicken • Collard greens • Eggs • Flaxseed oil • Legumes • Milk • Oatmeal • Oranges • Peanut butter • Peas • Potatoes • Romaine lettuce • Salmon • Soybeans • Spinach • Tuna • Turkey • Wheat germ • Yogurt 	<ul style="list-style-type: none"> • Artificial sweeteners • Colas • Corn syrup • Frostings • High-sugar "drinks" • Hydrogenated fats • Junk sugars • Nicotine • Overeating • White bread
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SMART LUNCH FOODS: DON'T BE LETHARGIC AFTER LUNCH

Ever wonder why school children's learning and behavior deteriorates after lunch? It's because some foods perk up the brain while others put it to sleep. Here are some lunch tips that can improve your child's attention, behavior, and learning in the afternoon:

Have the right balance of proteins and carbohydrates. Whether your child learns well after lunch or dozes through afternoon classes can be influenced by the proteins in the lunch and the carbohydrate company these proteins keep. Protein foods which contain the amino acid tryptophan tend to sedate the brain, and protein foods containing the amino acid tyrosine wake up the brain. Rich dietary sources of tryptophan are eggs, milk, bananas, dairy, sunflower seeds, and meat. Eating a lot of carbohydrates with tryptophan-containing foods increases their sedative effect. The carbohydrates trigger the release of insulin, which sends the amino acids that compete with tryptophan into muscle tissue. This allows more tryptophan to get into the brain. Serotonin production goes up and sluggishness follows. Fewer carbohydrates and calories with more protein, on the other hand, makes the eater more alert after lunch. The amino acid that perks up the brain is tyrosine, found in seafood, turkey, tofu, legumes, and tuna. So, a salad of legumes with tuna, tofu, or turkey would be the ideal lunch if you want your child to work and learn in the afternoon rather than drift off.

Even the order in which you eat the food in your lunch can affect afternoon performance. Whether the brain will rev up or slow down depends on whether tyrosine or tryptophan gets into the neurotransmitters first. Eat the protein first, and you allow the amino acid, tyrosine, to wake up the brain. Then when you eat the carbohydrates, the tryptophan ushered into the brain by insulin will have less effect. So, if you want to wake up the brain, eat a high protein lunch and eat the protein before the carbohydrates; if you want the brain to relax, eat a high carbohydrate lunch and eat the carbohydrates before the protein.

Encourage children to eat a light lunch. A healthy lunch for school-age children would contain between 600 and 800 calories, with a balance of complex carbohydrates and proteins and a minimum of fats. A high calorie, high carbohydrate meal, such as pasta with a fat-laden sauce, is likely to diminish your child's academic performance after lunch. A high fat meal diminishes mental alertness by diverting blood from the brain to the stomach to help with digestion. An example of a healthy lunch would be a tuna sandwich on whole wheat bread with lettuce, tomato, and a lowfat mayonnaise made with canola oil, a side salad, a piece of fruit, and a glass of milk. Encourage your child to skip dessert after lunch and to save his daily dessert treat for after dinner.

Lobby for healthy school lunches. In many schools, the hot lunch programs are a nutritional failure. Based on the lunches that are served, many schools deserve the behavior they get from children after lunch. Fast-food favorites are now taking over the counter space in school cafeterias, teaching children that the four food groups are: burgers, fries, pizza, and chicken nuggets. Get involved in your PTA and make the topic of healthy school lunches a high priority. Also, monitor what is sold in the vending machines and lobby for juices rather than heavily sugared, high caffeine sodas.

MOOD FOODS

Both research and experience are proving without a doubt that there is a connection between how we eat and how we think and act. The biochemical basis of this food-mood relationship lies in the neurotransmitters, those chemical messengers which relay thoughts and actions along the trillions of neural pathways in the brain. It seems logical that since food affects neurotransmitter action and changes in neurotransmitters are responsible for changes in moods, that food does affect mood. It also seems that food affects some people's moods more than others. Some children - we call them "vulnerable kids" -- are exquisitely sensitive to junk foods in their diets, while others seem to breeze through fast-food joints without any mood change. While it's easy to spot these vulnerable kids, I wonder how much "normal" behavior we attribute to "just being a kid" is really the result of poor nutrition. While the nature of the food-mood connection varies from person to person, here are the usual effects of various foods.

Carbs that calm. Complex carbohydrates and foods that have a low glycemic index (legumes, unrefined grains, and fruits) are likely to have a relaxing effect because they cause fewer blood sugar disturbances, with less release of stress hormones.

Carbs that rev. Sugars, such as those found in frostings and soft drinks, tend to cause more fluctuations in moods that run parallel with fluctuations in blood sugar. First, there's a high, then a low, and eventually the person becomes irritable as the mood fluctuations parallel the ups and downs of blood sugar. Junk sugars cause fewer mood fluctuations when eaten along with a fat or fiber that slows down their absorption into the bloodstream.

**NUTRITIP:
Buzz Foods**

Some foods, such as those containing caffeine, give the brain a buzz. This may be a welcome lift when the brain needs to be turned on, such as to study or to keep awake. Other times caffeine can be a detriment, such as when you want to turn off the brain and go to sleep, or when you need to stay relaxed under pressure.

Happy foods. Some feel that chocolate is calming because it triggers the release of endorphins. Other happy foods, such as milk, chicken, bananas, and leafy green vegetables may produce pleasant feelings because they stimulate the release of the neurotransmitter dopamine. Tryptophan-containing foods (See [Foods for Sleep](#)) also have a relaxing effect, so they could be called "happy foods."

NUTRITIP: Sweet Pleasures

Sweet lovers take note! Chocolate may be more nutritious than imagined. Depending on the type, chocolate can be a good source of iron, zinc, calcium, potassium, magnesium, and flavonoids. By a fortunate biochemical quirk, cocoa butter - the fat that gives chocolate that appealing melt-in-your-mouth feel - is metabolized like a heart-healthy monounsaturated fat. Chocolate as a mood elevator even merits a bit of scientific support. Possibly the caffeine or phenylethylamine compounds stimulate serotonin and endorphins, both calming and satisfying the chocolate craver. Enjoy!

Sad foods. Some people feel sad after a high-fat or sugar meal. Each person has unique food- mood connections, but if you pay attention, after a while you will begin to eat more of the foods that make you happy and skip the foods that bring you down.

Parents need to become the food-mood detective for their child. Follow these steps to figure out your child's unique fingerprints for food-mood connection:

1. Make a daily chart to record what your child eats and when he eats it. Fill in one of these forms every day for a week.
2. Record when behavior problems, bad moods, or irritability occur.
3. After a week, examine the charts and look for connections. Then decide what improvements you can make in your child's diet to improve his moods.
4. Continue keeping food-mood records to help you decide whether dietary changes have improved the behaviors.

Mood foods vary from person to person. Try to figure out your personal food-mood connection-which foods perk you up and which ones let you down. Being able to determine how foods affect your moods will help you make wise food choices.

A.D.D. FOODS (Attention Deficit Disorder)

Intuitive parents have long suspected that in some children undesirable behavior and poor school performance are linked to poor nutrition. New scientific studies of children with Attention Deficit Disorder are beginning to confirm these suspicions.

One theory about ADD is that it is caused by a neurotransmitter imbalance. Children with ADD use hyperactivity and undesirable behavior to stimulate production of neurotransmitters, but then they get overstressed and deplete themselves of neurotransmitters and are soon out of control. It seems, that a child with a tendency toward ADD needs a diet rich in nutrients that build neurotransmitters, given the difficulties he may have regulating their production. Research supports this idea, specifically:

- A 1996 study of 96 boys found that those with lower blood levels of omega 3 fatty acids were significantly more likely to have learning and behavior problems than those whose levels were normal.
- **DHA and A.D.D.** Another study showed that children with ADHD tended to have low blood levels of DHA and arachidonic acid, two key brain fats. Perhaps this is why studies have shown that children who have been breastfed are less likely to have ADHD, and the longer the period of breastfeeding, the less the likelihood of having ADHD. The reason seems to be that breastmilk is high in important fatty acids, such as GLA, ALA, DHA, arachidonic acid, and others, but prior to 1997 most formulas contained none or little of these fatty acids. Studies at Purdue University in Indiana suggest that many boys with ADHD have low levels of the omega fatty acids DHA, GLA, and AA in their blood, and tended to have lower levels of ALA and LA precursors in their blood than boys without ADHD, suggesting that these children were unable to make the fatty acids their brain needs from the fats in their diet. The boys with ADHD who had the lowest levels of DHA, GLA, and AA, exhibited the most anxiety, impulsivity, hyperactivity and conduct disorders. The researchers suggested three possible explanations for their findings: the children's diets were deficient in essential fatty acids, the children had a metabolic problem that prevented the body from converting dietary nutrients to essential fatty acids for the brain, or various lifestyle and dietary factors reduced the level of essential fatty acids available to the brain. Dr. Sears makes a fruit based [DHA soft chew](#) that may help your child.
- While a deficiency of omega 3 fats can contribute to poor behavior and learning, the ratio of omega 6 to omega 3 fatty acids in the diet is also important. A study of fifteen children with motor coordination problems showed that motor skills improved after the children were given a diet rich in omega 3 and omega 6 fatty acids. Brain researchers believe that the ideal ratio in the diet is 1:1, but a study found that children with ADHD had a higher omega 6 to omega 3 ratio in their diet. When the omega 6 to omega 3 ratio gets too high, the important omega 3 fats may be less available to the brain.
- Some children with ADHD have outward symptoms of essential fatty acid deficiency, such as excessive thirst, frequent urination, dry hair, and dry skin. These symptoms appear because the vital organs, such as the brain, seem to have claim on the essential fatty acids in the diet and rob these vital nutrients from less important organs, such as the skin.
- The Hyperactive Children's Support Group in England, after researching the connection between ADD and essential fatty acid deficiency, concluded that since some children may have a problem with the normal metabolism of essential fatty acids, they should supplement their diets with essential fatty acids. The group even suggested that perhaps males require two to three times more essential fatty acids than females, since hyperactive male children seem to outnumber females by three to one.
- In a study of DHA and behavior, a group of college students were given a daily supplement of DHA beginning in August and continuing until final exams. Students who took DHA supplements displayed far less external aggression than those not taking supplements.

- Sugars can also affect the learning and behavior of children. Glucose tolerance tests on 261 hyperactive children showed that 74 percent had abnormal glucose tolerance tests, indicating that some children with ADHD are more prone to blood sugar swings and the poor behavior and school performance that may accompany them. In one study, seventeen children with ADD were shown to have a lower rise in plasma epinephrine and norepinephrine in response to glucose infusion, another indication that these children may have more difficulty with blood-sugar changes.
- Some research suggests that vitamin and mineral supplements may help children with A.D.H.D. Studies have shown that A.D.H.D., along with their lower serum levels of free fatty acids, may contribute to their A.D.H.D. Studies have shown that schoolchildren receiving a daily multivitamin containing the recommended dietary allowance of essential vitamins and minerals showed better school performance. However, studies using megavitamin therapy (doses of vitamins well above the RDA) on children with A.D.D. showed no effects; researchers concluded that this type of treatment should be discouraged because of potential toxic effects from excess amounts of some vitamins.
- Other studies show that children placed on vitamin and mineral supplements tend to exhibit less violent, antisocial behavior, and show higher gains in academic performance than children on placebos. One study found that children who took 100 percent of the RDAs did better on I.Q. tests than those receiving 200 percent or 50 percent of the RDA. The conclusion was that taking more or less than the RDA may not be helpful.
- Finally, nutritionists who reviewed studies linking diet, behavior, and school performance, concluded that students who generally ate a nutritious diet showed improved conduct and academic performance. All the whys and wherefores may not have been discovered yet, but common sense prevails.

A.D.H.D. FOODS

The behavior and learning of children who are labeled A.D.H.D. (Attention Deficit Hyperactivity Disorder) tend to be influenced more by foods than other children. Clues that a dietary deficiency may be contributing to your child's behavior or learning problems are: excessive thirst, frequent urination, dry hair and skin, eczema, and allergies. But, most important are the observations you record in your food-mood connection diary. The acronym ADHD (Add to your Daily Healthy Diet) can help you remember to include foods that improve behavior and learning, such as fish, flax seeds or flax oil, vegetables, and whole grains.

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PURE MOMS

Over my thirty years in pediatric practice, I have noticed a striking connection between how children are fed and how healthy they are. Mothers who consistently don't allow any unhealthy food to pollute the minds and bodies of their children seem to have healthier children. I have noticed that these children are sick less often, and when they do come for periodic checkups they seem more settled and better

behaved. These "pure children" seem to get tagged with fewer labels, such as "ADD" or "learning disabilities." Even when these children do warrant such tags, they seem to cope better with behavioral and learning differences, and they seem less severe. These moms have made a believer out of me. I truly believe that there is a connection between how kids are fed and how they act and learn.

SMART FATS

Fats make up sixty percent of the brain and the nerves that run every system in the body. So, it stands to reason that the better the fat in the diet, the better the brain. So, with all the fat eaten by the average American, why don't we have more geniuses in this country? The average American brain is getting enough fat, but the problem is it's not the right kind of fat.

Think of your brain as the master gland that sends chemical messengers throughout the body, telling each organ how to work. An important group of these chemical messengers are the prostaglandins (so-called because they were originally discovered in the prostate gland). Prostaglandins initiate the body's self-repair system. The body needs two kinds of fat to manufacture healthy brain cells (the message senders) and prostaglandins (the messengers). These are omega 6 fatty acids (found in many oils, such as safflower, sunflower, corn, and sesame oils) and omega 3 fatty acids (found in flax, pumpkin seeds and walnuts, and coldwater fish, such as salmon and tuna). The foods from which oil can be extracted are generally the foods highest in essential fatty acids.

Most important to brain function are the two essential fatty acids, linoleic (or omega 6) and alpha linolenic (or omega 3). These are the prime structural components of brain cell membranes and are also an important part of the enzymes within cell membranes that allow the membranes to transport valuable nutrients in and out of the cells. When the cells of the human body - and the human brain - are deprived of the essential fatty acids they need to grow and function, the cells will try to build replacement fatty acids that are similar, but may actually be harmful. Higher blood levels of "replacement fatty acids" are associated with diets that are high in hydrogenated fats and diets that contain excessive amounts of omega 6 fatty acids. Levels of replacement fatty acids have been found to be elevated in persons suffering from depression or Attention Deficit Disorder. A diet rich in omega 3 fatty acids (such as the LNA from flax oil or the EPA and DHA from fish oils) not only provides the body with healthy fats, but it also lowers the blood level of potentially harmful ones, such as cholesterol and, possibly, even reversing the effects of excess trans fatty acids.

Using the lock and key analogy will help you understand how the brain communication system works. Neurotransmitters are biochemical messengers that carry information from one brain cell to another, sort of like sparks flying across the gap between nerve cells. Each cell membrane contains a series of locks. The various message carriers (prostaglandins and neurotransmitters) are like keys. The keys and the locks must match. When the cell membrane is unhealthy because it is made of the wrong kind of replacement fatty acids, the keys won't fit, and brain function suffers. Nutrients may also fail to fit in a mismatched lock.

The eye is a perfect example of the importance of getting the right kind of fat. The retina of the eye contains a high concentration of the fatty acid DHA, which the body forms from nutritious fats in the diet. The more nutritious the fat, the better the eye can function. And since most people are visual learners, better eyes mean better brains.

Western diets contain too much of the omega 6 fatty acids and too little of the omega 3's. Omega 3 fatty acids are found in ground flax seeds and flaxseed oil, coldwater fish (primarily salmon and tuna), canola oil, soybeans, walnuts, wheatgerm, pumpkin seeds, and eggs.

Fats for growing brains. Fats can also influence brain development and performance, especially at either end of life -- growing infants and elderly people. In fact, there are two windows of time in which the brain is especially sensitive to nutrition: the first two years of life for a growing baby and the last couple decades of life for a senior citizen. Both growing and aging brains need nutritious fats. An informative book on best fats for growing brains is: *SMART FATS* by Dr. Michael Schmidt.

The most rapid brain growth occurs during the first year of life, with the infant's brain tripling in size by the first birthday. During this stage of rapid central nervous system growth, the brain uses sixty percent of the total energy consumed by the infant. Fats are a major component of the brain cell membrane and the myelin sheath around each nerve. So, it makes sense that getting enough fat, and the right kinds of fat, can greatly affect brain development and performance. In fact, during the first year, around fifty percent of an infant's daily calories come from fat. Mother Nature knows how important fat is for babies; fifty percent of the calories in mother's milk is from fat.

DHA as a Brain Food

Different species provide different types of fat in their milk, fine-tuned to the needs of that particular animal. For example, mother cows provide milk that is high in saturated fats and low in brain-building fats, such as DHA. This helps their calves grow rapidly, though it may not do much for their brains. In adult cows, the brain is small compared with the body. Cows don't have to do a lot of thinking to survive. In human infants, the brain grows faster than the body. Highly developed brains are important to human beings, so human milk is low in body-building saturated fats and rich in brain-building fats, such as the fatty acid DHA (docosahexaenoic acid), an omega 3 fatty acid.

DHA is the primary structural component of brain tissue, so it stands to reason that a deficiency of DHA in the diet could translate into a deficiency in brain function. In fact, research is increasingly recognizing the possibility that DHA has a crucial influence on neurotransmitters in the brain, helping brain cells better communicate with each other. Asian cultures have long appreciated the brain-building effects of DHA. In Japan, DHA is considered such an important "health food" that it is used as a nutritional supplement to enrich some foods, and students frequently take DHA pills before examinations.

Just how important is DHA for brain development? Consider these research findings:

- Infants who have low amounts of DHA in their diet have reduced brain development and diminished visual acuity.
- The increased intelligence and academic performance of breastfed compared with formula-fed infants has been attributed in part to the increased DHA content of human milk.
- Cultures whose diet is high in omega 3 fatty acids (such as the Eskimos who eat a lot of fish) have a lower incidence of degenerative diseases of the central nervous system, such as multiple sclerosis.
- Experimental animals whose diets are low in DHA have been found to have smaller brains and delayed central nervous system development.

Some children with poor school performance because of ADD, have been shown to have insufficient essential fatty acids in their diet.

SMART FOODS FOR TEEN BRAINS

Even though the brain has completed most of its growth by adolescence, it still continues to make vital connections. Second to infancy, adolescence is the most critical time for nutritious eating. This is another window of opportunity for brain growth when a healthy diet is important. However, adolescence is generally a time when there is a lack of essential omega 3 fatty acids in their diet. There are several reasons for this deficiency: Adolescents tend to eat a lot of saturated fat foods and foods that contain hydrogenated fats. Also, due to pressure to please their peers and compete in athletics, teens often restrict their fat intake in order to keep fit and trim. When they cut out fat in general, they also cut out healthy fats, such as the omega 3's found in cold water fish, like Salmon. During teenage growth spurts, adolescents need extra calories, and they should be nutritious ones. Most teens are over fed and undernourished, teen brains need more fish and fewer fries. Here are some tips to improve the growth and performance of your teen.

- Model healthy eating habits rather than preaching them. Show your teens how to shop. Make each trip to the grocery store a nutrition lesson. Encourage teens to help with shopping selections and dinner planning, so they connect good food with good health.
- Say no. Especially resist the pressure of packaged foods (which are nutrient poor and loaded with hydrogenated fats) and drinks which are loaded with sugar, artificial colorings and chemicals that can rob the bones of the growing teens of calcium.
- Use teen thinking to your advantage. Teens want to grow, so you talk about foods that help them grow and foods that don't. For example, if your teen sees some of his peers growing at a faster rate (which is genetic, not nutritional), take this opportunity to talk with him about calcium rich foods and "grow foods" which can give them more calcium and protein that boosts bone and muscle growth. Adolescents are appearance conscious. Talk to them about the correlation between nutritious food and healthy-looking skin, fast food and weight maintenance, and how nutrition affects sports performance. These are all opportunities to teach your child more about the importance of nutrition.

This form of teaching uses the principle of "relevance." In order for a message to sink in, teens must believe the nutritional message has specific reference to them. Be specific. Tell them how it is going to affect their growth, their looks, their emotional feelings, their sports performance, or whatever seems to be the most important to the teen during that particular week. Besides, "grow foods" call nutritious foods: "soccer foods," "football foods," or whatever she's into. Since omega 3's contribute to healthy skin we call salmon "pretty skin food" for the appearance-conscious teen.

Here are the specific extra nutritional needs of your teen:

- **More protein.** Teen males need around 25% more protein, at least 15 more grams than a pre-teen. Most adolescent females, on the other hand, need less daily protein than males.
- **More iron.** When entering adolescence, males need around 20% more iron during the phase of rapid muscle growth. Females need around 33% more iron once they begin menstruation. Click [here](#) for food sources.
- **More zinc.** Adolescent males need about a 33% increase in their daily requirements for zinc; adolescent females need about 20% more zinc than pre-adolescent females.
- **More calcium.** Both adolescent males and females need around 33% more calcium than pre-adolescents (1,200 milligrams a day versus 800 milligrams).
- **More vitamins.** Both males and females show at least a 20 to 30% increase in daily requirements of nearly all the vitamins as they grow from pre-teens to adolescents.

Finally, avoid the Barbie Doll syndrome. Teen magazines can be hazardous to your children's emotional and nutritional health, leading them to feel that they can never measure up to the perfect body and perfect skin on the perfect model shown in the magazine. Many teens equate their self-worth with what they look like – an unhealthy perception that is fostered by the unrealistic photos and messages in publication targeted to adolescents.

One of the ways that we have shaped the tastes of our adolescents is to have frequent one-on-one “dates” or “sport outings” with our teens. Either Martha or I take our teen to one of their favorite restaurants with the condition that it must have an exciting and nutritious salad bar. Watching how we carefully select a variety of fruits, grains, and vegetables will, we hope, have a lasting effect on the eating habits of our teens.