

## Pain relief by current: Still looking good

In 1973 a revolutionary means of relieving pain was launched by Huda Akil of Stanford University School of Medicine and her colleagues. They implanted electrodes in the brains of a handful of patients whose excruciating pain could not be relieved by drugs. The electrodes were guided down the back of patients' heads and into their chests, where they converged into a silver dollar sized receiver. Whenever the patients felt pain, they placed a doughnut-sized inductance device next to their receivers, causing an electric current. This electrical stimulation of their brains relieved the pain.

By 1976 Akil and her co-workers had used this technique on 30 pain patients and found that it dramatically relieved pain in two-thirds of them. Last week, at an international pain meeting at the Johns Hopkins Medical Institutions in Baltimore (sponsored by Miles Laboratories), she reported that the technique is still relieving pain for more than half these patients. Ongoing research in her lab, she said, is also revealing more insights into both the benefits and limitations of the technique, as well as into how it works.

The patients using the technique suffer a wide range of illnesses, from low back pain (33 percent of all cases) to cancer, spinal cord paralysis, phantom limb pain and arthritis. After using the technique for a mean of 18 months, 18 out of 30 patients still experience good to excellent pain relief from it. The mean duration of pain relief after stimulation is 3.8 hours, rang-

ing from a few minutes to 24 hours. The patients describe their pain, upon stimulation, as "floating away" or as "tightening up," then disappearing altogether. Treatments usually result in improved sleep, increased physical activity and enhanced social and personal interactions. The most common side effects are skin tingling, visual blurring, nervousness, dizziness and a mild change in temperature at a localized body site. The most serious complication seen, in three patients so far, is postoperative meningitis. Other complications have been mostly mechanical, such as broken wiring and electrode migration.

How does brain stimulation lead to pain relief? Several studies by Akil and her colleagues suggest that it relieves pain by activating the enkephalins—proteins that have been found to be the brain's own natural pain-relieving chemicals. Acupuncture also appears to relieve pain by their stimulation (SN: 11/20/76, p. 324).

In one experiment, Akil and co-workers found that electrical stimulation of the midbrain of pain patients led to a significant rise in the levels of enkephalins in their cerebrospinal fluid. In another experiment, the researchers found that two out of four pain patients needed more brain stimulation to relieve their pain when taking naloxone, which is known to inhibit the action of the enkephalins in the brain, than when taking saline (a control substance).

"Taken together," Akil and her colleagues conclude, "the above results suggest a role of endogenous opioids [enkephalins] in the analgesia obtained by pain patients when they self-administer current. ... However, this does not preclude the role of other mechanisms of pain modulation in this analgesia." □

## Vasectomy worsens cholesterol build-up

Vasectomy is the most common method of sterilization for men; an estimated 12 million men in the United States have undergone the operation in the past 10 years. But the operation may do more than sterilize. It apparently accelerates the atherosclerosis resulting from a high-cholesterol diet—at least in monkeys. In a pilot study using monkeys fed a diet containing about twice the amount of cholesterol normally consumed by the average American male, researchers at the Oregon Regional Research Primate Center found that monkeys with vasectomies develop more extensive atherosclerosis than do monkeys without vasectomies.

J. Nancy Alexander of ORRPC, who worked in cooperation with Thomas P. Clarkson of the Bowman Gray School of Medicine of Wake Forest University in Winston-Salem, N.C., reported her findings at a recent meeting of the American Fertility Society in New Orleans. Ten adult monkeys were fed a high-cholesterol diet for 16 months. Six months after the diet was begun, vasectomies were performed on half of the monkeys; the five control monkeys were also operated on, but vasectomies were not performed. Ten months after the operations, the animals were autopsied, selected arteries were ground up and the cholesterol was measured. Compared with the controls, the cholesterol content in all the major arteries was higher in monkeys with vasectomies. Atherosclerotic plaques were particularly pronounced in the abdominal artery, the carotid arteries, some segments of the coronary arteries and in the cerebral arteries. In the abdominal aorta, one of the major arteries of the body, the cholesterol concentration in the vasectomized monkeys was twice that of controls.

Monkeys are thought to be good animal models because not only do they develop atherosclerosis when fed high-cholesterol diets, they also produce antibodies to sperm after vasectomy, a phenomenon often seen in men. Alexander reported that antisperm antibodies developed in all the monkeys with vasectomies but not in any of the control animals. Alexander and Clarkson speculate that the exacerbation of atherosclerosis by vasectomy might result from excessive antibody-antigen reactions. Apparently, sperm that are blocked by the cut and tied end of the vas deferens degenerate and leak out into the blood system. The immune system mounts an attack against the "foreign" proteins of the sperm, which are usually confined to the reproductive tract. Chronically recurring antigen-antibody complexes are known to injure cells in the inner linings of blood vessels in such a way as to increase the severity of atherosclerosis.

## DOE eyes fusion with other countries

With the possibility of a tight fusion budget in view, the Department of Energy is looking at fusion projects with other countries. The agency recently held talks with researchers from Europe and the Massachusetts Institute of Technology about building a small, high magnetic field tokamak. DOE has also expressed interest in a Soviet proposal to build and share an engineering test reactor and is considering a Japanese offer to sink millions of dollars into the U.S. energy program.

The European reactor would test how well alpha particles produced by a deuterium-tritium fusion are confined and whether heating plasma by those particles would produce instabilities in the fusion reaction. It was proposed by members of the European Atomic Agency, Euratom, and would be built in Garching, West Germany. If a six-month pilot study works out, the United States may provide some hardware for the project while the Europeans provide most of the funding.

The Soviets proposed to the Interna-

tional Atomic Energy Agency—including the United States, Japan, Britain and several European countries—that a large working tokamak be built on a cooperative international basis. DOE officials are reported to support the idea. Current tokamaks—such as the Tokamak Fusion Test Reactor under construction at Princeton (SN: 11/5/77, p. 294)—call for break-even energy production. With these, the fusion-energy output equals the huge amounts of energy needed to heat the plasma and initiate the reaction. The Russian proposal goes a step beyond this to a reactor that would produce excess energy.

Japan, too, seems interested in the fusion program. Japan's Prime Minister Takeo Fukuda made a cash offer and DOE officials say it is under consideration. Rumors within DOE place the figure somewhere between \$500 million and \$1.6 billion. DOE fusion budget officer Robert Rosselli says that the money may be earmarked for wider-ranging energy projects, as well as the fusion program. □