Major Plasma Carotenoids Levels in Growth Hormone Deficient Children

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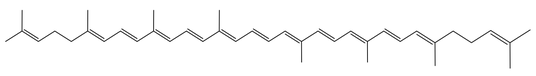
BACKGROUND

Carotenoids are potent antioxidants that affect many different metabolic processes. In plasma, carotenoids are transported with lipoproteins. Growth hormone deficiency (GHD) is known to induce oxidative stress and deterioration in the lipid profile, which can change the level and composition of carotenoids. Particularly interesting to measure these parameters in GHD children.

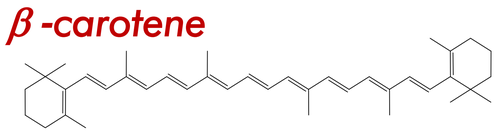
METHODS

The 13 prepubertal treatment-naive children (2 girls, 11 boys; aged 3.5-12.0 yr; median 8.0 years) with GHD and 7 prepubertal health children (7 boys; aged 6-11 years; median 9.3 years) were included in the study. The levels of total carotenoids, lutein (with zeaxanthin), various forms of lycopene, cryptoxanthin, and α- and β-carotene were measured using HPLC. Total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C), and triglycerides (TG) were measured. Activity of antioxidant system was also examined by thiobarbituric acid reactive substances (TBARS), ceruloplasmin and total antioxidant capacity (TAC).

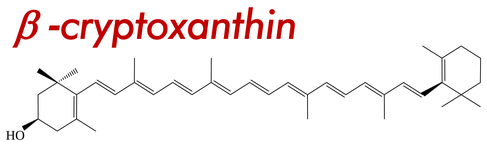
lycopene



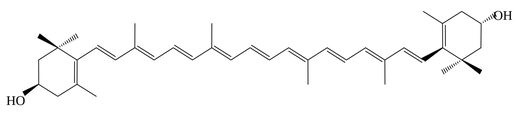
β -carotene



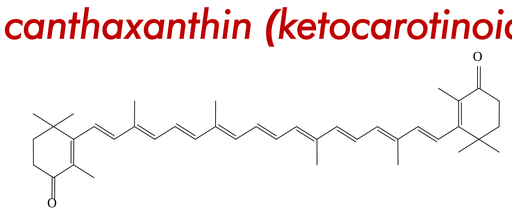
β -cryptoxanthin



lutein



canthaxanthin (ketocarotinoid)



The parameters of the blood prooxidant and antioxidant systems

Parameters	Substance function
Total antioxidant capacity of plasma (TAC)	total antioxidant capacity (TAC) of plasma was evaluated by FRAP (ferric reducing antioxidant power or ferric reducing ability of plasma), the TAC value proportional to the reducing power of the mainly nonenzymatic antioxidants in the plasma, mainly uric and ascorbic acids, but don't detect reduced glutathione and liposoluble antioxidants (e.g. carotinoids)
Thiobarbituric acid reactive substances (TBARS)	Proportional to the level MDA as end product of lipid peroxidation, one of the main markers of oxidative stress in plasma
Ceruloplasmin (CP)	Converts of superoxide anion radicals in plasma into water without formation of hydrogen peroxide, and plays a role in the transport, distribution and metabolism of Cu and Fe initiating generation of ROS

HPLC measurement

For pigment assay, the extraction by Folch was used (the lower (chloroform) fraction). The total pigment extracts were subjected to HPLC analysis using an Alliance 2995 separation module (Waters, USA) equipped with a 150 × 4.5-mm Prontosil RP C-18 column maintained at 25 C and a Waters e2695 DAD detector. The gradient elution of pigments was achieved at a flow rate of 1 mL min–1 using (A) acetonitrile, (B) water, and (C) ethyl acetate mixtures (vol. %): for the 'red' cell extracts, 98 : 2 : 0 (2 min), 40 : 0 : 60 (10 min), 0 : 0 : 100 C (2 min) followed by 6-min re-equilibration of the column; for the 'green' cell extracts: 98 : 2 : 0 % B (5 min); 48.5 : 1.2 : 50, 0 : 0 : 100 (3 min) followed by 6-min re-equilibration. Eluted components spectra were monitored in the range 400–700 nm. Pigments were identified and quantified using authentic standards (Sigma, USA).

OBJECTIVES

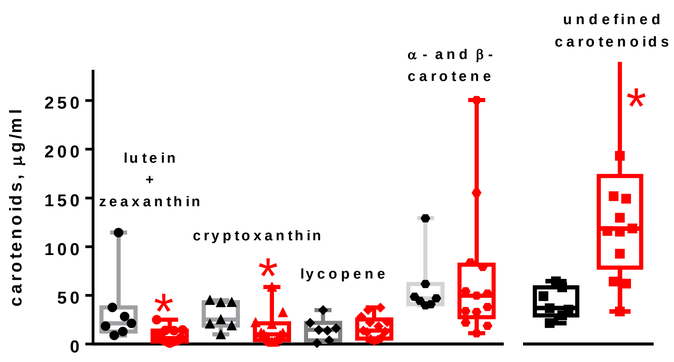
The aim of this study is to examine the amount and percentage of main plasma carotenoids in prepubertal treatment-naive GHD children.

RESULTS

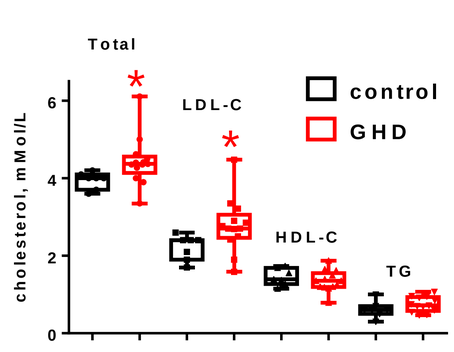
The level of TBARS, TC and LDL-C in GHD children was higher than in healthy children (median 5.6 vs 3.8 μM/L, 4.00 vs 4.37 and 2.40 vs 2.70 mM/L, respectively), whereas total carotenoid level did not significantly differ. However, content of lutein and cryptoxanthin were significantly lower in GHD children than in control group (2.4 vs 13.5 and 5.0 vs 13.7 %, respectively), in contrast to lycopene and α- and β-carotene (5.6 vs 8.0 and 22.2 vs 28.9 %, respectively). At the same time the percentage of undefined substances in GHD children increases (52.9 vs 20.9 %).

statistical significance between parameters of control and case groups, value was evaluated using Mann — Whitney U- test, $p<0.05$

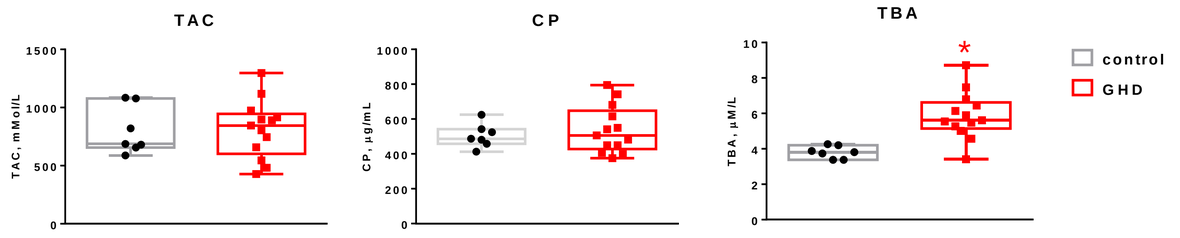
carotenoids



cholesterol



The antioxidant status parameters



CONCLUSIONS

We observed a mild oxidative stress and the altered lipid profile in GHD children. Very likely carotenoids protect the lipoproteins from oxidation, which change their composition.

Authors have nothing to disclose

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Growth

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