

# FERROCINETIC STATUS OF ADOLESCENT'S ORGANIZM

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**Introduction.** Chronologically the pubertal period tends to an increasing risk of clinical onset of iron-deficiency of teenagers population.(1). It is known that this period of age is specified as an acceleration phenomenon attended with the period of sexual development. In turn, the acceleration leaves its mark on the state of ferrum metabolism in human organism declaring itself in raucous increase of need in alimentary ferrum, which is conditioned by the growth of circulating blood volume and consequently, by the increase of eritropoiesis intensity, as well as a considerable growth of a body mass, e.g. at a peak year of this chronological period boys gain weight by 10 kg and girls by 9 kg. (2). To maintain stable concentration of hemoglobin in an increasing blood volume human organism needs 300 mg Fe during a pubertal period.(3). The peak time of the pubertal period of girls usually concurs with beginning of menstruation, in average menstrual blood loss in capacity of 30 ml of a 15 year old girl is equal to approximately 170 mg iron loss a year.

Thus, ferrum metabolism at the pubertal age effects during ferrostress, which is conditioned by arising disbalance between increasing needs in Fe and its limited supply from diet, accordingly marginal content of iron in utilized diets and onset of physiological loss of iron, which is conditioned by menstrual blood loss. Thereby, a regular monitoring of adolescent ferrum state with various functional

iron pools portray takes on special significance for practical health care in the aspect of programs on hemoglobin rehabilitation in risk groups.

**Objectives** – the investigation of ferrocenic state of healthy adolescent organism.

## **MATERIALS AND METHODS**

40 symbolically healthy teenage boys and 40 symbolically healthy teenage girls (15-16 year old) from Tashkent city with total hemoglobin level over normal inferior physiological line established for adolescents by WHO were studied through a random unrepeated selection. The condition of a plasma labile pool of ferrum was estimated by serum transferrine iron level, as described in (4). The state of spare deposited iron pool in human body was estimated by serum transferrine and ferritine, as described in (4). Moreover, derivative index-saturation of a general transferrine iron pool was analysed, as described in (4).

Besides, such informative index of Fe metabolism state as transferrine spectrum of blood serum was also studied, as described in (4).

The output was processed by the method of variation statistics with the estimation of mean arithmetic variation line (M), mean arithmetic of mean error (m), difference veracity of mean quantity (p).

## **DISCUSSION and OUTPUT**

Hemoglobin health of symbolically healthy teenage boys is characterized with sufficiently high total hemoglobin level; reference interval of this index was 130.0 gr/l (min) – 144.0 gr/l (max), in an average index –  $134.2 \pm 0.9$  gr/l, while this index of the same group of girls showed 120.0 gr/l (min) – 138.4 gr/l (max), in an average index –  $125.6 \pm 0.78$  gr/l ( $p < 0.001$ ).

In our investigation we used such index for estimating plasma labile iron pool as an index of serum transferrine iron, as (4) shows, which reflects that part of

serum iron that is associated with basic transport proteins of blood serum - transferrine. In other words, transferrine ferrum is functional iron of serum which arrives in transferrine formulation into a bone marrow to generate hemoglobin. We identified that the level of functional transferrine iron of teen boys in average was  $20.6 \pm 0.45$  micromole/l in reference interval of this index it was 23.6 micromole/l (max) – 18.5 micromole/l (min). The index of the same group of girls showed –  $17.8 \pm 0.62$  micromole/l in reference interval of this index it was 22.4 micromole/l (max)- 14.3 micromole/l (min). In comparative aspect, teen girls have lower plasma labile saturation of iron pool ( $p < 0.01$ ). It would be interesting to note, that in quantitative scheme of a plasma labile pool of ferrum reflected by the index of serum transferrine iron and teenage boys and girls being studied have lower index, approximately for 3-3.5%, than the pool reflected by serum iron index, provided if this index is analysed by the unified betophenanol technique of Henry.

One of the informative parameters mirroring spare deposit pool of Fe in human is an index of a total pool of transferrine in blood serum, as its concentration in serum is regulated by the total stock of iron in human body based on feedback inhibition, when exhaustion of pool stock in compensatory manner increases synthesis of this protein in hepatocyte, releasing it into blood flow, thereby increasing it in blood concentration. Physiological sense of such compensatory growth of a transferrine content in blood flow is to provide an accelerated turnover of Fe in human organism and physiological strength of eritropoesus. We recorded that the average stage of total transferrine in blood serum of symbolically healthy teen boys as  $3.15 \pm 0.02$  gr/l in referent interval of this parameter from 3.35 gr/l (max) – 2.95 gr/l (min), whereas the analogous parameter of the girls –  $3.24 \pm 0.02$  gr/l in referent interval of this parameter from 3.32 gr/l (max) – 3.10 gr/l (min). It is obvious, that differences in this important index conditioned by gender is not lost.

The study of isotransferrinised specter of blood serum of the teenage boys and girls, differentiated analysis of various molecular isoform of this protein, which differ in ferrum satiation, particularly, in differitransferrine (total transferrine

ferrum saturation which is functional in the aspect of ferrum supply of germinating eritroblasts) and apotransferrine (unsaturated ferrum transferrine –functionally inactive) showed, that in total transferrine pool of teenage boys and girls have functionally active transferrine – differitransferrine, its portion in total pool in percentagewise is 58% и 50%, accordingly, reflecting an evident degree of physiological eritropoesus. Here it should be noted, that such parameter in the last years is regarded as a quick - response barometer of ferrum metabolic status of a human body, since pathophysiological fluctuation in isotransferrine specter, as a rule, has its place against the background of still stable level of total transferrine in blood serum.

The saturation of a general transferrine iron pool, ranking with the indicators of ferrum metabolism that shows transferrine satiation rate (TSR) of the studied teen boys, in average, is  $26.1 \pm 0.52\%$  in referent interval of this index from 30.5% (max) – 24.1% (min), the symbolically healthy teen girls –  $22.0 \pm 0.6\%$  in referent interval of this index from 30.0% (max) – 19.5% (min). A high level of the saturation of a general transferrine iron pool is a sign of physiological rate of Fe turnover between ferrous plasma pool in a human organism and marrow for aphysiological eritropoesus supply. Another significant informative indicator of a spare deposited iron pool in a human body, as is known, is ferritine circulating in blood serum, which already makes it possible for a quantative estimation of ferrum stock in human, as indicates between ferritine level in blood serum and iron stock in a body; there are straight quantitative correlations manifesting, that ferritine content in serum in 1 ng/ml quantitatively correspond to 8-10 mg of ferrum stock, which was determined on the basis of dosed flebotomy and diminution of stained iron in marrow smears. We identified, that serum mean ferritine level of teen boys was  $55.96 \pm 1.84$  ng/ml in referent interval of this index from 76.05 ng/ml (max) – 44.69 ng/ml (min), for the teenage girls -  $49.01 \pm 1.60$  ng/ml in referent interval, appereantly, there is statistically reliably difference (  $p < 0.001$ ), conditioned by gender. Compared indicators of ferrum metabolism of studied boys and girls is shown in table 1.

Table 1. Ferrum metabolism indicators of symbolically healthy teenage boys and girls.

Beeng studied	Statistical indicator	Hemoglobin gr/l	Transferrine iron serum, micromole/l	Transferrine serum gr/l	TSR, %	Ferritine serum ng/ml
Boys	Min	130.0	18.5	2.95	24.1	44.69
	Max	144.0	23.6	3.35	30.5	76.05
	M ± m	134.2±0.9	20.6±0.48	3.15±0.02	26.1±0.52	55.96±±1.8
Girls	Min	120.0	14.3	3.10	19.5	40.24
	Max	138.4	22.4	3.32	30.0	60.83
	M ± m	125.6±0.7	17.8±0.62	3.24±0.02	22.0±0.60	49.01±1.60
P		<0.01	<0.01	<0.001	<0.001	<0.001

Note: p-veracity between compared indicators of symbolically healthy teenage boys and girls.

Hence, one may conclude, that in magnitude relation ferrum stock of symbolically healthy teenage boys, in average, is 447.7 – 559.6 mg iron, while this number constitutes 392.1 – 490.1 mg iron for symbolically healthy teenage girls.

### Output

1. The received index of Fe metabolism state, reflecting different functional ferrum pools in a human body, based on investigations of healthy teenage boys and girls may be used as informative ferrocinetic probes in ferrum state monitoring, in whole hemoglobin health of adolescent population.

2. In the index of Fe metabolism of symbolically healthy boys and teenage girls there is reliable difference, conditioned by gender.

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## RESUME

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Ferrocinetik status of organism of healthy adolescents-boys and girls by parameters, reflected some functional funds of iron in organism-plasma and storage was studied. Parameters of serum transferrin iron,transferrin and ferritin of serum, saturation of transferrin by iron and isotransferrins spectrum-saturated and unsaturated forms of transferrin-holo- and apotransferrin were studied. This parameters may be used in biomedical monitoring of hemoglobin healthy in adolescents.