Health improving effects of sage tea – A pilot study
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Introduction
Diabetes is a disease caused by loss of control of glucose homeostasis, that also involves imbalances in the internal metabolic environment that can lead to oxidative stress and damage in some cell populations. Decrease antioxidant defenses and alterations are also features of diabetes, the latter is one of the major causes for type 2 diabetes-related complications, such as cardiovascular disease. Sage (Salvia officinalis, common sage) is a medical plant to which antioxidant, anti-inflammatory and antimicrobial properties have been attributed [1]. Recent results from our lab also show that a water extract of sage officinalis reduces liver glucose production and fasting plasma glucose levels in rats, suggesting an antioxidant potential for sage [2]. In order to test these effects in humans we performed a pilot trial with six healthy volunteers. We investigated the protective effect of the regular intake of sage tea on the antioxidant response of human peripheral blood lymphocytes (PBLs) challenged with H2O2. We also assessed effects on HSP70 expression levels in PBLs because a therapeutic role for HSP70 induction in diabetes has been suggested [3]. The mechanisms of cellular protection conferred by sage tea drinking to human blood cells were further explored by evaluating antioxidant enzymes activities (SOD and CAT) in blood serum. Parameters such as aminotransferases activities (AST and ALT) and total cholesterol, LDL, HDL and glucose were measured as well.

Results

The presence of enzymes alkaloid aminotransferases (ALT) and separate aminotransferases (AST) in the plasma is considered as an indicator of liver injury. The results of this study indicate that sage tea had no toxic effects on the liver based on plasma ALT and AST activities (Table I). Although there were some variations, the values of aminotransferases activities remained well below the indicating level of pathological changes.

Figures

The significant increase in activities of superoxide dismutase (SOD) and catalase (CAT) suggests that sage treatment positively affected the erythrocyte antioxidant status (Fig. 2). These enzymes play an important role in organs/oxidative stress protection which is involved in aging and is associated to the development of different diseases, such diabetes melanoma and in secondary complications.

The results suggest a positive effect of sage tea in the reduction of total cholesterol levels and seem to be present even two weeks after sage treatment (Fig. 5). This beneficial effect is supported by the analysis of the lipoprotein results, where it was verified a gradual reduction of LDL levels and a gradual increase of HDL levels in the plasma (Fig. 5). As a result of the effect the risk from development of cardiovascular diseases, as diabetes consequences, becomes reduced.

The intake of sage tea induced a remarkable increase in the expression of HSP70.

Final Remarks

The results support the popular belief that drinking sage officinalis ( sage) tea is safe and can contribute for an improvement of diabetic patient health conditions. This pilot trial showed no adverse effects associated with sage tea drinking.

The effects on antioxidant as well as on plasma lipid profile are of use in diabetes management but may have broader applications.

Moreover the regular intake of sage tea has a protective effect against oxidative DNA damage in lymphocytes, which is accompanied by an increased HSP70 expression.

Higher HSP70 levels during treatment suggest that an induction of HSP70 may be, at least in part, responsible for the improved cellular response to induced oxidative damage. Because HSP70 induction coves the deleterious consequences of chronic diseases, such as diabetes [3], the positive effect of sage officinalis on the induction of molecular chaperones emphasises the value of this plant as a promising source of compounds with pharmacological potential.

Material and Methods

Single Cell Gel Electrophoresis
The alkaline version of this method was performed as described in [4]. Briefly, cells were prepared in 0.5% low melting agarose, spread over a microscope slide, presented with a layer of 1% normal melting point agarose, and fixed with 3% Triton X-100 overnight. After allowing DNA alkali denaturation, gel electrophoresis was performed at 4°C for 2 h, 250 V, 30 min, in 0.8 V/cm and 4°C. Slides were then neutralized, stained with ethidium bromide and analysed under a fluorescence microscope. Visual scoring was used to evaluate comet tail DNA. 100 cells were scored per sample (grade 0-6, grade 4 stands for the greatest damage).

Western Blotting
The quantification of HSP70 and Actin was assessed by Western Blot analysis as described in [5]. Methodist monodimensional antibodies against HSP70 (Fischer, 1:1114 dilution) and Actin developed by Jin Jing-Ching Lin (maintained by the University of Iowa, Department of Biological Sciences, 1:1000 dilution). Blood antibodies were revealed with a horseradish peroxidase conjugated secondary antibody (Amersham Biosciences, 1:10000) using the ECL documentimaging detection system (Amersham Biosciences). Signal was acquired with a Chemidoc XD (Biolmage) imaging densitometer and band intensity was quantified using image analysis software (SignalScan Pro 5.0, SPBS).

Acknowledgements

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References


Table I.

Expression of enzymes alkaloid aminotransferases (ALT) and separate aminotransferases (AST) in the plasma quantified throughout the different phases of the study. Data of plasma ALT and AST activities were assessed effects on HSP70 expression levels in PBLs because a therapeutic role for HSP70 induction in diabetes has been suggested [3]. The mechanisms of cellular protection conferred by sage tea drinking to human blood cells were further explored by evaluating antioxidant enzymes activities (SOD and CAT) in blood serum. Parameters such as aminotransferases activities (AST and ALT) and total cholesterol, LDL, HDL and glucose were measured as well.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Baseline</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Treatment 3</th>
<th>Treatment 4</th>
</tr>
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<tbody>
<tr>
<td>ALT (U/l)</td>
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<td>0.0</td>
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<tr>
<td>SOD (U/ml)</td>
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<tr>
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<tr>
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<tr>
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<tr>
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**Footnotes:**
* P<0.05, ** P<0.01, *** P<0.001

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*References:**