CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

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Project Number

S0518

Project Title

Nanohydrogel for Treating Cancer by Efficient Delivery of Resveratrol

Abstract

Objectives/Goals

The main goal is to improve the water solubility of resveratrol to prevent it from being metabolized too quickly. By polymerizing resveratrol with polyethylene glycol to make a hydrogel , it is hypothesized that the aqueous solubility of resveratrol can be increased. Also, by tuning the polymerization time, it is hypothesized that the particle size can be modulated, which affects the route of how cells can internalize the nanoparticles. The hydrogel consisting of resveratrol is hypothesized to still exhibit cytotoxic activities on different cancer cell lines.

Methods/Materials

Biosafety cabinet,Incubator,Pipettors and pipette tips,HeLa cell line,T98G cell line,Resveratrol, Acrylated resveratrol,Polyethylene glycol diacrylate(PEG),Irgacure,DMEM,Ethanol,MTT Assay Reagent,UV-vis spectrophotometer, Microscope,Eppendorf tubes,Dynamic Light scattering machine,centrifuge

Results

Aqueous solubility was improved at 1:10 molar ratio of acrylated resveratrol to PEG.This makes it easier to dissolve resveratrol in water to increase the cytotoxic effects towards the cells. The results of the MTT assay which determines cell viability show at least a 70% decrease in cell viability at all concentrations lower than 100 uM after 24 hours of dosing. The most significant decrease was seen in 4 uM in cell line T98G. At this concentration, resveratrol had 90% cell viability versus the hydrogel which had viability of less than 10%. The optimal concentration of PEG to acrylated resveratrol was found to be 1:10. By using DLS, it was observed that 1:1 and 1: 5 samples were not uniform in size due to its partial solublity which thus forms aggregates.

Conclusions/Discussion

The goal of making a hydrogel was to help solubilize resveratrol in water to improve cellular uptake and expand the bioavailability. At a 1:10 concentration of resveratrol to PEG, we can observe that it becomes completely soluble compared with 1:1 or 1:5. At lower molar ratios of resveratrol to PEG, it becomes only partly soluble which decreases cellular uptake efficiency. At increasing concentrations of resveratrol and the hydrogel, all cells seem to be non-viable.However at lower concentrations, the hydrogel has increased the cytotoxic effects at least seven-fold. All in all, the nanohydrogel increased the EPR Effect for resveratrol in the cancer cells with an effect that tested cell lines exhibit higher cytotoxicity as compared to treating with free resveratrol.

Summary Statement

Creating a nanohydrogel to optimize the delivery of resveratrol, an anti-tumor agent, for treating cancer.

Help Received

I used professional lab equipment under the supervision of Dr. Young Jik Kwon at UCI.