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Prevention of Alzheimer's disease using gamma entrainment

This Phase 2 clinical trial will examine whether stimulating brain cells may help prevent the development of Alzheimer's.

PI

- Ph.D., Microbiology, University of Texas Southwestern Medical Center, 1990
- Director, Picower Institute of Learning and Memory, Cambridge, MA, 2009-
- Member, National Academy of Medicine, 2011

STUDY

- CADRO category: Translational Research & Clinical Interventions

Background

Electrical activity by nerve cells in the brain often produces certain rhythms that could impact brain functions such as cognition and learning and memory among others. Rhythms known as gamma oscillations—patterns of nerve cell activity with a frequency of 30 to 90 vibrations per second—are shown to be key for brain function. Studies show that gamma oscillations in the brain may be disrupted in Alzheimer's.

Dr. Li Huei-Tsai and her team have developed an approach called Gamma Entrainment Using Sensory stimuli (GENUS). It employs a light- and sound-making device to stimulate nerve cells in the gamma frequency range in genetically engineered Alzheimer's-like mice. The results show that the GENUS approach may reduce brain changes such as beta-amyloid plaques and tau tangles, two hallmark brain changes observed in Alzheimer's. Additionally, their results found that the GENUS approach could improve nerve cell connectivity that is important for learning and memory. The researchers conducted initial testing of their non-invasive approach in cognitively unimpaired adults and found the GENUS approach to be easy to use and safe.

Research Plan

Building on their preliminary results, Dr. Tsai and colleagues will conduct a Phase II clinical study by leveraging the Harvard Aging Brain Study (HABS). HABS engages and monitors participants over time and as they age, collecting different types of brain scans, blood and other fluids, cognitive tests, medical history and more. The researchers will recruit 50 cognitively unimpaired participants from the HABS. These participants will have high levels of beta-amyloid in their brain based on blood-based biomarkers and brain scan results.

The participants will receive either the GENUS stimulation or placebo (an insignificant or a weak amount of stimulation that is not enough to activate the nerve cells). Then the researchers will collect samples of blood and cerebrospinal fluid (a biological fluid found in the brain and

spinal cord) as well as administer brain scans to study whether the GENUS stimulation impacts brain changes such as the level of beta-amyloid plaques. Furthermore, they will also administer cognitive tests to study whether the stimulation approach improves cognition in participants. They will then prepare to test the approach in larger clinical trials.

Impact

If successful, the study results may lead to a non-invasive approach to prevent at-risk individuals from developing Alzheimer's.

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