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Changes in the concentration of micronutrient (MN) composition and hair structure in children with alopecia

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Introduction & Objectives: The science of micronutrients (MN) remains at the stage of amassing factual material. Hair is a reliable and non-invasive source of information about the MN content in the body, for its metabolism is slow and only long-term disturbances in the concentration of nutrients can be reflected in it. The attention of many researchers has been drawn to the hypothesis of the influence of exogenous and endogenous factors on the hair functional status, especially with regard to essential and toxic MN.

Today a tendency towards an increase in the number of paediatric patients with hair diseases ranging from excessive hair loss to various clinical forms of alopecia is observed.

Objectives. The study was aimed to identify the MN imbalance, manifested through the condition and appearance of hair, to follow structural changes in hair and to assess the influence of internal organ pathologies.

Materials & Methods: During one year 27 patients with various forms of alopecia and 15 basically healthy children were examined using various methods, which included laboratory-instrumental examination and counselling by appropriate experts. Hair MN content was determined via quantitative and qualitative emission spectral analysis using spectrographs STE-1 and ICP-51. The hair structure was studied employing scanning electron microscopy (SEM) performed with a TESLA BS-300 scanning electron microscope.

Results: There were 17 boys and 10 girls with focal, marginal and diffuse forms of alopecia, which at the disease onset was manifested by increased hair loss. Digestive disorders (chronic gastritis, hepatitis, intestinal dysbacteriosis) and endocrinopathies (thyroid antibody titre, clinical disorders of glucose tolerance) were detected for the first time and prevailed in 83% of examined subjects.

Resting on quantitative indices we established the difference between the ME content in hair of patients suffering from a variety of forms of alopecia and the norm. Statistically reliable in marginal alopecia is the increase in magnesium 30.7+-11.81 μg/g, chromium 1.54+-0.48 μg/g, manganese 2.9+-0.9 μg/g, iron 11.3+-3.64 μg/g, copper 3.71+-1.15 μg/g, barium 6.7+-2.6 μg/g, lead 3.11+-1.0.9 μg/g, and in focal alopecia a statistically true elevation of vanadium 0.57+-0.25 μg/g, in diffuse alopecia silicon 18.5+-6.6 μg/g, iron 8.75+-2.93 μg/g, copper 2.95+-1.02 μg/g was observed. SEM revealed several types of structural changes in the root structure: a) with remnants of root sheaths; b) atrophic, without root sheaths; c) with root sheaths. The stem structure showed protrusions and depressions, absence of a tile-like pattern.

In characterising the hypothetical mechanism of the possible toxic effect of the above-mentioned MNs, which hair content significantly statistically differs from that of the reference group, it can be assumed that it involves a complex interaction, which causes possible occurrence of increased hair loss.

Conclusion: Increased hair loss and various forms of alopecia are associated with significant MN imbalance. Changes in the structural and spectral makeup of hair in examined patients indicate the atrophic nature of alopecia and the expediency of providing patients with appropriate pathogenetic therapy taking into account the MN hair content.