

PRACTICAL RECOMMENDATIONS CONCERNING PREVENTION AND CORRECTION OF IRON DEFICIT IN ATHLETES

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Annotation. *Purpose:* To develop practical recommendations for the prevention and correction of iron deficiency in athletes to improve the effectiveness of training and competitive activities, and accelerate recovery processes. *Material:* analysis and compilation of scientific and methodological literature on the exchange of iron, as well as ways of prevention and correction of iron deficiency in athletes. *Results:* It was found that iron deficiency in the body athletes may reduce sports (general and special) capacity and the situation of overtraining. The basic approaches on how to prevent and correct iron deficiency in athletes through nutrition. *Conclusions:* practical recommendations for the prevention and correction of iron deficiency in athletes.

Key words: iron deficit, correction, athletes, prevention, nutrition.

Introduction

Athletes' mineral deficiency associated by influence of various negative factors (specially extremely physical and psycho-emotional stress) [1, 5, 9]. According to different authors iron deficit is common and its' originate from inadequate nutrition [3, 14, 19].

Iron is the most important microelement and takes part in energy metabolism. This microelement is necessary for the creation of hemoglobin, myoglobin and it is a component of many enzymes and cytochromes [2, 4, 7]. Iron deficiency lead to decreasing of sports performance and overtraining [10, 16].

Also latent iron deficiency is frequent phenomenon. Iron deficiency is due to by different reasons, such as:

- iron deficiency in the diet;
- iron malabsorption;
- iron losses with sweat, urine, bleeding gums, etc.;
- low content of protein, vitamins C, B6, B12, folic acid in the diet;
- repartition of protein and iron for the creation of myofibrils' myoglobin as response to physical activity;
- hemolysis (destruction) of erythrocytes in the vessels;
- increased individual physiological iron needs in response to exercise;
- physiological losses of hemoglobin in female athletes;
- hemoglobin concentration decrease occurs due to increasing the volume of circulating plasma [11, 16,

18].

Thus, the study of methods of prevention and correction of athletes' iron deficit by using nutrition is an actual problem. Herewith, the development of practical recommendations permits the use of this knowledge to prevent athletes' iron deficiency.

The aim, tasks of work, material and methods.

The aim – to develop the practical recommendations of prevention and correction of athletes' iron deficit for increasing sports performance and acceleration the recovery processes.

Methods of research: the literature review about athletes' iron deficit and the ways of its correction.

Results.

According to different authors iron deficit is common and originate from inadequate nutrition [1, 13, 17]. Often athletes' diet contains a small percentage of foods with sufficient iron amount. Therefore athletes should are increased the consumption foods with high iron levels for prevention and correction of athletes' iron deficiency (table 1).

Table 1

The iron content in foods

№	Food	Iron/100 g
1.	Cocoa	22,0
2.	Pig liver	20,2
3.	Chicken liver	17,5
4.	Sea cabbage	16,0
5.	Mollusks	11,0
6.	Veal liver	9,0

№	Food	Iron/100 g
7.	Veal kidneys	7,1
8.	Pea	6,8
9.	Buckwheat	6,7
10.	Bean	5,9
11.	Chocolate bitter	5,6
12.	Beef tongue	5,0
13.	Almond	4,2
14.	Rye-bread	3,9
15.	Oat flakes "Hercules"	3,6
16.	Rabbit meat	3,3
17.	Apricots halves	3,2
18.	Raisins	3,0
19.	Prune	3,0
20.	Hazel-nut	3,0
21.	Briar dry	3,0
22.	Egg	2,5
23.	Apples	2,2
24.	Chocolate milky	1,5
25.	Chicken breast (fillet)	1,4
26.	Bread	1,1
27.	Rice grits	1,0

It should be noted that two types of iron exist (heme and non-heme). Heme iron (iron that is a part of hemoglobin) is better absorbed and contained in animal foods. That's exactly why athletes' diet should contain many foods with heme iron. As a result, a small amount of iron from food can consume. Foods which rich by phytates and polyphenols (coffee, tea, cocoa and red wine) can also greatly reduce the non-heme iron absorption (table 2).

Table 2

Foods with a low and high levels of phytates

Foods with a high levels of phytates	Foods with a low levels of phytates
Oat flakes (fast food)	Most fruits and vegetables
Soy flour	Sweet Corn
Nuts	Potatoes boiled in their jackets
Seeds	White bread
Nut oil	Apples
Muesli	Broccoli
Whole wheat bread	Strawberries and other berries

Athletes' diet should contain plenty of protein, so its' amount in the diet should be increased by 10 – 20% beside physiological norms. Protein is a necessary for the better absorption of iron and for creation of red blood cells

and hemoglobin. Also lipids suppress hematopoiesis, so their amount in the diet should be limited. It is subject to fatty meat, fish, lard, fatty sausages, cow and lamb fat.

Sufficient quantity of vitamins (thiamin, riboflavin, pyridoxine, cyanocobalamin, niacin, folic acid, ascorbic acid) is also necessary, because they are participating in erythropoiesis.

It is known that calcium reduces the absorption of iron, so foods that contain iron should be consumed separate with calcium high level foods.

Unfortunately a lot of recommendations in the scientific literature are general nature and therefore it is unclear how to apply this knowledge in practice. Therefore, we have proposed meals with high and low iron bioavailability for better understanding and for the further use of these guidelines in practice (table 3).

Table 3.

The meals with high and low iron bioavailability

The meals with high bioavailability	Serving size, g	Iron content, g	The meals with low bioavailability	Serving size, g	Iron content, g
Borsch	500	3	Rice soup	500	1,3
Bean soup	500	4,5	Okroshka with sour cream	500	2,0
Boiled tongue, buckwheat, black currant sauce	100/150/50	10,2	Stewed pork, mashed potatoes, cream sauce	100/150/50	2,5
Stewed liver (beef)	100	5	Chicken patty cake	100	1,8
Pasta with beef	200	1,8	Pasta with cheese	200	1,2
Shrimp salad with lemon juice	130	1,5	Salad Olivier	130	1,4
Fresh apples	100	2,2	Apple sauce	100	1,3
Fruit salad dressed with yogurt	300	3,3	Fruit yogurt	300	0,3
Pastille glazed with chocolate	100	3,2	Ice-cream	100	0,2
Marmalade glazed chocolate	100	2,6	Danish with hard sauce	100	0,5
Dried fruit compote	200	2,2	Tea	200	-
Apple juice	200	2,8	Grape juice	200	0,8
Grenadine juice	200	2,0	Peach juice	200	0,4

Conclusions:

1. Adequate and balanced nutrition is the basis for prevention and correction of athletes` iron deficit.
2. Foods of animal origin (meat, poultry, liver, kidney, etc.) are the main sources of iron.
- 3 The next practical recommendations are necessary for better iron absorption:
 - content of foods with high iron levels should be increased in the diet;
 - foods of animal origin should be used together with high carbohydrate foods (for better absorption of non-heme iron);
 - foods high in phytin (cereals, flour products) should be combined with products rich in vitamin C (fruit juices, berries, cabbage brokoli, fruit-drink with berry, briar drink, uzvar, fruit compotes, etc.);
 - don`t add screenings to the diet as they are rich in phytates;
 - foods that contain iron should be consumed separate with calcium high level foods (calcium reduces the absorption of iron);
 - strong tea and coffee must be eliminate from the diet.

The further prospects of the researches are introduction this practical recommendations into practice of training national teams of Ukraine.

References

1. Borisova O.O. *Pitanie sportsmenov* [Nutrition athletes], Moscow, Soviet sport, 2007, 132 p.
2. Gol'berg N.D., Dondukovskaia R.R. *Pitanie iunykh sportsmenov* [Nutrition young athletes], Moscow, Soviet sport, 2007, 240 p.
3. Osipenko G.A., Vdovenko N.V., Voroncova V., Durmanenko V. *Aktual'ni problemi fizichnoyi kul'turi i sportu* [Contemporary problems of physical culture and sports], 2012, vol.23, pp. 49-52.
4. Kalinskij M.I. *Pitanie. Zdorov'e. Dvigatel'naia aktivnost'* [Nutrition. Health. Motor activity], Kiev, Scientific opinion, 1990, 176 p.
5. Koval' I.V., Vdovenko N.V., Kozlovs'kij V.O. *Aktual'ni problemi fizichnoyi kul'turi i sportu* [Contemporary problems of physical culture and sports], 2008, vol.14, pp. 53-59.
6. Poliaev B.A., Makarova G.A. *Kratkij spravochnik vracha sportivnoj komandy* [Quick reference of a doctor of sports team], Moscow, Soviet sport, 2007, 336 p.
7. Martinchik A.N., Maev I.V., Ianushevich O.O. *Obshchaia nutritivologiya* [Total nutritology], Moscow, MED press-inform, 2005, 392 p.
8. Makarova G. A. *Sportivnaia medicina* [Sports medicine], Moscow, Soviet sport, 2006, pp. 261-265.
9. Kristin A. Rozenblium. *Pitanie sportsmenov* [Nutrition athletes], Kiev, Olympic Literature, 2006, 536 p.
10. Smul'skij V.L., Monogarov V.D., Bulatova M.M. *Pitanie v sisteme podgotovki sportsmenov* [Nutrition in the training system athletes], Kiev, Olympic Literature, 1996, 222 p.
11. Sazonov V.V., Koval' I.V., Vdovenko N.V. *Sportivnaia medicina* [Sports medicine], 2009, vol.1-2, pp. 17-29.
12. Sejfulla R.D., Ordzhonikidze Z.G. *Lekarstva i BAD v sporte* [Medications and biologically active additives in sport], Moscow, Literature, 2003, 320 p.
13. Skurikhin I.M., Shaternikov V.A. *Kak pravil'no pitat'sia* [How to eat right], Moscow, Agropromizdat, 1989, 256 p.
14. Loshkareva E.A., Ivanova A.M., Fus S.V., Kirilenko E.K. Status zheleza, medi i cinka u sportsmenov, specializiruiushchikhsia v akademicheskoy greble [Status of iron, copper and zinc in athletes specializing in rowing]. *Sportmed-2010* [SportMed 2010], Moscow, 2010, pp. 181–182.
15. Kulinenkov O.S. *Farmakologiya sporta v tablicakh i skhemakh* [Pharmacology sport in tables and figures], Moscow, Soviet sport, 2011. 192 c.
16. Shakhlina L.IA.-G., Vovchanycia IU.L., Tereshchenko T.A. *Sportivnaia medicina* [Sports medicine], 2013, vol.2, pp. 27-33.
17. Burke L. *Practical sports nutrition*. Human Kinetics, 2007, 532 p.
18. McClung J.P. Iron status and the female athlete. *Journal of Trace Elements in Medicine and Biology*. 2012, vol.26 (2 – 3), pp. 124 – 126.
19. Thomas R. Iron deficiency in athletes. *American Journal of Lifestyle Medicine*. 2012, vol.6(4), pp. 319-327.

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