

# Abstract

Acta Med Croatica. 2009 Oct;63(4):307-13.

## The role of zinc in the treatment of hyperactivity disorder in children

Dodig-Curković K, Dovhanj J, Curković M, Dodig-Radić J, Degmečić D.

University Department of Child and Adolescent Psychiatry, University Department of Psychiatry, Osijek University Hospital, Osijek, Croatia.

**BACKGROUND:** Zinc is an essential cofactor of more than 100 enzymes, including metalloenzymes and metalloenzyme complexes, which are necessary in the metabolism of carbohydrates, fatty acids, proteins and nucleic acids. It is an important factor in the metabolism of neurotransmitters, prostaglandins, and for maintaining brain structure and function. Dopamine is one of the most important factors in the pathophysiology of hyperactivity disorder, and the hormone melatonin has an important role in the regulation of dopamine. Because zinc is necessary in the metabolism of melatonin, it can be assumed that zinc is a very important factor in the treatment of attention deficit and hyperactivity disorder (ADHD).

**SUMMARY OF FINDINGS:** It is known that deficit of some minerals and vitamins is connected with hyperkinetic disorder. Preliminary investigations in humans show that many children with ADHD have lower zinc concentration in relation to healthy children. Zinc sulfate as an adjunct to methylphenidate has favorable effects in the treatment of ADHD children, pointing to the possible association of zinc deficit and ADHD pathophysiology. Zinc concentration can only point to some other factors (malnutrition) that can lead to ADHD, but is not a factor that has a causative role in ADHD. Therefore, zinc supplementation to nutrition or to ADHD therapy may be of great benefit in ADHD children with zinc deficit or low plasma zinc concentration. ADHD occurs in different cultures, mostly before seven years of age. In children younger than five years it is difficult to make an accurate diagnosis because their behavior is more variable than in older children. Hyperactive disorder is mostly observed in younger age, i.e. in childhood and adolescence. The majority of the main characteristics are less pronounced or completely lost in adult age. In the 1960s, the disorder was named "minimal cerebral dysfunction" and was most often the consequence of head trauma or low birth weight. Later, the term was changed as hyperactive reaction in childhood. Recent studies estimate its prevalence to three of ten hyperactive children, and there are data that about 4% of children have the complete frame of the disorder. The condition is more common in boys than in girls. The reason probably lies in the fact that girls primarily develop attention disorder and cognitive problems (concentration, memory, thinking), and less often have symptoms of aggressive and impulsive behavior, thus boys being earlier referred for examination. There are many theories about the possible origin of hyperactive disorder, and one of the most widely studied is the theory of the role of dopamine, which is supported by the results of treatment in these children with dopamine agonists like methylphenidate and amphetamines. Recent studies do not neglect the influence of maternal intake of food and drink additives, alcohol consumption and smoking during pregnancy, soil contamination, and low birth weight. Zinc is a coenzyme of the enzyme delta-6 desaturase, which is important in the anabolism of polyunsaturated long chain fatty acids, linolic and linolenic acids that constitute neuronal membrane. Studies point to the possible association of zinc deficiency and ADHD pathophysiology. In ADHD children with zinc deficiency or low plasma zinc concentration, zinc dietary supplementation or during therapy for ADHD may be of great benefit. A study of ADHD treatment with zinc sulfate as a supplement to methylphenidate showed beneficial effects of zinc supplementation in the treatment of children with ADHD. The dose of zinc sulfate used was 55 mg/day, which is equivalent to 15 mg zinc.

**CONCLUSIONS:** The improvement achieved in ADHD children with the use of zinc sulfate appears to confirm the role of zinc deficiency in the etiopathogenesis of ADHD. Additional studies are needed to identify the real and efficient dose of zinc.

PMID: 20034331