Biomedicine

HIV's heterosexual gender gap

A woman's risk of acquiring the AIDS-causing virus (HIV) from an infected male sex partner is nearly 18 times a man's risk of contracting it from an infected woman.

That's the conclusion reached by a team of epidemiologists who compared HIV transmission rates in men and women. The researchers, led by Nancy S. Padian of the University of California, San Francisco, recruited 72 male sex partners of HIV-infected women and 307 female partners of infected men. Most of the participants were whites in their 30s who had remained monogamous since 1978. All partners of HIV-infected individuals denied using intravenous drugs, another risk factor for AIDS; most did not know their HIV status.

The team gave these partners a blood test for HIV and questioned all participants closely about other AIDS risk factors and their past sexual habits. In the Sept. 25 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, Padian and her colleagues report that 61 of the female partners (20 percent) and one of the male partners (1.4 percent) tested positive for HIV infection.

The findings fit with other research suggesting that HIV passes much more easily from men to women than vice versa.

In the one case of apparent female-to-male transmission identified in the new study, the woman belonged to a "swinging singles" club and reported having sex with more than 600 men during the past five years, the researchers note. In addition, she reported more than 2,000 sexual contacts with a bisexual man and more than 1,000 sexual contacts with a man she knew to be infected with HIV. Her husband, in contrast, said he had engaged in sex with only three other women (who appeared to be at low risk of AIDS) during the same five-year period.

Padian emphasizes that female-to-male transmission in the United States, while rare, does occur. The public health message thus remains one of caution for both men and women, she asserts. "This is a lethal disease," Padian says. "You don't shoot craps for something that could kill you."

AIDS in Africa: Ravaging heterosexuals

In central Africa, the AIDS epidemic is ravaging the general population.

Researchers who studied 1,458 women living in Kigali, the capital of Rwanda, found an overall HIV-infection rate of 32 percent, according to a separate report in the Sept. 25 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. Participants' ages ranged from 19 to 37. Single women proved at highest risk, although even married women and those in long-term, monogamous relationships had an infection rate of 20 percent.

Susan Allen of the University of California, San Francisco, directed the Rwanda study.

AIDS report faults national leaders

The National Commission on AIDS last week urged President Bush and other U.S. government leaders to make the AIDS epidemic a high priority. "The lack of government leadership in the epidemic is everywhere evident," the 12 panelists charge. They call on Bush to establish a comprehensive national plan aimed at preventing HIV transmission.

Since 1981, the panel notes, 120,000 people in the United States have died of AIDS. The group predicts that the cumulative AIDS death toll will reach 350,000 by the end of 1993, and that the disease will increasingly strike entire families.

Panelists also note that experimental treatment may provide crucial help for people infected with this tricky virus. The commission recommends including more women and minority members with AIDS in drug trials funded by the National Institutes of Health. In addition, they say, the Food and Drug Administration should "aggressively pursue" options for dissemination of promising experimental AIDS therapies.

Physics

Putting neutrino detection on ice

The South Pole, already a popular site for meteorological and astronomical observations, may also provide the ideal location for a neutrino detector. Douglas M. Lowder of the University of California, Berkeley, and his collaborators propose drilling holes 1 kilometer into the Antarctic ice cap to bury an array of photomultiplier tubes for detecting light flashes generated by subatomic particles known as muons as these particles move through the ice. The investigators hope to detect high-energy neutrinos released in astrophysical events such as the cataclysmic gravitational collapse of a star or the accretion of matter in the massive core of an active galaxy. Such neutrinos interact with ice to produce telltale muons.

However, because neutrinos interact only weakly with ordinary matter, neutrino detectors must cover large areas to be effective. An ice-bound neutrino detector offers the key advantage of expandability. Researchers can readily drill additional holes to extend the Antarctic array, thereby increasing its likelihood of picking up and pinpointing the sources of neutrino signals. "Unlike existing and some proposed detectors, there would be no physical limit to its size and structure," the project leaders say.

In the Sept. 26 NATURE, Lowder and his colleagues describe the results of a pilot project carried out in Greenland to ascertain the feasibility of constructing what they call the Antarctic Muon and Neutrino Detector Array (AMANDA). The Greenland experiments demonstrated that polar ice is sufficiently transparent to permit detection of radiation generated by high-speed muons passing through ice.

"We find these results very encouraging and are planning more extensive experiments at the South Pole during the coming austral summer," they report.

Hunting down the magnetic monopole

The search for fundamental particles that have only one magnetic pole is now focused on a huge monopole detector nearing completion in Italy's Gran Sasso National Laboratory, located about 60 miles east of Rome, beneath the Apennine mountain range. This rectangular, concrete-and-iron structure, called the Monopole, Astrophysics and Cosmic Ray Observatory (MACRO), stretches nearly the length of a football field and already serves as the largest underground detector of cosmic rays. The bottom level of the two-layer detector is nearly finished, with several sections already collecting data. The top level should begin operating next year.

The project's main goal is to find a magnetic monopole. So-called grand unified theories, which mathematically tie together the electromagnetic, weak and strong forces, predict that magnetic monopoles – if they exist – would have a large mass and move much more slowly than other subatomic particles. These theories also suggest that the Big Bang created numerous monopoles, but only a small number would have survived from that time. "There's not any evidence whatsoever that there are lots of monopoles out there, and lots of evidence to the contrary," says Henry J. Frisch of the University of Chicago, who has led monopole searches in the past but is not associated with MACRO.

"We know they have to be scarce if they exist," says Richard M. Heinz of Indiana University in Bloomington, a physicist on the MACRO team. "But at least with a detector the size of MACRO, we have a shot at finding one."

Just in case there is no monopole out there waiting to be found, MACRO is versatile enough to serve several other needs. "It turns out that while you're looking for magnetic monopoles, you can do a lot of other science," Heinz says. Although designed for seeking monopoles, the detector can also pick up signals from neutrinos as well as cosmic rays.