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Luteolin interferes with oxaliplatin-induced cell cycle arrest in human colorectal cancer cells

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Background: Flavonoids are naturally occurring compounds that exist in fruits and vegetables. The flavonoids are known for having potent anti-cancer effects, such as the inhibition of cell proliferation and the induction of cell cycle arrest and/or apoptosis *in vitro* and *in vivo*. Cancer patients taking anti-cancer drugs have been found to consume food-derived flavonoids in order to enhance their anti-cancer activities, but combinatorial effects of phytochemicals and anti-cancer drugs remain poorly understood. In this study, we examined if luteolin, one of the food-derived flavonoids commonly consumed, shows the synergistic anti-cancer effects in HCT116 human colorectal cancer cells in presence of oxaliplatin, one of the chemotherapeutic agents used to treat colorectal cancer.

Methods: HCT116 p53^{+/+} cell line and its derivative HCT116 p53^{-/-} cells were used to investigate if luteolin inhibits cell proliferation and activates nuclear factor (erythroid-derived 2)-like 2/antioxidant response element (Nrf2/ARE) signaling pathway using cell counting kit-8 (CCK-8) and ARE-luciferase assays, respectively. Colony formation assay and fluorescence-activated cell sorting (FACS) analysis were performed to determine whether combinatorial treatment of luteolin and oxaliplatin has synergistic effects on the inhibition of cell proliferation and the induction of cell cycle arrest and/or apoptosis using HCT116 p53^{+/+} and p53^{-/-} cells or not.

Findings: Luteolin inhibited cell proliferation and also activated Nrf2/ARE signaling pathway of both HCT116 p53^{+/+} and p53^{-/-} cells at high concentrations. A high-dose of luteolin inhibited colony formation and induced apoptosis in HCT116 p53^{+/+} cells more strongly than in HCT116 p53^{-/-} cells as well as oxaliplatin-treated cells. Interestingly, cell cycle arrest by oxaliplatin was attenuated by the high dose of luteolin in HCT116 p53^{+/+} cells, but not in HCT116 p53^{-/-} cells.

Conclusions: The induction of cell cycle arrest by oxaliplatin was attenuated by the high dose of luteolin in HCT116 p53^{+/+} cells, suggesting that some food-derived flavonoids like luteolin might interfere with anti-cancer activity of chemotherapeutic agents in a p53-dependent manner.

Biography

Chan Ho Jang is pursuing his PhD in the School of Food Science and Biotechnology in Kyungpook National University, South Korea. His research interests focus on cancer prevention by phytochemicals, particularly in investigating the underlying mechanisms of the colon cancer prevention.

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