# Non-estrogen morning-after pill works best

In the 1970s, Canadian scientist Albert A. Yuzpe discovered that a multiple dose of birth control pills taken within a few days of sexual intercourse could avert pregnancy by flooding a woman's system with a burst of hormones.

The so-called morning-after pill containing estrogen and progestin works about three-fourths of the time, but it often causes nausea and vomiting. Researchers now report that a pill without estrogen but with a larger dose of progestin, also called progesterone, prevents conception better than the dual pill and causes fewer side effects.

A 14-country study by the World Health Organization (WHO) tested the two kinds of pills on 1,955 women, average age 27, who reported to clinics after having unprotected sex. About half were given the two-hormone pill and a follow-up dose 12 hours later. The other women received similarly timed doses of a synthetic progestin, also called levonorgestrel, but no estrogen.

Pregnancy occurred despite the treatment in 10 of the 976 women who had received levonorgestrel and in 28 of the 979 who had been given the dual contraceptive. The researchers estimated the number of pregnancies that might have been expected in these groups, given the timing of the unprotected sex in the menstrual cycle. Levonorgestrel averted 85 percent of the potential pregnancies, while the dual pill prevented 57 percent.

Only 23 percent of the women receiving levonorgestrel reported nausea, and less than 6 percent vomited. In the other group, 51 percent had nausea and 19 percent vomited.

"Estrogen is a well-known cause of nausea," says obstetric gynecologist Felicia H. Stewart of the Henry J. Kaiser Family Foundation in Menlo Park, Calif. The milder side effects of levonorgestrel and its high pregnancy-prevention rate make the WHO findings "very persuasive," she says.

Scientists had been concerned that levonorgestrel taken by itself would disrupt a woman's subsequent menstrual cycles. This study showed no difference between the two pills in this regard, says study coauthor Paul F.A. Van Look, an obstetric gynecologist at WHO in Geneva.

Even as scientists fine-tune the emergency contraception pill, the misnomer attached to Yuzpe's discovery still stands as a classic in medical science. The morning-after pill can in fact work up to 72 hours after intercourse. A U.S. study now finds that this mislabeling has had consequences.

Stewart and her colleagues report in the August ARCHIVES OF PEDIATRIC AND ADOLESCENT MEDICINE that U.S. teens show scant knowledge of emergency contraception. Of 1,510 boys and girls ages 12 to 18, surveyed by telephone in 1996, only 23 percent knew that such pills exist. Of those aware of the treatment, just 9 percent understood that the window of opportunity lasts a full 72 hours.

"Many people got the misconception that anything after [the morning after] would be too late," says study coauthor Suzanne F. Delbanco, a health policy analyst currently at the University of California, Berkeley. In the United States, the pills are mostly made available at emergency rooms and college health centers for rape victims or other women who report unprotected sex, she says.

U.S. drug companies have shied away from marketing hormone pills in emergency-contraception packets in part because birth control is politically sensitive and because contraception is often not covered by medical insurance, Stewart says. But some firms now have plans to package and sell them as such.

In Seattle, a pilot project in which pharmacists could dispense emergency-contraception pills after taking a brief patient history resulted in 800 treatments in the first month, she reports.

These pills, which use hormones to prevent conception, differ from the so-called abortion pill RU-486 that blocks the hormones and can work beyond the 72-hour window. —*N. Seppa*

# Birth zone shrinks for top cosmic rays

When cosmic rays, the universe's most energetic particles, pound into Earth's atmosphere, they unleash showers of particles streaking down with a dim, blue glow. Of these rays, those with the highest energy pepper the planet with the densest sprays over the widest areas, up to 10 kilometers across.

Astrophysicists have long pondered where and how the strongest cosmic rays acquire millions of times the energy that any earthbound particle accelerator can produce. Proposals on a growing list range from decaying superheavy particles in this galaxy to colliding cosmic strings of energy stretching across all of space.

If cosmic rays come from the farthest reaches of the universe, they must travel through the pervasive background radiation left over from the Big Bang. Theorists have shown that collisions with background-radiation photons would sap the cosmic rays' energies, limiting them to about 50 million trillion electronvolts (eV) on arrival at terrestrial detectors.

Yet cosmic rays are regularly, if infrequently, reaching Earth with higher energies, according to a report in the Aug. 10 PHYSICAL REVIEW LETTERS. Led by Masahiro Takeda of the University of Tokyo, a 28-scientist team recorded six such major impacts from February 1990 to October 1997. If cosmic rays spring up throughout the universe, the researchers calculate they should have detected at most one. They used Japan's Akeno Giant Air Shower Array, the world's largest detector of subatomic particle sprays from cosmic rays.

Looking skyward to where the rays seemed to originate, the team found no astronomical objects potent enough to spit out such energetic particles. "[They] have to come from very nearby. But the things we see and think we understand nearby don't seem capable of making things of this energy," says physicist James W. Cronin of the University of Chicago.

The Japanese team concludes that the highest-energy cosmic rays must originate within 150 million light years of Earth. That region still contains plenty of possible candidate sources for the rays, Cronin says, but all require either new physics or a revised understanding of known celestial objects.

A slim chance persists that the cosmic rays come from afar, he adds, but few astrophysicists fault the energy-sapping theory or think that the most energetic cosmic rays are exotic particles whose energy wouldn't be sapped.

The new findings complement the 1993 detection of the most energetic—300 million trillion eV—cosmic ray ever recorded (SN: 12/4/93, p. 372). They sound a death knell for theories of distant origins for the most potent cosmic rays, says Alexander Vilenkin of Tufts University in Medford, Mass. He favors the idea that undiscovered superheavy particles around the galaxy, as they decay, eject the strong cosmic rays.

New experiments "will solve the puzzle of the highest energy cosmic rays," the Japanese team predicts. The Pierre Auger Project, for example, is a $100-million, 19-nation collaboration intended to erect two vast detectors in Argentina and Utah. On July 24, the U.S. government agreed to provide 15 percent of the funding for the Argentinean site, beginning in October. U.S. support for the rest of the project may come later, project backers say.

According to Cronin, a spokesman for the project, the 3,000-square-kilometer array of detectors in Argentina is designed to pick up 30 of the highest energy cosmic rays each year, improving scientists' ability to draw a bead on cosmic ray sources. —*P. Weiss*