Green Tea Epigallocatechin-3-gallate (EGCG) oxidative stress and DNA Damage

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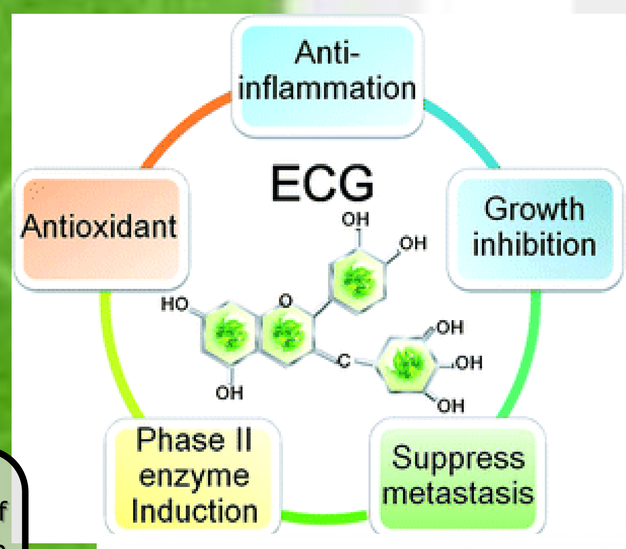
Epigallocatechin-3-gallate

Green tea, prepared from the dried leaves of the plant *Camellia sinensis* (Theaceae), is one of the most popular beverages worldwide, and it is known to contain catechins, dietary polyphenolic compounds that have a variety of beneficial health effects. The widely renowned biological actions of catechins have been associated with their antioxidant and free radical scavenging properties.

Epidemiological and interventional studies support a protective role of green tea in disease onset, including cardiovascular disorders and cancer. Epigallocatechin-3-gallate (EGCG) is the main polyphenolic constituent in green tea and, although its antioxidant properties have been demonstrated, increasing evidence indicates that EGCG may produce reactive oxygen species (ROS), leading to oxidative stress, and subsequent cell death.



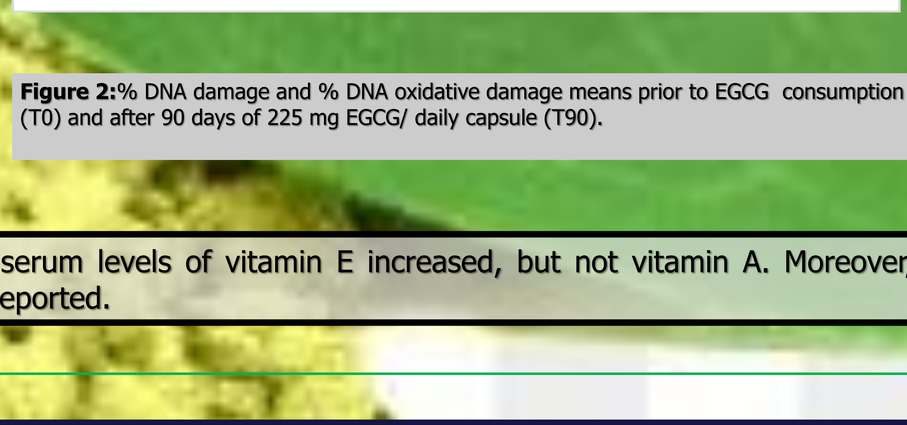
Aim: Evaluate the effect of EGCG intake during 90 days in hematological cardiovascular risk factors, vitamins A and E, DNA damage and oxidative damage in human blood *in vivo*.

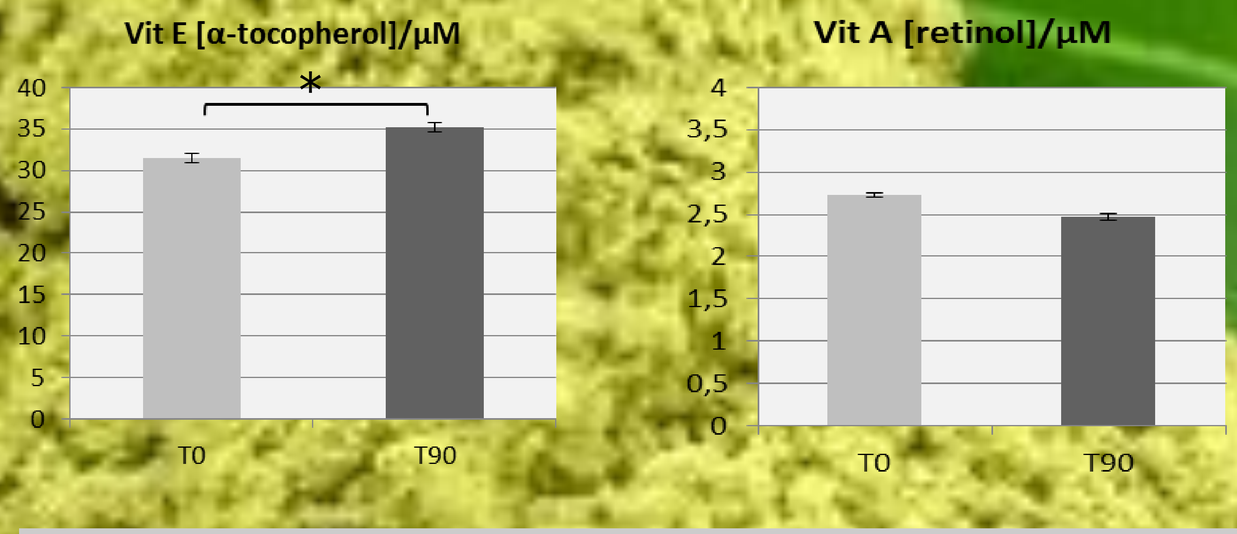
Methods: Peripheral blood from 30 healthy individuals (10 males and 20 females; 18 – 45 years), was collected at time 0 (T0) and time 90 (T90). During 90 days, participant's ingested daily commercial capsules of green tea extract (225mg EGCG). Hematological cardiovascular risk factors, including lipid profile (triglycerides, cholesterol, HDL and LDL) and liver function parameters (transaminases GOT, GPT, GGT) were assessed using colorimetric methods. Vitamins A and E in serum were quantified by HPLC. The analysis of DNA damage and oxidative damage in previously isolated peripheral lymphocytes was performed by comet assay.

RESULTS

Table 1: Lipid profile and liver function parameters average determination prior (T0) and after 90 days (T90) of EGCG 225mg daily capsule consumption.

	Triglycerides (mg/dL)	Cholesterol (mg/dL)	HDL (mg/dL)	LDL (mg/dL)	AST/GOT (UI/L)	ALT/GPT (UI/L)	GGT (UI/L)	RATIO LDL/HDL
T0 (average)	107,77	183,4	61,6	100,3	24,23	25,37	19,13	107,77
T90 (average)	119,17	181,67	63,53	93,967	25,4	30,73	22,07	119,17





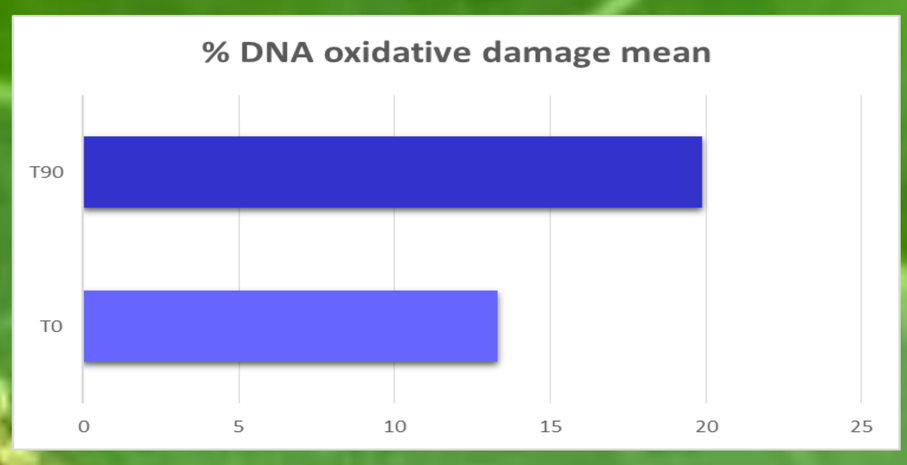


Figure 1: HPLC determination of Vit E [α-tocopherol]/μM and Vit A [retinol]/μM average prior to EGCG consumption (T0) and after 225mg EGCG daily capsule for 90 days (T90). Experiments were repeated three times per experiment. Student's t test (* $p<0.05$).

Figure 2:% DNA damage and % DNA oxidative damage means prior to EGCG consumption (T0) and after 90 days of 225 mg EGCG/ daily capsule (T90).

Results showed that lipid profile and liver function parameters were not affected by EGCG and serum levels of vitamin E increased, but not vitamin A. Moreover, an increase of DNA damage and DNA oxidative damage after 90 days of EGCG consumption was also reported.

Considerations

The results suggest that EGCG can induce DNA damage, possibly due to ROS induction, with associated increase of the antioxidant vitamin E, however without alteration of hematological cardiovascular risk factors. Increasing evidence demonstrate that tea constituents can be cell damaging and pro-oxidant themselves, being these effects suggested to spontaneous H_2O_2 generation by polyphenols in solution.

In summary, the study demonstrated that the daily consumption of low concentrations of EGCG (225 mg) does not affect lipid profile or liver function parameters *in vivo* to healthy volunteers, however it increases low level oxidative stress observed by DNA oxidative damage witch may act as a beneficial cue for the body to initiate induction of protective anti-oxidant systems associated with vitamin E, and boost immune responses. Further research is crucial in order to understand the extent and potential effects of EGCG oxidative stress and DNA damage.