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Influence of polyphenol-rich apple pomace extract on oxidative damage to DNA in type 2 diabetes mellitus individuals

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Background

Diabetes mellitus type 2 (DM2) is associated with increased oxidative stress and oxidative damage to DNA. An appropriate intake of antioxidants via the diet can improve this disturbed oxidative status [1]. Apples are the most widely consumed fruits in Europe and represent a major source of antioxidants due to their high polyphenol content [2]. Apple pomace as a polyphenol-rich byproduct of apple juice production could serve as a cheap and reliable tool for a nutraceutical with antioxidative properties.

Materials and methods

To test the antioxidant potential of a pectin-depleted apple pomace extract (APE) in human subjects, a placebo-controlled, crossover, double-blind, pilot human intervention study was performed. Eighteen postmenopausal women with DM2 (age=69.7±6.7 y; BMI=33.9±4.5 kg/m2) were randomly allocated to receive either APE (440 mg per capsule containing about 100 mg total polyphenols, once daily) or placebo during two 4-week supplementation periods separated by a 4-week wash-out period. Before and after each supplementation period oxidative damage to DNA (Comet Assay) in peripheral blood mononuclear cells (PBMC) and whole blood, urinary excretion of 8-oxo-7hydro-2'-deoxyguanosine (8-oxodG) and 8-oxo-7,8-dihydroguanosine (8-oxoGuo), glycated hemoglobin (HbA1c), fasting blood glucose, insulin, C-peptide and anthropometric indices were measured. The bioavailability of the main APE polyphenol Phloridzin and its metabolite Phloretin were analyzed in plasma samples.

Results

In contrast to the placebo-supplementation, APE resulted in detectable plasma Phloridzin (12.7±40.7 ng/ml) and Phloretin (19.3±36.5 ng/ml) concentrations. The study population was characterized by HbA1c =5 4.9±6.3 mmol/mol, fasting blood glucose = 8.1±1.9 mmol/l, fasting insulin = 99.3±36.6 pmol/l and C-peptide = 1.3±0.4 nmol/l baseline levels. However, these DM2 biomarkers were not influenced by the supplementation with APE compared to placebo. No changes occurred in 8-oxoGuo and 8-oxodG. FPG-sensitive sites of whole blood decreased (P = 0.026) regarding apple pomace intervention of both diet periods. Neither DNA strand breaks nor H_2O_2-sensitivity of DNA altered following APE supplementation.

Conclusions

Oxidatively damaged purines decreased after APE intervention while other markers of oxidative damage to DNA in DM2 individuals did not change after short-term supplementation with polyphenol-rich APE.

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