Tea and coffee intake in relation to plasma total homocysteine concentrations: a cross-sectional study in older women

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Elderly females are at increased risk of cardiovascular disease. The major aim of this study was to investigate the relationships of coffee and tea intake to plasma total homocysteine concentrations (tHcy) levels in a population based, unselected group of women over 70 years of age. Elevated tHcy are associated with increased risk of cardiovascular disease. This association is independent of other risk factors, is dose-related, and there is increasing evidence that it is causal. Several, but not all, population studies have shown that higher coffee intake is associated with elevated tHcy. In controlled intervention studies, regular chronic ingestion of coffee results in clinically relevant increases in tHcy. The effect of coffee to raise tHcy is predominantly due to chlorogenic acid, a phenolic acid and the major polyphenol present in coffee. Results of cross-sectional population studies generally show that higher tea intake, which is also rich in polyphenols, is associated with lower tHcy. This association is often attenuated after adjustment for coffee intake. A controlled intervention study using high doses of tea has shown an increase tHcy, but we have shown that a dose more representative of a usual tea intake did not alter tHcy.

The proposed mechanism for any tHcy raising effect of dietary polyphenols from coffee and tea involves polyphenols accepting methyl groups during metabolism of methionine to homocysteine. Results of our recent intervention study showing that the degree of methylation of a tea-derived polyphenol was positively associated with the tHcy response to regular ingestion of tea are consistent with this hypothesis. However the inverse association between tea and tHcy in populations is also consistent with the presence of other factors in tea, such as folate, which could contribute to lower tHcy.

A randomly selected subset of 233 women recruited to the Calcium Intake Fracture Outcome Study (CAIFOS) had a 24 hour urine collection at the end of which a blood sample and 24 hour diet recall were performed including coffee and tea intake. tHcy was assessed on fasting plasma samples. 4-O-methylgallic acid (4OMGA, the major O-methylated metabolite of gallic acid from tea) and isoferulic acid (an O-methylated metabolite of chlorogenic/caffeic acid from coffee) were measured on the 24 hour urine sample. Isoferulic acid and 4OMGA were used as markers of overall O-methylation of coffee and tea-derived polyphenols, respectively. Relationships of coffee intake, isoferulic acid excretion, tea intake and 4OMGA excretion with tHcy were investigated using SPSS version 11.

Mean (SD) tea and coffee intake were 2.1 (1.7) cups and 1.2 (1.3) cups, respectively. Coffee and tea intake were negatively correlated ($r = -0.43$, $P < 0.001$). Coffee intake and isoferulic acid excretion were not associated with tHcy. Tea intake was positively associated with 4OMGA ($r = 0.58$, $P < 0.001$). In comparison to a tea intake of ≤ 1 cup/d, an intake of > 1 cup of tea/d was associated with significantly lower tHcy [geometric mean (95% CI): 11.9 µmol/L (11.3, 12.5) v 10.9 µmol/L (10.4, 11.3) $P = 0.011$]. In comparison to 4OMGA excretion below the median, 4OMGA excretion above the median was also associated with significantly lower tHcy [geometric mean (95% CI): 11.9 µmol/L (11.4, 12.4) v 10.8 µmol/L (10.3, 11.3) $P = 0.004$]. The associations of tea intake and 4OMGA with tHcy were largely unchanged after adjustment for age and coffee intake ($P = 0.007$ and $P = 0.009$, respectively).

Our results are not consistent with the proposed tHcy raising effect of coffee in this group of older women. The observed lower tHcy in women with higher tea intake (by about 1 µmol/L) is consistent in direction and magnitude with previous epidemiological studies. The strength of the association between tea intake and 4OMGA excretion, and the similarity of observed associations with tHcy indicate that 4OMGA is a reasonable biomarker of tea intake. The results of this study do not provide support for the hypothesis that methylation of dietary polyphenols can contribute to elevations in tHcy. Rather they suggest that some other constituent of tea is associated with lowering tHcy.

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