A NON-INVASIVE PHOTOBIOMODULATION THERAPY FOR ALZHEIMER'S DISEASE

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Introduction: Studies have shown a strong link between reduced cerebral blood flow (CBF), oxidative stress, inflammation and the progression of Alzheimer's disease (AD). Normalizing CBF may improve AD symptoms. Cytochrome c oxidase (Cco) has recently been shown to possess a novel, photoresponsive pathway of nitric oxide (NO) production via the Cco/NO receptor.

Aims: With the goal of developing a safe, controllable, non-invasive treatment for AD, a light-based device has been developed that triggers the Cco/NO receptor, increasing production of the vasodilator NO, thereby increasing CBF, reducing oxidative stress and inflammation, and improving AD symptoms.

Methods: Light of a specific wavelength, intensity and duration was delivered to various cell types in vitro and the rate of NO production measured. Specific wavelength LED devices were used to treat the carotid artery of dogs with cognitive deficits modeling Alzheimer's.

Results:

IN VITRO: A variety of cell types including yeast and mouse brain mitochondria were shown to possess the Cco/NO receptor, produce NO over a wide range of oxygen concentrations, and the rate of NO production was modulated by applied light in a wavelength and intensity-dependent fashion.

IN VIVO: In an established canine model of cognitive impairment (CanCog Technologies, Toronto), tests for spatial memory and associated learning and attention showed significant improvement after treatment when compared with sham treatment.

Conclusions: By delivering specific wavelengths and durations of light to the carotid, activation of the Cco/NO receptor can non-invasively trigger targeted, localized and controllable production of NO and reduce cognitive dysfunction in AD.