Background

Essential trace elements (iron, iodine, copper, manganese, zinc, cobalt, molybdenum, selenium, chromium, fluoride) are part of enzymes, vitamins, hormones and directly affect the endocrine system in various stages of its development. Deficiency of essential tracer elements as their excess can lead to disorders of the children development and growth and also to increase already existing growth delay. An information about the content of essential tracer elements in children and adolescents with different forms of short stature is not enough in the professional literature, data on the relationship of growth hormone / insulin-like growth factor-1 system and content of essential trace elements in blood plasma are practically absent. There are no the complex studies of several essential tracer elements content in children of different age groups with growth hormone deficiency.

Objective: to study the possible relationship between the content of insulin-like growth factor-1 (IGF-1) and essential tracer elements (zinc, selenium, copper, manganese, chromium) in plasma of children with short stature of different genesis.

Materials and Methods

The content of insulin-like growth factor-1 was determined once a morning in the blood sample by radioimmunoassay using standard kits «IRMA IGF-1" firm «Immunotech» (Czech Republic). The body height was measured using stadiometer «System Dr. Keller J.», the body mass using Seca electronic scales. The atlas of W.W. Greulich, S.P. Pyle (1993) was used to determine the bone age. The content of trace elements (zinc, selenium, manganese, chromium, copper) in plasma was also determined by X-ray roentgen fluorescent spectrometer «ElvaX-med» (Ukraine) using the method of measuring chemical elements in blood plasma (method MVV 081 / 12-0468-07), certified by Ukrainian State Committee for standardization, metrology and certification (Certificate of 12.10.2007) and approved by the State sanitary and epidemiological service of Ukraine (Decree №8 from 05.10.2000).

Results

The content of insulin-like growth factor-1 and essential tracer elements (zinc, selenium, copper, manganese, chromium) in blood plasma of children with short stature, depending on the etiology of the disease was studied. All 206 patients (mean age 10.06 ± 0.2 years) with short stature (144 boys, 69.9 %) were divided into five groups: group I - patients with isolated (complete) somatotropic deficiency (66 patients); group II - patients with partial somatotropic deficiency (36 individuals); group III - 29 patients with short stature, due to the syndrome biologically inactive growth hormone (type Kowarski), group IV - patients with familial constitutional short stature (66 people) and group V - patients with genetically determined short stature (9 persons). Observation period was 4 years. The presence of a significant imbalance of
essential tracer elements was established in patients with short stature, primarily caused by deficiency of growth hormone and insulin-like growth factor-1. A significantly weak correlation between indicators of IGF-1 and the average level of zinc in the blood plasma of children with short stature was revealed in the whole group. At the same time, the significant strong correlation between indicators of insulin-like growth factor-1 and zinc was demonstrated in blood plasma of children with isolated somatotropic deficiency - full or partial. No correlation between indicators of insulin-like growth factor-1 and indicators of selenium, manganese, chromium, copper in plasma was noted.

**Conclusions**

Short stature due to growth hormone deficiency (full or partial) in children is associated with a sharp reduction of insulin-like growth factor-1 and zinc in blood plasma. Examining children with growth hormone deficiency it is advisable to study the zinc content, and in a case of its deficiency, an addition of the zinc drugs to complex therapy of short stature is required.