

# ASSOCIATION BETWEEN ELEMENT CONTENT AND AUTONOMIC CARDIAC ACTIVITY IN HEALTHY YOUNG URBAN RESIDENTS

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## Introduction

Cardiovascular diseases (CVD) are the leading cause of death globally with more and more scientists and doctors acknowledging the link between environmental agents and CVD as well as importance of a field that some are calling environmental medicine. Heart rate variability (HRV) as a non-invasive indicator of cardiac autonomic modulation is most commonly associated with a higher risk of CVD and mortality in case of reduced HRV-derived parameters.

## The aim of this study

The aim was to assess the autonomic cardiac activity in healthy young individuals related to their element status under background exposure.

## Methods

Concentration of 28 elements was determined by neutron activation analysis (Tomsk, Russia) in hair of 17-20 year-old healthy young individuals (34 males and 46 females) residents of Simferopol. For the assessment of autonomic cardiac activity HRV indices were derived from 5-minute recordings at rest (Varicard 2.6, Russia).

## Results and discussion

Na, Ba, Br, Ca, Fe excess and Cr, Rb deficiency was revealed in most individuals (Fig. 1). Na, Br, Sb levels were significantly higher in males and Au, Ca hair concentrations were greater in females ( $0.001 \leq p \leq 0.024$ ).

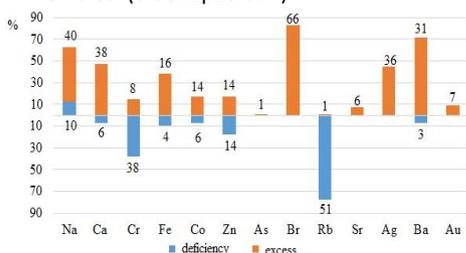


Fig. 1. The occurrence of deviations from the references based on the results of the hair element analysis in residents of Simferopol (n=80)

Y - the proportion of the total number of people, %;  
X - chemical elements; numbers above the columns - the absolute number of cases.

## Results and discussion

Correlations were revealed between La and LFn, LF/HF ( $r=0.31$ ;  $p=0.006$ ), HFn ( $r=-0.31$ ;  $p=0.006$ ) suggesting sympathetic activation accompanied by a reduction of vagal tone that may be associated with La ability to displace intracellular Fe and Ca.

Correlations were also noted between Rb and LFn ( $r=0.29$ ;  $p=0.01$ ), HFn ( $r=-0.29$ ;  $p=0.001$ ) and LF/HF ( $r=0.30$ ;  $p=0.006$ ) where low hair Rb levels were associated with increased parasympathetic activity determined by the Rb ability to increase the duration of the action potential in human myocardium accompanied by decreases in the force of contraction.

In males correlations found between Br and heart rate ( $r=-0.44$ ;  $p=0.01$ ), Mo ( $r=0.50$ ;  $p=0.003$ ), Me ( $r=0.48$ ;  $p=0.004$ ) suggest negative chronotropic effect.

Correlations between the hair chemical elements content were also found (Fig. 2).

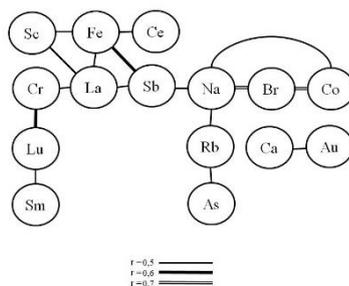


Fig. 2. Correlations between the hair elements content in the Simferopol residents

(r<sub>s</sub> - Spearman's rank correlation coefficient,  $p < 0.05$ ; critical value  $r = 0.22$ ).

## Conclusions

The element imbalance was revealed in young individuals under background exposure. Individuals with higher hair La concentration had lower HRV indices. Therefore, cardiac autonomic functions might be altered in cases of element imbalance.

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