Biomedicine

Nicotine addiction curbed by new drug

Given nicotine regularly, rats—like humans—can become addicted. A study of 60 such rats shows that an anti-epilepsy drug called gamma vinyl-GABA, or GVG, blocks the craving, scientists led by a team at Brookhaven National Laboratory in Upton, N.Y., report in the January SYNAPSE. A test on baboons unveils similar findings.

When rats getting 75 milligrams of GVG per kilogram of body weight were given access to a nicotine dispenser in their cages, they tapped the dispenser at their usual rate to satisfy their addiction. Rats getting 90 mg/kg, however, consumed only half as much nicotine. At higher doses, GVG abolished nicotine craving completely. A similar pattern resulted from tests on other rats conditioned to get nicotine from a dispenser in response to specific cues—a model of humans' urge to smoke in certain situations, such as while drinking alcohol or coffee.

The anti-epilepsy drug boosts production of gamma-aminobutyric acid. This brain chemical inhibits release of dopamine, a pleasure-inducing substance. Production of dopamine is triggered by nicotine, cocaine, alcohol, and some other drugs. Indeed, previous studies have indicated that GVG inhibits animals from sensing a reward from these drugs. "It looks like there might be a global, generalizable strategy to treat multiple addictions," says study coauthor Stephen L. Dewey, a neuroanatomist at Brookhaven.

The researchers used positron emission tomography to measure dopamine in the brains of baboons: seven that were undrugged, three that received nicotine only, four that were given GVG only, and six that received both. In the baboons, GVG blocked the dopamine release resulting from nicotine.

From these findings, the researchers estimate that the daily adult human dose of GVG needed for smoking cessation would be 250 to 500 mg, much less than the dose currently given to epilepsy patients to prevent seizures. —*N.S.*

Drug dulls shingles, diabetes pain

A drug called gabapentin effectively reduces nerve pain associated with diabetes and shingles, two studies in the Dec. 2, 1998 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION show.

Roughly half of all long-term diabetes patients experience neuropathy, a painful inflammation of nerves. These patients complain of sharp pain, such as pins-and-needles or burning sensations "like an electrical current," says neurologist Miroslav Backonja of the University of Wisconsin-Madison.

Backonja and his colleagues measured gabapentin's effects by testing it in patients whose neuropathy had lasted from 1 to 5 years. The patients kept a daily log using a scale in which 0 represented no pain and 10, severe pain.

Seventy patients who received the drug for the full 8-week study rated their pain at an average of 6.4 before taking the drug and 3.9 afterward. Another 65 patients who received an inactive substance, or placebo, instead of the drug rated their pain at 6.5 before taking the pill and 5.1 afterward. Neither researchers nor patients knew which pills were placebos.

Meanwhile, a research team led by scientists at the University of California, San Francisco finds that gabapentin also works better than a placebo in counteracting pain from shingles, a viral disease that attacks nerve endings.

These two trials suggest that gabapentin may prove to be "the drug of first choice" in most cases of shingles and in some cases of diabetic neuropathy, say Phillip A. Low and Rose M. Dotson of the Mayo Clinic in Rochester, Minn., in an editorial accompanying the studies.

Gabapentin is approved by the Food and Drug Administration to control convulsions in epilepsy, but Backonja says some doctors already prescribe it for neuropathy pain. Precisely how it works remains unknown. —*N.S.*

Chemistry

A new twist on mirror-image molecules

Like hands or ears, many molecules come in two similar but distinct forms that are mirror images. This property, known as chirality, leads to a curious optical effect. Polarized light shone on a solution of one molecular form rotates clockwise; shone on the mirror image, the light will rotate counterclockwise.

Even though scientists have known about this phenomenon for 150 years, only recently have they been able to predict the angle and direction of the rotation for a particular molecule. Now, Rama K. Kondru, Peter Wipf, and David N. Beratan of the University of Pittsburgh have further advanced the understanding of chirality by figuring out a way to calculate how much individual atoms and their electrons within the molecule contribute to the optical rotation. They describe their method in the Dec. 18, 1998 SCIENCE.

The calculations require a lot of computing power, so the researchers limited the molecules they tested to 10 or 12 atoms, says Beratan. Based on electron distributions, they predicted optical rotation for three classes of compounds: oxiranes, simple chiral molecules that are small and rigid; more complex cyclic esters; and linear molecules, specifically fluorohexane. The "most provocative" finding, Beratan says, is that the presence of a twist in a fluorohexane chain, as well as the arrangement of its atoms, appears to influence the light rotation. —*C.W.*

Metal grains dye fabrics in muted hues

Mere mortals may not be able to afford garments made of spun gold, but a new fabric-dyeing process offers humble folk a less costly alternative. By bonding tiny particles of gold and other metals to cloth fibers, William J. Todd of Louisiana State University in Baton Rouge can tint fabrics with a range of colors.

The hues achieved by this process evoke a misty meadow rather than the shiny lamé costume of a Las Vegas entertainer. Gold grains turn fabric pink or red, and other metals look yellow, green, gray, and tan, Todd says. The nanometer-size particles scatter light in such a way that the material takes on those various colors (SN: 10/3/98, p. 216).

To dye a piece of fabric, Todd soaks the fibers in a solution of metal ions. The ions cluster around the fibers and react to form solid particles that adhere to the threads. Unlike organic dyes, the metal grains don't wash out or fade in the sun, he says.

Although the technique sounds expensive, not much metal is needed to dye fabric. "We work with very dilute solutions that have an ion concentration of about one-hundredth of one percent," Todd says. He estimates that 1 ounce of gold would color about 380 miles of spun viscose yarn. —*C.W.*

Thin probe measures pH of heart

Doctors may soon have a new tool to help them monitor cardiac patients in intensive care. A small pH sensor, developed by a team at the University of North Carolina at Chapel Hill, can be placed on the end of a catheter and threaded through a vein to the heart. There, the probe continuously measures the acidity or alkalinity of heart tissues and blood.

Measuring pH can tell doctors a lot about a patient's condition, says cardiologist Wayne E. Cascio. For example, if not enough oxygen is reaching the heart muscle, lactic acid builds up and lowers the pH. Current probes designed for this purpose "tend to be large and uncomfortable," says Cascio. He and his colleagues describe the sensor in the Dec. 1, 1998 ANALYTICAL CHEMISTRY.

The researchers made the sensor by electroplating iridium oxide onto a platinum wire just 1 millimeter in diameter. Sayed A.M. Marzouk, a chemist from Ain Shams University in Cairo and a study coauthor, developed a way to successfully deposit iridium oxide in a pH-sensitive state, a feat that had eluded previous attempts. —*C.W.*