

NEUROSCIENCE

Two Therapies Release Different Brakes on Impulsive Behavior

To unlock rigid limbs and restore their mobility, people with Parkinson's disease often require strong therapy, such as drugs that boost levels of the neurotransmitter dopamine—and if that fails, stimulating electrodes implanted deep in the brain. Yet these treatments can trigger impulsivity: Pathological gambling and hypersexuality have been associated with dopamine drugs, for example. Impulsive behavior can also accompany deep brain stimulation (DBS), but the electrical treatment promotes it in different ways than the drugs do, according to a study published online this week by *Science* (www.sciencemag.org/cgi/content/abstract/1146157).

Michael Frank and colleagues at the University of Arizona, Tucson, report that DBS interferes with patients' normal tendency to hesitate when faced with a difficult decision, whereas dopamine drugs interfere with the ability to learn from bad experiences. Although the study doesn't immediately point to ways to counteract such impulsive tendencies, other researchers say that the work does shed light on the neural mechanisms that control our thoughts and actions. "It's an advance towards understanding the architecture of cognitive control in the human brain," says Adam Aron, a cognitive neuroscientist at the University of California, San Diego.

Frank and his team used a computer game to investigate decision-making in 15 people with Parkinson's disease taking dopamine drugs and 17 patients receiving DBS targeted to the subthalamic nucleus, part of the network of brain regions disrupted by the disease. In the initial learning phase, the participants saw pairs of unfamiliar squiggles (actually Japanese hiragana characters) and were told, without further instruction, to pick the one that was "correct." Unbeknownst to the subjects, each character had a fixed success rate: In one pair, for instance, one character caused the

word "Correct!" to flash on the screen 80% of the time, whereas the other was correct the remaining 20% of the time. With practice, the people generally picked the character with the highest success rate.

Next, the researchers presented new pairings of the same characters. Healthy subjects and medicated patients hesitated for a split second when faced with a pair of characters with similar success

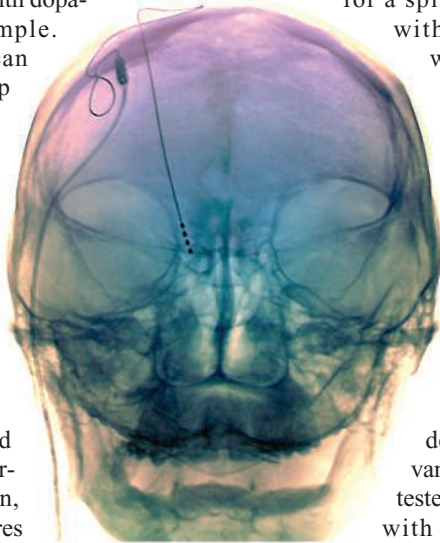
Wired. Deep brain electrodes may stimulate impulsivity as well as mobility in Parkinson's patients.

rates. DBS patients, on the other hand, made faster choices when the alternatives were similarly attractive. This tendency to rush close calls vanished when researchers tested the same DBS patients with the stimulating electrodes turned off. The findings, says Frank, bolster his group's suggestion that when a difficult decision presents itself, the normal role of the subthalamic nucleus is to send a "hold your horses" signal to other parts of the brain to allow more time to weigh the options. DBS interferes with this signal, leading to hasty choices, Frank hypothesizes.

Dopamine-boosting drugs had no effect on the speed of decisions, but they did reduce patients' tendency to avoid bad choices that had burned them in the past (such as picking the character with a 20% success rate). That fits with previous work, and it may help explain why some medicated patients with Parkinson's disease keep gambling despite repeated losses, says cognitive neuroscientist Roshan Cools of Radboud University Nijmegen in the Netherlands.

"What's really novel is the argument here that there are multiple pathways by which these impulsive behaviors can occur," says Cameron Carter, a cognitive neuroscientist at the University of California, Davis.

—GREG MILLER



The Million-Dollar Genome

Beijing Genomics Institute's (BGI's) Shenzhen branch made a splash this month with the announcement that it had sequenced the first complete genome of a Chinese individual, the third personal genome sequenced this year, after those of J. Craig Venter and James Watson. Now the new kid on the genome block is offering its service to any Chinese who can plop down \$1.3 million.

BGI Shenzhen, also known as Shenzhen Huada, was incorporated last April as a non-profit research organization funded primarily by local governments. The institute plans to sequence 99 more Chinese genomes as part of a 100-person project to map DNA polymorphisms in the Chinese population. To help finance the endeavor, Shenzhen Huada is offering wealthy Chinese the opportunity to have their own genome completely sequenced and analyzed. Forty percent of the income will go to a foundation to support Shenzhen Huada's health-related genomic research, including a plan to sequence 10,000 genomes of the dominant Han and ethnic minority Chinese as well as other East Asians, says BGI Director Yang Huanming. Another project sequencing the panda genome is already under way.

—HAO XIN

Updates

- The ITER Organization—which aims to show that nuclear fusion is a viable power source—came into being this week, 2 decades after the idea was proposed. The European Union and six member nations have ratified the necessary agreement and will now begin building a €5 billion reactor in Cadarache, France.
- Last week, six universities joined the ranks of the German elite. Government officials announced the winners of a second round of funding designed to boost a few top universities to world-class status (*Science*, 20 October 2006, p. 400). Winners this time were the RWTH Aachen University, Freie Universität Berlin, the University of Freiburg, the University of Göttingen, the University of Heidelberg, and the University of Konstanz. They join last year's three winners in receiving an extra €3 million a year in federal funding for the next 5 years.
- Hundreds of French researchers gathered last week at the headquarters of the National Centre for Scientific Research to protest the government's alleged plans to turn the \$4.3 billion institute into a funding agency. The government will announce its plans for CNRS later this year.