Green tea epigallocatechin gallate regulates the growth and autophagy protein expression in white fat cells

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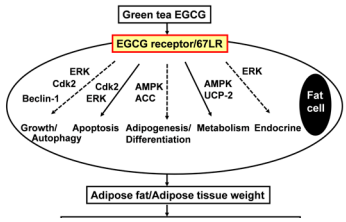
Statement of the Problem: Green tea catechins, particularly (-)-epigallocatechin gallate (EGCG), have been reported to regulate obesity and white fat cell activity. This study investigated the effects of EGCG on the expression of autophagy pathway proteins in 3T3-L1 white preadipocytes.

Methodology & Theoretical Orientation: 3T3-L1 preadipocytes were treated with EGCG and then cell number and autophagy pathway proteins were measured by the dye exclusion method and Western blot analysis, respectively.

Findings: EGCG was found to inhibit preadipocyte growth in a dose- and time-dependent manner, as indicated by decreased cell number. Pretreatment with the respectively early staged and late-staged autophagy inhibitors, such as 3-methyladenine (3-MA) and chloroquine (CQ), suppressed preadipocyte growth and enhanced further EGCG-decreased cell number. This suggests that a functional process of autophagy is necessary for preadipocytes to grow and that EGCG may act differently from 3- MA and CQ in regulating levels of autophagy pathway proteins. Indeed, EGCG was found to time- and dose-dependently reduce the expression of autophagy pathway proteins, such as Beclin-1, ATG3, ATG5, ATG7, ATG16L1, and ERK proteins, while it increased the level of late-staged autophagy proteins, p62 and LC3β-II. Interestingly, 3-MA tended to increase levels of Beclin-1, ATG3, ATG5, ATG7, ATG16L1, p62, LC3β-II, and ERK proteins, while CQ significantly increased levels of Beclin-1, ATG3, ATG16L1, p62, LC3β-II, and ERK proteins, decreased ATG5, and unaltered ATG7. Pretreatment with 3-MA generally reversed EGCG-induced changes in levels of autophagy proteins. Moreover, pretreatment with CQ enhanced the EGCG-increased levels of p62 and LC3β-II proteins.

Conclusion & Significance: These data suggest that EGCG exerts its anti-growth action on preadipocytes via regulation of multiple autophagy proteins and its effects may act differently from autophagy inhibitors 3-MA and CQ. Results of this study possibly support that EGCG can be a therapeutic agent to regulate obesity by autophagy mechanism.



Biography

Kao, PhD (1997) in Zoology at North Dakota State University in US, Postdoc Research Associate (1997-2000) at University of Chicago, and a distinguished professor of the National Central University in Taiwan, has his expertise in functional green tea catechin in improving the health. His used animal and cell systems based on responsive body weight changes, fat cell function, and prostate cancer activity discover signalling pathways of epigallocatechin gallate for improving obesity and prostate cancer. He has discovered the results after years of experience in research, evaluation, teaching and administration both in research and education institutions.

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