



CALIFORNIA STATE SCIENCE FAIR 2004 PROJECT SUMMARY

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Project Title Phase II: Correlation of Thorium-232 Radiation to ATP Production Rate of Mitochondria	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This Phase II experiment is designed to further develop a new protocol to quantify and track the ATP production rate of mitochondrion and determine the effects of thorium-232 radiation on the ATP production rate of celery cell mitochondria for possible environmental and consumer safety applications.</p> <p>Methods/Materials The following new protocol was developed: Janus Green B stains only active mitochondrion within a cell with a blue-green dye. In terms of wavelength, this is 600 nanometers. The mitochondria are stimulated by first introducing a sucrose solution. Since the stain is absorbed into the mitochondrion of the celery cells, the spectrometer can detect the amount of absorbency when set to 600 nanometers. By detecting the absorbency (A) of the 600-nanometer wavelength the spectrometer effectively measures the amount of activity of the mitochondrion based on the fact that the spectrometer absorbency reading will adjust to the absorbency of the stain, which will be based on the movements within the mitochondrion itself. A greater amount of activity in the mitochondrion means that there is a greater amount of ATP production, or energy. The theory is validated by the fact that a reflective spectrometer is designed and used to measure the intensities and wavelengths of the visible region of the electromagnetic spectrum. Experiment: Celery mitochondria were exposed to Thorium-232 radiation from a lantern mantel and normal non-radiated conditions. ATP production rate of mitochondria of both groups was tracked by using the above-mentioned protocol.</p> <p>Results Initial starting point averages for no radiation exposure and a radiation exposure of thorium-232 were 0.000. The final average for no radiation exposure was 0.002 A. The final average for a radiation exposure of thorium-232 was #0.008 A.</p> <p>Conclusions/Discussion By staining only active mitochondria with Janus Green B, by introducing a stimulating sucrose solution, and the use of the principles of spectrometry indeed allowed us to further develop our new protocol. Data collected from the experiment did show that radioactive isotope thorium-232 greatly harmed mitochondrion ATP production rate. These data suggest possible applications to environmental safety and consumer consumption issues. Further experimentation may include the application of the protocol to radiated cancer cells.</p>	
Summary Statement The project is about further developing a new protocol of tracking and quantifying the ATP production rate of mitochondria and determining the effects of thorium-232 radiation on the ATP production rate of celery cell mitochondria.	
Help Received Received biological stain from La Sierra University; Mr. Newton (High School Chemistry Teacher) and Webster M. Edpao (MD-candidate at Northwestern Medical School) provided validation for theory behind project design; Used lab equipment at Centennial High School.	