CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
S1522

Project Title
Role of t-Darpp in Making Herceptin-Sensitive Breast Tumor Cells Become Herceptin-Resistant

Abstract

Objectives/Goals
Breast cancer's genetic makeup determines this tumor's behavior. The Her-2 gene codes for a growth factor receptor that helps cell proliferation. About 20-30% of breast cancers overexpress the Her-2 oncogene. This cancer has a poor prognosis because it metastasizes quickly. The drug Herceptin blocks the Her-2 receptors, preventing further proliferation. However, in 50-70% of Her-2 positive breast cancers, Herceptin fails to prevent further proliferation. It has been discovered that there is an overexpression of t-Darpp in Herceptin-resistant breast cancer cells. This study aimed to determine if an overexpression of t-Darpp in Herceptin-sensitive breast tumor cells can make those cells become Herceptin-resistant.

Methods/Materials
Digestions, gel purifications, ligations, and transformations created a t-Darpp DNA strand. Flow Cytometry identified Herceptin-sensitive SK-BR3 breast tumor cells that were cultured, transfected with t-Darpp, and cultured again. The cells were given different Herceptin concentrations (0M, 0.2uM, and 1.0uM), and the Sulforhodamine B assay stained the protein (measured by a spectrophotometer) found in the cells as an indicator of cell survival on the 7th, 14th, and 21st days after giving Herceptin to the cells.

Results
On day 21, the cells in the control group (without t-Darpp) that did not receive Herceptin (0M) had an average protein biomass of 0.129 while those that received 1.0uM Herceptin had an average biomass of 0.051, indicating that the cells died in the presence of Herceptin. For experimental groups 1 and 2, which were transfected with t-Darpp, on day 7, the cells that did not receive Herceptin (0M) had an average protein biomass of 0.162 and 0.155, respectively, while on day 21, these cells had an average biomass of 0.392 and 0.370, respectively. On day 7, the experimental cells exposed to 1.0uM Herceptin had an average protein biomass of 0.233 and 0.260, respectively, and on day 21, these cells had an average biomass of 0.628 and 0.638, respectively, indicating that the cells grew even in the presence of Herceptin.

Conclusions/Discussion
The results verified the hypothesis that an overexpression of t-Darpp makes Herceptin-sensitive cells become Herceptin-resistant. Further studies can attempt to prevent the overexpression of t-Darpp in Herceptin-resistant breast tumor cells, thereby facilitating breast cancer treatment and increasing breast cancer patients' survival rate.

Summary Statement
The protein t-Darpp can make Herceptin-sensitive breast tumor cells become Herceptin-resistant.

Help Received
Used lab equipment at Beckman Research Institute at City of Hope under the supervision of Dr. Susan Kane and Dr. Long Gu.