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Anti-proliferative interaction of quercetin and cadmium – A possible new quercetin-related benefit in the human

Ladislav Novotny and Nada Ahmed Al-Hasawi
Kuwait University, Kuwait

Cadmium (Cd) is a toxic heavy metal and industrial pollutant of the environment. Its biological half-life in humans is approximately 30 years. The flavonoid, quercetin (QE) is distributed in plants and is a part of human diet. Many studies demonstrated potential therapeutic effects of QE. Additionally, some studies demonstrated protective effects of QE against Cd-induced toxicity in healthy intact animals. The aim of our study was to investigate the effect of QE and Cd on proliferation in already cancerous cells. Human cancer cells of astrocytoma 1321N1 served as our experimental model. The simultaneous exposure of the cells to QE and Cd (16 µM), significantly reduced cell viability to 21% and 7% at 100 and 200 µM QE, respectively, compared to viability decrease by Cd alone to 81% (48-hours exposure). Other experiments with QE pre-treatment and Cd exposure or co-exposure with QE were performed. The observed effects were time and concentration-dependent. In general, these experiments show the ability of QE to induce cytotoxicity in an *in vitro* model of cancer cells that may undergo further carcinogenic transformation due to exposure to Cd. Cd alone was less cytotoxic in 1321N1 cells and cells did not benefit from QE presence in the medium. In general, a synergetic anti-proliferative interaction of Cd and QE in malignantly transformed cells was shown. This may represent a novel aspect of QE protective effects on organisms that are exposed to toxic agents as it would not only protect normal cells from toxicity of these toxic agents but would contribute to removal of already malignantly transformed cells from the system or removal of any cell undergoing malignant transformation.

Recent Publications

1. Gupta R, Shukla R K, Chandravanshi L P, et al. (2017) Protective role of quercetin in cadmium-induced cholinergic dysfunctions in rat brain. *Mol Neurobiol.* 54:4560–4583.
2. Ranganathan S, Halagowder D and Sivasithambaram N D (2015) Quercetin suppresses twist to induce apoptosis in MCF-7 breast cancer cells. *PLoS One.* 10:e0141370.
3. Zhou X, Koizumi Y, Zhang M, Natsui M, Koyota S, Yamada M, et al. (2015) Cadmium-coordinated supramolecule suppresses tumor growth of T-cell leukemia in mice. *Cancer Sci.* 106:635–641.
4. Russo G L, Russo M, Spagnuolo C, et al. (2014) Quercetin: a pleiotropic kinase inhibitor against cancer. *Cancer Treat Res.* 159:185–205.
5. Bruning A (2013) Inhibition of mTOR signaling by quercetin in cancer treatment and prevention. *Anticancer Agents Med Chem.* 13:1025–1031.

Biography

Ladislav Novotny got his PharmD from Charles University and his PhD from Czechoslovak Academy of Sciences in Prague, Czech Republic. He obtained his Specialization in the field of Pharmacology and Toxicology of Drugs. He received a Doctor of Sciences at Slovak Academy of Sciences. He worked at the Czech Academy of Sciences in Prague, at Comenius University in Bratislava and at the Cancer Research Institute of the Slovak Academy of Sciences in Bratislava. He spent a substantial amount of time at M D Anderson Cancer Center in Houston, USA. He served as a Dean at the Faculty of Pharmacy, Kuwait University from 2003 to 2014. He has authored more than 120 original scientific papers, 36 reviews and 7 patents. His scientific work is in the area of anticancer agents, experimental cancer therapy and in the area of studying physico-chemical and biological properties of various natural and synthetic compounds.

novotny@hsc.edu.kw

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