

# ADHD & AUTISM

The Benefits of Omega-3 Fatty Acids for Children

In the early 1980s, researchers first linked ADHD to essential fatty acid deficiency. Recent years have seen an unprecedented rise in autism and attention deficit hyperactivity disorder (ADHD). Since our nerves and brain are composed mainly of fats, poor omega 3 fatty acid status can alter neurotransmitter function and inhibit brain performance on many levels. This deficiency has a greater impact on males because their requirements for essential fatty acids are, in general, much higher – one reason why autism occurs more frequently in boys.<sup>1164,1168</sup>

Brain and nerve growth throughout childhood is extraordinarily rapid. The need for omega 3 fatty acids remains critical all the way through adolescence and into adulthood. Our brains can actually create nerve pathways in response to new experiences and learning environments. Called “neuronal plasticity,” this phenomena is crucial for long-term memory and learning and proper levels of the omega 3 fatty acid, DHA (docosahexaenoic acid) are needed for this to occur.<sup>1151</sup>

The ratio of omega 6 fatty acids, which differ in structure and function, to omega 3 fatty acids also affects neuronal plasticity. Scientists now agree that the ratio of omega 6 fats to omega 3 fats is as important as the actual levels, especially in autism and ADHD. A lower ratio is better and when this ratio is improved, symptoms of autism and ADHD often improve.<sup>1155,1159</sup>

One Oxford University study demonstrated that fatty acid supplements given to children for 3 months who struggled with ADHD resulted in improvements in reading, spelling and behavior, which were not seen in a placebo group. When the placebo group in this study were given the same supplementation of essential fatty acids as a second part of this trial, the same improvements were eventually seen.<sup>1117</sup>

Stimulant drugs such as *Ritalin* are commonly prescribed for ADHD but studies show that **supplements can be equally effective in treating symptoms of ADHD.**<sup>1118</sup>

Differences in the fatty acid levels between people with ADHD and those without it are not wholly explained by differences in intake of either supplements or fatty acid-rich foods. This suggests that people with autism or ADHD are perhaps genetically predisposed to fatty acid deficiencies, and therefore metabolize fatty acids differently from normal controls. Children with low scores on behavioral assessment tests consistently have lower omega 3 fatty acids levels, and when supplemented with fish oils, the symptoms of ADHD in these children such as hyperactivity, impulsiveness, and inability to pay attention – dramatically improve.<sup>1115,1125</sup>

#### REFERENCES

- <sup>1164</sup>Gov AV et al. Total red blood cell concentrations of omega-3 fatty acids are associated with emotion-elicited neural activity in adolescent boys with attention-deficit hyperactivity disorder. *Prostaglandins Leukot Essent Fatty Acids* 2009;80:151-156.
- <sup>1168</sup>Cotler AL, Cutler C, Meckling KA. Fatty acid status and behavioural symptoms of attention deficit hyperactivity disorder in adolescents: a case-control study. *Nutr J* 2008;7:8.
- <sup>1151</sup>Ramakrishnan U, Imhoff-Kunsch B, DiGirolamo AM. Role of docosahexaenoic acid in maternal and child mental health. *Am J Clin Nutr* 2009;89:958S-962S.
- <sup>1155</sup>Bell JG et al. The fatty acid compositions of erythrocyte and plasma polar lipids in children with autism, developmental delay or typically developing controls and the effect of fish oil intake. *Br J Nutr* 2010;103:1160-1167.
- <sup>1159</sup>Schuchardt JP, Huss M, Stauss-Grabo M, Hahn A. Significance of long-chain polyunsaturated fatty acids (PUFAs) for the development and behaviour of children. *Eur J Pediatr* 2010;169:149-164.
- <sup>1117</sup>Harding KL, Judah RD, Gant C. Outcome-based comparison of Ritalin versus food-supplement treated children with ADHD. *Altern Med Rev* 2003;8:318-330.
- <sup>1115</sup>Richardson AJ, Montgomery P. The Oxford-Durham study: a randomized, controlled trial of dietary supplementation with fatty acids in children with developmental coordination disorder. *Pediatrics* 2005;115:1360-1366.
- <sup>1125</sup>Burgess JR, Stevens L, Zhang W, Peck L. Long-chain polyunsaturated fatty acids in children with attention-deficit hyperactivity disorder. *Am J Clin Nutr* 2000;71:327S-330S.
- <sup>1118</sup>Stevens L, et al. EPA supplementation in children with inattention, hyperactivity, and other disruptive behaviors. *Lipids* 2003;38:1007-1021. Scores on behavioral assessment tests consistently have lower omega 3 fatty acids levels, and when supplemented with fish oils, the symptoms of ADHD in these children such as hyperactivity, impulsiveness, and inability to pay attention – dramatically improve.<sup>1115,1125</sup>

# AUTISM

## Vitamin A

One cause of autism may be a defect in a retinoid receptor protein (G-alpha protein) which is critical for language processing, attention and sensory perception; Evidence suggests natural vitamin A fixes this protein defect in autistics.<sup>1,2</sup>

## Vitamin D

High dose vitamin D therapy reversed autistic behaviors in severely deficient children; Maternal vitamin D deficiency may predispose children to autism.<sup>3,4,5</sup>

## Carnitine

Transports fatty acids into cells; Low carnitine (common in autism) impairs the ability to use fatty acids for learning and social development.<sup>6,7</sup>

## Zinc

Eliminates toxic mercury from brain tissue; Zinc/ copper ratio is particularly low in autistic kids; Low zinc impairs the protein (called metallothionein) that removes heavy metals from the body.<sup>8,9,10</sup>

## Magnesium

Cofactor for the neurotransmitters that affect social reactions and emotion; Autistics have low levels; Improves effectiveness of B6 therapy.<sup>11,12,13</sup>

## Folate

Oral folate therapy can resolve symptoms of autism in some cases, particularly in autistics with genes that impair folate dependent enzymes.<sup>31,32,33</sup>

## Glutamine

Blood levels of this amino acid which acts as a neurotransmitter are particularly low in autistics. Glutamine also helps prevent leaky gut syndrome, which can exacerbate autistic symptoms.<sup>28,29,30</sup>

## Vitamin B6

Cofactor the neurotransmitters serotonin and dopamine; Conversion of B6 to its active form is compromised in many autistics; Supplementation trials with B6 resulted in better eye contact, speech and fewer self-stimulatory behavior in autistics; Some consider B6 in combination with magnesium to be a breakthrough treatment for autism.<sup>14,15</sup>

## Vitamin C

Improved symptom severity and sensory motor scores in autistic patients possibly due to interaction with dopamine synthesis; Vitamin C also has a strong sparing effect on glutathione.<sup>26,27</sup>

## Glutathione & Cysteine

Commonly deficient in autistic patients, lack of these antioxidants impair detoxification and methylation processes; Low levels linked to neurological symptoms in autism which is often considered an oxidative stress disorder.<sup>21,22,23,24,25</sup>

## Vitamin B1

Deficiency linked to delayed language development; Supplementation may benefit autistic patients.<sup>19,20</sup>

## Vitamin B12

Low B12 impairs methylation (detoxification) which causes the neurological damage responsible for many autistic symptoms; Deficiency of B12 can cause optic neuropathy and vision loss in autistics; B12 raises cysteine and glutathione levels.<sup>16,17,18</sup>

Copyright 2013 SpectraCell Laboratories, Inc.  
All rights reserved. Doc 385 02.13



# ADHD

## Antioxidant Status

Oxidative imbalance is prevalent in ADHD patients and likely plays a causative role; Deficiency of glutathione common in ADHD.<sup>3,4,5,6</sup>

## 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.<sup>1,2</sup>

## 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.<sup>7,8,9</sup>

## Magnesium

Deficiency linked to poor function of the neurotransmitters that control emotion, social reactions, hyperactivity and attention; Synergistic effect with Vitamin B6.<sup>8,9,10</sup>

## Choline

Precursor to neurotransmitter acetylcholine, which regulates memory focus and muscle control (hyperactivity).<sup>24,25,26</sup>

## 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.<sup>11,12,13,14</sup>

## 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.<sup>21,22,23</sup>

## 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.<sup>18,19,20</sup>

## 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.<sup>15,16,17</sup>

Copyright 2013 SpectraCell Laboratories, Inc.  
All rights reserved. Doc 388 02.13