

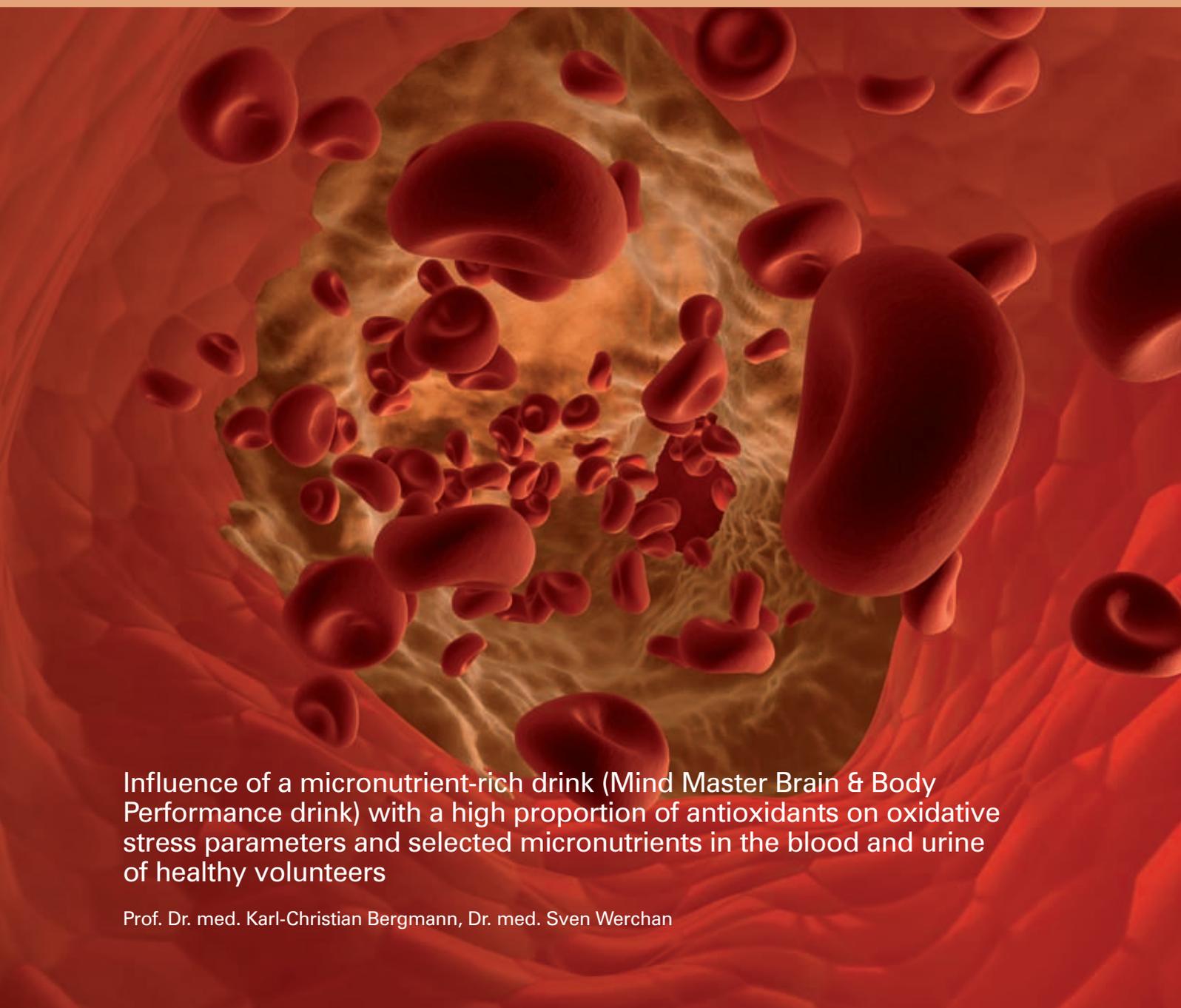
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Influence of a micronutrient-rich drink (Mind Master Brain & Body Performance drink) with a high proportion of antioxidants on oxidative stress parameters and selected micronutrients in the blood and urine of healthy volunteers

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Influence of a micronutrient-rich drink (Mind Master Brain & Body Performance drink) with a high proportion of antioxidants on oxidative stress parameters and selected micronutrients in the blood and urine of healthy volunteers



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Abstract

Introduction

Increased exposure to free radicals (ROS) and the following oxidative stress as an etiological factor is considered as the cause for a variety of diseases. Chronic stress goes hand in hand with increased exposure to free radicals. These free radicals damage membranes and molecules that can serve as markers for the current stress load. The increased supply of antioxidant micronutrients can reduce the biochemical exposure to free radicals. This was examined in the present study.

Material/Methods

15 subjects with elevated levels of oxidative stress markers (lipid peroxides $> / = 275 \mu\text{mol/L}$ in the blood and/or 8-epiprostaglandin $> / = 3.5 \text{ g/g creatinine}$) consumed daily for 3 weeks a drink rich in antioxidants (Mind Master Brain & Body Performance drink, 43,000 mol TE/L).

After day 2, 8, 15 and 22 respectively lipid peroxides were determined in the blood as well as 8-epiprostaglandin and creatinine were determined in urine.

Moreover, at the beginning and after 22 days the status of the micronutrients selenium, coenzyme Q10 and vitamin B12 was also measured that are also included in the Mind Master Brain & Body Performance Drink.

Results

As a result of the intervention the oxidative stress markers decreased significantly especially in the subjects who had elevated levels at the beginning (lipid peroxides $> / = 275 \text{ mol/l}$ in the blood and/or 8-epiprostaglandin $> / = 3.5 \text{ g/g creatinine}$ or creatinine $> / = 1.8 \text{ g/l}$) (lipid peroxides total group

42.7%, 8-epiprostaglandin total group 11.8%, Subjects with elevated values (starting values $> / = 2.63 \mu\text{g / g}$) to 41.3%). At the same time the blood concentration of stress-related micronutrients such as coenzyme Q10 increased during the intake period (total group 18.2%, subjects with low values 41.3%). In vitamin B12 it was only the subgroup with the lowest values (starting levels $< / = 289 \text{ pg/ml}$) that increased by 16.7%. The selenium values remained stable at the good starting values during the intake period.

Summary

The daily intake of 80 ml Mind Master Brain & Body Performance Drink was able to reduce oxidative stress markers rapidly and improved the supply of micronutrients. The results were already measurable after a few days identifiable and were more evident the more unfavorable the initial situation of the subjects was. Mind Master Brain & Body Performance Drink can thus make a positive contribution to the reduction of elevated oxidative stress levels.

Introduction

Stress, especially in connection with unfavorable lifestyle factors such as smoking or insufficient vitamin intake is increasingly becoming the focus of preventive considerations. According to the WHO stress-resulting diseases are one of the greatest health problems our days. Especially the everyday stress plays an essential causal role.

After 10 years of felt excessive demands the risk for physical malfunction, pain and cardiovascular-diseases is increasing. This is the result of an American long-term study (MIDUS – midlife in the United States) [1] that is performed by the University of Wisconsin since 1995 in the United States.

The physical and mental mechanisms caused by stress are complex and individual. On physiological and biochemical level, however, stress leads to similar adaptation and damage mechanisms in all individuals. The biochemical responses to stress include an increased formation of reactive oxidative species (ROS / free Radicals) [2]. ROS are part of the biochemical process of energy formation and they have a variety of roles and functions within the life cycle of cells.

Physical or mental stress can disturb the balance between ROS and antioxidant protection mechanisms and lead temporarily or permanently to increasing oxidative stress.

Oxidative stress is a causative factor at the beginning of many disease developments such as atherosclerosis, cancer and degenerative brain diseases [3].

The sufficient supply of antioxidants in the form of fruits and vegetables therefore has a prominent preventive role [4]. The frequent coming together of increased physical and mental stress, oxidative stress and unfavorable nutritional or physical behavior make it appear sensible to supply additional antioxidant micronutrients.

There are studies that show that additionally consumed micronutrients obtain positive effects [5, 6].

These include an improved handling with stressors and an improved well-being (SF-36 test) [7]. Studies also show a reduced exposure to ROS and higher robustness of the antioxidant defense system. This was the starting point for the development of the Mind Master Brain & Body Performance Drink (LR Health & Beauty Systems GmbH) and the background for the present study.

The study wanted to answer the question whether the additional consumption of antioxidant micronutrients can influence oxidative stress markers (lipid peroxides, 8-epiprostaglandin, creatinine) in blood and urine. In addition, the study controlled the levels of micronutrients (coenzyme Q10, selenium, vitamin B12) in the blood that are important for the antioxidant protection systems or for the cellular energy production. Even a slight deficiency of these micronutrients can already become an increasing risk in longer prolonged stress.

Materials and Methods

The study focused on the question whether and to what extent, additionally to the normal diet consumed antioxidants in the form of an antioxidant drink (Mind Master Brain & Body Performance drink) effect oxidative stress and micronutrient markers in the blood and urine of healthy adults.

The Mind Master Brain & Body Performance Drink was developed by LR Health & Beauty Systems GmbH.

Ingredients: Aloe Vera Barbadosensis Miller Gel (USA/Mexico 36%), grape juice from grape juice concentrate, water, dextrose, extract mixture green tea extract, resveratrol containing knotweed extract), stabilizer (xanthan gum), L-carnitine, vitamin premix (vitamin B1, folic acid, vitamin B12, vitamin E), coloring: chlorophylls from plant extracts, acidifier (citric acid), Iron (III) pyrophosphate, preservative (Potassium sorbate), natural flavoring, sweetener steviol glycosides, coenzyme Q10, antioxidant (ascorbic acid), Choline, sodium selenite. This corresponds to an ORAC value of 43,000 $\mu\text{mol TE/L}$.

Only adults were included in the study design between 20 and 65 years of age with a BMI <35 and without serious pre-existing conditions but that showed increased values in one or both of the following oxidative stress markers:

Lipid peroxides > / = 275 micromol/L in blood and/or
8-epiprostaglandin > / = 3.5 g/g creatinine

To identify persons that fulfil the inclusion criteria of the increased stress markers the starting values (T0 values) were taken from a total of 50 persons. 15 of the 50 subjects met these inclusion criteria and were included in the main study.

In the studied group the gender distribution was 80% women and 20% were men. The subjects were in the age 23–65 years. Smokers were not ruled out. The smoking rate was 60%. The study took place under everyday conditions. Other guidelines concerning lifestyle did not exist. The intervention consisted in the daily intake of 80 ml Master Mind Brain & Body Performance Drink over a period of 3 weeks. This corresponds to an ORAC value of 3,400 per daily dose. This dose is based on the usual recommendations for the supply of antioxidant substances (ORAC values). Its being understood that an uncontrolled high intake of antioxidant substances also can have negative effects [14].

The study was performed in March 2013.

The data for the oxidative stress were taken before the first intervention (T0-value = day 1), as well as on the first day after (day 2) and in each case after one week (day 8, 15 and 22) in the morning urine creatinine and 5 hours after ingestion of Mind Master Brain & Body Performance Drink the lipid peroxides were determined in the blood and the 8-epiprostaglandins were determined in the urine.

The micronutrients selenium, coenzyme Q10, vitamin B12 were measured before the first dose (T0-value = day 1) and after three weeks (Day 22) from the respective blood samples determined.

The recruitment of subjects and blood samples and collection of all laboratory samples was carried out by the Institute Dermatest GmbH. All laboratory tests were done by the company Ganzimmun Diagnostics AG. Statistical analysis was performed by the company Medistat GmbH. The study was coordinated by LR Health & Beauty Systems GmbH. The medical consultation and evaluation was carried out by Dr. Sven Wer-

chan. The accompaniment from an internist's point of view was carried out by Prof. Dr. med Karl-Christian Bergmann (Charité University Medicine, Berlin).

Results

The selected parameters showed at the beginning the current status of oxidative stress of the studied subjects and are at the same time course parameters for the influence of antioxidant micronutrients. In the present study, the stress marker reacted already after one day. However, these values are influenced by a large number of lifestyle factors (such as smoking) and the actual load of stress.

Oxidative stress markers

Lipid peroxides and 8-epiprostaglandin are both specific and sensitive markers of exposure of the organism to free radicals (ROS) and depend on the current strength of the antioxidant system.

Increased creatinine levels in people with healthy kidneys can be a sign of actual physical burden.

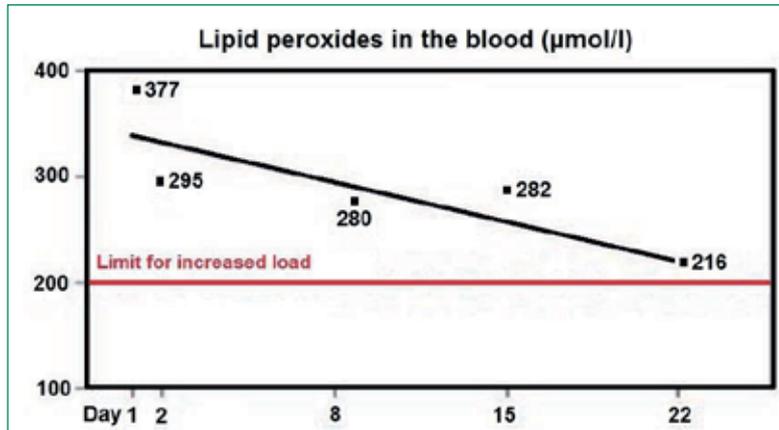


Fig. 1 Lipid peroxide levels in the blood of the total group (n=15) (Median values) in µmol/l

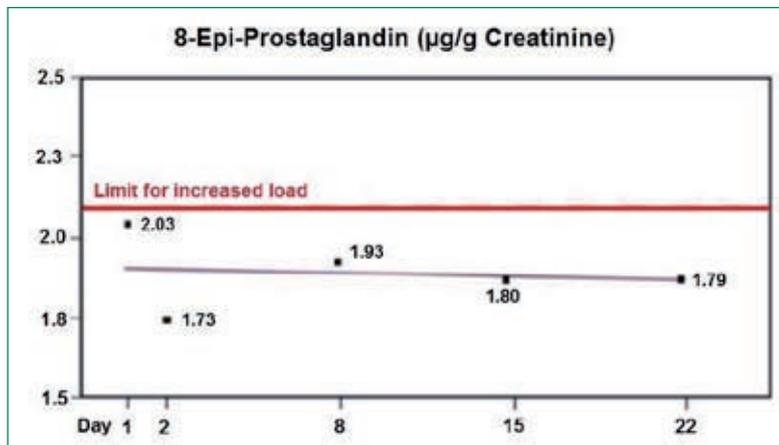


Fig. 2 Changes of the 8-Epi-Prostaglandins in the total group (n=15) (Median values)

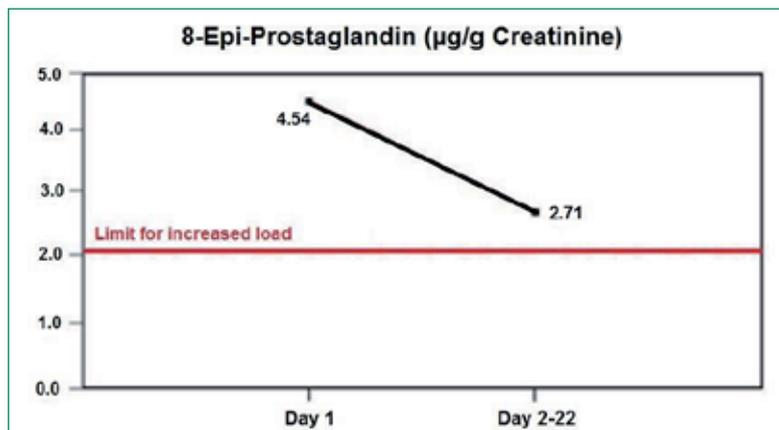


Fig. 3 Changes of the 8-Epi-Prostaglandins in the subgroup with the highest values (n=7) (Median values)

Lipid peroxides

During the study, there was a reduction of lipid peroxides by -42.7%. In this case, there was a significant reduction of the values already after the first dose (Fig. 1).

8-Epi-prostaglandin

The 8-Epi-prostaglandin – value of the total group during the investigation period decreased by - 11.8%. However increased values of 8-Epi-prostaglandin were reported only 7 subjects at baseline. Therefore, there was only a moderate reduction of 8-Epi-prostaglandin in the whole group (Fig. 2).

An analysis of the 7 subjects with the highest output values (persons with baseline $> / = 2.63$ g/g) showed a reduction of 8-Epi-prostaglandin by -40.3% (Fig. 3).

Creatinine

The average creatinine values of the total group before the start led in the normal range (< 1.8 g/l).

A change of the creatinine values for the entire group was not observed (Fig. 4). However, 4 subjects showed increased urinary creatinine values at the beginning (persons with baseline values ≥ 1.8 g/l). In this subgroup, there was a decrease by -10.8% (Fig. 5) during the period of investigation.

Micronutrient markers

The selected markers reflect the actual status of stress-relevant micronutrients. Short-term changes are only expected in poor status situation. This was only partially the case. Nevertheless, during the study period there were improvements found, especially the coenzyme Q10-status was improved.

Coenzyme Q10

During the whole studied there was found a significant increase of 18.2% (Fig. 6).

In the sub-group ($n = 4$) with the lowest plasma Q10 Values (average $0.138 \mu\text{mol}/\text{mmol}$) the Q10 plasma level over the intake period of three weeks increased by +41.3% to $0.195 \text{ mol}/\text{mmol}$ (Fig. 7).

Vitamin B12

The mean value of plasma Vitamin B12 in the total group was with $295 \text{ pg}/\text{ml}$ within in the recommended range and increased slightly by 8.5% during the intake period (Fig. 8). The sub-group ($n = 5$) of the test subjects with the lowest vitamin B12 plasma values (values $\leq 289 \text{ pg}/\text{ml}$) the plasma Vitamin B12 levels increased by +16.7% during the intake period of three weeks (Fig. 9).

Selenium

The selenium supply differs substantially depending on the selenium content of the soils in Europe [8]. The detected selenium plasma in this study values were within the recommended range. In the study period there were no appreciable increases in the selenium values observed.

Discussion

Oxidative stress markers

Free radicals (reactive oxygen species, abbreviated ROS) are part of the normal physiological human metabolism. They arise in the normal course of metabolism in most body cells.

A complex antioxidant protective system consisting of endogenous enzymes and exogenous compounds, such as vitamins and bioactive plant substances, protects cells and membranes against attacks by free radicals.

Though the capacity of most tissues to defend against radicals is limited and encounters for example in the very breathing-active brain under stress rapidly to its limit. An imbalance between low antioxidant protection mechanisms and high free radicals is called oxidative stress. This can be due to increased stress load as well as insufficient supply of antioxidant micronutrients. Often both factors come together. As a result, cell organelles up to tissue can be damaged [9].

Particularly at risk are the endothelial cells, neuronal cells and epithelia. Especially in the development of cardiovascular diseases and chronic degenerative brain diseases (Dementia, Alzheimer's disease) [10] a significant impact of oxidative stress is assumed [11, 12].

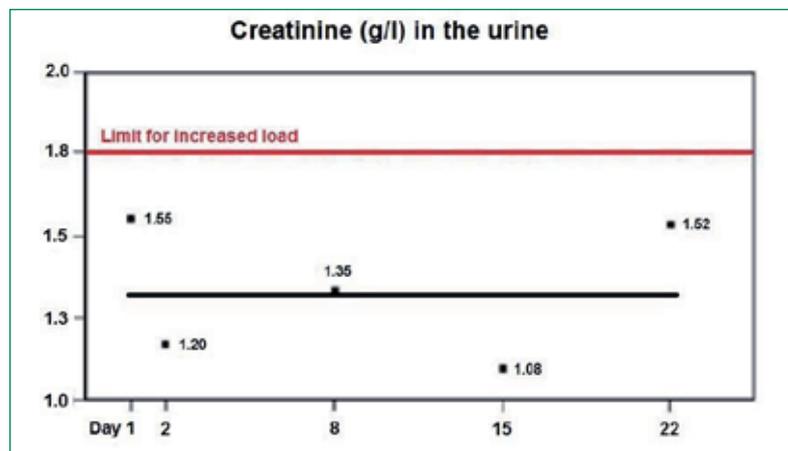


Fig. 4 Changes of urinary creatinine values in the total group ($n=15$) (Median values)

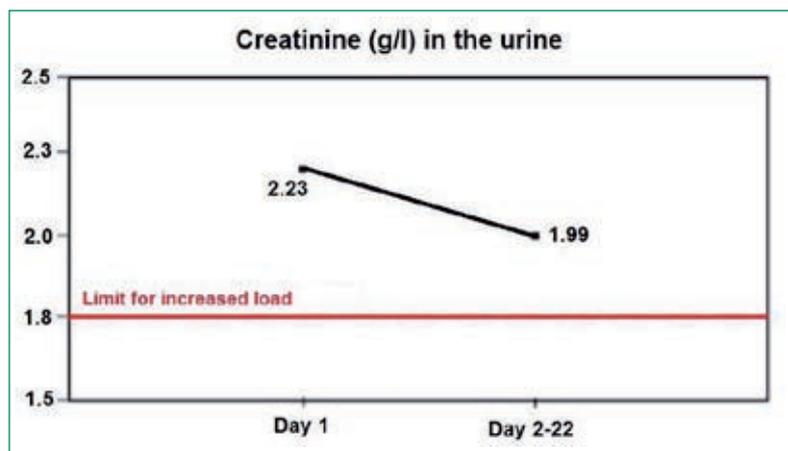


Fig. 5 Changes of urinary creatinine values in the subgroup with the highest values ($n=4$) (Median values)

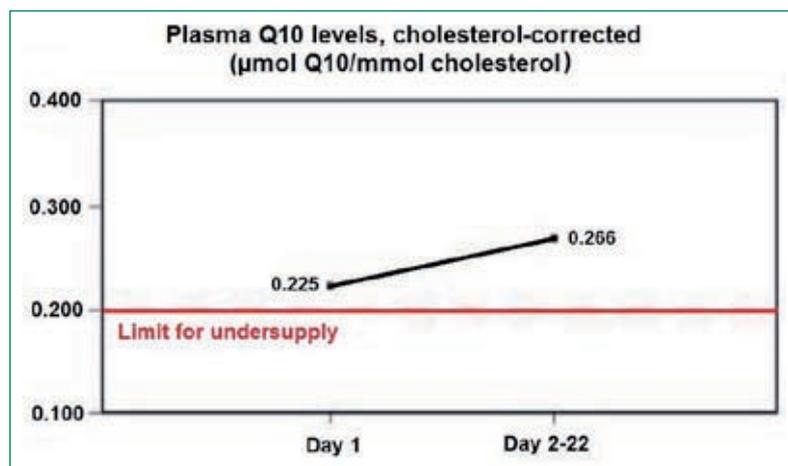


Fig. 6 Changes of plasma Q10 values in the total group ($n=15$) (Median values)

As a marker of the exposure of the body to ROS damaged molecules play an important role as markers of oxidative stress. Thus, lipid peroxides occur after the reaction with free radicals. Values above $200 \mu\text{mol}/\text{l}$ represent an increased stress load of the body. On the other side elevated levels give no information about

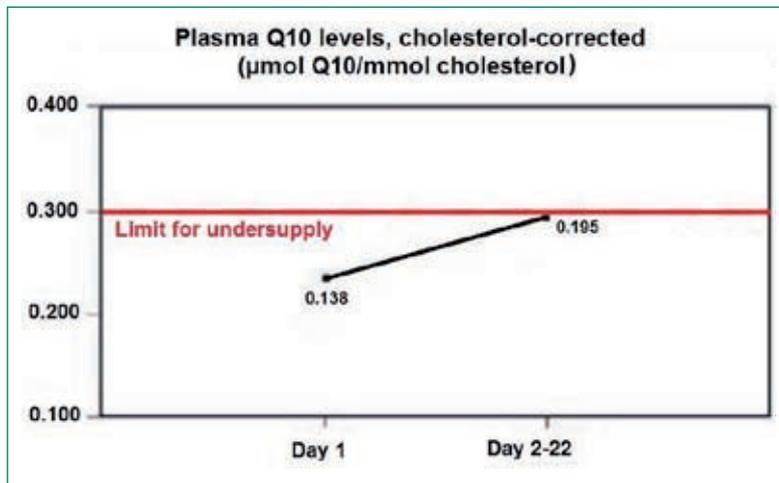


Fig. 7 Changes of plasma Q10 values in the subgroup with the lowest values (n=4) (Median values)

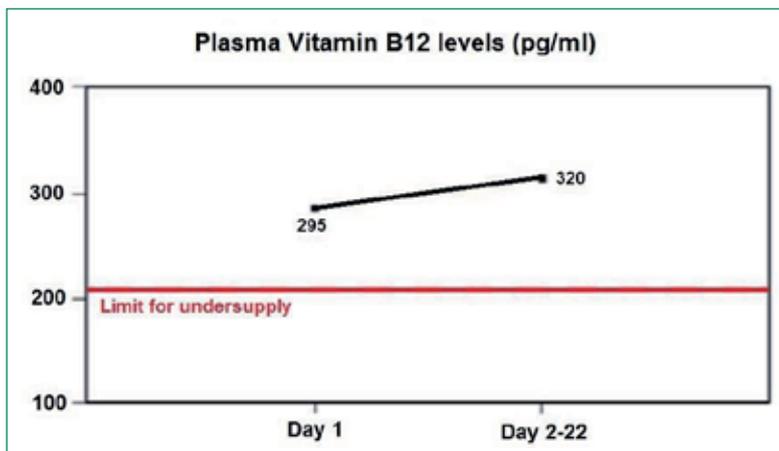


Fig. 8 Changes of plasma Vitamin B12 values in the total group (n=15) (Median values)

the causative mechanisms. Many different influences (stress, smoking, drugs, chronic inflammation, poor diet, such as low fruit and vegetable intake) can play a role. The reduction of this marker, however, is equivalent with a reduced damage to the body by free radicals. This could reduce the risk for the development stress-induced diseases in the long run [13].

Therefore, the decrease of this marker for more than 40% within a few days in this study is an indication of the effectiveness of the additional antioxidants in the Mind Master Brain & Body Performance Drink in reducing oxidative cell damage which has great relevance. Natural sources and physiological concentrations of antioxidant substances are necessary here because otherwise adverse effects may occur [14].

8-Epiprostaglandin is produced, among other substances by the oxidative attack on cell lipids in human body cells. It is therefore used to determine the loading of the organism with free radicals. The reduction of 8-Epiprostaglandin value especially in subjects with increased baseline values (-40.3%) is also evidence for

the antioxidant effect of the Mind Master Brain & Body Performance Drink [15]. Ultimately important is the in vivo effect of the absorbed micronutrients and not only the theoretical potential antioxidant level (ORAC) of the ingested beverage. Because this indicates the actual bioavailability of the ingredients, how it could be proven for the Mind Master Brain & Body Performance drink. There is a presumption of a synergism of the antioxidants. The functioning of the antioxidant cell protection system depends on the interaction of endogenous and exogenous antioxidants, which must complement each other with different solution and distribution behavior in their inhibitory efficiency. Therefore, only the combined and coordinated consumption of micronutrients makes sense.

Creatinine is produced in the energy metabolism, and it is increasingly formed at elevated stress loads and excreted in the urine. However, its concentration in the urine is influenced by the amount of consumed liquids and other factors. Its value as suitable display for oxidative stress is limited.

When the starting values are within the normal range, larger changes, such as found in this study cannot be expected in general. At elevated levels, a slight decrease of about 10% was measured.

Micronutrients

Especially under high stress load a sufficient (increased) supply with the relevant micronutrients is particularly important. These mainly include the antioxidant vitamins in combination with appropriate bioactive compounds (polyphenols) and co-factors of the mitochondrial respiratory chain especially (Q10), iron and important antioxidant enzyme systems (selenium and glutathione peroxidase GSH-Px). Our physical and mental performance depends on this and more.

How much stress, especially chronic stress, affects human health and the development of diseases depends mainly on the supply particularly of antioxidant micronutrients [16]. This has especially long-term consequences for the compensation ability of the stressed organism and the time point of the occurrence of stress-induced diseases.

As lipophilic and hydrophilic antioxidant in the mitochondria the vitaminoid coenzyme Q10 plays a special role in the energy production and protects against free radicals [17].

A significant increase in Q10 blood levels could be detected in the whole group over the intake period. The detected average starting value was 0.225 µmol Q10/mmol cholesterol, which is just above the limit value for undersupply (> 0.2 µmol/mmol). The recommended reference value of plasma Q10 is > 0.3 µmol/mmol. Because the body's Q10 biosynthesis begins to decline from the age of mid 30's, it becomes it more important in the second Half of life to pay attention

to a sufficient Q10 uptake via nutrition and / or supplementation. In addition to this frequently prescribed medications, such as Statins have a negative impact, on the Q10 status in humans [18].

A deficiency of the storage vitamin B12 is seen only after a longer lasting undersupply.

The absorption of vitamin B12 into body is reduced, for example by gastric diseases that occur frequently in stress. The mean value of the total group was 295 pg/ml which is in the recommended range and increased during the intake period slightly by 8.5%.

The results reflect the experience that an additional supply of micronutrients is useful, especially for people with low micronutrient values. These people achieve then the highest increase of the blood values.

The trace element selenium is a key nutrient of the antioxidant defense system of the body, as important enzymes in this area (glutathione system) are linked to the presence of adequate selenium. The selenium status of the subjects was good with 79 µg/l selenium in the plasma. Therefore, it was not a surprise that during the intake period there was no increase in selenium blood levels found. For stress and high loads at higher ages higher blood levels of selenium are recommended from an orthomolecular point view (90–120 µgrams/l). However, this could only be achieved by a prolonged intake, which was not the aim of this investigation. In this case the continuous intake of Mind Master Brain & Body Performance drink could maintain stable selenium levels.

Summary

The daily intake of 80ml Mind Master Brain & Body Performance Drink is able to reduce elevated markers of oxidative stress and to increase the concentration of micronutrients. The reduction of stress markers is more pronounced, the higher the output values were at the beginning. That means, at high (stress) loads the product works best. It was noticeable that there were already measurable effects after taking the drink for a short period (1–2 days), a significant reduction particular of the oxidative stress markers. This could be due to the high antioxidant capacity of the Master Mind Brain & Body Performance Drink and/or due to the good availability of its ingredients. Synergistic effects of the micronutrients can contribute to a rapid improvement of the stress marker. The variations of the values in the further course can have different causes.

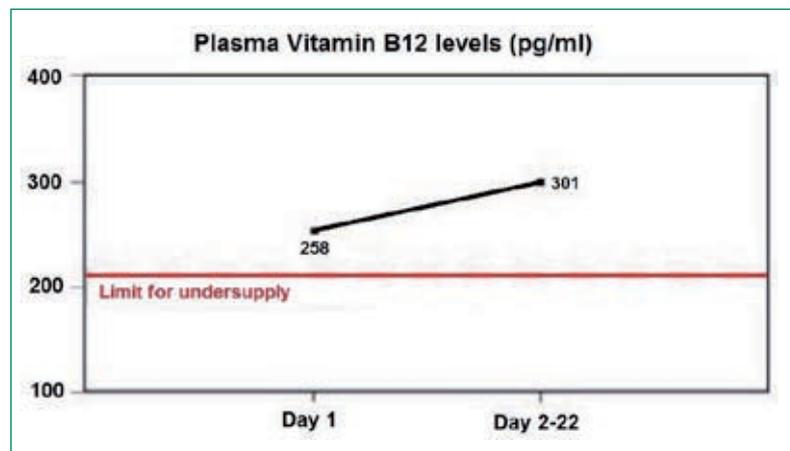


Fig. 9 Changes of plasma Vitamin B12 values in the subgroup with the lowest values (n=4) (Median values)

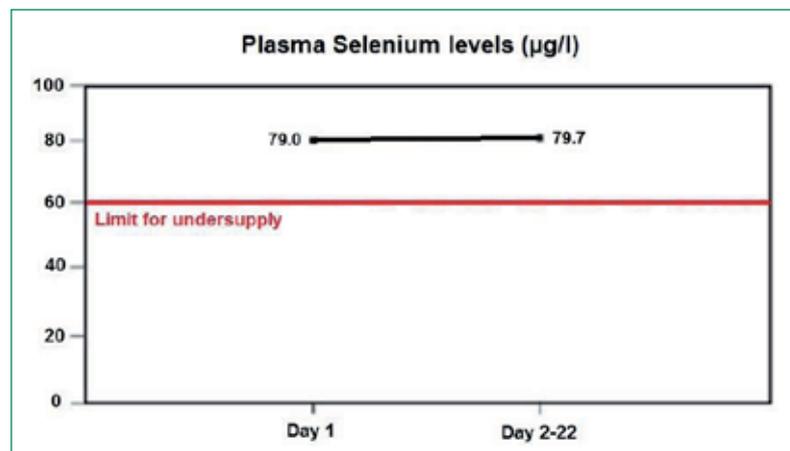


Fig. 10 Changes of plasma selenium values in the total group (n=15) (Median values)

Since the study was conducted under everyday conditions, lifestyle factors (smoking, alcohol), acute stress, additional sports or even a fluctuating patient compliance could have had an impact on the parameters.

The micronutrient status improved particularly in subjects who had low initial values. This is especially true for Q10 and partly for vitamin B12. The blood concentration of both increased continuously. Prolonged ingestion periods could therefore contribute to a further improvement in the nutrient status. This is especially useful at high stress loads for all investigated micronutrient parameters.

Given the aetiological importance of oxidative stress for the development of civilization diseases in the context of physical and psychological stress Mind Master Brain & Body Performance drink can offer a preventive benefit in terms of reducing oxidative stress markers. Especially in the case of increased stress and unfavorable

dietary its consumption can therefore be recommended.

This is also due to the ability of the Master Mind & Body Brain Performance Drink, to influence the blood concentration of micronutrients such as Q10 positive. Thus, the energy production and the physical performance in particular of stressed organism can be strengthened long-term.

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