

Biomimetic Systems to Reveal the Action Mode of Epigallocatechin-3-Gallate in Lipid Membrane

Authors : F. Pires, V. Geraldo, O. N. Oliveira Jr., M. Raposo

Abstract : Catechins are powerful antioxidants which have attractive properties useful for tumor therapy. Considering their antioxidant activity, these molecules can act as a scavenger of the reactive oxygen species (ROS), alleviating the damage of cell membrane induced by oxidative stress. The complexity and dynamic nature of the cell membrane compromise the analysis of the biophysical interactions between drug and cell membrane and restricts the transport or uptake of the drug by intracellular targets. To avoid the cell membrane complexity, we used biomimetic systems as liposomes and Langmuir monolayers to study the interaction between catechin and membranes at the molecular level. Liposomes were formed after the dispersion of anionic 1,2-dipalmitoyl-sn-glycero-3-[phospho-rac-(1-glycerol)(sodium salt) (DPPG) phospholipids in an aqueous solution, which mimic the arrangement of lipids in natural cell membranes and allows the entrapment of catechins. Langmuir monolayers were formed after dropping amphiphilic molecules, DPPG phospholipids, dissolved in an organic solvent onto the water surface. In this work, we mixed epigallocatechin-3-gallate (EGCG) with DPPG liposomes and exposed them to ultra-violet radiation in order to evaluate the antioxidant potential of these molecules against oxidative stress induced by radiation. The presence of EGCG in the mixture decreased the rate of lipid peroxidation, proving that EGCG protects membranes through the quenching of the reactive oxygen species. Considering the high amount of hydroxyl groups (OH groups) on structure of EGCG, a possible mechanism to these molecules interact with membrane is through hydrogen bonding. We also investigated the effect of EGCG at various concentrations on DPPG Langmuir monolayers. The surface pressure isotherms and infrared reflection-absorption spectroscopy (PM-IRRAS) results corroborate with absorbance results performed on liposome-model, showing that EGCG interacts with polar heads of the monolayers. This study elucidates the physiological action of EGCG which can be incorporated in lipid membrane. These results are also relevant for the improvement of the current protocols used to incorporate catechins in drug delivery systems.

Keywords : catechins, lipid membrane, anticancer agent, molecular interactions

Conference Title : ICNME 2017 : International Conference on Nano and Materials Engineering

Conference Location : Amsterdam, Netherlands

Conference Dates : May 14-15, 2017