

WIRED V. TREMORS

An electronic brain implant that works like a pacemaker eases disabling motor symptoms associated with Parkinson's disease

Dong de los Reyes

Contributing Editor

There is no cure for Parkinson's disease, which wreaks havoc on over 300,000 Filipinos and three in every 1,000 people throughout Southeast Asia. Medications are taken to control symptoms. The disease can only get worse over time—and in time, the efficacy of medicines wanes and doses required to control motor functions may touch off side effects.

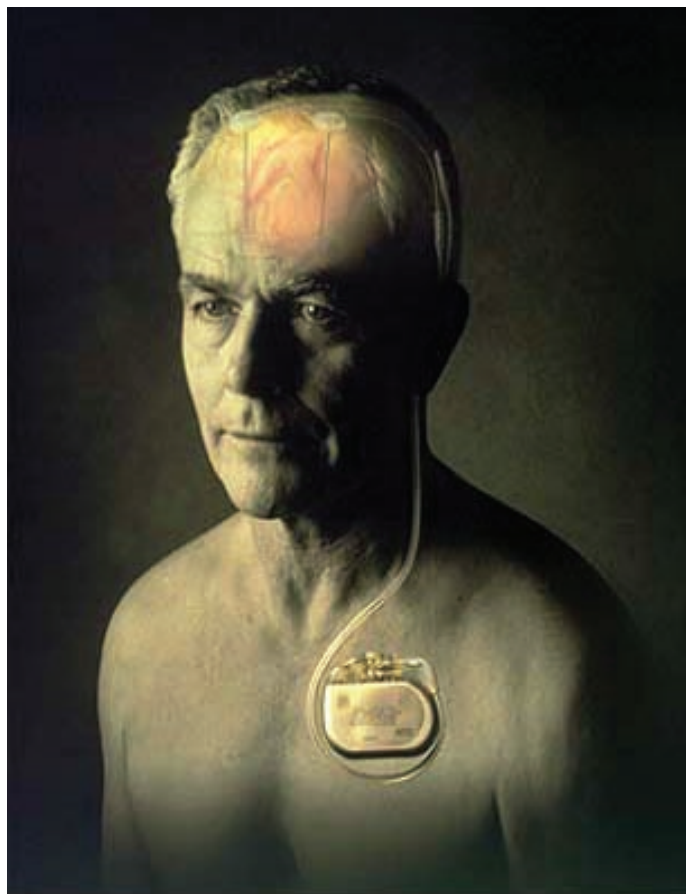
A last recourse may be needed—a surgical treatment that has been proved to reduce the symptoms associated with the disease. The therapy uses electrical stimulation for safe and effective management of the most disabling symptoms of advanced Parkinson's disease, tremor including. The therapy had been given the go-ahead in Canada, Europe, and Australia in 1998 and the United States and Singapore in 2002.

Parkinson's ravages cells in the dark colored portion of the brain called substantia nigra. The cells die—and as these are into production of dopamine that enables communication among brain cells, the cell deaths result in depletion of dopamine and the consequent symptoms of the disease:

- Tremor—involuntary, rhythmic shaking of a limb, head, or entire body. In early stages of Parkinson's, the tremor may affect only one part or side of the body. Not everyone with Parkinson's has tremor.
- Rigidity or stiffness, inflexibility of the limbs or joints. Muscle rigidity often starts out in the legs and neck. Muscles turn tense and contracted causing pain and stiffness in some patients.
- Slowness or absence of movement, bradykinesia or akinesia. Over time, the Parkinson's sufferer may develop a stooped posture and a slow, shuffling walk that in turn may lead to inability to start and keep moving. After a number of years, the muscles freeze—akinesia—or may not move at all.
- Postural instability. The afflicted stoops, head bowed and shoulders drooped often with a forward or backward lean that can lead to injury-causing pratfalls. Those with a backward lean tend to step backwards, a condition called retropropulsion.

In August 2006, a team of two neurosurgeons and a neurologist from the Cardinal Santos Memorial Medical Center (CSMMC) carried out the operation that took over five hours on the first Philippine patient—a businessman in his 70s who wanted to walk sans uncontrollable body tremors daughter to the altar on her wedding day.

Before going under the knife, the patient was already a likely candidate for deep-brain-stimulation (DBS) therapy. He was in the advanced stages of the disease with tremors horribly racking his entire torso and upper limbs, but still responding to levodopa to bolster depleted dopamine in his systems.



LIKE A PACEMAKER

Each side of the patient's brain is implanted—through a small opening in the skull—with a thin, insulated coiled wire with four stimulating electrodes at the tip that is linked to the neurostimulator (below). As a cardiac pacemaker does, the battery-powered neurostimulator sends up 10 watts of electrical pulses to both sides of the brain involved in movement and muscle functions.



The operation cost him US\$20,000 but it was worth the gala and gaiety of giving away one's daughter in marriage and a memorable nuptial fete without the inconvenience of rigidity of limbs or joints, bradykinesia/akinesia, and body tremors.

Experts say DBS has been used worldwide since 1987 to treat movement disorders. By September 2004, more than 30,000 people worldwide have benefited from DBS therapy for Parkinson's disease while over 150 neurosurgical teams perform DBS across Western Europe.

DBS works by electrically stimulating targeted structures in the brain—either the subthalamic nucleus (STN) which is seven to 10 millimeters in diameter, or the internal globus pallidus (pale globe), which turns up a frying sound under computed tomography.

The operation: Each side of the patient's brain is implanted—through a small opening in the skull—with a thin, insulated coiled wire with four stimulating electrodes at the tip that is linked to the neurostimulator, a pacemaker-like gadget. The extension is threaded under the skin from the head, down the neck and into the upper chest. As a cardiac pacemaker does, the battery-powered neurostimulator sends up 10 watts of electrical pulses to both sides of the brain involved in movement and muscle functions. Electrical stimulation of these areas eases Parkinson's disabling motor symptoms.

After the surgery, the patient returns to the physician for initial programming of the neurostimulator to optimize symptom control and lessen any side effects.

The neurostimulator battery's longevity varies, depending on settings and number of

hours the gadget is turned on each day. The battery may last three to five years depending on the patient's requirements. Neurostimulator replacement entails a simple surgical procedure—the extension and lead aren't replaced.

Patients installed with the DBS system say the surgical procedure is “demanding and exhausting but not painful.” Indeed, the brain itself has no pain receptors and feels no pain.

Neurosurgeon Jose Aguilar, who leads the CSMMC team that carries out DBS surgery, points out some drawbacks:

- DBS is expensive at US\$20,000 a pop, neurostimulator thrown in;
- neurostimulator-setting adjustments can be inconvenient and time-consuming; and
- there are risks of complications related to the neurostimulator. **M**

CROSSING THE BARRIER

Scientists figure out how the deadly bird-flu virus jumps to humans

Scientists have figured out how influenza viruses carried by birds latch on to humans, a discovery that may open the way to a vaccine against not just deadly avian flu but against all flu types.

There are many strains of flu virus, but only a few have succeeded in crossing the species barrier from animals to humans. Strains known as H1 and H3 are the most common, and are especially efficient in attacking cells in the upper reaches of the respiratory system.

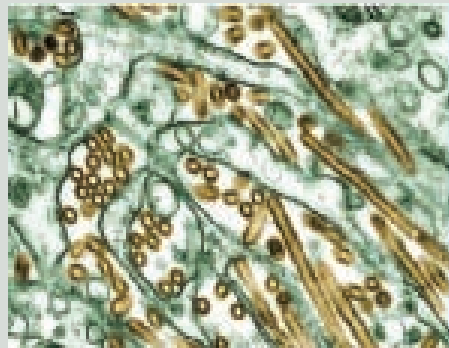
Variants of the H5 virus, by contrast, usually remain confined to wild or domesticated fowl. But when they do infect humans it is often with lethal results, as immune systems are unable to recognize and counter the novel pathogen.

Of 348 confirmed cases of H5N1 avian flu in the last five years, 216—more than 60 percent—have died as a result, according to the World Health Organization.

What health officials fear most is the emergence of a new H5 strain that can easily “jump” from birds to humans, potentially unleashing a pandemic on the scale of the Spanish flu of 1918 that killed tens of millions of people.

The findings, published in *Nature*, over-

PARIS



haul scientific understanding of how viruses attach themselves to cells inside human lungs.

Researchers have long known that whether an influenza strain infects humans depends on the ability of a protein on the surface of the virus, called hemagglutinin, to bind to a sugar receptor in the respiratory tract.

In humans, these receptors are known as alpha 2-6, whereas their counterparts in birds are known as alpha 2-3. Up to now, scientists believed it was a genetic switch in the virus that allowed it to bind to human rather than bird receptors, thus making the much-feared “species jump” possible.

But the study, led by Prof. Ram Sasisekharan of the Massachusetts Institute of Technology, says that the big factor is the shape of the sugar receptors in human lung

cells. The human alpha 2-6 receptors come in two shapes, one broadly resembling an umbrella, and the other a cone. To infect humans, flu viruses must bind to the umbrella-shaped receptors, the researchers found.

“This work enables researchers to look at flu viruses in an entirely new way,” said Jeremy Berg, director of the National Institute for General Medical Sciences, which funded the research.

At the very least, the new discovery will help scientists rapidly identify strains that may develop the capacity to attack human respiratory systems.

“Now that we know what we are looking for, this could help us not only monitor the bird flu virus, but it can aid in the development of potentially improved therapeutic interventions for both avian and seasonal flu,” said Sasisekharan.

Some 500,000 people around the world die every year from seasonal influenza, in which a strain mutates slightly from previous strains. A virus that would cause a pandemic, though, would be genetically so new that immune systems and vaccines would not be primed to recognize it.

The Spanish flu killed as many as 50 million people, although the toll is widely disputed. **M AFP**