

various repetitive movements—episodes of sniffing, for example. These behaviors lessened greatly in the vaccinated rats. New experiments, Koob says, will highlight the vaccine's effect on more crucial addictive behavior, in which the rats repeatedly press a bar to get the drug.

The vaccine also appears to be highly specific. It does not prevent the effects of amphetamines, another type of stimulant.

A similar vaccine to treat addiction in people remains distant. For one thing, the particular antibody-stimulating part of the vaccine, which comes from marine limpets, may do too good a job. "We'd need to rule out potential autoimmune problems," says Koob.

"I see a possible place for a vaccine with people who want to get off the drug, who are highly motivated but tempted," says Koob. Heroin addicts determined to kick the habit need constant monitoring to stay on drugs that block heroin's pleasurable effects, says George Uhl of the National Institute on Drug Abuse's Baltimore laboratories. A vaccine might reduce the need for monitoring.

"I don't think you'd ever grab people using crack cocaine off the street, immunize them, and expect this is going to work," says Koob. Psychiatrist David W. Self of Yale University School of Medicine agrees. Vaccination, he says, does not target the basic process of addiction in those already addicted.

Koob suggests that a vaccine may someday serve as an adjunct to behavior-shaping therapy and drugs. "It would put up a significant barrier for cocaine."

—M. Centofanti

## Heart drug busts brain clots from stroke

A clot-busting drug commonly used to treat heart attacks also curtails brain damage caused by the most prevalent type of stroke.

A collaborative study of people who suffered strokes caused by blood clots in the brain indicates that patients treated with tissue plasminogen activator (t-PA) were 30 percent more likely to make excellent recoveries than patients given a placebo.

"This is a real breakthrough," says John R. Marler of the National Institute of Neurological Disorders and Stroke in Bethesda, Md., which funded and coordinated the work. "It is the first time a drug has shown a clear benefit in treating acute stroke."

Marler notes that the researchers also confirmed suspicions that t-PA increases a person's risk of having a serious brain hemorrhage. Even so, approximately the same number of patients died in each group. Moreover, fewer patients treated with t-PA sustained permanent disability.

Approximately 500,000 people in the United States suffer strokes annually. Ischemic strokes, which result when a blood clot reduces blood flow to the brain, constitute 80 percent of these cases. The rest—known as hemorrhagic strokes—are caused by bleeding in the brain.

The trial, conducted by researchers across the United States, included 624 patients who received either intravenous t-PA or a placebo within 3 hours of initial stroke symptoms. Before giving either treatment, researchers used very

fast computerized tomography to confirm that the patient was having an ischemic stroke.

As reported in the Dec. 14 *NEW ENGLAND JOURNAL OF MEDICINE*, patients treated with t-PA faced less disability after 3 months than those given the placebo. Hemorrhaging in the brain occurred in 6.9 percent of the patients on t-PA but in only 0.6 percent of those taking the placebo.

Stroke researchers are excited, despite the treatment's risk of hemorrhage. "This is the first stroke treatment which has withstood the crucible of scientific investigation," says Charles H. Tegeler of Wake Forest University's Bowman Gray School of Medicine in Winston-Salem, N.C. J.P. Mohr of Columbia University's College of Physicians and Surgeons notes that "this finding is the first of hopefully many that will change the public attitude from 'nothing to be done' to 'everything to be done.'"

While the findings impress Cathy A. Sila of the Cleveland Clinic Foundation, she emphasizes that "it is amazing that the researchers mobilized the community to recognize the symptoms of stroke and get [the patient] to the hospital." Strokes are often painless, but warning signs include sudden weakness or numbness, loss of vision, severe headache or dizziness, and difficulty in moving—symptoms the victims themselves often don't recognize.

Marler notes the need for further research and training before this treatment becomes the standard of care.

—L. Seachrist

## Hubble finds an off-center black hole

Over the past few years, astronomers have gathered compelling evidence that black holes lurk at the heart of several galaxies. However, the latest finding has caught researchers by surprise: The newest unseen monster lies slightly askew.

Instead of residing at the exact center of the elliptical galaxy NGC 4261, the suspected black hole lies slightly to one side, astronomers reported at a Hubble Space Telescope workshop in Paris last week. But how did a black hole more massive than a billion suns move 9 light-years from the center, its presumed birth site?

Still considered hypothetical by many scientists, black holes represent a collapsed state of matter so extreme that not even light can escape their gravitational tug. Evidence over the past decade suggests that these invisible objects power the fireworks at the core of many active galaxies.

Astronomers have suspected for

more than 15 years—ever since radio telescopes detected twin, oppositely directed jets of radiowaves streaming out of the galaxy's center—that NGC 4261 harbors a black hole. Last August, Hubble's faint-object spectrograph measured the rotational speed of a disk of gas and dust at the galaxy's core. The high velocity betrays the presence of a massive black hole, report Laura Ferrarese and Holland Ford of Johns Hopkins University in Baltimore and Walter Jaffe of Leiden University in the Netherlands.

Both the disk and the calculated location of the black hole lie slightly apart from the exact center of the galaxy. According to one theory, the location of the disk suggests that an intruder galaxy collided with NGC 4261 long ago. Material from the off-center disk falling onto the black hole may have propelled the hole away from the galaxy's center.

Douglas O. Richstone of the University of Michigan in Ann Arbor believes



Disk of gas and dust in the galaxy NGC 4261.

that the orientation of the disk rather than its location implies a past galactic collision. Because the disk lies perpendicular to the plane of the galaxy, stars in NGC 4261 could not have provided the gas to make the disk, he asserts. Instead, Richstone says, the gas must have come from a colliding galaxy.

—R. Cowen