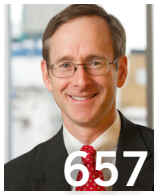
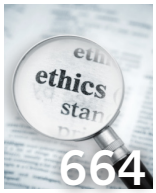


Security update:
Biosecurity center gets a new name to better reflect priorities

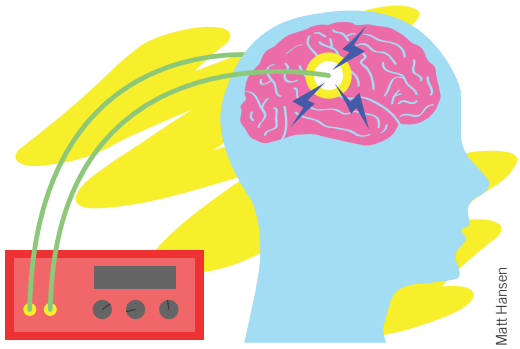
Designated drugs:
Breakthrough status may speed cancer agents to market



I do declare:
Ethics guidelines updated to provide extra protections

Charged by GSK investment, battery of electroceuticals advance

BERLIN — When the French neurosurgeon Alim-Louis Benabid developed deep brain stimulation to treat Parkinson's disease in the early 1980s, it was pure serendipity. To relieve symptoms, Benabid routinely caused lesions in the thalamus of the brains of people with the neurodegenerative disorder. One day he applied various electrical frequencies to the tissues instead to see what would happen. To his surprise, at a frequency of 100 Hertz, he suppressed a patient's tremors. Jolted by Benabid's inspiration, deep brain stimulation is now standard therapy for Parkinson's as well as for treatment-resistant depression.


Matt Hansen

Shocking relief: Electrostimulation advances for pain.

At this month's World Congress of the International Neuromodulation Society here in Berlin, researchers will present data that may extend the strategy of electrostimulation to complex pain syndromes such as fibromyalgia and refractory angina. The results come hot on the heels of an announcement made by GlaxoSmithKline (GSK) in April that, for an undisclosed amount, it will fund up to 20 external research projects that aim to advance the field of 'bioelectronic medicine' even further to develop a new class of therapies, dubbed 'electroceuticals.'

In its current form, electrostimulation therapy involves placing a few electrodes near affected brain tissue to alter action potentials of a group of nerves. The therapy is very unspecific. "It's brute force compared to what the nervous system actually does," says Dominique Durand, a biomedical engineer at Case Western Reserve University in Cleveland, Ohio. For treating depression, people had simply experimented with placing electrodes near nerve tissue that imaging had shown to have different activity than that in normal people "No one really understands how it works," Durand notes.

That lack of understanding has not stopped researchers from testing electrical stimulation therapy in other disorders. At the Berlin meeting, Mark Plazier, a neurosurgeon at the University Hospital of Antwerp's Brain Research Center in Belgium, will present data from a study in which individuals with fibromyalgia received electrostimulation of the occipital nerves at the back of the neck. Out of 25 patients treated for six months, 20 reported a decrease in symptoms of 64% on average, as recorded on an impact questionnaire. (The other five patients did not report greater than 20% reduction in symptoms, which was the cutoff value to consider the treatment successful.)

In another study, Plazier showed that pain relief in ten patients with fibromyalgia was controlled by the limbic system, a group of functionally related neural structures involved in emotion and motivation, supporting existing evidence that fibromyalgia is indeed a pain syndrome. Moreover, stimulation almost halved average pain scores on a commonly used scale, from 6.6 to 3.9 (out of 10). Both studies are the first to ever use electrostimulation therapy to treat fibromyalgia, which affects an estimated 3–6% of the world population.

Electrostimulation therapy may also help treat refractory cases of chest pain known as angina. A team led by cardiologist Siegfried Eckert at the Heart and Diabetes Center of North Rhine-Westphalia in Bad Oeynhausen, Germany, will report here that of 144 people implanted with a spinal cord stimulation device, 89% reported fewer angina symptoms after almost eight years of follow-up.

Of all the nerve

Such mounting evidence, combined with scientific progress, is what prompted GSK to enter the field, explains Kristoffer Famm, head of bioelectronics research and development at the UK pharmaceutical giant in London. "Technology has advanced to a level that allows us a much greater specificity to modulate the impulses that flow through individual nerves," he says. Citing the launch of two massive brain mapping projects that partly aim to map neural circuits—the US Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative and the Human Brain Project in Europe—Famm says that researchers could transform the tools and insights from both projects into useful therapies.

For example, Kevin Tracey and his colleagues at the Feinstein Institute for Medical Research in Manhasset, New York, recently mapped part of a neural circuit that controls aspects of the inflammatory process (*Science* **334**, 98–101, 2011). According to Famm, there is now early clinical evidence in people with rheumatoid arthritis that you can modulate the signals in this circuit with electricity and suppress levels of proinflammatory cytokines to reduce symptoms. To advance the research further, GSK plans to fund projects aimed at characterizing how specific nerves in the body are related to arthritis and other diseases, with a particular focus on understanding the firing patterns of those nerves. The company also hopes to develop new technologies that will enable researchers to modulate individual nerve fibers.

GSK will accept proposals through 2013 and will dole out exploratory grants to outside groups for up to one year. Researchers at the Feinstein Institute, the University of Pennsylvania in Philadelphia and the Massachusetts Institute of Technology in Cambridge are already collaborating with the company on various bioelectronic medical research projects.

"Because these neural circuits are so complex, we haven't been able to selectively tap into them," Famm says. "Now we are at the brink of being able to do so."

Gunjan Sinha