



Antioxidant Status

Oxidative imbalance is prevalent in ADHD patients and likely plays a causative role; Deficiency of glutathione common in ADHD.^{3,4,5,6}

Folate

Low folate status in pregnancy linked to hyperactivity in children; People with the MTHFR(methyl tetrahydrofolate reductase) gene are predisposed to folate deficiency and more likely to have ADHD.^{1,2}

Vitamin B6

Evidence suggests high dose supplementation of B6 is as effective as Ritalin for ADHD, probably due to its role in raising serotonin levels.^{7,8,9}

Magnesium

Deficiency linked to poor function of the neurotransmitters that control emotion, social reactions, hyperactivity and attention; Synergistic effect with Vitamin B6.^{8,9,10}

Zinc

Cofactor for dopamine synthesis which affects mood and concentration in ADHD; Low zinc depresses both melatonin and serotonin production which affect information processing and behavior in ADHD.^{11,12,13,14}

Carnitine

Reduces hyperactivity and improves social behavior in people with ADHD due to its role in fatty acid metabolism; Some consider it a safe alternative to stimulant drugs.^{15,16,17}

Serine

Administration of phosphatidylserine with omega 3 fatty acids improved ADHD symptoms (attention scores) significantly better than omega 3 fatty acids alone, suggesting a synergistic effect; Phosphatidylserine increases dopamine levels.^{18,19,20}

Choline

Precursor to neurotransmitter acetylcholine, which regulates memory focus and muscle control (hyperactivity).^{24,25,26}

Glutamine

Precursor for the calming neurotransmitter GABA (gamma-aminobutyric acid) that affects mood, focus and hyperactivity; Disruption of the glutamine-containing neurotransmission systems may cause ADHD.^{21,22,23}

REFERENCES

- ¹Krull R, Brouwers P, Jain N et al. Folate pathway genetic polymorphisms are related to attention disorders in childhood leukemia survivors. *J Pediatr* 2008;152:101-105.
- ²Schlotz W, Jones A, Phillips D et al. Lower maternal folate status in early pregnancy is associated with childhood hyperactivity and peer problems in offspring. *J Child Psychol Psychiatry* 2010;51:594-602.
- ³Selek S, Savas H, Gergerlioglu H et al. Oxidative imbalance in adult attention deficit/hyperactivity disorder. *Biol Psychol* 2008;79:256-259.
- ⁴Dvorakova M, Sivonova M, Trebaticka J et al. The effect of polyphenolic extract from pine bark, Pycnogenol on the level of glutathione in children suffering from attention deficit hyperactivity disorder (ADHD). *Redox Rep* 2008;11:163-172.
- ⁵Spahis S, Vanasse M, Belanger S et al. Lipid profile, fatty acid composition and pro- and anti-oxidant status in pediatric patients with attention-deficit/hyperactivity disorder. *Prostaglandins Leukot Essent Fatty Acids* 2008;79:47-53.
- ⁶Bulut M, Selek S, Gergerlioglu H et al. Malondialdehyde levels in adult attention-deficit hyperactivity disorder. *J Psychiatry Neurosci* 2007;32:435-438.
- ⁷Coleman M, Steinberg J, Tippett J et al. A preliminary study of the effect of pyridoxine administration in a subgroup of hyperkinetic children: a double-blind crossover comparison with methylphenidate. *Biol Psychiatry* 1979;14:741-751.
- ⁸Mousain-Bosc M, Roche M, Polge A et al. Improvement of neurobehavioral disorders in children supplemented with magnesium-vitamin B6. I. Attention deficit hyperactivity disorders. *Magnes Res* 2006;19:46-52.
- ⁹Mousain-Bosc M, Roche M, Rapin J et al. Magnesium VitB6 intake reduces central nervous system hyperexcitability in children. *J Am Coll Nutr* 2004;23:545S-548S.
- ¹⁰Huss M, Volp A, Stauss-Grabo M. Supplementation of polyunsaturated fatty acids, magnesium and zinc in children seeking medical advice for attention-deficit/hyperactivity problems - an observational cohort study. *Lipids Health Dis* 2010;9:105.
- ¹¹Arnold L, DiSilvestro R. Zinc in attention-deficit/hyperactivity disorder. *J Child Adolesc Psychopharmacol* 2005;15:619-627.
- ¹²Yorbik O, Ozdag M, Olgun A et al. Potential effects of zinc on information processing in boys with attention deficit hyperactivity disorder. *Prog Neuropsychopharmacol Biol Psychiatry* 2008;32:662-667.
- ¹³Arnold L, Pinkham S, Votolato N. Does zinc moderate essential fatty acid and amphetamine treatment of attention-deficit/hyperactivity disorder? *J Child Adolesc Psychopharmacol* 2000;10:111-117.
- ¹⁴Dodig-Curkovic K, Dovhanj J, Curkovic M et al. The role of zinc in the treatment of hyperactivity disorder in children. *Acta Med Croatica* 2009;63:307-313.
- ¹⁵Arnold L, Amato A, Bozzolo H et al. Acetyl-L-carnitine (ALC) in attention-deficit/hyperactivity disorder: a multi-site, placebo-controlled pilot trial. *J Child Adolesc Psychopharmacol* 2007;17:791-802.
- ¹⁶Van Oudheusden L, Scholte H. Efficacy of carnitine in the treatment of children with attention-deficit hyperactivity disorder. *Prostaglandins Leukot Essent Fatty Acids* 2002;67:33-38.
- ¹⁷Torrioli M, Vernacotola S, Peruzzi L et al. A double-blind, parallel, multicenter comparison of L-acetylcarnitine with placebo on the attention deficit hyperactivity disorder in fragile X syndrome boys. *Am J Med Genet* 2008;146:803-812.
- ¹⁸Kidd P. Omega-3 DHA and EPA for cognition, behavior, and mood: clinical findings and structural-functional synergies with cell membrane phospholipids. *Altern Med Rev* 2007;12:207-227.
- ¹⁹Vaisman N, Kaysar N, Zaruk-Adasha Y et al. Correlation between changes in blood fatty acid composition and visual sustained attention performance in children with inattention: effect of dietary n-3 fatty acids containing phospholipids. *Am J Clin Nutr* 2008;87:1170-1180.
- ²⁰Pellow J, Solomon E, Barnard C. Complementary and alternative medical therapies for children with attention-deficit/hyperactivity disorder (ADHD). *Altern Med Rev* 2011;16:323-337.
- ²¹Perlov E, Philipson A, Hesslinger B et al. Reduced cingulate glutamate/glutamine-to-creatine ratios in adult patients with attention deficit/hyperactivity disorder - a magnetic resonance spectroscopy study. *J Psychiatr Res* 2007;41:934-941.
- ²²Carrey N, MacMaster F, Gaudet L et al. Striatal creatine and glutamate/glutamine in attention-deficit/hyperactivity disorder. *J Child Adolesc Psychopharmacol* 2007;17:11-17.
- ²³Rusch N, Boeker M, Buchert M et al. Neurochemical alterations in women with borderline personality disorder and comorbid attention-deficit hyperactivity disorder. *World J Biol Psychiatry* 2010;11:372-381.
- ²⁴Barth V, Need A, Tzavara E et al. In vivo occupancy of dopamine d3 receptors by antagonists produces neurochemical and behavioral effects of potential relevance to attention-deficit-hyperactivity disorder. *J Pharmacol Exp Ther* 2013;344:501-510.
- ²⁵English B, Hahn M, Gizer I et al. Choline transporter gene variation is associated with attention-deficit hyperactivity disorder. *J Neurodev Disord* 2009;1:252-263.
- ²⁶Kronenberg G, Ende G, Alm B et al. Increased NAA and reduced choline levels in the anterior cingulum following chronic methylphenidate. A spectroscopic test-retest study in adult ADHD. *Eur Arch Psychiatry Clin Neurosci* 2008;258:446-450.