

Abstract

Effects of black tea with and without a fat load on vascular function in mildly hypertensive volunteers

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Introduction. Endothelial dysfunction has been supposed to be the first step of atherosclerosis. Endothelial dysfunction may be an early biomarker for the development of cardiovascular disease and a predictor of future cardiovascular events. Flavonoids are a class of compounds occurring in different plant foods. Major dietary sources include fruits and vegetables, tea, red wine and chocolate. Recent studies in healthy subjects reported positive effects of both acute and chronic black tea consumption on endothelium-dependent flow-mediated dilation (FMD). Further, we recently observed black tea ingestion dose-dependently improved FMD and decreased peripheral arterial stiffness in healthy volunteers. In contrast, lipemia following a fatty meal occurs several times per day and a fat-rich meal decreased FMD.

Aim: To assess the effect of black tea with and without a fatty meal on FMD, digital volume pulse (DVP) and office blood pressure (BP) in never treated grade 1 hypertensive patients without additional cardiovascular risk factors.

Methods. According to a randomized, double-blind, controlled, cross-over design, 19 grade 1 hypertensives were assigned to receive 150 mg tea flavonoids or placebo twice a day for eight days. Wash-out between treatments was of 13 days. On day 7 all measurements were performed in a fasted state while on day 8 patients consumed ultra-heat-treated whipping cream (1 gram fat per kg body weight) approximately 30 minutes after consuming the test product. FMD, DVP and BP measurements were measured basally and repeated at 1, 2, 3 and 4 hours after consumption of the test product.

Results: After 1-week, tea ingestion improved FMD ($p < 0.0001$). One cup of tea further increased FMD at 1, 2, 3 and 4 hours after consumption with acute improvement and maximal response 2 hours after intake ($p < 0.0001$). Fat challenge significantly decreased FMD, while tea consumption counteracted FMD impairment by the fat challenge ($p < 0.0001$). Tea improved reflection index (small vessel tone; $p < 0.0001$) and stiffness index (large arterial stiffness; $p < 0.0001$) with additional effects after acute tea consumption (1, 2, 3 and 4 hours), with and without fat load. Further, tea decreased systolic and diastolic BP with and without a fat load (all $p < 0.0001$). Tea intake significantly increased the number of circulating blood endothelial progenitor cells ($p < 0.005$).

Conclusions: We observed for the first time that black tea may have beneficial effects on BP and vascular function and attenuated, or completely prevented, the abnormalities in endothelial function, peripheral arterial hemodynamics and BP caused by an acute oral fat load in never-treated hypertensive patients. Considering that the ingestion of the main daily meal has been considered a possible trigger for acute myocardial infarction, our findings are of clinical relevance and interest.

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Atherosclerosis is the main cause of death and disease in US. An impaired vasodilation with dysfunction of the arterial function precedes and cause atherosclerosis and recent studies in healthy subjects reported positive effects of both acute and chronic black tea consumption on arterial function and vasodilation, as investigated by the gold standard technique, i.e. flow-mediated dilation (FMD).

In this regard, an uncorrect with high fat content can occur even several times per day and is known to induce a marked and repeated damage at the vascular level, particularly by decreasing the vasodilatory ability.

Thus, in our more recent studies we evaluated for the first time the effect of black tea with and without a fatty meal on FMD and blood pressure levels in never-treated grade 1 hypertensive patients without additional cardiovascular risk factors.

Main results showed that black tea ingestion (1 week) improved FMD ($p < 0.0001$). As expected, the fat challenge significantly decreased FMD. Black tea consumption counteracted FMD impairment by the fat challenge ($p < 0.0001$). Tea also reduced systolic and diastolic BP with and without a fat load (all $p < 0.0001$). Of note, we also observed that black tea intake significantly increased the number of circulating blood endothelial progenitor cells, i.e. of protective circulating cells, ($p < 0.005$).

In conclusion, we observed for the first time that black tea exerts beneficial effects on BP and vascular function and attenuated, or completely prevented, the acute vascular abnormalities induced by fats. The main responsible for this benefits are likely to be the flavanols contained in black tea.

Considering that an “junk diet”, rich in fats and/or glucose, is considered as a trigger for acute myocardial infarction and stroke, our findings are of clinical relevance.