Interaction and protective effect of epigallocatechin gallate on human erythrocytes and molecular models of its membrane

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Abstract

Epigallocatechin gallate (EGCG) is the most abundant and biologically active compound found in green tea; it exhibits potent antioxidant and anti-inflammatory properties both *in vitro* and *in vivo*[1]. In the present study, it was investigated the interaction and protective effect of EGCG on human erythrocytes (RBCs) and on molecular models of its membrane; these consisted in bilayers built-up of dimyristoylphosphatidylcholine (DMPC) and dimyristoylphosphatidylethanolamine (DMPE), representative of phospholipid classes located in the outer and inner monolayers of the human erythrocyte membrane, respectively[2]. X-ray diffraction and differential scanning calorimetry experiments showed that EGCG induced significant structural and thermotropic perturbations in multibilayer and vesicles of DMPC; however, this effect was not observed in DMPE. Fluorescence spectroscopy results at the laurdan probe level showed that EGCG produced alterations in the fluidity of DMPC vesicles and human erythrocyte ghost. SEM observations showed that EGCG causes morphological alterations in human erythrocytes inducing the formation of echinocytes. All these results indicate that EGCG molecules located in the outer monolayer of the erythrocyte membrane. It was also found that at low concentrations EGCG inhibits the morphological alterations induced by HClO to human erythrocytes. Hemolysis experiments also showed that EGCG protects the RBCs from the membrane rupture caused by HClO. Our results allow to conclude that the EGCG insertion into the outer monolayer of the erythrocytes might prevent the access and deleterious effects of oxidant molecules like HClO as well as of free radicals into the red cells, protecting them from oxidative damage.

[1] S. Riegsecker et al., Life Sciences. 93, 307–312 (2013)
[2] M. Suwalsky et al., J Membrane Biol. 249, 769–779 (2016)