Human Stem Cell Derived Extracellular Vesicles for the Treatment of Neurodegenerative Disease

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Extracellular Vesicles (EVs) are tiny particles containing biomaterials that have been noted for their regenerative capabilities and potential, especially for treating neurodegenerative diseases like Alzheimer's Disease (AD) due to their ability to cross biological barriers. Current treatments for AD emphasize symptom relief and protein pathology, with fewer focusing on stressors like chronic neuroinflammation and oxidative stress which accelerate neuronal loss. This study aims to analyze the interactions between cells, AD, and EVs. Alzheimer conditions were created using media conditioned by patient-derived organoids carrying the e4e4 genotype. Four variable groups were prepared: AD environment with EVs, AD environment without EVs, control environment with EVs, and control environment without EVs. Each group was evaluated for AD-associated markers (APP, BACE1, MAPT, P53), inflammatory markers (TNF alpha, IL 6, IL12 beta), anti-inflammatory markers (CD163, IL10, TGF beta1), and then analyzed for reactive oxygen species (ROS). This experiment showed that treating the samples with EVs reduced inflammatory markers, AD markers, and ROS levels. The EVs did not increase anti-inflammatory markers. Overall, the results from implementing EVs in AD treatment indicate the role of EVs in alleviating neuronal stress, contributing to future preventative therapeutics for AD and similar neurodegenerative diseases.

Awards Won:
National Anti-Vivisection Society: Awards of $3,000
Patent and Trademark Office Society: First Award of $500