TECHNOLOGY

Implanted cow cells ease the pain

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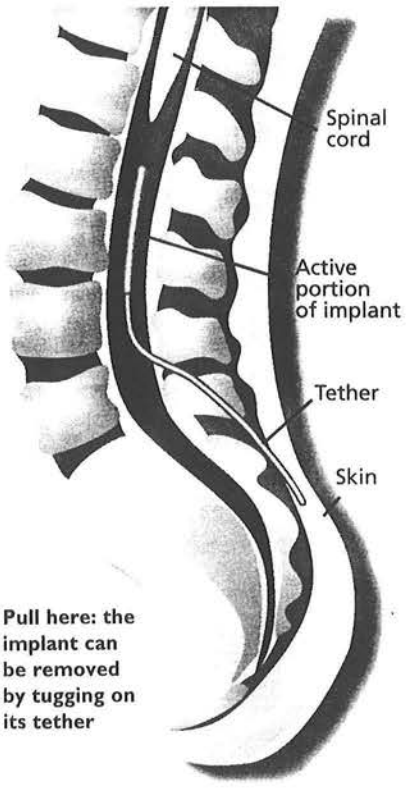
DOCTORS in Switzerland have helped to relieve the pain of six terminally ill patients by implanting live cultured cells from the adrenal glands of cows into their spines. The cells produce a cocktail of natural painkillers, which may cause fewer side effects than drugs such as morphine.

The implants contain chromaffin cells, which secrete adrenaline and noradrenaline and are thought to play a role in animals' "fight or flight" response to danger. But they also produce a cocktail of natural painkillers, such as catecholamines, enkephalins, neurotensin and somatostatin. The experiment was carried out by researchers from the University of Lausanne, Switzerland, and Brown University and the biopharmaceutical company Cytotherapeutics, both based in Providence, Rhode Island.

David Lurie/Katz Pictures

Because of the risk of infection, implanting tissue from another species into humans is controversial, so the team had to find a way to minimise this risk. They also had to protect the cells from the patients' immune systems and allow the painkilling chemicals to circulate. They came up with a tubular implant that encases the cells in a semipermeable acrylic polymer membrane. The membrane prevents anything with a molecular weight of more than about 50 000 from passing in or out of the implant. "The membrane is impermeable to viruses and plasmids," says Michael Lysaght, associate professor of artificial organs at Brown.

The prion proteins blamed for spreading diseases such as scrapie in sheep, BSE in cows and Creutzfeldt-Jakob disease in people are small enough to pass through the pores. But the researchers say that the chromaffin cells are cultured from cows that are free from BSE. "The process involves very careful sourcing and testing of the cells," says Lysaght.



Pull here: the implant can be removed by tugging on its tether

Although the patients in the initial study were terminally ill, Lysaght is confident that the implants will not lead to infections in longer-lived patients. "It's certainly not my perspective that this is just for the terminally ill," he says. "The reason for choosing terminally ill people for the first study was not so much the danger of the process but its novelty."

The membrane also prevents the large, complex molecules and cells of the patients' immune system from reaching the chromaffin cells. Tiny pores allow basic nutrients to reach the cells, and the small analgesic molecules they produce to pass into the spinal fluid.

Lysaght and his colleagues Patrick Aebischer of Lausanne and Moses Goddard of Cytotherapeutics filled the implant with around 2 million chromaffin cells—enough to secrete about 2 to 3 micrograms of catecholamines over 24 hours. They then inserted the device into the spines of the six patients, all of whom were using morphine epidurals to relieve their pain.

All six patients said the implants made them more comfortable, and three were able to reduce their intake of conventional painkillers. One of these stopped using morphine completely. A similar trial is now planned for the US, and a bigger trial for Switzerland. Some of the patients involved will not be terminally ill.

The implants remained in place for between 41 and 176 days. After removing the tube, the researchers found no fibrous cells sticking to the device, indicating that the surface of the implant had not aggravated the immune system. They also found that the chromaffin cells were still secreting as much of their chemical cocktail as they did when they were first inserted. Lysaght reported the group's findings last month to the Controlled Release Society at its annual symposium in Kyoto, Japan.

Lysaght acknowledges the possibility of a placebo effect in such a small number of patients. The larger Swiss trial should decide whether the pain relief is genuine.

"These are exciting initial results as a proof of principle that cell culture implantation works in humans," says Bruce Cerksey of New York University, whose research into neurological diseases involves studying the effects of cultured adrenal chromaffin cells implanted in the brains of rats. But he cautions that the cells must remain functioning in the implant for a long time for the procedure to be practical. □