

AIDS: Disease, Research Efforts Advance

What emerged from last week's international AIDS conference in Atlanta is a grim picture of a disease that remains one step ahead of the researchers seeking ways to stop it. The meeting focused on work in progress—some of which was so new that the rawness of the data led to conflicting interpretations about the finer details of the disease.

But there was agreement on most points, among them that acquired immune deficiency syndrome is continuing to increase exponentially and to gain a foothold in more risk groups, and that it is transmitted primarily through intimate contact. Results of treatments are beginning to trickle in, but proven therapies and vaccines are still down the road.

The numbers are chilling. There will be as many cases diagnosed in the next year as have occurred since 1978, when an increased incidence of opportunistic infections among homosexual men was first noticed, predicted James W. Curran, head of infectious diseases at the Centers for Disease Control (CDC) in Atlanta. So far, 9,760 AIDS victims have been diagnosed in the United States; 4,760 have died.

The test used to screen donated blood for antibodies to the AIDS-associated virus, which indicates a history of infection, has been used to screen several groups of people. Extrapolating from this and other data, Curran estimated that from 300,000 to 1 million people have been infected with the virus. What will happen to them remains an open question; anywhere from 5 to 20 percent could go on to develop symptoms, he said. There is a spectrum to the syndrome—some people are infected and have no signs of the disease, and some have "pre-AIDS" or AIDS-related complex (ARC), a collection of symptoms that isn't quite full-blown AIDS.

"Clinical AIDS is a very small fraction of the seropositive [antibody-positive] population," Jerome Groopman, a Harvard Medical School hematologist and oncologist who is studying AIDS, told *SCIENCE NEWS* at the meeting. "What determines the clinical outcome after infection is unclear." A CDC and San Francisco Department of Public Health study found that two-thirds of 362 homosexual men who were AIDS-antibody-free in the late 1970s had developed the antibodies by 1984. And no one knows how many people who have been infected are contagious, Groopman said.

Paul Volberding of the University of California at San Francisco (UCSF), head of the AIDS clinic at San Francisco General Hospital, estimated that five to 10 times as many people have ARC as have AIDS.

In 1981, UCSF began a study of homosexual men with one of the symptoms of ARC, swollen lymph nodes or

lymphadenopathy. After one year, there were no cases of AIDS in this group, but by the end of the third year 14 of 200 men had it. Other research, noted study participant Donald I. Abrams of UCSF, shows that anywhere from 3 to 26 percent of men with lymphadenopathy go on to develop AIDS.

Women are victims of AIDS as well. In Africa, where the disease is believed to have originated, as many women as men have AIDS, presumably as a result of heterosexual transmission. In Haiti, Port-au-Prince and Cornell University researchers reported at the meeting, the incidence in women is on the increase. In 1982, 7 of 49 cases, or 14 percent, were women; by 1984 the numbers had increased to 30 of 93, or 32 percent. As has been the case with homosexual transmission, there is a correlation with the number of sexual partners.

Robert R. Redfield of the Walter Reed Army Hospital in Washington, D.C., has been studying AIDS incidence in military personnel with no known risk factors. While noting that his subjects may have been reluctant to admit to homosexuality or intravenous drug abuse, which would put them into known risk groups, he said that five of seven wives of men with AIDS or ARC had virus or antibodies.

Though an increase in heterosexual transmission is inevitable, Curran said, "It is likely that heterosexual spread of infection will not be as rapid as among gay men and drug users. The virus in AIDS has been present in the United States among heterosexual men and women since the late 1970s and yet a maximum of no more than 5 percent of cases can be attributed to this type of transmission at this time."

Artificial insemination may represent another form of transmission. Groopman told *SCIENCE NEWS* he has seen a woman who developed antibodies to the AIDS-related virus following artificial insemination with semen from a man who turned out to be an asymptomatic virus carrier. Scientists at several large sperm banks contacted by *SN* said they have not yet begun donor blood screening and knew of no banks where it was currently done.

Saliva, said Groopman, is "very unlikely to be an efficient form of transmission. Is it possible? Yes. But there's no epidemiological evidence for it."

On the question of transmission of AIDS through the casual contact that occurs among members of the same household, most researchers are in agreement—yes in Africa, no in the United States, but just what accounts for the difference is unknown. Jonathan M. Mann of the CDC, with colleagues at the National Institutes of Health and in Zaire, compared household contacts of confirmed AIDS cases with healthy controls. They found that spouses

excluded, 11 percent of household members had antibody to the virus, while only 4 percent of the control cases did.

"The data have to be examined with extreme caution," said Mann. "It's impossible to distinguish [between] person-to-person transmission and some other common risk factor. Our findings are not generalizable to the United States. Studies in the United States thus far have shown no evidence of household transmission." Cultural and social differences may explain the discrepancy, he said.

AIDS has been showing up in other countries as well, among them France, Belgium, Italy and Australia. A poster presented at the meeting by a Soviet researcher claimed "2?" possible cases. And cases continue to occur in children, presumably caused by transmission from mothers before, at or shortly after birth. As of April 8, there were 108 U.S. children under 13 who had been diagnosed.

Several Florida researchers presented data indicating that the impoverished Florida town of Belle Glade has the highest U.S. per capita rate of AIDS, suggesting other modes of transmission, including possibly squalid conditions or insects.

Treatment of AIDS is complicated by the virus's lifestyle. When it enters the cell, the virus, which comprises a single strand of RNA, manufactures an enzyme that allows it to be transcribed into the host's DNA. "Once infection with a retrovirus occurs," noted the National Cancer Institute's Robert Gallo, "the infection is extremely likely to be for the lifetime of the individual."

A number of treatments undergoing clinical trials were discussed at the meeting. Some address individual infections associated with AIDS and others attempt to halt the process itself. The disease stoppers are either immune system modulators that reconstitute the failed immune system or antiviral drugs aimed at the virus associated with AIDS. Among the viral inhibitors: suramin, HPA23, phosphonoformate, ribavirin, interferon, ansamycin. Immunomodulators undergoing trials include interleukin-2.

Martin S. Hirsch of the Massachusetts General Hospital in Boston noted that while safety and tolerance tests followed by a randomized control trial are needed, "I think it's truly amazing that in less than the year that these studies have been going on, already six drugs have been shown to have some antiviral effect." But, he added, it is very early in the process.

The virus hides itself well in the cell, and because infection appears to persist for life, Hirsch and several others predicted that lifelong treatment will be needed. And, as has happened with cancer therapy,

a combination — probably an antiviral drug in concert with an immunomodulator—may be necessary.

Before a vaccine is possible, proof is needed that the body can successfully mount a battle against AIDS infection. Several laboratories reported evidence of effective antibodies, but there was some disagreement about the best substance to provoke the response. In preparing the vaccine, special care needs to be taken not to include whatever part of the virus is suppressing the immune system.

One problem with an AIDS vaccine is that, as one researcher noted, the "sloppy replication mechanism [of the virus] allows for a lot of mutational error to occur."

The virus, much like influenza virus, changes over time, so that the "prepped," vaccinated person's immune system might not recognize it.

As economists are wont to do, they have come up with a dollar cost for the disease. CDC researchers reported that: The average cost for hospital care per patient is \$140,000; the cases thus far have run up \$1.3 billion in hospitalization bills and \$2.9 million in outpatient visits. Indirect costs include \$4.2 billion in lost earnings and \$162 million in disability payments. Total cost to date: \$5.6 billion.

Researchers have yet to agree on a name for the virus associated with the disease. At the conference, the players could

be identified largely by what they called it. The French researchers and the CDC referred to it as lymphadenopathy-AIDS virus (LAV), though the A previously stood for associated. Most U.S. East Coasters were calling it HTLV-III, for human T cell lymphotropic virus, though the L used to stand for leukemia. And some of the Californians called it ARV, for AIDS-related virus.

Meanwhile, the disease continues into uncharted waters. "We've seen the epidemic for only a few years," said UCSF's Volberding. "What happens 10 or 15 years down the line is really anyone's guess."

Said Gallo, "This is a problem for the world."
— J. Silberner

The shuttle and the satellite: The great flyswatter caper

On Launchpad 39A at NASA's Kennedy Space Center in Florida this week, engineers and technicians were at work on the space shuttle Challenger, preparing for its planned April 29 launching of the Spacelab 3 research module. This will place the event only 17 days after the lift-off, from the same pad, of the shuttlecraft Discovery (and only 10 days after Discovery's landing), making it the shortest time between launchings in the shuttle program's history.

The preparations have been going fine, according to space center officials, who express optimism even though there are no extra days built in to accommodate possible problems that might interfere with the tight schedule. Meanwhile, however, work is under way on some of the consequences of Discovery's flight, which left an inoperative satellite in orbit (as well as another in working order), made a U.S. senator sick (as planned) and melted a hole in Discovery itself.

The mission's first main item of business was the deployment of Canada's Anik C-1 communications satellite, which went without a hitch. So did the deployment of LEASAT 3, also known as Syncom IV-3, which was to be leased to the U.S. Navy by Hughes to replace older satellites providing communications between ships, planes and ground installations.

It was after LEASAT's deployment that the trouble appeared.

Several previous shuttle-deployed satellites (one each for Western Union and the Indonesian government, and NASA's own Tracking and Data Relay Satellite) had been sent into the wrong orbits, not by the shuttle but by the auxiliary rocket stages that were supposed to lift each satellite from the shuttle's altitude to their much higher duty stations. Unlike the earlier satellites, LEASAT's rocket motor was built-in rather than separately purchased, but when the time came for a built-in timer to ignite the rocket, 45 minutes after deployment, nothing happened. Hughes officials concluded that a lever that should have automatically activated the timer



The "flyswatter" at the end of the shuttle's remote arm is manipulated toward a switch (arrow) on the LEASAT 3 satellite by astronaut Rhea Seddon. Previously, Seddon had helped improvise the flyswatter from a plastic document cover (right).



during deployment had for some reason not been moved far enough, and NASA and Hughes' officials set about working out a way to nudge the lever the rest of the way.

No spacewalks had been scheduled for the mission, and shuttle officials were reluctant anyway to send an astronaut across to hand-flip a lever that would ignite a rocket motor, particularly if the presumably faulty timer might set it off with no 45-minute getaway time. Instead, planners at NASA's Johnson Space Center in Houston (the mission's ground-control center) proposed using the shuttle's remote-control arm to reach out and flip the switch, even though neither the arm nor the switch had been designed with such a task in mind.

The task was made more difficult by the fact that LEASAT 3 was spinning slowly, and that special equipment would have to be constructed by the astronauts aboard the shuttle and installed — via spacewalk — on the end of the arm. After a great deal of consultation and test runs by engineers and astronauts on the ground (including rehearsals in water tanks to simulate the near-weightless environment of space), Discovery crew members David Griggs and Jeffrey Hoffman went out into the shuttle's open cargo bay and installed the "flyswatter." Jerry-rigged from a plastic

document cover and other such items, the flyswatter was to be held out toward the satellite, where it would hook the switch and administer a slight tug. With Griggs and Hoffman back inside, astronaut Rhea Seddon gingerly extended the arm toward LEASAT 3, and apparently snagged the switch at least twice.

Nothing happened. Hughes engineers decided that something else must be wrong, and NASA this week was studying the possibility of retrieving the satellite on a later shuttle flight for return to earth — a potentially tricky matter, since the rocket motor's full fuel load is still aboard.

The crew member drawing the most public interest, however, was probably Sen. E.J. "Jake" Garn (R-Utah), head of a Senate committee that votes each year on NASA's funding. Garn served as a research subject in several tests relating to "space sickness," which has affected about half of the astronauts in past U.S. spaceflights. Also aboard was a repeat of the electrophoresis experiment being conducted by McDonnell Douglas Corp. to study production of biological materials in weightlessness. And several simple toys such as jacks were filmed in use by the crew for future audiovisual materials to aid schoolchildren studying such concepts as "zero-gee."
— J. Eberhart