OFFICIAL ABSTRACT and CERTIFICATION

A Novel Cationically Enframed High Density Aromatic Peptide, A2, Mitigates Mitochondrial Dysfunction and Promotes Cell Survival Via Reduction of ROS and Maintenance of Mitochondrial Inner Membrane Potential in a Cell Starvation Model

Rachel Bocian
Half Hollow Hills High School East, Dix Hills NY, USA

Mitochondrial dysfunction is one of the most significant contributors to cell death and clinical abnormalities. Metabolic starvation is a common cause for most mitochondrial-associated diseases including diabetes, and neurodegenerative, cardiac, autoimmune, psychiatric, and musculoskeletal disorders. High density aromatic peptides (HDAP) are known to increase conductivity and electrical energy storage. However, the few previous attempts that were made to deliver those peptides into cells resulted in cellular toxicity and cell death. A structurally novel water-soluble HDAP, named A2, was recently synthesized to address the toxicity associated with cellular delivery of HDAP. Biotinylated-A2 was shown to be rapidly taken into Madin-Darby Bovine Kidney (MDBK) epithelial cells, and detected by Steptavidin-Alexa Fluor™ 488 (Molecular Probes). Surprisingly, A2 was shown to colocalize with a selective mitochondrial probe, MitoTracker. Furthermore, in a serum-starvation model, A2 was shown to increase fluorescence of the mitochondrial membrane potential probe, MitoTracker Red, and decrease fluorescence of the cellular oxidative stress probe, CM-H2DCFFDA. It is important to note that A2 had no cellular toxicity and promoted cell survival in a serum-starvation model. Thus, the novel HDAP, A2, was shown to target mitochondria and promote cell survival by optimizing mitochondrial membrane potential and preventing cellular oxidative stress. Further work will be required to determine the mechanisms of A2 for its clinical development in the future.

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.