A cell encapsulating membrane designed to house engineered ARPE-19 cells for the treatment of drug-resistant form of epilepsy

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Keywords:
bioengineering and biotechnology, neuroscience

Abstract

Neurological diseases represent one of the most complex medical challenges of this century, with epilepsy being one of the most common prevalent and serious conditions. Affecting approximately 1% of the global population, i.e. about 70 million people worldwide, (6 million in Europe), epilepsy remains a significant health concern.[1] Current treatments, such as anti-epileptic drugs and brain surgery, are effective for only about 2/3 of patients, leaving the remaining third still suffering from recurrent, unprovoked epileptic seizures.[2] This highlights the urgent need for new approaches to treat and simultaneously to improve the quality of life of those patients suffering from epilepsy.

The PRIME project, funded by the European Union, aims to develop an implantable device that detects and controls impending epileptic seizures. The ultimate goal is to prevent the onset of seizures, allowing patients to live seizure-free. The device uses engineered ARPE-19 retinal cells that are designed to detect elevated levels of epilepsy biomarkers and, in response, secrete seizure-suppressing molecules, such as glial-derived neurotrophic factor (GDNF). These cells are housed in a porous polyethersulfone (PES) encapsulating membrane filled with a supportive 3D scaffold (GrowDex-T®), enabling stable environment for cell survival and growth. The cells were cultured inside the device for 15 weeks, during which viability assays confirmed cell survival. While initial results show successful GDNF secretion through the encapsulating membrane, further research is needed to confirm the cells' ability to respond epileptic biomarkers effectively.

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