OFFICIAL ABSTRACT and CERTIFICATION

The Effects of Hypoxia on the Expression of Hypoxia-Inducible Factor 1α (HIF-1α) and Carbonic Anhydrase 9 (CA9) in Various Breast Cancer Cell Lines

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Breast Cancer is a disease which affects 245,000 women and 2,200 men in the United States yearly. Hypoxia is a condition of low oxygen and is known to promote cancer growth and metastasis. Hypoxia can be artificially induced by exposing Breast Cancer cells to CoCl, a chemical that directly induces the expression of hypoxia-inducible factor 1α (HIF-1α). The aim of this study is to investigate the optimal conditions for CoCl treatment of breast cancer cells in vitro. Using quantitative RT-qPCR and Western blot analysis, mRNA was measured as well as protein expression levels of HIF-1α and its downstream target carbonic anhydrase 9 (CA9) in various breast cancer cells (MCF-7, MDA-MB-231 and BT-474). During the trials, breast cancer cells were treated with various concentrations of CoCl (50, 100, 200, and 300 μM) for a period of 24 and 48 hours. Results showed that CoCl in concentration range 50 to 100 μM for 24 hours modulates HIF-1α and CA9 expression.The results depicted that CoCl in the tested concentrations (50-300 μM) downregulated HIF1α mRNA expression, but upregulated HIF1α protein levels. This research will help better understand the general role of hypoxia on two specific genes —HIF1α and CA9 and can potentially lead to the possibility of using target gene therapy to treat cancer.

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