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In-vitro investigation of changes in efficacy and toxicity of nano-paclitaxel during co-applications with antioxidant natural compounds

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Traditionally applied cancer therapies have the disadvantage of dispersing the chemotherapeutic agent in whole body with inadequate coverage of the tumor area and reduced efficacy. Many methods of treatment under the title of "Targeted Cancer Therapy" have become the focus of numerous workers today. Nano-Drug Delivery Systems (NDDS) capture the major part of these applications. Using antioxidants along with chemotherapy agents, could reduce the side effects of chemotherapy drugs and increase the ability of the patient to tolerate full-dose antineoplastic drugs with continuous treatment programs. This is the main reason for the use of antioxidants during chemotherapy. Antioxidants, besides cancer treatment, are not only advantageous but could show some disadvantages. Reactive oxygen species (ROS) show significant increase in cancer cases. However, the cancer cells have a resistance mechanism against this increase. Chemotherapy agents increase the amount of ROS as well as their specific mechanism of action and this increase is so high that the cancer cell can no longer resist. Therefore, antineoplastic drugs kill cancer cells not only with tubulin binding, DNA damage and so on but also with ROS increase. Presence of antioxidant compounds in the body of the cancer patient could cause the reduction of ROS elevated by the antineoplastic drug and could provide resistance in cancer cells. This study investigated the co-administration of nano-paclitaxel, which was developed for targeted cancer treatment, together with the nano-formulations of well-known anti-oxidant compounds consisted of quercetin, rosmarinic acid and piperlongumine on MCF-7 breast cancer cells. Paclitaxel was administered in constant in the therapeutic dose while several concentrations of natural antioxidants were used while the desired dose was kept constant in the therapeutic dose. Our results showed that the effect of natural compounds are dose dependent and very low doses of natural anti-oxidants could be harmful in co-administration with chemotherapeutic agents.

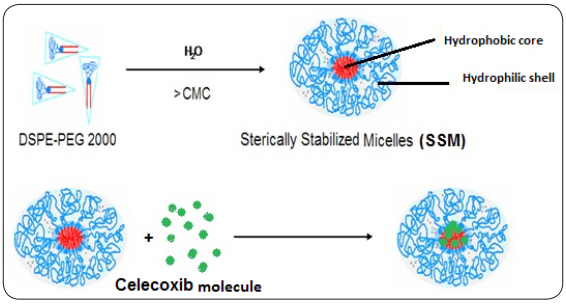

Figure Description: Loading paclitaxel to nano-micelles

Recent Publications:

1. Keith I Block et al. (2008) Impact of antioxidant supplementation on chemotherapeutic toxicity: a systematic review of the evidence from randomized controlled trials.
2. Meshkini A and R Yazdanparast (2012) Involvement of oxidative stress in taxol-induced apoptosis in chronic myelogenous leukemia K562 cells. Experimental and Toxicologic Pathology. 64(4):357-365.
3. S Kumar and A K Pandey (2013) Chemistry and biological activities of flavonoids: an overview. Sci. World J. 2013:162750.
4. W Bors, C Michel and M Saran (1994) Flavonoid antioxidants: rate constants for reactions with oxygen radicals. Methods Enzymol. 234:420-429.
5. S Erkoç, F Erkoç and N Keskin () Theoretical investigation of quercetin and its radical isomers. Journal of Molecular Structure THEOCHEM. 631(1-3):141-146.

Biography

Fatma Kazdal completed her Bachelor's Degree in Biology from Karadeniz Technical University, Turkey; Master's Degree in Biotechnology from Bezmialem Vakif University Health Sciences Institute, Turkey. She has her expertise in Molecular Biology and Nano Drug Delivery system. Her thesis subject involved the targeting nano-formulatıon of active plant extracts to blood brain barrier wıth metal protein attenuating activity for treatment of Alzheimer's disease. She is currently pursuing PhD at Bezmialem Vakif University in Medical Biochemistry.

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