



BIOCHEMICAL CHARACTERISTICS OF IRON METABOLISM IN NEWBORNS AND CHILDREN OF THE FIRST YEAR OF LIFE

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ABSTRACT

As a rule, all children's diets contain marginal, or maximum, amounts of digestible dietary iron. At the same time, children have increased dietary iron requirements due to rapid growth, weight gain, increased circulating blood volume, and the accompanying intensification of erythropoiesis. All of this undoubtedly impacts iron metabolism in the child's body, as well as the exchange of metabolic forms of iron—transport and storage iron—which are represented in the peripheral blood by serum transferrin and ferritin, respectively. The levels of these metalloproteins in the bloodstream are regulated by a feedforward and feedback loop with the overall pool of iron stored in the body. Therefore, these metalloproteins can be considered sensitive biochemical markers of iron metabolism in the body, and their bloodstream levels can be used in the diagnosis of iron deficiency conditions and in monitoring treatment.

Purpose of the work. To study the serum transferrin and ferritin levels, which reflect plasma and deposited iron levels, respectively, in newborns and children in the first year of life.

Materials and methods of research. The study utilized umbilical cord blood and microsamples of blood from infants in the first year of life, obtained with the consent of their mothers. Transferrin levels were measured using an immunoassay using rabbit anti-human transferrin serum, and ferritin levels were measured using an enzyme-linked immunosorbent assay.

Results and discussion. It has been shown that iron status in the neonatal period and during the first year of life is subject to certain fluctuations, which reflect the phenomenon of substitution of the stable mechanism of iron supply to the child's body - the placental one - for a less stable one - the dietary mechanism. According to our data, the neonatal period is characterized by pronounced hyperferremia (the average serum iron level is $34.8 \pm 1.1 \mu\text{mol/L}$) and hyperferritinemia ($232.0 \pm 13.7 \mu\text{g/L}$) against the background of hypotransferrinemia ($1.96 \pm 0.04 \text{ g/L}$). It was noted that in the first month of life, the concentration of ferritin in the blood serum increases even more (on average, according to our data, to a level of $298.5 \pm 14.7 \mu\text{g/L}$), which is a characteristic sign of the phenomenon of physiological suppression of erythropoiesis in response to the increasing postnatal oxygen supply to the tissues of the newborn's body. During this period, the iron entering the bloodstream after the destruction of red blood cells is not reutilized by the erythron, since the intensity of erythropoiesis is reduced, and iron accumulates in the body's iron reserve fund, which is precisely what manifests an increase in the ferritin content in the bloodstream. Iron reserves in newborns are quite impressive, an average of 2320 mg of iron, given that there is a direct correlative relationship between the amount of reserve iron and the level of ferritin in the blood serum (1 $\mu\text{g/L}$ of ferritin corresponds to 10 mg of reserve iron). During the first year of life, iron

stores in children progressively decline to 550 mg, due to increased erythropoiesis and the accompanying increased consumption of stored iron. Concurrently, transferrin levels in the bloodstream increase (almost twofold), averaging 350.0 g/L, as increased erythropoiesis requires active iron transport into the erythron and, consequently, an increase in the amount of transferrin that carries this iron.

Conclusions. The metabolism of the main hematopoietic biometal iron was studied in children during the neonatal period and the first year of life.

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