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Author: Mrs. Kathrin Jüttner
Germany, kathrin.juettner@uk-erlangen.de

Dr. Natalia Rakova
Germany, Natalia.Rakova@uk-erlangen.de
Dr. Anke Dahlmann
Germany, Anke.Dahlmann@uk-erlangen.de
Dr. Manfred Rauh
Germany, Manfred.Rauh@uk-erlangen.de
Dr. Boris Morukov
State Scientific Center of Russian Federation, Institute of Biomedical Problems, Russian Academy of Sciences, Russian Federation, info@imbp.ru
Dr. Agureev Alexander
Russian Federation, info@imbp.ru
Prof. Friedrich C. Luft
Germany, luft@charite.de
Mrs. Liubov Lenkova
Russian Federation, lenkovaln@yandex.ru
Dr. Jens Titze
Germany, Jens.Titze@uk-erlangen.de

THE EFFECT OF MODERATE DIETARY SALT REDUCTION ON BLOOD PRESSURE IN YOUNG HEALTHY MALE SUBJECTS DURING THE MARS500 PROJECT

Abstract

Background: The prevalence of hypertension and associated cardiac end points are constantly increasing. Dietary salt consumption is believed to be a major risk factor for increased blood pressure, while the mechanisms of salt-induced hypertension are still unknown. The classical concept is based on the idea that increased salt intake leads to a raise in total body sodium. In terms of maintaining iso-osmolality of body fluids this raise is accompanied by increasing extracellular volume, thus increasing blood volume and blood pressure. But earlier human studies in space science and animal experiments showed that Na+ can also be stored in an osmotically inactive form, which in consequence leads to uncoupling of total body Na+ content and elevated blood volume as the underlying mechanism of induced hypertension. Therefore "well known" regulatory mechanisms (e.g. aldosterone) have to be questioned and the search for new players in the regulation of total body Na+ has to restart.

Methods: The Mars500 project offered the unique opportunity to perform a long-term sodium balance study in young healthy male subjects. Under strictly controlled environmental conditions, the crew was provided individualized diets with stepwise decreasing sodium contents. All other nutrients were kept constant. By analysing daily medical control data (blood pressure, heart rate, body weight) and 24h-urine samples we evaluated salt-dependant blood-pressure changes, changes in total body sodium content and also urinary aldosterone excretion.

Results: The results of the pre-test were very promising. In three out of four compliant subjects highly significant dose-response relationship of stepwise decreasing salt ingestion on blood pressure by – 4 / – 6

mmHg (systolic/diastolic; 12 g/d vs. 6 g/d) was observed. However, this blood pressure reaction was not associated with a decrease in TBNa+. In contrast, changes in TBNa+ showed rhythmical change patterns as well as urinary sodium and aldosterone excretion. The still ongoing Mars500 study already confirmed the rhythmicity of changes in TBNa+ and demonstrated that the moderate salt reduction mainly affects blood pressure on the long-term. Hormone analysis is still running.

Conclusion: Reduced dietary salt intake impressively lowered blood pressure even in young healthy subjects. This blood pressure lowering effect was not necessarily coupled with changes in TBNa+ content. Changes in TBNa+, as well as urinary sodium and aldosterone excretion spontaneously varied with infradian rhythms. These findings provide new research avenues for our current ideas how internal environment and blood pressure are regulated on the long-term.