NUTRITION PECULIARITIES AND ELEMENTAL STATUS OF NUCLEAR INDUSTRY WORKERS

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SUMMARY: A comparative analysis of hair elemental content and nutrition peculiarities of nuclear industry workers was carried out. It was shown, that workers did not receive enough Se, Ca, I and Mn (provision of chemical elements at the level ~70% of daily requirement), but provision of the majority of vitamins, fibers, fats, carbohydrates and food value of a diet was satisfactory. As was established that the reason of hair elemental content imbalances of majority of chemical elements was not their inadequate content in diets, but was due to a profession of workers.

Introduction

Today insufficiency of micronutrients in diet is the main factor negatively influencing on health, growth and development of all the population of the planet. It is well-known, that trace elements are necessary components of nutrition (Anke, 1999), and the level of their intake to the organism depends on their content of foodstuff and water. On the other hand, it is well-known, that human scalp hair reflects element status of the organism. Thus, studying of provision of diets by micronutrients, and also comparison of the received results with hair elemental content, are very interesting.

Material and methods

During 2003-2004 provision of diets of a Novosibirsk factory (nuclear industry) workers with essential macro- and trace elements and peculiarities of hair element structure were investigated.

For this aim diets of 6 workers, eating during the working day in dining rooms of the factory and the preventorium menu were analyzed. The calculations were carried out with the help of the specialized program "Aspon-pitanie" certificated by Ministry of Health of Russian Federation.

Analytical determination of hair elemental content has been carried out by atomic emission spectrometry with inductively coupled argon plasma (ICP-AES) method using ICAP-9000 (Thermo Jarrell Ash, USA) and Optima 2000 DV (Perkin Elmer, USA) spectrometers. Hair analyses were carried out in accordance with IAEA recommendations and methodical guidelines of Ministry of Health of Russian Federation. For the check-up of our laboratory data the certified reference material of human hair GBW09101, obtained from Shanghai Institute of Nuclear Research, was used (Skalnaya et al., 2004). Statistical calculations were made using Microsoft Excel XP application package.

Results and discussion

As a result of studying nutrition peculiarities it has been established, that a typical diet of workers does not provide them with enough Se, Ca, I and Mn (provision at the level ~70% of the daily requirement). At the same time, provision of the majority of vitamins, fibers, fats, carbohydrates and food value of a diet was satisfactory.

Diet offered in preventorium had insufficient amount of Se, Ca and I (61%, 73% and 75% of the daily requirement, accordingly). In some diets moderate deficiency of Mn and Fe was marked. As a whole, men are provided with macro- and trace elements to a lesser degree than women.

The carried out multielement hair analysis of workers has shown, that prevalence of the decreased hair content of some elements whose lack was established in diets, is great enough. So, deficiency of Se in hair was established in 55% of cases, Fe – in 22%. At the same time decreased Ca and Mn content of hair is not typical for the surveyed workers. On the contrary, in hair of workers increased contents of Ca and Mn were frequently marked. It is interesting to note, that among the surveyed workers the decreased Cr, K, Mg and Zn contents in hair (about 30%) were widely distributed. However, the investigated diets contain enough quantity of these chemical elements.

Thus, the reason of increased or lowered content of most investigated chemical elements is not their inadequate content in diets. Obviously, to a considerable degree, the elemental content of hair dpends on workers' specialization.

Conclusion

1. Typical diet of workers does not provide them with enough Se, Ca, I and Mn, but provision of most vitamins, fibers, fats, carbohydrates and food value of a diet is satisfactory.

2. The reason of the imbalances in hair trace elements content is not their inadequate intake with food, but, to a considerable degree, the profession of investigated peoples.

References

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