

# Synergistic effect of Doxorubicin and Sulfonamide derivative on induction of apoptosis

\*Shabnam Pedarpour Vajargah<sup>1</sup>, Hossien Ghafouri<sup>1</sup>

Faculty of Basic Sciences, University of Guilan, Rasht, Iran

[pedarpourshabnam@gmail.com](mailto:pedarpourshabnam@gmail.com)

**Abstract**—Breast cancer is the most common malignancy in women and one of the three most common cancers worldwide along with lung and colon cancer. One in eight to ten women will get breast cancer during their lifetime. Doxorubicin is one of the most potent anti-neoplastic drugs, given alone or in combination with other agents, and it is also the class of the class that has the widest range of activities. In fact, Doxorubicin is used to treat solid tumors and blood cancers, including breast, bile duct, prostate, uterus, and ovary. Despite significant anti-cancer activity, the practical and therapeutic use of Doxorubicin is limited by toxicities such as cardiac toxicity. Therefore, it is desirable in combination therapy with other drugs. A synergistic therapeutic effect is defined as a stronger effect by combining two or more compounds compared to single compounds as equal concentrations. It is believed that combined chemotherapy methods have been used to reduce drug toxicity, delay the growth of cancer cells, and achieve greater efficacy than an active drug alone. A Sulfonamide is a functional group (part of a molecule) that forms the basis of several groups of drugs called Sulfonamides, called Sulfa drugs. Sulfonamide-based compounds exhibit a large number of biological activities such as anti-cancer activity. In this study, we investigated the synergistic effect of Doxorubicin and Sulfonamide derivatives on the expression of the anti-apoptotic protein Bcl-2 in MCF-7 breast cancer cell line using Western blotting technique to evaluate the induction of apoptosis. Concentrations of 0.2 µg / ml for Doxorubicin and a concentration of 14.5 µM for the new Sulfonamide derivative alone and in combination were selected for this study and Bcl-2 protein expression was assessed by Western blotting that In this study, Bcl-2 protein expression was reduced in combination with two substances, indicating a synergistic effect and induction of apoptosis in breast cancer in MCF-7 cell line.

**Keywords**— *Breast cancer, Doxorubicin, Sulfonamide derivative, Synergistic effect, apoptosis*

## REFERENCES

- [1] Harbeck, Nadia, and Michael Gnant. "Breast cancer." *Lancet (London, England)* 389, no. 10074 (2016): 1134-1150.
- [2] Carvalho, Cristina, Renato X. Santos, Susana Cardoso, Sónia Correia, Paulo J. Oliveira, Maria S. Santos, and Paula I. Moreira. "Doxorubicin: the good, the bad and the ugly effect." *Current medicinal chemistry* 16, no. 25 (2009): 3267-3285.
- [3] Yang, Jun, and Rui Hai Liu. "Synergistic effect of apple extracts and quercetin 3-β-D-glucoside combination on antiproliferative activity in MCF-7 human breast cancer cells in vitro." *Journal of agricultural and food chemistry* 57, no. 18 (2009): 8581-8586.
- [4] Apaydin, Sinem, and Marianna Török. "Sulfonamide derivatives as multi-target agents for complex diseases." *Bioorganic & medicinal chemistry letters* 29, no. 16 (2019): 2042-2050.