P40

Genotoxic effects of Taxifolin on lymphocytes and MDA-MB-231 breast cancer cell line

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Breast cancer is aggressive cancer in women, and according to recent statistics, it is the most common cancer among women worldwide. DNA damage and repair mechanisms directly affect the mechanisms of cancer; therefore, improving DNA damage repair represents a logical treatment and prevention strategy. Studies have shown that taxifolin (dihydroquercetin) belongs to the subclass flavanonols in the flavonoids, a well-known antioxidant with DNA repair properties in cancers, with reduced metastases and mortality.

In the present study, the genotoxic effects of taxifolin were evaluated on peripheral lymphocytes from breast cancer patients compared to healthy donors using the Comet assay. Furthermore, the cytotoxicity effect of taxifolin on the MDA-MB-231 breast cancer cell line was assessed by using Comet assay.

Also, the cell viability effects of taxifolin were measured on the MDA-MB-231 breast cancer cell line using the cell counting kit-8 (CCK-8).

The comet assay was performed on the healthy blood samples which were treated with different doses of taxifolin to evaluate the genotoxic effect of taxifolin on the healthy blood samples. The results showed that the highest reduction in the genotoxicity on the treated healthy blood samples was 20 µl of 60 µM concentration of taxifolin. Our comet assay results indicated that taxifolin as an antioxidant could have considerable efficacy and potential in repairing the DNA of lymphocytes in patients with breast cancers and increasing DNA damage in the MDA-MB-231 breast cancer cell line. The best dose of taxifolin was observed as 20µl of 60µM concentration with the least and highest genotoxicity in treated whole blood lymphocytes of breast cancer samples and in treated MDA-MB-231 breast cancer cell line, respectively.

The cell proliferation and cytotoxicity assay results in 30 minutes, 2, and 12 hours as 60 µl of 60 µM concentration shows the least cell viability in comparison with the non-treated samples (****, $p<0.0001$); while at 24 hours treatment of 40 µl of 60 µM concentration of taxifolin shows least viability compared to the non-treated samples (****, $p<0.0001$). Although, the IC50 value was calculated to be 40µl of 60 µM concentration, which indicates the amount of taxifolin is needed to inhibit MDA-MB-231 breast cancer cell line proliferation by half. The results from (CCK-8) indicate that taxifolin as an antioxidant could have a considerable cytotoxicity effect on the MDA-MB-231 breast cancer cell line.

This study's results revealed that taxifolin could be used as anti-breast cancer in terms of its cytotoxic effect and promoting apoptosis in the cancer cell and no harm to healthy cells. More investigation to detect the mechanism of action and targeted genes are demanded to understand this flavonoid 's function at the molecular and cellular level.

Keywords:
Breast cancer; Genotoxicity; Taxifolin; Comet assay; MDA-MB-231 cell line.