POSTPRANDIAL BIOACTIVITY OF SPREAD CHEESE, ENHANCED WITH MOUNTAIN TEA AND ORANGE PEEL EXTRACT, IN HEALTHY VOLUNTEERS. A PILOT STUDY.

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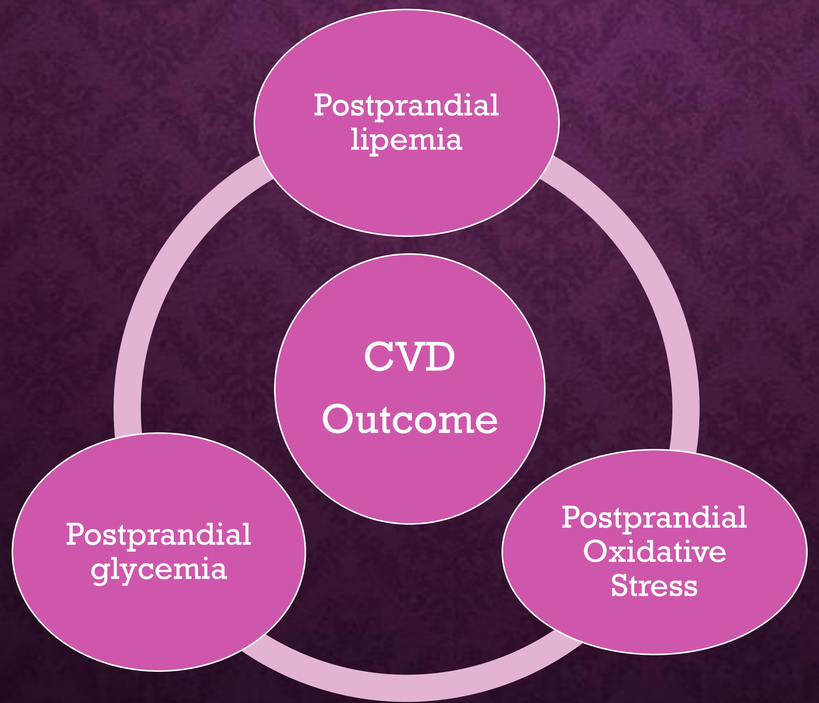
Introduction

- Postprandial lipemia, glycemia and oxidative stress may promote cell dysfunction and affect the outcome of cardiovascular disease(CVD).
- Mountain tea (Sideritis sp.) and orange peel (fruit by-product), as natural functional foods, contain **bioactive compounds** with possible beneficial effects on serum lipids and glucose levels, as well as on plasma total antioxidant activity.

- It has been investigated that *the enhancement of a spread cheese with natural bio-functional foods, such as mountain tea (Sideritis sp.) and dried orange peel extract*, may reduce postprandial metabolic biomarkers in healthy volunteers.



Purpose

The purpose of this pilot study was the investigation of possible postprandial bioactivity of such a spread cheese.

POSTPRANDIAL EFFECT

- ✓ Total cholesterol
- ✓ LDL-cholesterol
- ✓ Glucose
- ✓ Triglycerides
- ✓ HDL-cholesterol
- ✓ Antioxidants

?

Methods

Study Design

- ❑ *Cross-over design, pilot study*
- ❑ *9 healthy volunteers 20-30 years old, were randomized and participated to this nutritional intervention.*
- ❑ *Filling in a short questionnaire on medical history and eating habits*
- ❑ *Anthropometrics & blood tests (at a public hospital)*

- ✓ The 9 volunteers (4 men and 5 women) who participated in the 2 day randomized nutritional intervention-clinical study, arrived at the Nutrition Unit of Aegean University, in Lemnos.

- ✓ The trial included the consumption of a meal, rich in fat and carbohydrates, *[2 slices-80g of white bread, spread with 40g of butter and 30g of full fat spread cheese]* (control meal). After a week washout period, the same volunteers consumed the same meal contained a novel spread cheese, enhanced with 6% mountain tea and dried orange peel extract [3g mountain tea, 3g orange peel, 100ml boiling water]* (intervention meal).

**Antioxidant capacity of the extract- FRAP method : 34,67μmol Fe2SO4/ml*
Total phenolics of the extract-Folin- Ciocalteu method: 49,9μg gallic acid/ml

- ✓ *Blood sampling was performed, before and 1.5, 3 and 5 h after meal consumption.*

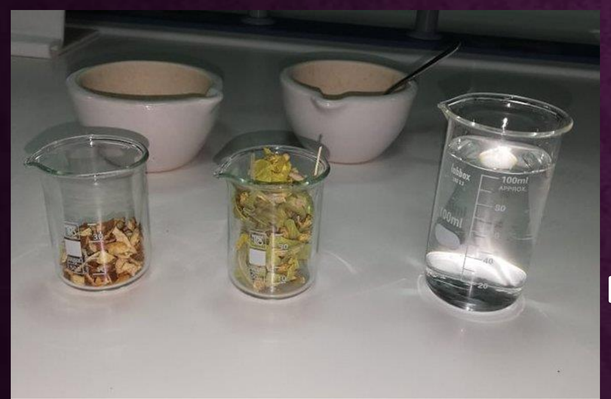
Ethics

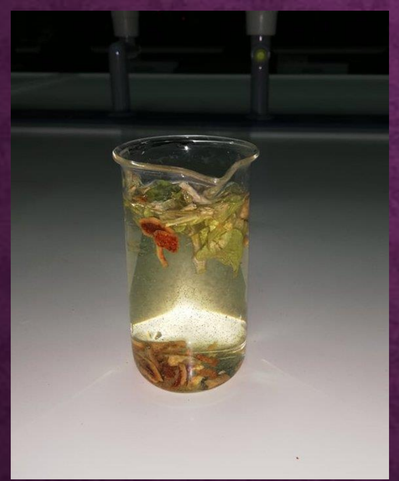
The study protocol was approved by the Ethics committee of Aegean University and the study performed in accordance with the Declaration of Helsinki. All the participants signed an informed consent form and informed about the prime target of this study, the confidentiality of data and the voluntary nature of participation.

❖*Preparation of the novel, spread cheese*

- *In 100 ml of boiling water were added 3g of mountain tea and 3g of dried orange peel, and then remaining for 5min until the extraction of bioactive compounds.Filtration of the extract was followed by filter paper.*

- *The functional spread cheese was prepared adding 6ml of mountain tea-orange peel extract to 94g cheese, followed by mixture homogenization.*



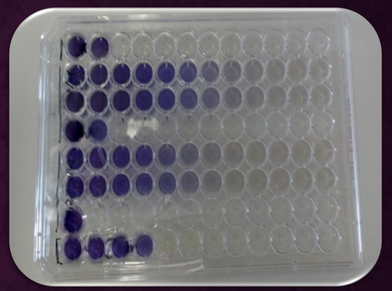


Mountain tea-Orange peel extraction

Novel cheese preparation

Analytical techniques

❑ ***Measurement of antioxidant capacity and total phenolics of the extract(mountain tea-orange peel)***



- *Antioxidant capacity determination- FRAP (Ferric Reducing Antioxidant Power) method*

A spectrophotometric method for measuring the absorption of antioxidants, expressed in terms of μmol Fe_2SO_4/ml, since they have the property of converting Fe^{+3} to Fe^{2+} (in complex with TPTZ), giving a blue color.

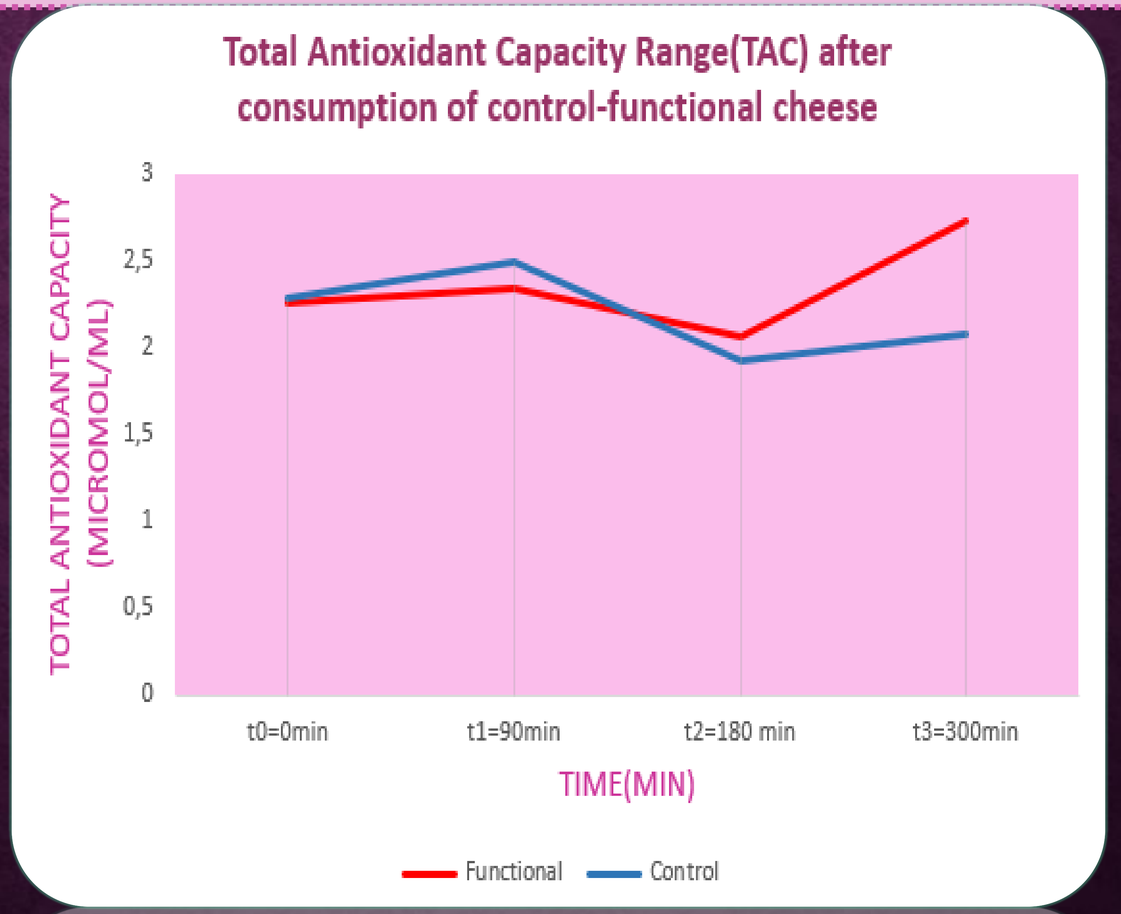
- *Determination of total phenolics- Folin-Ciocalteu method*

A spectrophotometric method for the absorption of total phenolics, expressed in μg gallic acid/ml, based on the ability of phenolic compounds to reduce phosphomolybdenum and phosphobolphoric acid compounds in an alkaline environment, giving a blue color.

❑ ***The total antioxidant capacity (FRAP assay), serum lipids [Total, HDL-, LDL- cholesterol and triglycerides], glucose and uric acid were measured using a Roche Cobas c111 biochemical analyzer, while anticoagulant activity were also determined for each instant.***

Results

A statistically significant increase in the antioxidant capacity of plasma 3h after meal consumption, and HDL-cholesterol 1.5h after meal, in the presence of the novel cheese [enhanced with mountain tea-orange peel extract],compared to the consumption of control cheese ($p < 0.05$). There was a tendency to decrease the rate of increase of glucose and triglycerides 1.5h after interventional meal. The remaining biomarkers did not show statistically significant differences ($p > 0.05$).

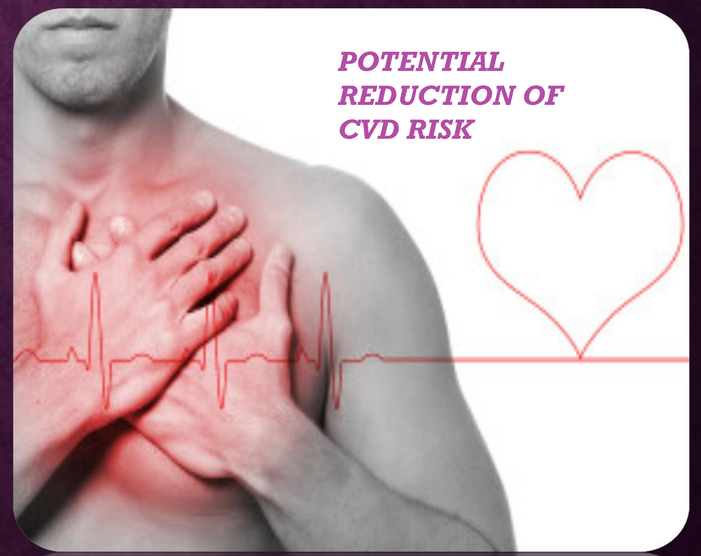


Graph 1. Value range curves for total antioxidant capacity of volunteer plasma, after consuming control and functional(novel), spread cheese respectively.

Conclusions

These findings suggest that the enhancement of a spread cheese with mountain tea and orange peel extract may be beneficial on plasma antioxidant capacity, attenuating possible postprandial oxidative stress. The phenolic compounds metabolites may also affect the postprandial levels of serum triglycerides and glucose levels.

Nevertheless, this was a pilot study; thus the extention of the study with more participants could lead to safer conclusions about the postprandial effect of the extracts to postprandial oxidative stress, lipemia and glycemia biomarkers, factors that significantly affect the risk of cardiovascular disease.



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2. Georgakopoulou V., Dimou C., Karantonis C. In Vitro Antioxidant, Antithrombotic, Antiatherogenic and Antidiabetic Activities of Urtica dioica, Sideritis euboea and Cistus creticus Water Extracts and Investigation of Pasta Fortification with the Most Bioactive One. Current Pharmaceutical Biotechnology, 2019, 20(10): 874-880