CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Isha Mehrotra; Rohan Mehrotra

Project Number

35762

Project Title

Effect of Natural Compounds Curcumin and Nicotinamide on a-Synuclein Accumulation in a C. elegans Model of Parkinson's

Abstract

Objectives/Goals

The goal of our project was to test if nicotinamide and curcumin, two natural compounds, are viable treatments for Parkinson's disease. We assessed the effects of nicotinamide and curcumin on the amount of a-synuclein in C. elegans after treatment, then compared these results to the effects of Levodopa, a commercial Parkinson's drug.

Methods/Materials

We used C. elegans, a nematode, as the model organism. Specifically, strain NL5901, which expresses human a-synuclein protein fused to yellow fluorescent protein, was used. (The a-synuclein protein is responsible for the death of dopamine-producing neurons in Parkinson's disease.) Our study examined the effect of curcumin and nicotinamide on the fluorescence intensity of a-synuclein in C. elegans, and compared them to the effect of levodopa (the commercial drug). We used two methods to measure fluorescence of the protein. In Trial 1, the worms were imaged after treatment under a fluorescence microscope, and the fluorescence in the images was quantified using ImageJ software. In Trial 2, fluorescence of the worms was directly measured after treatment using a microplate reader machine.

Results

Our study showed that curcumin and nicotinamide reduce the fluorescence intensity of a-synuclein as effectively as levodopa. Control, curcumin, and levodopa NL5901 worms were measured for their a-synuclein protein accumulation. In Trial 1, after 96 hours, nicotinamide reduced fluorescence by 64.2%, curcumin reduced fluorescence by 55.5%.and levodopa reduced fluorescence by 47.6%. The most effective compound was nicotinamide, then curcumin, then levodopa. However, all compounds were competitive in reducing a-synuclein. In Trial 2, after 96 hours, nicotinamide reduced fluorescence by 43.6%, curcumin reduced fluorescence by 49.8% and levodopa reduced fluorescence by 65.7%. The most effective compound was levodopa, then curcumin, then nicotinamide. However, all compounds were again competitive.

Conclusions/Discussion

This means that curcumin and nicotinamide are viable treatments for Parkinson's disease, which achieved the goal of the project. This also implies that Parkinson's patients should eat foods high in curcumin and nicotinamide, and that drugs should take advantage of the benefits of these compounds. These findings encourage further investigations on nicotinamide, curcumin, and other natural compounds as possible therapies against Parkinson's disease.

Summary Statement

This project showed that curcumin and nicotinamide, two naturally derived compounds, are effective targets for treatment of Parkinson's disease.

Help Received

Used fluorescence microscope and microplate reader from Biocurious, an amateur community lab