

## CURRENT TOPICS IN NUTRACEUTICAL RESEARCH

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87-94 **COPPER REDUCTION IS RELATED TO IMPAIRMENT OF CYTOCHROME C OXIDASE ACTIVITY IN STRIATUM IN AN ANIMAL MODEL OF PARKINSON'S DISEASE**

Patricia Rojas, Sergio Montes, Yessica Heras-Romero, Pedro Montes and Carolina Roja

**ABSTRACT:** Copper is an essential transition metal ion for the function of key metabolic enzymes. Copper deficiency produces impairment of mitochondrial function due to a decreased of cytochrome c oxidase activity, this leads to reactive oxygen species production, which in turn triggers mitochondria-mediated apoptotic neurodegeneration. Defects in mitochondrial energy production have been implicated in Parkinson's disease (PD) pathology. Reduction in complex IV (cytochrome c oxidase) activity, the terminal enzyme of the mitochondrial electron transport chain, is copper-dependent and has also been observed in PD. We studied the changes of cytochrome c oxidase activity and copper content in different brain regions in animal model of PD using 1-methyl-4-phenylpyridinium (MPP+). Male Swiss albino mice were treated with saline or MPP+ (18 µg/3 µl, intracerebroventricular). All animals were sacrificed 24 hours after MPP+ administration and different brain regions were removed. Cytochrome c oxidase activity was analyzed using a spectrophotometric technique and copper was determined by atomic absorption analysis. Dopamine levels were measured by HPLC and spontaneous locomotor activity in an activity meter. Cytochrome c oxidase activity was reduced in corpus striatum (27.5%) after MPP+ treatment. However, its activity in cerebellum, midbrain, and frontal cortex was not different from the control group (saline). Copper content decreased only in striatum (56%) and midbrain (31%) after MPP+ administration. Copper administration (CuSO<sub>4</sub>, 2.5 mg/kg, i.p.) blocked dopaminergic neurotoxicity and displayed a significant reduction (59%) in locomotor activity after MPP+ administration. Our results suggest that copper reduction is related to impairment of cytochrome c oxidase activity in striatum and other parameters in MPP+ neurotoxicity.

Current Topics in Nutraceutical Research 10 (2): 95-100

95-100 **LIPOIC ACIDS AND MULTIPLE SCLEROSIS: A RANDOMIZED CONTROLLED CLINICAL TRIAL**

Mohammad Khalili, Ghazaleh Eskandari, Mahsa Ghajarzadeh, Amirreza Azimi, Shahryar Eghtesadi, Mohamad Ali Sahraian, Abbas Motevalian, Hasan Hashemi, Abbas Mirshafiey and Abbas Norouzi

**ABSTRACT:** The goal of this study was to evaluate the effects of lipoic acid on disease severity and fatigue experience in cases of multiple sclerosis. Fifty multiple sclerosis patients were randomly assigned to lipoic acid or placebo groups. Lipoic acid (1.2g/day) or placebo was administered to the two groups for three months. All subjects were asked to fill out valid and reliable Persian version of FSS (fatigue severity scale) questionnaires, were evaluated by neurologists and underwent MRI examinations before and after the study. Thirty-nine subjects participated in the study. Demographic characteristics, (EDSS) Expanded Disability Status Scale and FSS were not significantly different between the two groups at baseline. No significant differences between EDSS and FSS of the two groups after placebo or supplement applications were observed. In comparison with baseline, the EDSS scores did not decrease significantly in either group (P value =0.06 and p value=0.8). In subjects with baseline EDSS >0, EDSS showed significant decreases in the lipoic group (p value=0.028). Comparing MRI findings with baseline, three new enhanced plaques were observed in one control case, two new enhanced plaques were observed in one

supplement case and three in the placebo group had one new enhanced plaque ( $p=0.1$ ). Based on the positive results of the current study future studies with larger patient populations and longer durations are needed.

### Current Topics in Nutraceutical Research 10 (2): 101-112

#### 101-110 POTENTIAL APPLICATION OF MILK AND MILK PRODUCTS AS CARRIER FOR HERBS AND NUTRACEUTICALS

Pravin D. Sawale, GR Patil, RRB Singh, K Arvind, and Avinash K. Ghule

**ABSTRACT:** In different herbs, a wide variety of active phytochemicals including the flavonoids, terpenoids, lignans, sulfides, polyphenols, carotenoids, coumarins, saponins, plants sterols, curcumins and phthalides have been identified. These phytochemicals have been shown to have several medicinal benefits. There are several ways in which the medicinal benefits of herbs could be conveyed via certain foods as carriers. Milk is one such carrier that has been effectively used to deliver phytochemicals for targeted health benefits in the traditional Indian system of medical science. Addition of herbs or its extracts to milk and subsequent processing treatments, however, poses a definite challenge as possibilities exist for varying degree of interactions among the major and minor biomolecules of milk and bioactive compounds in herbs. Such interactions could have beneficial effect but at times it may also lead to certain practical difficulties if they modify properties of the foods. There are evidences to suggest that addition of polyphenols (mainly phenol) from certain herbs into milk increased antioxidative (free radical scavenging) stability, heat stability, alcohol stability but reduced non-enzymatic browning, RCT (Rennet coagulation time), astringency etc. These modifications in properties of the milk system are of great commercial significance as it may alter processing parameters for the manufacture of products significantly. In present review we have discussed the potential of milk and milk products to act as carrier for nutraceuticals.

### Current Topics in Nutraceutical Research 10 (2): 113-116

#### 111-116 PINITOL DOES NOT AFFECT GLUCOSE LEVELS, INSULIN RESISTANCE AND THE ADIPOCYTOKINE IN PREDIABETIC INDIVIDUALS - A PRELIMINARY STUDY

H. J. Kim, I. S. Lee, J. M. Kim, H. Jung, Y. E. Kang, T. K. Kim, J. M. Lee, K. S. Park and B. J. Ku

**ABSTRACT:** *Pinitol is thought to improve insulin resistance. We performed this study to evaluate the effects of pinitol on the glucose level, insulin resistance and the adipocytokine levels in prediabetic individuals. A total of 23 subjects with pre-diabetes were enrolled. The subjects were randomized to receive pinitol ( $n=12$ ) or a placebo ( $n=10$ ) for 12 weeks. The clinical and laboratory parameters were assessed for all the participants. There was no significant difference in the mean change with regard to the levels of glucose, HbA1c, insulin and HOMA-IR between the pinitol and control groups at the end of 12 weeks treatment. The mean increment of the adiponectin level was significantly higher in the pinitol group than that in the control group. There was also no difference in the mean change in the level of leptin and RBP-4 between the two groups. The twelve week treatment with pinitol was effective in increasing the adiponectin level, but it had no effect on the glucose level, insulin resistance and the levels of other adipocytokines in the subjects with pre-diabetes.*

### Current Topics in Nutraceutical Research 10 (2): 117-122

#### 117-122 PALM TOCOTRIENOLS AND -TOCOPHEROL ATTENUATE INFLAMMATORY BIOMARKERS IN STREPTOZOTOCIN - INDUCED DIABETIC RATS

Mansoorah Sadat Mojani, Asmah Rahmat, Rajesh Ramasamy and Seyed Majid Akhavan Hejazi

**ABSTRACT:** Inflammation assumedly plays an important role in both development and related disorders of diabetes mellitus. Dietary components can modulate the grades of inflammation to some extent. This study investigated the antidiabetic and anti-inflammatory impacts of palm based vitamin-E in streptozotocin-induced diabetic rats. Diabetic Sprague-Dawley rats received daily oral supplementation of a-tocopherols (AT) and/or palm based mixed-tocotrienols (TT) in two dosages (6 mg/kg, 12 mg/kg and in combination) for 8 weeks. The blood glucose level, interleukin-6 (IL-6), tumor necrosis factor (TNF- $\alpha$ ) and C-reactive protein (CRP) were measured. A significant decrease was observed in fasting blood glucose in two groups of rats that received combinations of both supplements compared to the baseline levels. IL-6 and CRP were significantly changed in all treatment groups after 8 weeks ( $p < 0.05$ ). Similarly, significant decreases were observed in levels of TNF $\alpha$  only in AT 6 and 12 mg/kg, TT 6 mg/kg and combination group of TT and AT 6 mg/kg when compared with the baseline ( $p < 0.05$ ). The present study demonstrated a significant suppression ability of a-tocopherol and palm mixed-tocotrienols on IL-6 and CRP, but further investigations are recommended for anti-diabetic effects.

### Current Topics in Nutraceutical Research 10 (2): 123-132

#### 123-132 ESSENTIAL OILS AND NEURODEGENERATIVE DISEASES: CURRENT DATA AND FUTURE PERSPECTIVES

Pagonopoulou Olga, Koutroumanidou Eleni and Charalabopoulos Konstantinos

**ABSTRACT:** *This review article aims to present the research that has been done over the past few years on the potential therapeutic role of essential oils on neurodegenerative diseases. Some general information on the plants is given, along with the basic features of the most important neurodegenerative diseases. After an extend database research, a number of either original papers or review articles dealing with the antioxidant and radical scavenging activity of the essential oils was revealed; papers have been evaluated and the most recent and representative have been chosen and are presented in this review. As expected, the essential oils that have been chosen possess antioxidant and radical scavenging activities. Research reveals to an extent their ability to act as antioxidants and radical scavengers. It is obvious that more research is needed for the potential therapeutic role of the eight essential oils to be better understood and specified. What is certain is that it is a promising field for further study.*

### Current Topics in Nutraceutical Research 10 (2): 133-136

#### 133-136 FLAVONOID CONTENTS AND 2,2-DIPHENYL-1-PICRYLHYDRAZYL RADICAL SCAVENGING ACTIVITIES OF SOME EDIBLE MUSHROOMS FROM TURKEY: A. BISPORUS AND PLEUROTUS SPP.

Mehmet Akyüz, Ayse Nilay Onganer, Pinar Erecevit and Sevda Kirbag

**ABSTRACT:** In this study, flavonoid and resveratrol contents and 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activities of *Agaricus bisporus*, *Pleurotus eryngii* var. *eryngii*, *P. eryngii* var. *ferulae*, *P. sajor-caju*, *P. ostreatus* and *Pleurotus sp. florida* were determined. In addition, the amounts of resveratrol and flavonoid such as rutin, myricetin, morin, quercetin, kaempferol, catechin, naringenin were also determined to be 0.00-0.75 and 0.00-3.00, 0.00-11.75, 0.00-64.50, 0.00-0.50, 0.00-0.25, 0.00-396.00, 0.00-2.00  $\mu\text{g/g}$  of dry weight, respectively. Furthermore, naringenin was not detected in any of the samples. EC<sub>50</sub> value in scavenging ability on DPPH free radical was 11.78% in *P. ostreatus*, 13.01% in *P. sajor-caju*, 13.11% in *P. eryngii* var. *eryngii*, 14.58% in *Pleurotus sp. florida*, 17.25% in *A. bisporus* and 24.67% in *P. eryngii* var. *ferulae*. In fact, *P. ostreatus* was the most efficient species concerning antioxidant activity, while *P. eryngii* var. *ferulae* presented lower antioxidant properties. Based on EC<sub>50</sub> values, *P. ostreatus* was good in antioxidant properties for the scavenging ability on DPPH free radical.

