

Iron chelation properties of green tea Epigallocatechin-3-Gallate (EGCG) in colorectal cancer cells: analysis on Tfr/Fth regulations and molecular docking

ABSTRACT

In many studies, green tea epigallocatechin-3-gallate (EGCG) has already shown its therapeutic effects in colorectal cancer cells (CRC). However, its mechanism of actions in CRC is poorly elucidated. Hence, this study attempts to elucidate the mechanism of actions of green tea EGCG via iron chelation activity in CRC. In order to investigate this property, HT-29 cell lines (CRC) were treated with EGCG for 24 h, 48 h, and 72 h. From western blot analysis, EGCG had upregulated transferrin receptor (TfR) protein and downregulated Ferritin-H (FtH) protein indicating that iron chelation activity has occurred in CRC. Meanwhile, the molecular docking study demonstrated that EGCG is able to strongly interact the ferritin protein with a high binding affinity (-7.3 kcal/mol) via strong hydrogen bindings to glutamic acid 64 and lysine 71; two moderate hydrogen bindings to asparagine 74 and a hydrophobic interaction to the hydrophobic pocket of lysine 71. The strong interaction predicted between EGCG to ferritin may lead to inhibition of ferritin by EGCG, thus supporting the downregulation of FtH observed in in vitro studies. Molecular docking study of TfR to EGCG cannot be modulated based on the in vitro results. In conclusion, EGCG possesses iron chelator property in CRC and this potential could be further exploited for CRC treatment.