Medicinal Properties in Whole Foods

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"Functional foods," "nutraceuticals," "designer foods" and "medicinal foods" are terms that describe foods, and key ingredients isolated from foods, that have non-nutritive or tertiary functional properties. Researchers, healthcare practitioners, laypersons, and the popular media use these words interchangeably. The purpose of this column is to detail valid scientific information available on the physiologic actions of known constituents and combinations of constituents, as they naturally occur in "functional foods," highlighting their medicinal and nutritive mechanisms of action in the body.

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Attention Deficit Hyperactivity Disorder (ADHD) is the most recent name for a complex neurobiological disorder, which can occur in children, adolescents or adults. Symptoms include difficulty with attention, concentration, memory, organization and for some, impulsivity, hyperactivity, aggressiveness and relationship problems. A wide range of behaviors and variability of symptoms are hallmarks of ADHD. Learning disabilities, depression, anxiety, oppositional behaviors and other psychiatric or medical disorders may coexist with ADHD.

The National Institute of Health sponsored a Consensus Conference on Attention Deficit Hyperactivity Disorder (ADHD) in November 1998. A panel of experts reviewed professional literature, listened to professional and public presentations, and then prepared a written report. This Consensus Report (available for public viewing at www.consensus.nih.gov) revealed that "...after years of clinical research and experience with ADHD, our knowledge about the cause or causes of ADHD remains speculative. Consequently we have no strategies for the prevention of ADHD." This revelation has profound implications for psychiatry and the treatment of ADHD. If our current knowledge of ADHD is so limited that we are unable to develop strategies for preventing this condition in the future, then current science is missing a critical component in this psychiatric condition. I believe that the missing ingredient is the notion of nutritional biochemistry as it relates to physiologic function, and particularly neurotransmitter function. This article explores the use of nutrients, as found in whole foods, to help normalize neurotransmitter function in the ADHD sufferer.

Prescription Medications

No single conventional treatment has been effective with all ADHD children or adults. Psychostimulant medications combined with behavioral and cognitive therapies (such as self-monitoring, modeling and role-playing) are used by the medical community to help influence health symptom expression. One drug of choice is methylphenidate. Commonly reported side effects of taking methylphenidate include appetite suppression, depression, headache, elevated blood pressure, reduction of growth, insomnia and stomachache. It is said to be more effective than tricyclic antidepressants and other psycho stimulants and has fewer associated side effects than dextroamphetamine (Ritalin).

The number of prescriptions for drugs to people with ADHD has tripled since 1990. In 1996, researchers analyzed the Medicaid system and published the results indicating that physicians prescribed one or more of some 22 different medications to 57% of ADHD children under three. Over 33% of the children received a combination of medications, and there was no consistency in the combinations of drugs prescribed. In fact, the researchers found that there were 30 different combinations of medications prescribed to these young children. The medications used included Dexedrine, Prozac, Nortriptyline, Effexor, Wellbutrin, Lithium, Risperdal, and Ritalin. No scientific literature exists to support the use of these medications in the treatment of children less than three years of age. Furthermore, researchers have not shown if these drugs have a long-term effect on neurological and/or hepatic functioning, or if they are even helpful. The lack of evidence supporting the use of medications in young ADHD children compounds the issue of professional discrepancy. A result of this confusion has been a renewed interest in the use of scientifically valid alternative therapies, and particularly nutritional interventions, for the prevention, management and treatment of ADHD.
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Whole Foods

Whole Foods Rich in EFA's
One area of nutrition that has received recent attention is essential fatty acid (EFA) deficiency, faulty EFA metabolism and hyperactivity in children. Essential fatty acids are required constituents of every membrane in the body, including neuronal cell membranes. They serve as essential components in the biosynthesis of eicosanoids, which function as mediators and modulators of the autonomic and central nervous system, steroid synthesis and hormone metabolism and essentially affect the workings of every cell in the body. Some of the cardinal signs of an EFA deficiency include excessive thirst, hyperallergic responses to common foods, and skin conditions such as eczema, clinical signs that also tend to be common in ADHD children. Symptoms such as thirst, eczema, and allergies are nonspecific symptoms that may have multiple etiologies unrelated to ADHD. However, this correlation led researchers to hypothesize that fatty acid supplementation would positively affect patients with ADHD and most clinical research reports are confirming their initial hypotheses. Several case studies have shown that a forced EFA deficiency will lead to neurological abnormalities, and that these abnormalities will reverse with EFA supplementation.
Curiously, male animals require three times as much EFAs in their diet as do female animals in order to assure proper development. While no direct comparisons can be made, this ratio is consistent with the fact that boys are more likely to show signs of ADHD than are girls of the same age group, socioeconomic status, and genetic history.
It is important to note that individuals suffering with ADHD may have defects anywhere along the fatty acid cascade (see diagram 1). Some may be deficient in arachidonic acid (AA) and have a relative increase in linolenic acid and decrease in linoleic acid, while others may be producing an excess of AA metabolites. Whole food sources of EFAs, such as meat, fish, eggs, raw nuts, raw seeds and green vegetables, contain constituents that are present throughout the entire fatty acid cascade. They provide the body with nutrients required to protect the cell nucleus (essential for nervous system disorders). They also contain essential enzymes, minerals and vitamins required to carry out the fatty acid pathways. Most importantly, consuming a variety of whole food sources of EFAs ensures that one receives a balance of the key products of fatty acid metabolism including arachidonic acid, DGLA (di-homo-gamma linolenic acid), and DHA (docosahexaenoic acid). Low arachidonic levels are associated with speech impairment, slow development and learning difficulties, low DGLA levels are generally associated with hyperactivity, and low DHA levels are generally associated with learning disabilities.
In 1995, Stevens L et al.1 studied 96 subjects to determine whether ADHD children had a significantly different fatty acid profile from children without ADHD. They found that all 53 of the ADHD children in the experimental group had significantly lower concentrations of key fatty acids in their plasma polar lipids and in RBC total lipids, while 100% of the 43 subjects in the control group had relatively normal EFA profiles. 21 of the subjects with ADHD also presented with classic EFA deficiency symptoms, including excessive thirst, dry skin, frequent urination and dry hair. The researchers also found that only 45% of the ADHD children were breastfed (for a significantly shorter period than control subjects - on average, two months) as compared to 85% of the control subjects. Breast milk contains a significant amount of DHA, an important component of brain and peripheral neuron structure. It is found in high concentrations around nerve synapses and plays a critical role in the developing brain. At least one study has suggested that children who are breast fed are 50% less likely to manifest symptoms of ADHD than are children who are bottle fed.5 Most infant formulas in the United States and Europe do not contain enough, if any, DHA. The results of Stevens' study are consistent with previous studies completed on EFAs and ADHD subjects.

Whole Foods Rich in Zinc and Magnesium
In addition to EFA deficiencies, numerous studies have indicated specific vitamin and mineral deficiencies in ADHD sufferers.6-10 For example, in 1997 Tadeusz et al.7 examined 116 children with ADHD and found that 96% of those examined were deficient in magnesium in blood serum and hair. Magnesium has a profound influence on regulating the central and peripheral nervous systems. Chronic magnesium deficiency results in hyperactivity, impaired reaction to external stimuli, irritability, fatigue, difficulty sleeping, and poor mental concentration. Whole food sources of magnesium include dark green vegetables, chlorella, nuts, grains, fish, beans and meat.
Researchers also discovered a positive correlation between zinc deficiency and hyperactivity. Toren et al,11 for example, found

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that 486 hyperactive children had significantly reduced serum, hair and urine levels of zinc as compared to 172 age and sex-matched controls. Song and Adham identified a possible link between fatty acid deficiencies and zinc deficiencies. They recognized that a zinc deficiency could cause a fatty acid deficiency due to its role as a coenzyme in EFA metabolism, and found that the series-2-prostaglandins are necessary for zinc absorption from the gut.  

Managing Carbohydrate Intake

Children with ADHD may also show signs of faulty carbohydrate metabolism. Girardi et al. (1995) found that ADHD children exhibit strikingly different changes in plasma catecholamine levels after oral GTTs, compared to control subjects. In healthy children, even a modest reduction in plasma glucose evokes a sharp increase in circulating epinephrine levels and symptoms related to the epinephrine response. Girardi believes that ADHD children have low plasma epinephrine levels, and thus a reduced sympathetic response. This generalized impairment of sympathetic activation involves adrenomedullary as well as central catecholamine regulation. An abnormally low epinephrine response to hypoglycemia is a complex phenomenon that requires further research and evaluation. Limiting excessive carbohydrate intake, coupled with maintaining steady glucose levels (eating smaller, high protein meals throughout the day) in order to prevent severe hypoglycemia is a safe and logical way of handling this aspect of ADHD.

OPC-Rich Foods

OPC (oligomeric proanthocyanidins), found in the skins and seeds of foods such as grapes and berries, show excellent promise in treating ADHD patients. ADHD subjects have been shown to produce more theta (4-8 Hz) slow EEG activity and less beta (13-31 Hz) fast wave activity. Theta is associated with inattention, distractibility, disorganization and poor task sequencing. Beta correlates with the ability to focus, organize and pay attention. It has recently been suggested that the only objective test for diagnosing ADHD is the electrophysiological output (pw) in the theta band divided by the output in the beta frequency band. OPC decreases theta wave activity, decreases histamine reactions to minimize effects of allergens that may compromise brain function, and combats free radicals. OPC also has an indirect effect on the actions of epinephrine and norepinephrine in the body. In vitro studies confirm that OPC stimulates the production of nitric oxide by vascular endothelial cells. Increased nitric oxide levels in turn counteract the vasoconstrictive effects of too much or too little epinephrine and norepinephrine in the body. These findings support the use of OPC for patients with ADHD, as an imbalance in sympathetic activation and catecholamine response plays a crucial role in the behavioral and cognitive symptoms associated with ADHD. Of great importance is the fact that OPC crosses the blood-brain barrier.

Siberian Ginseng and Ashwaghanda

Siberian Ginseng (Eleutherococcus senticosus), indicated for stress and nervous exhaustion, has adaptogenic actions that complement the use of OPC, encouraging nitric oxide synthesis that contributes to the herb’s vasodilatory and antioxidant effects, and functions to reestablish a proper epinephrine response to hypoglycemic reactions, which, as described by Girardi et al. (1995), positively affects ADHD behavior. Ashwaghanda may also prove to be quite useful in the treatment of ADHD symptoms due in part to the immunomodulatory and CNS effects of several glycowithanolides found in this herb; Namely, santonolides IX and X.

Genetics

A natural concern in using therapeutic nutrition to manage this syndrome is the issue of genetics. Critics argue that nutritional factors cannot affect the clinical manifestations of ADHD because it is an “inherited” condition. There is undoubtedly an inherited predisposition to ADHD in the majority of patients with this syndrome. Epidemiological studies support this fact and recent studies have successfully identified differences in specific dopamine receptors (D2 and D4) in ADHD patients. However, nutritional therapies are proving to prevent and treat the manifestations of this predisposition. It is highly unlikely that scientists will discover a gene for ADHD. Multiple genes are responsible for neurotransmitter function and the reactivity of neuronal receptors. Environmental stressors are at least in part responsible for the expression of these genes and poor dietary habits and subclinical nutrient deficiencies are clear representations of such environmental stressors.

Studies done by the American Dietetic Association (1999), the US Department of Health and Human Services, and the National Cancer Institute, indicate that a large percentage of children in the United States are not obtaining the RDA for nutrients from their food. In 1997, Munoz et al. studied 3307 children in the US (age 2-19) to determine the number of children meeting national recommendations for food group intake and found that only 1% met all the recommendations. Furthermore, 64% of children studied failed to meet the minimum RDA requirements for vegetable intake, and, of the 36% that actually met these requirements, 1/4 of all the vegetables they consumed were in the form of French fries. The data is startling and it is becoming increasingly evident that our children are not receiving the essential vitamins, minerals, phytochemicals and EFAs that are required for proper brain functioning.

In the case of ADHD, it is important to remember that the metabolic rate of the brain is significantly higher than in any other organ system in the body. Thus, a new paradigm in treating brain dysfunction might allow us to see that even mild, subclinical nutrient deficiencies adversely affect brain function long before the classic physical manifestations of a gross nutrient deficiency appear.

Final Thought

Should we wait for the scientific community to analyze and agree upon this research before we act to assure that ADHD sufferers are getting the essential nutrients they need for optimal brain function? If we base our decision on trends established by researchers and medical doctors in the past, we may be harming
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thousands of individuals. Research identified a solid relationship between folic acid deficiencies and birth defects as early as 1965. It was not until 1992 that the United States Public Health Service shared this critical knowledge with the country and recommended that all women of childbearing age, capable of becoming pregnant, consume 400mcg of folic acid per day. It took the scientific community almost 30 years to accept that a nutrient deficiency might cause such a gross distortion in human neuronal development and actually come forward with the information. Anyone trained as a physician, and indoctrinated with the philosophy that we must “first do no harm” might seriously question the number of lives that were lost to this delay in bringing critical information about nutrition to the surface. This article has brought forth explicit evidence to make the case for popularizing the intelligent use of therapeutic nutrition in the treatment and prevention of ADHD. This evidence certainly warrants the establishment of a scientific and social effort to educate physicians, parents and caretakers on the value of optimizing brain function with whole food nutrition. For those patients with specific genetic vulnerabilities, the implications are even more profound, as poor nutrition may very well be the environmental link that accelerates a diseased state like ADHD.

References

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