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Background: Breast cancer is the second leading cause of death from cancer in women throughout the world. Nicotine is one of the most important carcinogenic factors in cigarettes, which, by binding to the acetylcholine receptor of the cell, stimulates cell division and increases drug resistance in the cancerous cell of the smoker. In the present study, the effect of nicotine on the expression of $\alpha 9$ receptor gene, Cyclin D1 and Cytochrome C proteins in terms of induction of drug resistance in MCF-7 cancer cell line was investigated. **Methods:** MCF-7 cells were treated with 100 microliters of nicotine for 72 hours. Then, they were exposed to doxorubicin (1-5-10 $\mu\text{g/ml}$). Cell survival was evaluated by MTT assay. The biochemical parameters of apoptosis including CyclinD1, Cytochrome C and $\alpha 9$ receptor proteins were assessed by western blot method. $\alpha 9$ receptor expression was investigated using Real-time PCR. **Results:** The results showed that in nicotine-treated cells, α -9 receptor, and CyclinD1 proteins were increased, however, Cytochrome C was reduced compared with control. There were no significant changes of $\alpha 9$ receptor gene expression in the cells treated with nicotine compared with the control. **Conclusion:** It is most probably that nicotine in the MCF-7 cell line has an effect on some anti-apoptotic proteins and causing drug resistance and thus inhibits the treatment process.

Keys word: Breast cancer, nicotinic $\alpha 9$ receptor gene, CyclinD1, Cytochrome C apoptosis, drug resistance



University of Zabol
Faculty of Basic Sciences
Department of Biology

Title:

**Study of nicotine's effect on $\alpha 9$ receptor,
Cyclin D1 and Cytochrome C proteins in
MCF-7 cancer cells**

Supervisor:

Dr. G.R.Motalleb

Advisor

Dr. S.Esmaeili Mahani

By:

S.Moridi Nejad

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