Improving Raloxifene's Affinity with Estrogen Receptor Beta Through Synergy with S-Equol as a Novel Chemopreventive Treatment

ABSTRACT

Current methods of breast cancer treatment such as chemotherapy or mastectomy can cause harmful side effects like immunosuppression or hair loss; therefore many people choose not to take chemoprevention in fear of these risks. A hormonal therapy drug is a drug taken to block estrogen from conjoining with estrogen receptors to stimulate mammary cell division. Raloxifene is already utilized for breast cancer chemoprevention but can have many side effects. The goal of this experiment was to bolster the efficiency of raloxifene on cancerous cells only to prevent detrimental side effects on healthy cells. A synergetic treatment between s-equol and raloxifene was created to increase efficiency while reducing inhibitory effects on healthy cells. Raloxifene inhibits estrogen receptor alpha, but does not strongly inhibit estrogen receptor beta. S-equol, having a higher affinity with estrogen receptor beta, was applied in conjunction with raloxifene. Testing was performed on cancerous MCF-7 cells and healthy 2BS cells. Data collection results via MTT assay, cell morphology analysis, and Annexin V-FITC showed that while pure raloxifene did inhibit cancer cells, application of the synergy had a 600% increase in efficiency on breast cancer and harmed healthy cells 10% less.

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EXECUTIVE SUMMARY

A synergy a combination that is greater than the sum of each individual component. For this project, the synergetic properties between two substances were conjoined to create a chemopreventive treatment. Chemoprevention is the prevention of cancer before it becomes prominent throughout an individual. The drug improved, called raloxifene, is currently used to treat breast cancer. However, it is not very efficient and therefore requires larger concentrations which can be harmful toward healthy cells. Raloxifene works by blocking off estrogen receptors in cancer cells. Breast cancer requires estrogen to grow, so by blocking off the estrogen receptors, raloxifene can stop cancer growth. In recent years, studies have shown that there are actually two estrogen receptors, estrogen receptor alpha and estrogen receptor beta. Raloxifene is known to have a higher affinity for estrogen receptor alpha. Therefore, the experiment incorporated another drug that has a higher affinity for estrogen receptor beta, s-equol. This synergy was tested on both cancerous and healthy cells. Results showed that by combining the two drugs into one treatment, there was over a 600% increase in efficiency and a 10% decrease on its effects toward healthy cells.