OFFICIAL ABSTRACT and CERTIFICATION

Supplementation of Antioxidants to Reduce Dopaminergic Neurodegeneration and Alpha-synuclein Accumulation Associated with Parkinson's

Kevin Carratu
Manhasset High School, Manhasset, New York, United States of America

Parkinson's disease (PD) is a progressive neurodegenerative disorder that diminishes motor functioning and affects over 10 million people worldwide. PD is exacerbated by an imbalance between reactive oxygen species (ROS) and cellular antioxidant activity which leads to dopaminergic neurodegeneration, Alpha-synuclein accumulation and decreased motility due to unstable free radicals damaging and denaturing cellular structure. The purpose of this study was to examine the effectiveness of curcumin (25μM, 50μM, 100μM), quercetin (50μM, 100μM, 200μM), and L-glutathione (0.1mM, 1mM, 10mM) in reducing dopaminergic neuron degeneration and alpha-synuclein accumulation in fluorescently tagged Parkinson' s induced C. elegans. BZ555 strain C. elegans express green fluorescent protein (GFP) where the level of fluorescence signals the amount of tagged dopaminergic neurons. OW13 strain C. elegans express yellow fluorescent protein (YFP) where the level of fluorescence indicates the amount of tagged Alpha-synuclein. Both strains were exposed to 10mg/L copper sulfate (CuSO4) for 24 hours and then treated for 72 hours with either curcumin, quercetin, or L-glutathione. Fluorescence images were captured using a Zeiss Axiovert fluorescence microscope under 250x magnification, and analyzed through ImageJ, then the corrected total cellular fluorescence was calculated. The means of each assay were analyzed through One Way ANOVA followed by a post-hoc Scheffe test ($p<0.05$). Curcumin treated BZ555 showed the most significant increase in dopaminergic neuron levels and L-glutathione treated OW13 showed the most significant inhibition of Alpha-synuclein levels. It' s postulated that C. elegans treated with curcumin, quercetin, and L-glutathione experienced a balance between ROS and cellular antioxidant activity, reducing which oxidative stress.

Category
Pick one only — mark an "X" in box at right

- Animal Sciences
- Behavioral & Social Sciences
- Biochemistry
- Biomedical & Health Sciences ■
- Biomedical Engineering
- Cellular & Molecular Biology
- Chemistry
- Computational Biology & Bioinformatics
- Earth & Environmental Sciences
- Embedded Systems
- Energy: Sustainable Materials and Design
- Engineering Mechanics
- Environmental Engineering
- Materials Science
- Mathematics
- Microbiology
- Physics & Astronomy
- Plant Sciences
- Robotics & Intelligent Machines
- Systems Software
- Translational Medical Sciences

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check ALL that apply):

   ☐ human participants ☐ potentially hazardous biological agents

   ☐ vertebrate animals ☐ microorganisms ☐ rDNA ☐ tissue

2. I/we worked or used equipment in a regulated research institution or industrial setting: ☐ Yes ■ No

3. This project is a continuation of previous research. ☐ Yes ■ No

4. My display board includes non-published photographs/visual depictions of humans (other than myself): ☐ Yes ■ No

5. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only ■ Yes ☐ No

6. I/we hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work. ■ Yes ☐ No

This stamp or embossed seal attests that this project is in compliance with all federal and state laws and regulations and that all appropriate reviews and approvals have been obtained including the final clearance by the Scientific Review Committee.