

# Blood Trace Elements under Personalized Metabolic Correction: The Preliminary Data

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## Abstract

The *purpose of the work* was to estimate the dynamics of blood trace elements under the use of personalized vitamin and mineral complex.

*Methods.* The study aimed to the estimation of the effect of a personalized vitamin and mineral complex on the blood parameters of practically healthy people (n=252), first of all - on microelement homeostasis. Each of the surveyed individuals was taken twice to determine the concentration of trace elements (before the course and immediately after its completion). The duration of the course was fixed and was 30 days with a daily single admission. The composition of the vitamin and mineral complex was selected individually based on the results of initial testing for those components that were present in deficient or pre-deficient concentrations in a particular patient. Determination of the level of trace elements in peripheral blood was performed by atomic absorption spectrometry on the apparatus "Shimadzu AA7000" (Japan).

*Results.* The study allowed to demonstrate the presence of a deficit or pre-deficit state in the blood content of trace elements in the considered group of practically healthy people. The analysis of the effectiveness of the course individualized vitamin and mineral complex, has allowed to establish its beneficial effect on the metabolism of some trace elements. In this preliminary study we observed this tendency on the example of particularly iron, copper, selenium and zinc.

**Key words:** metabolic correction; blood; iron; copper; selenium; zinc

## INTRODUCTION

Even at a session of the medical and biological Department of the USSR Academy of Medical Sciences in 1975, it was discussed the allocation of a special group of compounds that can have a pronounced physiological effect in minimal quantities. They were combined under the name of biologically active substances [19, 24, 25]. At the same time, even a brief acquaintance with the chemical structure of food products suggests that they contain most of the groups of biologically active substances discussed at the mentioned session (alkaloids, hormones and hormone-like compounds, vitamins, trace elements, biogenic amines, neurotransmitters, substances with pharmacological activity, etc.) [3-6, 9, 11, 15, 23].

However, the biological, physiological and regulatory activity of these substances is still not sufficiently taken into account by pharmacologists and doctors of various specialties. Moreover, many of the biologically active substances are present in food in equal and sometimes higher doses than the doses used in Russian Pharmacopoeia [23, 25]. On the other hand, many of them serve as the closest precursors of potent compounds that, when isolated from food, are the object of purely pharmacological research [2, 11, 19, 21, 23]. It is in this context, i.e. from the point of view of biologically significant impact of various food components on the course of metabolic processes in both healthy and diseased organisms, it is necessary to consider the role of the main micronutrients, taking into account a number of new information about the mechanisms of their therapeutic and preventive action [3, 4, 7-9].

It is well-known that in a healthy condition, trace elements constituting the living body are regulated and maintained their balance of each other and their range of physiological optimum concentration in order to maintain the normal vital functions [8, 9, 15]. Essential trace elements are in

humans the chromium (Cr), cobalt (Co), copper (Cu), fluorine (F), iodine (I), iron (Fe), manganese (Mn), molybdenum (Mo), selenium (Se), zinc (Zn), and questionably the boron (B) and vanadium (V) [1, 8-10]. When the optimum conditions of their balance and their homeostasis, however, are broken down by deficiency or excess of certain trace element, an excess accumulation or deficiency of specified element is induced and it follows that peculiar disease is caused according to function of each specified element [10, 14-18]. Hence, one of the important tasks of micronutrientology is to substantiate, create and prevent the use of entire ensembles of functionally interconnected micronutrients of different nature and structure [4, 7, 13, 20, 21].

One of the least studied aspects of the potential therapeutic effect of biologically active substances and micronutrients is the analysis of their influence on the microelement status of the body. In this regard, The *purpose of the work* was to estimate the dynamics of blood trace elements under the use of personalized vitamin and mineral complex.

## MATERIALS AND METHODS

The study aimed to the estimation of the effect of a personalized vitamin and mineral complex on the blood parameters of practically healthy people (n=252), first of all - on microelement homeostasis. Our study consists of two stages. On first stage we tested the plasma level of 23 trace elements. The average value and its standard deviation were calculated for each parameter. At the next stage, using the current standards of indicators for this certified laboratory, we divided the area of values into 6 ranges: below the norm, 1-4 quartiles of the norm, above the norm. Data was represented as a percentage for each of the selected ranges.

All data about blood trace elements were used for second stage of our study. In this stage we formed personal vitamin and mineral complex for all patients. The composition of this complex was selected individually based on the results of initial testing for those components that were present in deficient or pre-deficient concentrations in a particular patient.

Each of the surveyed individuals was taken twice to determine the concentration of trace elements (before the course and immediately after its completion). The duration of the course was fixed and was 30 days with a daily single admission. All patients were tested in the morning. The level of trace elements in peripheral blood was determined by atomic adsorption spectrometry using the Shimadzu AA7000 device (Japan).

Statistical processing was performed using the standard statistics method. Statistical analysis of the data was performed with Statistica 6.0 program. Data were expressed as means  $\pm$  SE, the Student's t-test was used for detection of statistical difference.

Study was approved with local bioethics committee. All persons in including in this study signed standard informed consent sheet.

### RESULTS

First stage of our study allowed to state the initial level of blood trace elements in healthy people. We fixed that significant part of our group of "healthy subjects" values has deviated from population reference intervals. For visualization of prevalence of these deviations in trace elements homeostasis we used quartile method.

The quartile analysis of the microelement status of the population of the megalopolis made it possible to establish that the structure of their distribution differs significantly from the a priori assumed Gaussian distribution for a large number of indicators.

In addition, it is shown that a number of trace elements also have a deficit state. Thus, more than half of the surveyed individuals (55.3%) show a reduced

concentration of copper, and another 14% of people on this indicator belong to the 1 quartile, showing a pre-deficit state (Fig. 1). This element, being a component of a number of enzymes, belongs to the category of biogenic, and also determines the need to correct its level.

A similar but significantly smoother structure was registered for the plasma level of zinc (Fig. 1). However, according to this parameter, a significant part of the population (7.7%) has hypozincemia, which can be considered as a pre-pathology.

The study of the profile of other microelements in the blood of patients allowed us to establish that in many parameters there was a pre-deficit or deficit state. This especially included for concentrations of iron, copper, selenium, and zinc.

Taking into account the fact that these compounds are essential for the functioning of the body, they were included, if necessary, in the composition of the applied vitamin and mineral complex. That is why on second stage of our study we tested the efficiency of complex individual metabolic correction. Effect of this metabolic support was estimated after the month of daily administration of the complex. It was found that the course intake of the latter provides an increase in the concentration of iron in a month of daily use by 40.6%. The plasma copper level was elevated at 8.0% ( $p < 0.05$ ). We also observed positive dynamics for other trace elements. For example, plasma level of selenium was increased at 59.2% after personalized correction. The concentration of zinc was fixed in 119.5% to initial value (Fig. 2-3). It should be emphasized that all these shifts were statistically significant ( $p < 0.05$  for all parameters). These trends were fully comparable to the data obtained based on an assessment of the average individual deltas of patient parameter levels. It is important to underlined that most pronounced shifts were verified for persons with preliminary deficiency of these elements.

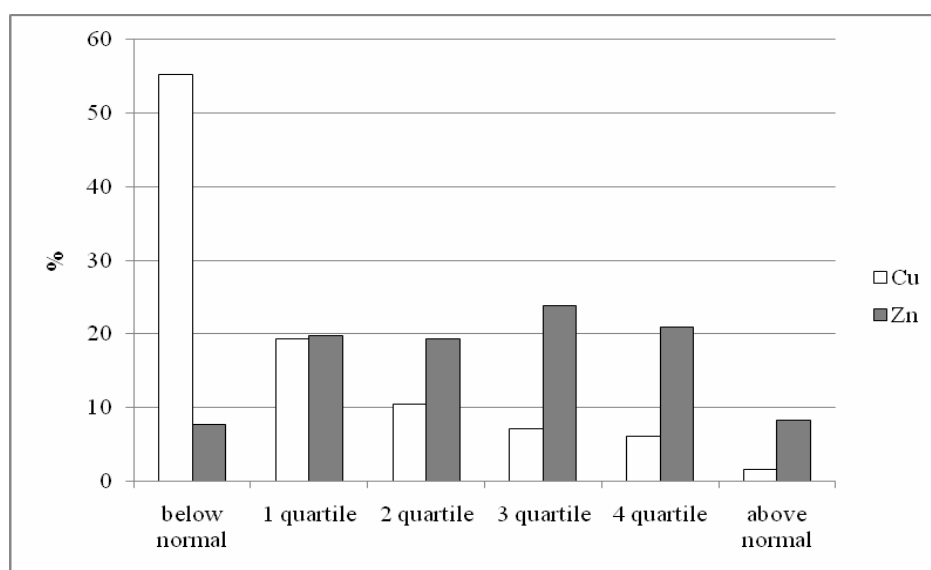


Fig. 1. Plasma level of copper and zink in healthy people (in %)

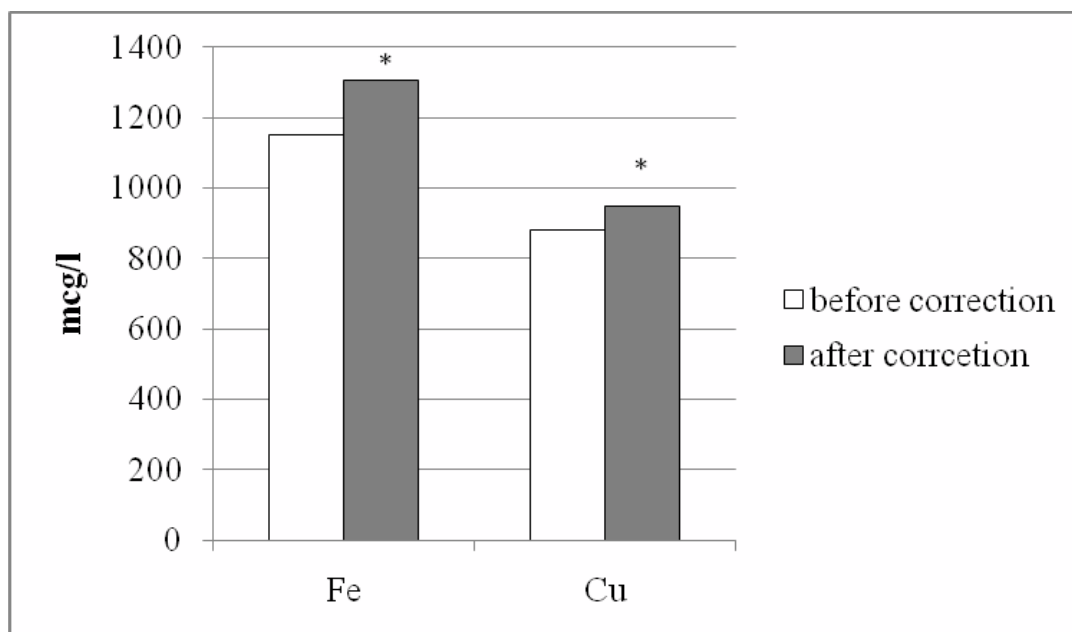


Fig. 2. The influence of personalized vitamin and mineral complex on plasma level of iron and copper («\*» - statistical value of differences to initial state  $p < 0,05$ )

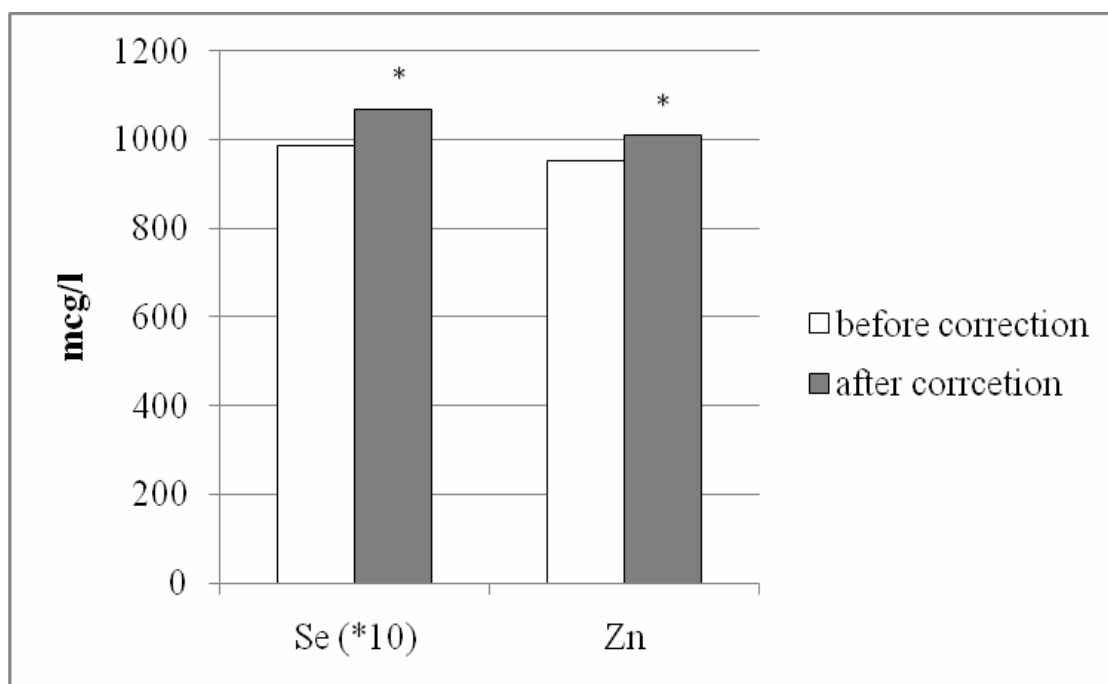


Fig. 3. The influence of personalized vitamin and mineral complex on plasma level of selenium and zinc («\*» - statistical value of differences to initial state  $p < 0,05$ )

### CONCLUSION

In whole, the study allowed us to demonstrate the presence of a deficit or pre-deficit state in the blood content of trace elements in the considered group of practically healthy people. The analysis of the effectiveness of the course individualized vitamin and mineral complex, has allowed to establish its beneficial effect on the metabolism of some trace elements. In this preliminary study we observed this tendency on the example of particularly iron, copper, selenium and zinc.

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