

The evolution of brain transplants: It's harder at the top

The transplantation of any part of one body into another is fraught with the pitfalls of biological rejection and other serious, even fatal, complications. It is ironic, and puzzling, that the body's most complex organ — the brain — appears to be among the most fertile, and immunologically safe, sites in which to attempt a transplant. Scientists are now referring to the brain as a "privileged area," one that may not be as subject to antibodies as are other organs.

Still, it remains to be seen whether it is possible for neuroscientists to take advantage of this and provide normal, functioning brain tissue to specific areas of diseased or damaged brains. So far, the results have been mixed. Hundreds of grafting experiments on the small, relatively simple brains of rats have been highly successful in alleviating symptoms equivalent to those in Parkinson's disease. But preliminary work with the more sophisticated brains of monkeys reflects a far less positive picture. And the best that can be said about the only reported human brain graft — performed last May on a 60-year-old Swedish Parkinson's victim — is that the patient is still alive and apparently not any worse than he was before the operation.

A scenario of stringently restrained optimism was described last week by psychopharmacologist Richard Jed Wyatt of the National Institute of Mental Health. "We're not comfortable yet with human [brain grafts]," Wyatt said at a meeting of the Council for the Advancement of Science Writing in Cambridge, Mass. Wyatt, however, did detail the considerable success he and his NIMH colleagues have had in rat experiments since their first report of successful implantation in 1979 (SN: 5/12/79, p. 308).

That first graft involved the implantation of the brain's substantia nigra (SN) — an area that produces the chemical dopamine — from a rat embryo into the brains of adult rats whose SN had been destroyed. Parkinsonism is believed to involve a deficiency in the dopamine system and, indeed, those rats that had their SN's destroyed displayed involuntary rotational movements — a reaction scientists say corresponds to tremors in humans. The symptoms substantially decreased or disappeared, however, following the grafting.

For obvious medical and ethical reasons, fetal brain material cannot be used in human transplantation. So over the last few years, Wyatt and his group have implanted a portion of the dopamine-producing adrenal gland of one rat into the Parkinson-like brain of another rat of the same strain. In hundreds of such experiments, the researchers achieved the same lessening of symptoms as they had with the SN transplants, Wyatt said. Unlike the

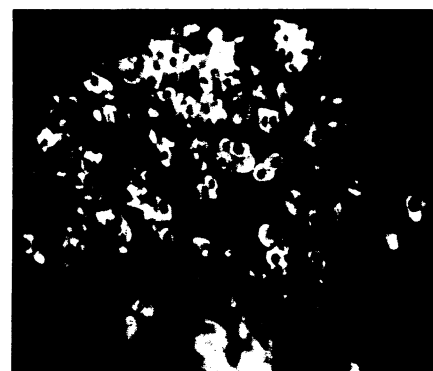
SN graft, however, the adrenal implant does not grow its nerve fibers *into* the adjacent caudate region, an area involved in the brain's control of motor activity. Rather, the adrenal tissue spews out dopamine by diffusion — "It still gets there [to the caudate]," says Wyatt.

Such results would seem to hold great promise for humans, where part of an adrenal gland from the patient or from someone else could be used rather easily for implantation. However, it is the brain's very complexity at the top of the evolutionary ladder that could hamper or prevent effective transplantation in human beings. Because of the relatively large size of the human brain, thousands of individual grafts would have to be used, according to Wyatt (3,000 separate tissue grafts from the patient's own adrenal gland were injected in the Swedish operation, he says); in addition, he says that though rejection does not seem to be a problem, questions remain about the long-term adaptation of adrenal and other types of tissue into the brain.

The lack of the Swedish patient's improvement, as reported recently by Ake Seiger and his colleagues at the Karolinska Institute in Stockholm who performed the procedure, would seem to punctuate

Wyatt's cautioning. In addition, Wyatt and NIMH colleague William Freed report that in experiments with only a few rhesus monkeys they have been unable to replicate the success achieved with rats. Nevertheless, Wyatt says, animal work thus far "gives hope for people who have substantial lesions of the brain."

—J. Greenberg



Freed/NIMH

Cells from the central part of the adrenal gland, the medulla, from one rat, spewed out dopamine and other neurochemicals in the brain of another rat from the same strain. Such implants have alleviated Parkinson symptoms in the animals but not, as yet, in higher animals or man.

Wilderness trespasser drills for gas

"On Tuesday, Nov. 2, I was quail hunting in the vicinity of the [Bitter Lake National Wildlife] refuge when I noticed heavy equipment in an area I thought was part of the wilderness," recalled Bob Burnett, New Mexico Wildlife Federation's vice president. Returning home, Burnett verified via land-status maps that the drilling equipment he had seen was in fact trespassing on wilderness land. Since then he has done everything possible to halt the natural-gas drilling. But "shockingly," he told a House subcommittee on public lands and national parks Nov. 10, "despite the fact that Yates Petroleum has no legal right to be drilling on the refuge and despite the fact that the government has known about this illegal trespass since at least Nov. 2, the company is still drilling."

The federal government asked for and received a temporary restraining order to halt Yates's drilling on Nov. 10. On Nov. 18, the government is scheduled to petition a federal district judge to consider a preliminary injunction against Yates. But many feel the case calls into question Interior's policing capability and motivation.

The story began in 1972 when New Mexico granted Yates Petroleum Co. of Artesia, N.M., an oil and gas lease involving portions of the Salt Creek Wilderness within the Bitter Lake refuge. Although the property was designated a federal wilder-

ness two years earlier, the state retained subsurface mineral rights. And those had been leased to Yates. To maintain its lease, Yates had to begin developing the site by October 31, 1982. And according to Robert Jantzen, director of the Interior Department's Fish and Wildlife Service, on Oct. 31, "someone walked into the refuge and ... hand dug a hole."

The next day, Yates bulldozed a road to the refuge, cut through a surrounding fence, entered, "and cleared a drill site," the Sierra Club's Tim Mahoney testified at the House hearing. Yet regardless of any state permits Yates held, Mahoney noted, "federal authorization and permits to the surface are an absolute prerequisite which must be met before drilling can commence." And Yates has no such permits, federal officials testified.

Environmentalists like Burnett are galled that Yates has threatened and bodily removed demonstrators from the site where they were legally protesting Yates's illegal trespass. What's more, environmentalists complain, Interior took 10 days to act and then did so only because public outcry was so loud. "This controversy goes far beyond any threat to this one refuge," claims Jay Hair, the National Wildlife Federation's executive vice president. Mahoney agrees, saying it effectively tells energy companies they "will be considered above the law."

—J. Raloff