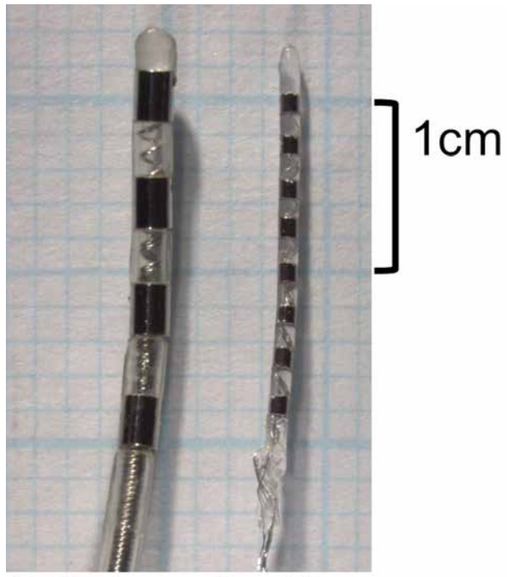
Research update



Improving outcomes with Deep Brain Stimulation. Neurobionics research at the Bionics Institute

By Hugh McDermott, Deputy Director at the Bionics Institute

Many people with Parkinson's experience good symptom alleviation with Deep Brain Stimulation (DBS). Already over 100,000 people worldwide have received DBS treatment to alleviate certain movement disorders, in particular Parkinson's and essential tremor.

In general, DBS helps reduce motor symptoms such as tremor, slow movement, muscle stiffness, and problems with gait. Although medications are typically the primary treatment for Parkinson's, they can have severe side effects and their benefits vary over time. If the motor symptoms progress to a point where medications and other therapies are inadequate, DBS may help.

Today's DBS devices require an array of electrodes to be implanted in the brain and a stimulator, containing a battery, to be placed under the skin usually below the collarbone. The stimulator delivers a series of brief electrical pulses to the electrodes. The parts of the brain closest to the electrodes are important in controlling movements, and they are affected by the electric stimulation in ways that reduce many of the unwanted motor symptoms of Parkinson's and other movement disorders. Although the precise mechanism of action is unclear, the stimulation is safe and most people who undergo DBS benefit significantly from the treatments.

At the Bionics Institute, we are developing better DBS implants and carrying out studies on how to get the best outcomes from DBS.

The basic principle underlying our research is that nerves can be electrically stimulated to treat various neurological or sensory conditions. This principle applies both to the cochlear implant, with which the Institute – formerly the Bionic Ear Institute – has 30 years of experience, and to the bionic eye device that is currently under development.

The Institute's Neurobionics program is specifically focused on development of an advanced device to treat Parkinson's symptoms. This includes preclinical work to design and test improved DBS electrodes and clinical research to maximise patient benefit.

Our electrodes will be smaller than existing implants, enabling surgeons to target the selected areas in the brain more precisely. They will be connected to an advanced stimulator developed originally for cochlear implant use, which will provide much greater control over the patterns of pulses delivered to the brain, and will be placed in the skull rather than in the body far from the electrodes.

Our clinical studies currently involve users of DBS who are living with Parkinson's or essential tremor. We have developed a sophisticated system for accurately measuring movements and disorders of movement, as well as certain side-effects of DBS such as problems with speech production. By relating these measurements to the settings programmed into the DBS stimulator (e.g. the level of the pulses), we can determine which settings will give the most benefit with the least side effects to each patient. In addition we can ensure that the implant has the longest possible battery lifetime, which means longer intervals between surgical battery replacement or between charging sessions.

By combining this information with our advanced stimulator and electrodes we will produce a new DBS system that provides even better outcomes for people living with Parkinson's and other disorders.

We believe our research can transform lives. This year, the Bionics Institute is celebrating 30 years of research and development know-how. We are using our proven technology platform to develop devices which will provide practical benefits for a large number of people. However, this requires significant funding and commercialisation to take our innovative DBS system into clinical practice.

We have therefore established a company, Bionic Enterprises, to seek investment and commercial partners and to manage the path to market. Although this work is at an early stage, by focusing on Parkinson's and with adequate funding and investment, we predict we can get our advanced DBS device into clinical trials within about three years.

For more information visit **www.bionicsinstitute.org**

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