CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

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Project Number

S0414

Project Title

Tumor Suppressor Gene PTEN as a Chemosensitizer: Overexpression of PTEN in Breast Cancer Cells and Normal Cells

Abstract

Objectives/Goals

In order to assess the potential of PTEN as a chemosensitizer and its ability to reduce side effects of chemotherapy, this study was conducted to examine the effect of tumor suppressor gene PTEN on the response of breast cancer and normal cells to cisplatin treatment, a chemotherapeutic agent.

Methods/Materials

The plasmids pCMV-PTEN and pCMV-null were constructed and transiently transfected into normal (MCF 10A) and tumorigenic cells (MCF-7, MDA-MB-468, MDA-MB-231, and BT-549) in 96-well plates. After 24 hours of transfection, different concentrations of cisplatin (0.0977uM to 50uM) were added into the cell media. Cell viability was assessed at 0, 16, 24, 48, and 72 hours for the first two trials and at 0, 48, and 96 hours for the third trial. Each trial was performed in triplicate or quadricate. A western blot was performed to assess the PTEN expression level of each cell line. Transfection efficiency was monitored by co-transfection of pEGFP (enhanced green fluorescence protein).

Results

The normal cell line, MCF 10A, showed a significant increase of growth in the PTEN line over the null line ($p<0.05$) in the presence of cisplatin. The tumorigenic cell lines varied in their responses to cisplatin with PTEN overexpression. MDA-MB-231 was sensitized to the drug at concentrations higher than 0.781uM by 24 hours ($p<0.05$). In MCF-7, effects of chemosensitization were only displayed at 96 hours ($p<0.05$). BT-549 cells appeared not to be sensitized by PTEN expression within 72 hours of treatment.

Conclusions/Discussion

The hypothesis was supported to different extents. Normal MCF 10A / PTEN cells were de-sensitized to cisplatin treatment, while tumorigenic cells reacted differently, from chemosensitization to no chemosensitization. In summary, this study indicates that PTEN can enhance drug sensitivity in some breast cancer cells and decrease drug sensitivity in normal breast epithelial cells. This suggests that overexpression of PTEN along with cisplatin treatment could potentially enhance chemotherapy and lower side effects.

Summary Statement

The potential of PTEN as a chemosensitizer was determined by testing its effects in non-tumorigenic and tumorigenic cell lines.

Help Received

Mother helped in lab technique, father performed cell sorting for third trial, Peter Kretschmer and Terry Grimer allowed me to use their lab at Berlex Biosciences.