Determining the Effect of a Disulfiram Copper Complex on Drug Resistance Through Deletion of ALDH1 in Metastatic Breast Cancer Cells (A Three Year Study)

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Cancer is one of the leading causes of death in the U.S., with about 1 in 8 women developing invasive breast cancer in her lifetime. Drug repurposing, an underused treatment, is crucial for faster cancer treatments via drugs because the drugs have already gone through all the needed steps to safely be out in the market and available to people, while also greatly reducing the estimated $1.3 billion it cost to develop a new cancer drug. This experiment was designed to study whether CRISPR, a cost-effective way to knockdown ALDH1 in the cancer cells, can reduce drug resistance so that Disulfiram (a drug commonly used to treat alcoholism) combined with a copper supplement (to enhance the effect of disulfiram) will effectively decrease the metastatic properties of the cells. After the cells were put through an extracellular matrix invasion chamber to test their ability to metastasize, it was shown that the knocked-down cells were unable to metastasize in both experimental groups. ANOVA tests were performed to test the significance and at p-value < 0.05, the results were significant meaning that after knocking down ALDH1 expression in metastatic breast cancer cells through CRISPR, the drug resistance in the cells was reduced, and the Disulfiram combined with a copper supplement was able to significantly decrease the metastatic properties of the cell line. This shows that CRISPR has a future in cancer research. It can stop drug resistance which allows drugs to keep their effectiveness in targeting and eliminating tumors.

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