

# Oxidative stress and immune aberrancies in attention-deficit/hyperactivity disorder (ADHD): a case-control comparison

Verlaet AAJ, Breynaert A, Ceulemans B, De Bruyne T, Fransen E, Pieters L, Savelkoul HFJ, Hermans N.

Eur Child Adolesc Psychiatry. 2018 Oct 22.

doi: 10.1007/s00787-018-1239-4.

## Abstract

The objective of this study is to compare oxidative stress and immune biomarkers between attention-deficit/hyperactivity disorder (ADHD) patients and controls without ADHD. A case-control comparison between 57 paediatric (6-12 years) untreated ADHD patients from the Antwerp University Hospital and 69 controls without ADHD from random schools in Flanders, Belgium, was conducted. Erythrocyte glutathione (GSH) and plasma lipid-soluble antioxidants (retinol,  $\alpha$ -tocopherol,  $\gamma$ -tocopherol, retinyl palmitate,  $\beta$ -carotene, and co-enzyme Q10) were determined by HPLC with electrochemical detection, plasma malondialdehyde (MDA) by HPLC with fluorescence detection, plasma cytokines (interleukin (IL)-1 $\beta$ , IL-5, IL-6, IL-8, IL-10, tumour necrosis factor (TNF) and interferon (INF)- $\gamma$ ) and immunoglobulins (IgE, IgG and IgM) by flow cytometry and urinary 8-hydroxy-2'-deoxyguanosine (8-OHdG) levels by ELISA assay. Dietary habits were determined by a food frequency questionnaire. Plasma MDA levels were on average 0.031  $\mu$ M higher in patients than in controls ( $p < 0.05$ ), and a trend for higher urinary 8-OHdG was observed. Erythrocyte GSH and plasma retinyl palmitate levels, as well as IgG and IgE levels, were higher in patients than in controls as well (on average 93.707  $\mu$ g/ml, 0.006  $\mu$ g/ml, 301.555  $\mu$ g/ml and 125.004  $\mu$ g/ml, resp.,  $p < 0.05$ ). Finally, a trend for lower plasma IL-5 levels was observed. After Bonferroni correction for multiple testing, the difference in GSH levels remained statistically significant (nominally significant for retinyl palmitate), while significance was lost for MDA, IgG and IgE levels. Dietary habits do not appear to cause the observed differences. These results point at the potential involvement of slight oxidative stress and immune disturbances in ADHD.