

FOOD AND YOUR MOOD: The Role of Nutrition in Four Psychiatric Illnesses

Katherine Baker, BS, and Sara Weekly, MD

Psychiatric disorders are complex in etiology and prognosis, and most are thought to be a result of both genetics and environmental factors. As researchers delve deeper into uncovering causes and improving treatments for patients, the long-overlooked role of nutrition is entering the spotlight as a contributing factor in both cause and course of many mental illnesses.

Improper eating has been observed to exacerbate or worsen symptoms in several mental illnesses. These relationships are not yet well understood but have sparked curiosity about the interaction between nutrition and mental illness. The scientific community has been looking more closely into how what we eat nourishes not only the body but also the brain. This article will review four psychiatric illnesses that may be influenced by diet and nutrition and provide tips for asking about nutrition in the clinical setting.

Attention-Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by significant impairment in attention and/or hyperactivity and impulsivity. The causes of this disorder are largely unknown, despite being one of the most studied and diagnosed psychiatric disorders in children and adolescents.

There has been longtime speculation that food additives are to blame for increasing or worsening ADHD symptoms. Dr. Ben Feingold began the Feingold diet in 1976 for ADHD management, advising patients to eliminate certain artificial colors, dyes, preservatives, and chemicals from their diets. Many subsequent studies have found this regimen's effects to be non-significant, but this diet nevertheless brought the relationship between food sensitivities and ADHD into the spotlight. Some subsequent studies have shown symptom improvement in ADHD patients when a food they are either allergic or sensitive to is completely removed from their diet.¹

People with ADHD have also been observed to have lower levels of omega-3 fatty acids, docosahexaenoic acid (DHA), and arachidonic acid (AA) omega-6 fatty acids in their bodies, as well as altered fatty acid metabolism. Sup-

plementation of fatty acids has produced small reductions in ADHD symptoms in some studies, but clinical significance remains uncertain.¹

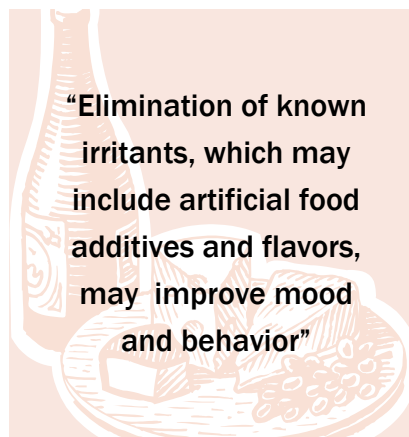
When it comes to children being hyperactive, some people point to sugar consumption as a potential trigger. Although parents anecdotally report that increased sugar consumption is related to hyperactive behavior in their children, most studies have not found evidence of an association. Although high sugar consumption may lead to a spike in glucose level and provide a boost of energy, the effects on classifiable hyperactive and inattentive behavior such as attention, learning abilities, memory, and cognitive tasks have been found to be non-significant.¹

There is, however, evidence that dramatic spikes and troughs in glucose are associated with increased irritability, inattentiveness, and distractibility. For those who already have difficulties with inattention, unstable blood sugar levels may worsen these symptoms or make them more difficult to manage. Additionally, it has been documented that those with ADHD may have abnormal glucose tolerance levels. During hypoglycemia-like episodes, these individuals may suffer from headaches,

difficulty concentrating, irritability, and “brain fog,” all of which may exacerbate already-present ADHD symptoms.²

Autism spectrum disorder (ASD) is characterized by communication deficits, inappropriate responses in conversations, difficulty building relationships, and misreading of nonverbal cues. ASD diagnoses have increased dramatically in recent history for unknown reasons. Treatment can be challenging, particularly in geographical areas without specialists trained in ASD.

Parents of children with ASD often try a variety of diet modifications in an attempt to improve their children's symptoms. Gluten- and casein-free diets have recently become popular. Supporters of these diets claim that excessive opioid activity seen in autism is related to improper breakdown of gluten and casein in the body, and that the peptides from such proteins cross the blood brain barrier, delaying social and language skills. Some studies have



found such diets to be somewhat effective in areas of cognition, behavior, and social functioning, although they have received criticism for being small and/or uncontrolled.³ Several other double-blind controlled studies have found the diet to have no significant effect.⁴ More well-conducted, randomized trials with significant participant numbers and well-controlled diets will be needed to determine if there are, in fact, clinically significant effects or improvements in autism symptoms to warrant recommendation of such diets.

Much like in ADHD, there has been speculation that food additives, dyes, and artificial colors, flavors, and sweeteners are responsible for worsening symptomatology. More certain, it seems, is the link between autism spectrum disorders and increased incidence of GI problems. Elimination of known irritants, which may include artificial food additives and flavors, may improve mood and behavior. Additionally, those with autism often have imbalanced levels of omega-3 and omega-6 fatty acids, and so a dietary increase of these fatty acids may be beneficial.⁵

Researchers are looking at gestation as a possible starting point for uncovering causes of autism. The impact of diet during pregnancy and of breastfeeding on incidence of ASD is currently being investigated. Autism Speaks (<http://www.autismspeaks.org>) has a list of guidelines for pregnant women to avoid environmental factors and certain toxic substances they believe may be linked to developmental disorders. In addition to a recommended focus on thoroughly washed produce and reduction of packaged food consumption, they advise reduced consumption of oily fish and tuna. It is their logic that several dyes and mercury from fish consumed during pregnancy are correlated to increased risk of autism.⁶

Gestational folic acid deficiency and premature discontinuation of breastfeeding have also both been linked to increased risk of autism.^{6,7} While these are currently correlational studies and may potentially be linked to confounding issues (i.e., infants with neurodevelopmental issues may have trouble breastfeeding), these findings have focused more attention on the influence of maternal behavior and early nutrition on autism risk. Conclusive studies on the issue could have benefits for expectant mothers and children already diagnosed with ASD, in terms of both reducing risk and improving prognosis.

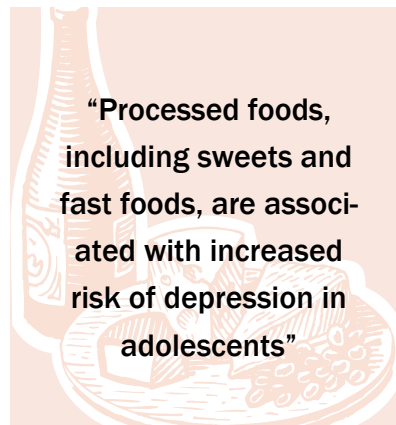
Depressive disorders are characterized by persistent low moods and/or irritability that affect a person's thoughts, behaviors, and feelings. Depression is often accompanied by loss of interest or enjoyment of normal activities and daily functioning. In addition to feeling sad, empty, hopeless, anxious, and irritable, some symptoms, such as changes in appetite and weight loss or gain, are directly related to diet. Poor diets are frequently reported by depressed patients and prospective epidemiological

studies have shown links between diet patterns and depressive symptoms. Processed foods, including sweets and fast foods, are associated with increased risk of depression in adolescents.⁸ Moreover, consumption of sweets has been shown to be positively correlated with depressive symptoms.⁹

When it comes to healthy sources of fats, polyunsaturated fatty acids (PUFAs) and omega-3 fatty acids have both been observed to be significantly lower in depressed patients than in nondepressed patients.¹⁰ Olive oil and fish may provide the essential PUFAs and omega-3s individuals with depression

often lack. These are both common in the Mediterranean diet, which has been found in studies to have protective effects against depression. This diet is comprised largely of whole-foods and plants. Core tenets of the Mediterranean diet may be beneficial to some; studies negatively correlate the Mediterranean eating style and depressive symptoms (e.g., fewer symptoms with Mediterranean diet and more depressive symptoms with unhealthy diet).¹¹

But how might food affect mood? Metabolism of neurotransmitters is one speculation. It is known that depressed patients often do not process serotonin and dopamine in the same way as nondepressed individuals. Selective serotonin reuptake inhibitors (SSRIs) are often prescribed, in theory, to correct these imbalances, but there may be a link between neurotransmitters and diet. Animal studies have shown that carbohydrate consumption at either extreme can harshly impact the rate at which serotonin is turned over in the brain, and such fluctuations can negatively impact mood.¹² L-tryptophan is a precursor to serotonin and is directly linked to diet. Starvation may deplete the brain of means to build these important mood neurotransmitters, and diets too rich with excessive sugar may overwhelm turnover.^{13,14} It has even been observed that consumption of dietary fat and sugar



in excess can reduce dopamine D2 receptor sensitivity (an important receptor of the brain's reward pathway), and diets too high in fat have been shown to alter dopamine gene expression.¹⁵ Eliminating processed foods may reduce sources of these potentially harmful substances and improve depressive symptoms. While more research needs to be done, it is evident that an appropriately balanced diet may be beneficial to those suffering from depression.

Alzheimer's Disease is a degenerative form of dementia, which worsens as it progresses. Today it affects an estimated 1 in 85 people worldwide, and the scientific community is devoting a great deal of effort to finding the etiology and an effective treatments. Oxidative stress has been considered as a cause of worsening symptoms, and some researchers are looking to diet in hopes of reducing or minimizing these effects. While it has been documented that antioxidant therapy reduced oxidative modifications in mice, long-term antioxidant therapy within tolerable guidelines may have limited benefits.¹⁶

The Alzheimer's Association suggests that high intake of saturated fat and imbalanced cholesterol levels increase risk for Alzheimer's disease.¹⁷ Higher LDL cholesterol, lower HDL values, and diets high in saturated fat and have been speculated to increase risk for neuron dysfunction that could hasten the progression of dementia. These unhealthy patterns often start early in life, during childhood.

Several studies show that those following a Mediterranean diet have a lower risk of developing Alzheimer's disease and improved prognosis by lowering the likelihood of cognitive decline.¹⁸ Consumption of omega-3 fatty acids is speculated by some to be protective against risk.¹⁹ Additionally, those following a diet high in simple carbohydrates (such as refined sugar) and saturated fat have an increased risk.

Other studies are looking to a few trace nutrients, specifically vitamin B12 and folate, as risk factors for development of Alzheimer's disease. In one study, researchers found that low serum levels of vitamin B12 and folate more than doubled the risk of developing Alzheimer's disease, and associations were even larger in participants with good baseline cognition.²⁰

Nutrition and Child and Adolescent Psychiatry

A nutritious diet and appropriate exercise are important to overall health, and encouraging awareness is well within the purview of the child and adolescent psychiatrist. Asking about basic diet, nutrition, and exercise is therefore an important component of an intake evaluation.

However, some families may be sensitive to these questions due to cultural and social differences. Thus, it is important to start with open-ended questions and avoid seeming judgmental. Specific questions for youth include: "tell me about your favorite foods" and "which foods do you like so much you eat them several times a week?" These early questions can evolve to more elaborate, diagnosis-specific discussions over time and segue into opportunities to improve health through nutrition.

Conclusion

As researchers try to better understand cause and prognosis of complex mental illnesses including depression, ADHD, ASD, and Alzheimer's disease, the role of nutrition is receiving more attention as an influential risk or protective factor. Although it is accepted that diet is indeed an important component of mental health, at this time little is deeply understood about the extent of impact of nutrition on mental illnesses. Current information is limited but deserving of more clinical attention and research in the future. At the end of the day, we all must eat, and we know that what we put in our bodies matters. It is becoming increasingly evident that nutrition plays a role in nourishing not only our physiological wellbeing,

Take-Home Summary:

Increasing evidence points to a role of diet and nutrition in several psychiatric illnesses. Incorporating general screening questions into intake evaluations may be beneficial.

but our psychological wellbeing, as well.

References:

1. Songua-Barke ESJ, Brandeis D, Cortese S, et al. Nonpharmacological Interventions of ADHD: Systematic Review and Meta-Analyses of Randomized Controlled Trials of Dietary and Psychological Treatments. *Am J Psychiatry*. 2013;170:275-289.
2. Prinz RJ, Riddle DB. Association Between Nutrition and Behavior in 5-year-old Children. *Nutrition Reviews*. 1986;48:760-769.
3. Whiteley P, Shattock P, Knivsberg AM, et al. Gluten- and Casein-Free Dietary Intervention for Autism Spectrum Conditions. *Front in Hum Neuros*. 2013;6:344.
4. Millward C, Ferriter M, Calver SJ, Connell-Jones GG. Gluten- and Casein-Free Diets for Autistic Spectrum Disorder (Review). *Cochrane Database of Systematic Reviews*. 2008; CD003498. DOI: 10.1002/14651858.CD003498.pub3.
5. Privett D. Autism Spectrum Disorder — Research Suggests Good Nutrition May Manage Symptoms. *Today's Dietitian*. 2013;1:46.
6. Avoiding Toxic Exposures During Pregnancy. Autism Speaks. <http://www.autismspeaks.org/science/initiatives/environmental-factors-autism-initiative/avoiding-toxic-exposures-during-pregnancy>. Published 2014. Accessed September 1, 2014.

7. Shafai T, Mustafa M, Hild T, Mulari J, Antonia C. The Association of Early Weaning and Formula with Autism Spectrum Disorder. *Breastfeeding Medicine*. 2014;9:275-276.
8. Sanchez-Villeagas A, Toledo E, de Irala J, et al. Fast Food and Commercial Baked Goods Consumption and the Risk of Depression. *Public Health Nutr*. 2012;15:424-432.
9. Jeffery, RW, Linde, JA, Simon GE, et al. Reported Food Choices in Older Women in Relation to Body Mass Index and Depressive Symptoms. *Appetite*. 2009;52:238-240.
10. Sublette ME, Ellis SP, Geant, AL, Mann JJ. Meta-Analysis of Effects of Eicosapentaenoic acid (EPA) in Clinical Trials in Depression. *J Clin Psychiatry*. 2011;72:1577-1584.
11. Mamplekou E, Boutziouka V, Psaltopoulou T, et al. Urban Environment, Physical Inactivity and Unhealthy Dietary Habits Correlate to Depression Among Elderly Living in Eastern Mediterranean Islands: The MEDIS (Mediterranean Islands Elderly) Study. *J Nutr Health Aging*. 2010;14:449-455.
12. Schweiger U, Broocks A, Tuschl RJ, Pirke KM. Serotonin Turnover in Rat Brain During Semistarvation With High-Protein and High-Carbohydrate Diets. *J Neural Transm*. 1989;77:131-139.
13. Buwalda B, Blom WA, Koolhass JM, van Dijk G. Behavioral and Physiological Responses Are Affected by High-Fat Feeding in Male Rats. *Physiol Behav*. 2001;73:371-7.
14. Banas SM, Rouch C, Kassis N, Markaki EM, Gerozissis K. A Dietary Fat Excess Alters Metabolic and Neuroendocrine Responses Before the Onset of Metabolic Diseases. *Cell Mol Neurobiol*. 2009;29:157-168.
15. Lee AK, Mojtahed-Jaberi M, Kyiakou T et al. Effect of High-Fat Feeding on Expression of Genes Controlling Availability of Dopamine in Mouse. *Nutrition*. 2010;26:411-422.
16. Siedlak SL, Casadesus G, Webber KM, et al. Chronic Antioxidant Therapy Reduces Oxidative Stress in Mouse Model of Alzheimer's Disease. *Free Rad Res*. 2009;43:156-164.
17. Adopt a Brain-Healthy Diet. Alzheimer's Association website. <http://www.alz.org/we-can-help-adopt-a-brain-healthy-diet.asp>. Published 2014. Accessed September 1, 2014.
18. Tsivgoulis, G, Judd S, Letter AJ. Adherence to a Mediterranean diet and risk of incident cognitive impairment. *Neurology*. 2013; 80: 1684-1692.
19. Morris MC, Evans DA, Bienias JL, et al. Consumption of fish and n-3 fatty acids and risk of incident Alzheimer's disease. *Arch Neurol*. 2003; 7: 940-6.
20. Wang HX, Wahlin A, Bascun H, Fastbom J, Winblad B, Fratiglioni L. Vitamin B12 and folate in relation to the development of Alzheimer's disease. *Neurology*. 2001; 56: 1188-1194.

About the Authors:

Katherine Baker, BS, is a graduate of New York University with a bachelor's degree in psychology. She plans to pursue a Master's Degree in clinical nutrition before attending medical school for psychiatry, and is very interested in the role of nutrition in both physical and mental health.

Sara Weekly, MD, is a Clinical Assistant Professor of Psychiatry at the State University of New York Downstate where she works as an emergency psychiatrist. She is also a clinical instructor with the New York University Department of Child and Adolescent Psychiatry, and she leads an advanced seminar in eating disorders for New York University undergraduate students. She has a passion for learning and teaching about both healthful and disordered eating, as well as the ways in which nutrition interacts with mental illness.

CALL FOR APPLICATIONS

Are you an early career child and adolescent psychiatrist interested in joining the JAACAP editorial team?

The *Journal of the American Academy of Child and Adolescent Psychiatry (JAACAP)* is seeking applicants for the John F. McDermott Assistant Editor-in-Residence position. The John F. McDermott Assistant Editor-in-Residence position provides the opportunity for an early career child and adolescent psychiatrist to join the editorial team of *JAACAP* for two years and become involved in and familiar with the operations of the *Journal*. The position is for an early career psychiatrist no more than five years out of child and adolescent psychiatry training (there can be flexibility around this timeline, depending on personal circumstances). The position entails a two-year commitment (corresponding to the January 2016–December 2017 issues) and is subject to approval by the AACAP Council. Final decisions will be made in the spring of 2015, and the selected candidate will begin activities in mid-2015.

Interested applicants should contact the Editorial Office at support@jaacap.org to request additional information with the subject line 'John F. McDermott Assistant Editor-in-Residence.' The deadline for applications is February 15, 2015.