The effect of synergistically combination of vitamin D and doxorubicin on the MCF-7 line breast cancer cells.

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Breast cancer is the most prevalent cancer in the female population. The prolonged action of estrogens may affect tumor proliferation. Additionally, a fat-rich diet may show various effects on cancer proliferation, depending on the type of fat. Vitamin D, similarly to estrogens, is a fat-soluble cholesterol derivative. The deficiency of vitamin D correlates with increased proliferation of breast cancer cells. In turn, doxorubicin is commonly used cytostatic in chemotherapy. The study aimed to assess whether vitamin D enhances the anti-cancer effect of doxorubicin (DOX) in the MCF-7 cell line.

The cells were divided into four groups: untreated control, DOX- and vitamin D-treated cells, and cells treated with the combination of compounds in a 1:1 ratio. We applied MTT colorimetric assay (cell viability analysis), Annexin V/PI assay (cell death analysis), flow cytometry (cell cycle distribution), and fluorescence staining of cytoskeletal proteins (F-actin and vimentin). The type of DOX and vitamin D interaction was estimated based on the Chou-Talalay method.

Our results showed that vitamin D and doxorubicin in a 1:1 ratio act synergistically. We observed a decrease in the survival of MCF7 cells. The combination of DOX and vitamin D enhanced changes in morphology and organization in F-actin and vimentin network compared to the treatment with the substances separately.

In summary, we suggest that natural compounds such as vitamin D may be useful in anticancer treatment in the context of enhancing the cytostatic effects of drugs.