Fetal Tissue: A Hope for Huntington's?

Four years ago, Swedish researchers pioneered a controversial treatment for Parkinson's disease that involved transplants of brain tissue from aborted human fetuses. At a meeting in New Orleans this week, Mexican scientists reported adapting the same therapeutic technique to ameliorate symptoms in a patient with Huntington's disease, another disabling genetic disorder affecting the brain. At the same meeting, two other researchers reported encouraging results from animal studies aimed at developing fetal-transplant techniques that do not rely on human tissue.

A 37-year-old woman suffering from moderate to severe Huntington's symptoms showed "minor signs of improvement" after receiving transplants of fetal brain tissue into multiple sites within her brain, according to Ignacio Madrazo of the Instituto Mexicano del Seguro Social in Mexico City. One year after the operation, she has clearer speech and exhibits fewer of the involuntary, dance-like movements characteristic of Huntington's, Madrazo reported at the Society for Neuroscience's annual meeting.

Madrazo and his colleagues isolated nerve tissue from the brain of a spontaneously aborted human fetus. In contrast to mature nerves, these fetal ones still possess the ability to grow and divide. The Mexican team then surgically transplanted the fetal cells into the foremost region of the woman's caudate, a brain region that helps direct movement.

Afterward, the researchers found slight improvements in the woman's motor control, but no improvement in her memory or comprehension, activities controlled by areas of the brain that did not receive the transplant.

"This opens a new door in neural transplantation," says Madrazo, who has also treated Parkinson's patients with fetal-tissue transplants. "There is a benefit only in those areas [receiving transplants]," he says, which suggests that the tissue grafts helped.

John Sladek is critical of Madrazo's new work. A physician at the University of Health Sciences Chicago Medical School, Sladek contends that the woman's slight improvement may result from unknown factors activated during postsurgical healing. He says the Mexican team could have eliminated this variable by injecting the fetal tissue through a needle, as was done in the Swedish Parkinson's experiments (SN: 2/3/90, p.70).

"I believe that this test was performed too soon and in the absence of the appropriate [animal] testing," argues Sladek, who has transplanted human fetal tissue into Parkinson's patients.

One such animal study was reported at the meeting by a research group led by Ole Isacson of McLean Hospital in Belmont, Mass. Together with colleagues in France, Isacson created an animal model of Huntington's by giving monkeys a drug that caused them to develop abnormal, Huntington's-like movements. The researchers drastically reduced these symptoms in five animals with grafts of nerve cells harvested from a fetal rat's striatum. In Huntington's patients, this brain region secretes reduced levels of a key neurotransmitter. And when the monkeys were taken off the immunosuppressant drugs that prevented them from rejecting the rat-striatum transplants, their symptoms returned.

"This study shows the potential of the neurotransplantation approach to Huntington's disease" and suggests how the use of human fetal cells can be avoided by using other animal cells, Isacson says.

Patrick Aebischer of Brown University in Providence, R.I., also reported on animal tests involving transplants between species. Prior to transplantation, he coated the fetal tissue to be grafted with a permeable plastic film. This coating shielded the tissue grafts from rejection by the recipient's immune system, while allowing the transplanted cells to secrete beneficial neurotransmitters.

Aebischer's team elicited Parkinson's-like tremors in rats with a drug that destroys the brain's ability to produce the neurotransmitter dopamine. When the researchers transplanted coated clumps of laboratory-grown nerve cells that produced dopamine into the brains of these rats, the rodents' tremors diminished – a finding that Aebischer attributes to the grafted cells' dopamine production. Moreover, when the transplanted cells were removed, the tremors returned, he reports.

Aebischer says he and his colleagues also used a plastic coating to successfully transplant dopamine-producing cells from the adrenal glands of cows to rats with Parkinson's symptoms. "We can now transplant neural tissue across species without the danger of rejection," he says.

– C. Ezzell

Injecting tritium into magnetic fusion

Researchers have for the first time achieved the fusion of deuterium and tritium nuclei in a magnetically confined plasma. The resulting nuclear reactions generated roughly 1.7 million watts of power in a burst lasting nearly one second, scientists at the Joint European Torus (JET) laboratory in Culham, England, reported last week.

"This is the first time that a significant amount of power has been obtained from controlled nuclear fusion reactions," says JET Director Paul-Henri Rebut. "It is clearly a major step forward in the development of fusion as a new source of energy."

Placing tritium in a magnetically confined plasma marks a significant break with previous practice. Because of the special care required for handling tritium, a radioactive hydrogen isotope, and the risk of contaminating the reactor itself, researchers had in the past concentrated on studying the behavior of magnetically confined plasmas consisting mainly of nonradioactive hydrogen isotopes – either hydrogen itself or its heavier form, deuterium. But because the fusion of tritium and deuterium occurs at a lower temperature and more rapidly than the reaction between two deuterium nuclei, they expected eventually to switch to a mixture of tritium and deuterium.

As a first step, scientists at the JET fusion reactor injected a small amount of tritium into a magnetically confined, intensely heated deuterium plasma. Under these conditions, tritium and deuterium nuclei fused to produce helium nuclei (alpha particles) and highly energetic neutrons.

Advancing to tritium "was the next logical thing to do," says Richard D. Petrasso of the Massachusetts Institute of Technology. "No one had ever before put tritium inside any sort of magnetic confinement device."

Data from the JET experiment should provide crucial information about how well instruments designed to measure such quantities as temperature and impurity levels inside a reactor function when bombarded by high-speed neutrons, Petrasso says. Researchers will also learn how long it takes to clean out leftover tritium embedded in the reactor's walls.

Although the experiment produced a significant amount of power, it required nearly 10 times more power to heat the tritium-deuterium plasma to a temperature high enough to initiate fusion. "It was an important step in trying to decide whether fusion will eventually be an [energy] option," Petrasso says. "But we've still got a long way to go."

– I. Peterson