Enhanced Alzheimer's Treatment via External Gamma Brain Wave Stimulation

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MIT researchers stimulated gamma waves in genetically modified mice brains with flashing lights to trigger microglia to clean up beta amyloid plaques (the cause of Alzheimer’s Disease). The lights are uncomfortable for humans and may trigger seizures. We built an EEG with spare parts and an Arduino to test whether sounds and vibrations at 40 Hz would cause the same result in humans without the side effects. We modified code found online to filter out low quality data, record gamma waves, and save data to a memory card. We are working on using a medical grade EEG and we anticipate having this data by ISEF. We collected baseline rates of gamma wave activity in a quiet room. Then we turned on a blinking light, sound, or vibration at 40 Hz, the frequency of gamma waves, and measured the brain's response. We found a very strong response to the 40 Hz vibrations and little or no response to the light and sound. We hypothesize that visual and auditory processing happen near the back of the brain and our sensor is on the forehead. Sensory processing happens in the top/mid brain which is picked up by our sensor. We cannot prove that an increase in gamma brain waves also reduced amyloid plaques, but Dr. Tsai proved that. Therefore, we can assume that an increase gamma activity will result in reduced beta-amyloid plaques. Despite limitations in our equipment, we showed a strong relationship between 40 Hz vibrations and gamma waves in the brain. We anticipate that a real EEG will show that light and sound also produce a strong response. Combined with the research of Dr. Tsai, we can conclude that it is possible to reduce beta-amyloid plaques with 40 Hz vibrations and we anticipate that we will be able to prove the same for flashing lights and clicking sounds.

Awards Won:
Sigma Xi, The Scientific Research Honor Society: First Life Science Award of $2,000