# Spermicides may not offer HIV protection

Risky sex just got riskier. A new study suggests that a common spermicide offers no protection against the AIDS virus (HIV).

Previous human trials had suggested that spermicide use helped ward off infection with disease-causing microbes such as *Neisseria gonorrhoeae*. Many researchers jumped to the conclusion that spermicides also offered a shield against HIV because nonoxynol 9, the active ingredient in most spermicides, kills HIV in the test tube.

Right now, the male condom represents the most reliable method (short of abstinence) of avoiding infection with sexually transmitted microbes. However, studies show that a number of men will not use this method. Some public health experts therefore recommend that women whose partners won't use condoms turn to spermicidal methods, such as a vaginal sponge that contains nonoxynol 9.

A new study suggests that such advice may prove premature. Joan Kreiss of the University of Washington in Seattle and her colleagues studied 138 prostitutes in Nairobi, Kenya, who tested negative for HIV infection at the study's start. The team randomly assigned 74 of the women to a group instructed to wear a sponge impregnated with nonoxynol 9. The remaining 64 used a placebo cream or suppository during sexual encounters. In addition, the researchers stressed to all women the importance of getting their partners to use condoms.

For more than a year, the research team followed these women, asking them to return to the clinic for periodic visits. During that time, 14 women in the nonoxynol 9 group and eight women in the placebo group dropped out of the study, leaving a total of 60 in the sponge group and 56 in the placebo group.

When the team analyzed their data, they found that the two groups were similar with respect to age and percentage of sex partners who used condoms.

Prostitutes using the nonoxynol 9 sponge reduced their risk of *N. gonorrhoeae* infection by 60 percent, a finding that confirms previous data. However, the sponge failed as a guard against HIV.

"We were unable to demonstrate that nonoxynol 9 sponge use was effective in reducing the risk of HIV infection among highly exposed women," the authors report in the July 22/29 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. Their findings were also presented during a briefing at the VIII International Conference on AIDS in Amsterdam last week. The team discovered that 27 of the 60 women (45 percent) in the sponge group and 20 of the 56 women (36 percent) in the placebo group developed HIV antibodies during the course of the study.

In addition, sponge users had an increased risk of genital ulcers, a finding that suggests the sponges may actually increase the risk of HIV transmission, comments Katherine M. Stone, an epidemiologist at the Centers for Disease Control in Atlanta. Stone, who wrote an editorial accompanying the report, wonders whether the study's findings can be applied to women who are at lower risk of HIV infection. "The bottom line is the jury is still out on spermicides and HIV," Stone says. *– K.A. Fackelmann*

# GABA receptor linked to absence seizures

A new animal study offers hope of better treatment for so-called "absence" seizures in humans.

Also known as petit mal, this form of epilepsy occurs mainly in children and is marked by seconds-long lapses in consciousness. A child can experience up to 100 episodes a day, during which he or she may seem to stare, often blinking rapidly, or sway slightly before recovering. Frequent seizures can interfere with concentration and lead to problems in school. Fortunately, seizure frequency tends to decline with time; four-fifths of all affected children outgrow absence seizures by age 20.

New findings suggest that these seizures result from an overabundance of receptors for a brain chemical called gamma-aminobutyric acid$_B$ ($GABA_B$), according to neurologist David A. Hosford and his colleagues at the Duke University Medical Center and the Veterans Administration Medical Center in Durham, N.C. They describe their work in the July 17 SCIENCE.

This study represents "a major advance . . . the first step in designing new therapies" for absence seizures, says Robert J. DeLorenzo, a neurologist with the Medical College of Virginia at Virginia Commonwealth University in Richmond.

The anticonvulsant drugs currently used to suppress absence seizures often cause drowsiness, and can effectively treat only about 80 percent of the approximately 100,000 U.S. children affected by these seizures, Hosford says.

In their study, the Durham researchers determined that specially bred, epilepsy-prone mice, called lethargic mice, have seizures that closely resemble absence seizures in humans. During the seizures, the brains of these mice produced electrical signals similar to those seen in humans experiencing absence seizures. The mice also responded to the same anticonvulsant drugs used to treat people with absence seizures.

Hosford's team then used the lethargic mice to test a theory, proposed last year by researchers in England, linking absence seizures to the actions of $GABA_B$ receptors, which help transmit signals from one nerve cell to another. The Durham scientists found that the activity of these receptors directly influenced seizure frequency: Compounds designed to block the activity of $GABA_B$ receptors greatly decreased the number of seizures in the lethargic mice, while a compound designed to enhance the activity of $GABA_B$ receptors increased the number of seizures.

Close examination of tissue samples revealed that the brains of the lethargic mice contained 26 percent more $GABA_B$ receptors than the brains of normal mice. Electrical tests confirmed that overall $GABA_B$ receptor activity was greater in the epileptic mice.

Hosford hopes that such research will "lead to a more tailored therapy designed to attack the mechanism of petit mal and perhaps treat the seizures without producing some of the more unfortunate side effects" caused by current drugs. *– K. Hoppe*

# Magnetic activity: A flare for research

Like giant accelerators in the sky, the arching magnetic fields that pierce the upper atmosphere of stars can unleash vast amounts of energy. Colliding, breaking apart, and reconnecting, the fields accelerate charged particles high in the atmosphere, triggering an explosive brightening, or flare, near the visible surface of the star below. New observations of the sun and of a nearby Milky Way star reveal the profound role that magnetic fields and protons play during a flare – and in its high-energy afterglow.

For years, researchers have speculated about how magnetic energy released in a star's upper atmosphere, or corona, heats the lower depths, where visible-light flares occur. Some scientists proposed that beams of electrons in the corona, excited by the magnetic fields, rain down on the star and carry the energy. Others suggested that proton beams could transport the energy more efficiently.

In 1976, two U.S. astronomers predicted that if downward-moving proton beams were indeed the carriers, these particles would collide with hydrogen atoms to produce a brief but telltale type of ultraviolet radiation. At a press conference last week, researchers announced that the Hubble Space Telescope had detected such radiation from a Milky Way flare star called AU Microscopium.

Located 30 light-years from Earth, this

star undergoes flares many times more intense than those on the sun. Hubble's Goddard High-Resolution Spectrograph monitored the star for some three hours last Sept. 3, but it detected enhanced emission of a particular wavelength of ultraviolet light for a mere 3.2 seconds – just at the onset of a flare, when astronomers had predicted a higher intensity would occur.

According to theory, as protons stream down from the corona, they knock into hydrogen atoms, robbing each of its solitary electron. Each electron then pairs with a proton to form a new, downward-moving hydrogen atom. The newly created atoms briefly emit a type of ultraviolet light called Lyman-alpha emission.

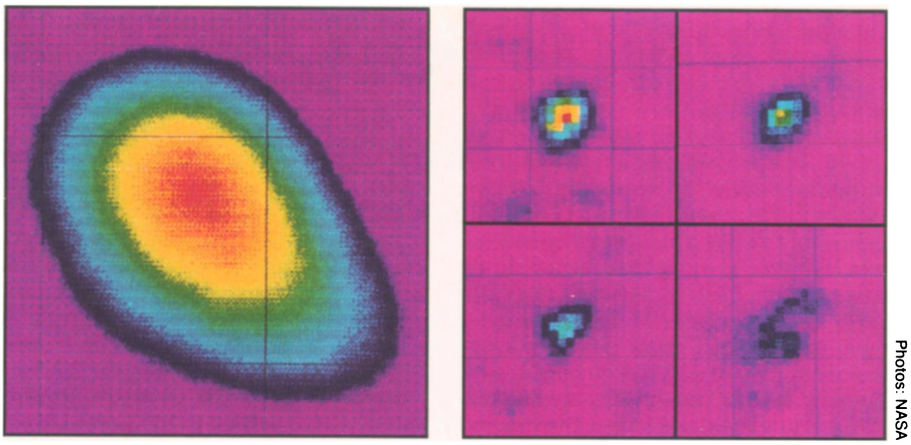
And because the atoms are moving toward the surface of the flare star, away from Earth, the ultraviolet light they radiate appears to have shifted to a slightly redder, or longer, wavelength. Bruce E. Woodgate of NASA's Goddard Space Flight Center in Greenbelt, Md., reported that Hubble measured red-shifted Lyman-alpha emissions as the flare began, indicating that hydrogen atoms were streaming toward the star at about 1,800 kilometers per second.

Woodgate notes that the finding doesn't preclude the possibility that electron beams also carry some of the energy unleashed by magnetic activity. But the observations hint that protons serve as the dominant energy carrier in AU Microscopium – and perhaps in other stars, including the sun.

In June 1991, the Compton Gamma Ray Observatory (GRO) recorded high-energy emissions from the sun during a month of spectacular flares (SN: 6/22/91, p.388). The findings, also reported last week, indicate that magnetic fields in the corona help create an afterglow of gamma rays and neutrons for many minutes to hours after flares begin. James M. Ryan of the University of New Hampshire in Durham announced that GRO's EGRET telescopes detected solar gamma rays for more than five hours after a flare began on June 11, 1991. Four days later, GRO's Compton Telescope detected gamma rays and neutrons for more than 90 minutes after the onset of another flare.

The findings, says Ryan, support the theory that some protons get trapped in the magnetic arches of the corona, rattling back and forth inside a kind of magnetic slinky. Earth's Van Allen radiation belts trap protons in a similar way, he adds. As the protons slowly leak out of the slinky, they strike atoms near the solar surface, accounting for the extended neutron and gamma-ray emissions.

In imaging the spray of neutron particles from the sun, the Compton Telescope made astronomical history. The blurry picture marks the first time that researchers have used neutrons to image any celestial object. The spectra of neutrons, Ryan adds, may provide more information than gamma rays about the energy of the trapped protons and the nature of the magnetic fields that accelerated them. *– R. Cowen*



Photos: NASA

*Neutron emissions from the sun (left), recorded an hour after a flare's onset June 15, 1991, marks the first time a celestial object has been depicted using these subatomic particles. Red denotes highest intensity. Images at right show that the sun emits gamma rays for more than an hour after the X-ray peak of the flare.*

# Runaway greenhouse gas losing its steam

Although the international community missed its opportunity in Brazil last month to set limits on carbon dioxide emissions, not all the news under the greenhouse is bad. Without even trying, humans have apparently succeeded in slowing the atmospheric buildup of methane, another powerful greenhouse gas, scientists reported this week.

Measurements made around the world reveal that while concentrations of methane continue to increase, they are not rising as quickly now as they were almost a decade ago. In 1983, methane levels were climbing at 13.3 parts per billion per year. But by 1990, the rate of increase had dropped to 9.5 parts per billion per year, according to researchers with the National Oceanic and Atmospheric Administration (NOAA), the University of Colorado at Boulder, and the Australian Commonwealth Scientific and Industrial Research Organization, based in Mordialloc, Victoria. They describe their findings in the July 23 NATURE.

Climate experts worry about rising methane levels because the buildup of this gas accounts for roughly 15 to 20 percent of the greenhouse warming power added to the atmosphere each year. Methane comes from natural sources as well as from human activities such as cattle rearing, rice farming, and the mining of fossil fuels.

The researchers analyzed a data set of roughly 10,000 air samples, collected at 37 sites scattered around the world, mostly on islands. While the scientists cannot pinpoint what has put the brakes on the methane buildup, the pattern of recent changes offers some clues.

The data indicate that the greatest slowdown in methane accumulation has occurred in the higher latitudes of the northern hemisphere. "The fact that that's where most of the industrialized world lives, in that latitude zone, suggests that there's some human involvement in this decrease we're seeing," says Edward J. Dlugokencky, a NOAA researcher based in Boulder.

Other groups have also detected a drop in the methane accumulation rate, but they relied on less extensive sampling networks that cannot reveal as much about the regional pattern of methane changes, Dlugokencky says. If the present trend continues, methane concentrations will level off in about 15 years. But without knowing what has caused the changes, scientists cannot predict what will actually happen with methane, Dlugokencky adds.

F. Sherwood Rowland, an atmospheric chemist at the University of California, Irvine, mentions several factors that could explain why the buildup of methane has slowed. Between 1950 and 1975, the number of cattle in the world increased from 800 million to 1.25 billion, but since 1975 the cattle population has leveled out. Rice production seems to have followed a similar pattern of rapid increase followed by a slowdown. Lastly, oil companies apparently changed their practices during the late 1970s to cut down on methane loss during oil extraction. Because methane persists in the atmosphere for a decade, any or all of these changes could have caused a slowdown in methane buildup during the 1980s. *– R. Monastersky*