
Breakthrough brain implant suppresses epilepsy seizures

Life-altering brain implant created by researchers at Waterford's TSSG will sense and treat impending seizures.

A group of Waterford-based researchers are leading a ground-breaking new project that has been awarded €4.4m in EU funding to develop a 'living brain implant' that senses and treats an impending epilepsy seizure.

The 'PRIME' project team, based at Waterford Institute of Technology's Telecommunications Software & Systems Group (TSSG), will develop an innovative diagnostic-therapeutic treatment for people with epilepsy and other neurological diseases, by implanting engineered biological cells in the brain that will act as bio-computers to treat and suppress impending seizures.

'PRIME' will see the Waterford team collaborate with six other partners, including FutureNeuro, the SFI Research Centre for chronic and rare neurological disease hosted at RCSI University of Medicine and Health Sciences.

The project was awarded funding of €4.4m under the EU's Future and Emerging Technologies (FET) programme, making it the first ever FET programme project awarded to an Irish Institute of Technology.

Potential to treat other neurological disorders

"The initial focus of the research team will be the detection and treatment of epilepsy, though the project does offer the potential to also treat other neurological disorders, including Parkinson's Disease and also certain types of cancer, going forward," explained Dr Sasitharan Balasubramaniam, Director of Research in TSSG, FutureNeuro investigator and PRIME project co-ordinator

The multi-disciplinary project will see the Waterford team join forces with researchers at FutureNeuro in RCSI University of Medicine and Health Sciences, the University of Ferrara in Italy, the University of Aarhus in Denmark, Tampere University in Finland and private companies EPOS-lasis Research and Development Ltd in Cyprus and Omiics AS in Denmark.

The Waterford-based research aims to provide a diagnostic-therapeutic treatment for epilepsy and other neurological diseases by developing technology that could suppress chronic and recurring seizures, allowing people with epilepsy to perform jobs that some are currently restricted from doing, such as operating machinery, driving a car, or working near open water or at heights.

During the four-year project, which commenced on 1st February, the research team will capitalise on a significant breakthrough discovery by FutureNeuro collaborators Professor Jochen Prehn and Professor David Henshall, who discovered that increases in transfer RNA (tRNA) fragments – a type of molecule found in the blood of epilepsy sufferers - precede seizure onset in some patients.

By understanding the role of tRNA in predicting seizure onset, the multidisciplinary team will aim to develop a biological brain implant that will detect spikes in tRNA and then respond with a seizure-suppressing treatment.

Unlike previous implanted devices to treat neurological diseases, which offered ways to interrupt seizures in drug-resistant epilepsy patients only after they began, this pioneering treatment developed at TSSG holds the potential to transform the lives of people with epilepsy, to the point where they won't even be aware that they were in danger of having a seizure.

Use of engineered biological cells in the revolutionary technology means the implanted device won't have any electronic-based components that require an energy supply, as was often the case with earlier brain implants made from non-organic material.

The implants to be developed by the PRIME team can also be personalised, using Artificial Intelligence, to accommodate the different types and levels of seizures experienced by individual epilepsy patients.

“The PRIME project represents the very best of FutureNeuro research, taking a discovery in patients and working with world-leading multi-disciplinary teams in Ireland and abroad to develop what could be a transformative new technology to provide better seizures control,” Prof David Henshall explained.

By [John Kennedy](mailto:john.kennedy3@boi.com) (john.kennedy3@boi.com)

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