

Investigating the effect of coumarin and nanocoumarin in inducing apoptosis and reducing migration of prostate cancer cell lines (PC3) and (DU145)

## Abstract

**Background:** Prostate cancer is one of the most common cancers with a high mortality rate. So far, many studies have been done to find various treatment methods for this disease with the least side effects. Coumarin is a member of the family of phenolic substances in plants and is known as one of the common secondary metabolism products in vacuolar sap. These phenolic substances are physiologically active and have cytotoxic properties, and play a role by disrupting nuclear division and growth, as well as inhibiting enzymes such as amylases or sucrases. Coumarin as a cytotoxic compound has important effects on the process of changing gene expression. This characteristic of coumarin is used to change the gene expression of cancer cells and induce apoptosis. Coumarin in the form of nanoformulation can have different effects compared to the non-derivative form.

**Aim:** the purpose of this study is to investigate the effects of anti-migration (anti-metastasis) and induction Apoptosis induced by nanocoumarin is through inducing changes in the expression level of vimentin and E-cadherin genes in prostate cancer cell line.

**Materials and methods:** two cell lines PC3 and DU145 were used in this study. The cells were treated at different concentrations for 24 and 48 hours. The amount of cytotoxicity of the studied compounds and IC50 were measured in time intervals of 24, 48 hours by MTT technique. The percentage of cell apoptosis was determined by flow cytometry test, the rate of cell migration and metastasis was evaluated using the wound healing technique, and finally, the expression level of TP53, CASP3, CASP9, MMP-9, MMP-13, E-Cadherin, Vimentin, and BCL genes. -2, SNAIL1 and CD274 in both cell lines studied by RT-PCR technique.

**results:** The results of the tests showed a significant increase in the amount of apoptosis in both cell lines after treatment with coumarin and nanocoumarin compared to the control group. After the wound healing test, the reduction of cell migration after exposure to coumarin and nanocoumarin was evident. With

increasing incubation time, the minimum concentration to halve the cell growth in all three cell lines decreased. RT-PCR results showed increased expression of TP53, CASP3, CASP9, and E-Cadherin and decreased expression of BCL2, MMP-9, MMP-13, and Vimentin in two cell lines.

**Conclusion:** The results of this study show the positive effects of coumarin and nanocoumarin in suppressing cancer cells, inducing apoptosis, inhibiting cell migration and finally had significant effects on the expression of various oncogenes. Also, the results showed the better effect of nanocoumarin compared to coumarin. Therefore, this combination can be used as a practical option for further examinations at the bedside.

**Key words:** coumarin, nanocoumarin, cancer, Prostate