18th National and 3rd International Conference of Iranian Biophysical chemistry

هجدهمین همایش ملی و سومین همایش بین المللی بیوشیمی فیزیک ایران

25-26 Des, 2024, University of Hormozgan

۶-۵ دی ماه ۱۴۰۳، دانشگاه هرمزگان

Targeted treatment of the effective herbal ingredient papaverine in the ERK-MAPK signaling pathway of breast cancer cells in-silico and in-vitro

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Abstract

Breast cancer is a deadly disease that causes the death and disability of hundreds of women around the world every year. The poppy plant contains important medicinal alkaloids, such as morphine, codeine, and papaverine, which have high economic value in the pharmaceutical industry. So far, different strategies have been used to commercialize their extraction. The aim of this research was to investigate the proliferative or inhibitory effect of the active substance papaverine on breast cancer cells. In order to carry out this research, three proteins—MEK2, MEK1, and BRAF—were used. To determine the effective dose of the researched herbal substance, the MTT test was performed on the cell lines. The samples were then diluted with MTT dye solution, mixed, and incubated. Real-time PCR is a practical method for the amplification of cDNA extracted from RNA, and it was used in this research. The purity of the RNA sample was checked by optical absorption or spectrophotometry. The melting curve and the duplication of each gene were plotted and checked. Docking methods were used to investigate the composition of papaverine on MEK2, MEK1, and BRAF. After the docking, the three-dimensional structure of the ligand-receptor complex and its binding type were studied. Graphs were created and entered into bioinformatics statistical calculations. This research showed that the active ingredient papaverine in poppy plant can play a therapeutic role in the ERK-MAPK pathway of breast cancer cells.

Keywords: Breast Cancer, MEK1, Papaverine, ERK-MAPK.