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IPN Develops Electrodes to Alleviate Symptoms in Parkinson's Patients

- **By creating cost-effective prototypes of medical devices, the IPN aims to extend benefits to more low-income patients**
- **The device reduces the characteristic symptoms of Parkinson's disease, improving patients' quality of life and functionality.**
- **The same technology could also help treat epilepsy, chronic pain, and certain psychiatric disorders.**

The Instituto Politécnico Nacional (IPN) is developing ultrathin electrodes for deep brain stimulation to enhance the quality of life and functionality of individuals suffering from Parkinson's disease, a neurodegenerative condition marked by symptoms such as tremors, rigidity, slow movement, and gait disturbances.

Dr. Christopher René Torres San Miguel, project lead and researcher at the Escuela Superior de Ingeniería Mecánica y Eléctrica (ESIME) Zacatenco Unit, highlighted the high costs of current electrodes used for this therapy, ranging from 600,000 to 700,000 pesos, limiting access to treatment.

He noted that in private hospitals, health insurance typically covers 70% of implant costs. Recognizing this barrier, the IPN aims to produce affordable electrodes, making treatment accessible to more low-income patients. These devices also hold promise for addressing epilepsy, chronic pain, and psychiatric disorders.

To advance the project, Dr. Torres, a mechanical engineering specialist and member of the Sistema Nacional de Investigadores (SNII), has partnered with Dr. Fiacro Jiménez Ponce, a neurosurgeon and alumnus of the Escuela Superior de Medicina (ESM). Dr. Jiménez contributes his expertise in deep brain stimulation electrode implantation, providing critical guidance in device development.

Dr. Torres explained that deep brain stimulation targets regions responsible for controlling symptoms like tremors, rigidity, slow movement, and gait issues, harmonizing

motor functions through electrical pulses. The process requires electrodes implanted in specific brain areas, then connected to a pacemaker-like stimulator placed under the collarbone.

"The ideal electrode thickness is 0.2 mm (200 microns). So far, we've achieved 0.6 mm, but we plan to improve this by using specially designed molds to reach the optimal size. Thinner electrodes are less invasive, reducing the risk of damaging brain tissue during insertion," said Dr. Torres.

The electrodes, made from biocompatible medical-grade polyimide, are entirely flexible. The cannula used for insertion provides their rigidity. To ensure optimal electrical conduction, 4 to 6 silver threads are embedded inside, depending on the number of ports and the desired current speed.

The manufacturing model has been registered with the Mexican Institute of Industrial Property (IMPI). When the time comes, the IPN will seek partners to transfer the technology to companies interested in manufacturing the electrodes.

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