ease Control (CDC) in Atlanta.

Heterosexual transmission in both men and women "has been going up," says CDC epidemiologist Harold W. Jaffe, but it has remained at about 1 percent of the total U.S. AIDS cases. It's "not likely" the percentage will increase in the next year or two, he says, "but beyond that who knows?"

Both studies were described in the March 8 LANCET. In one, Harvard and Boston University researchers collected cervical secretions from 14 women who had antibodies to the AIDS virus in their blood. Only three were free of signs of immune dysfunction, and all were in high-risk groups — because of either intravenous drug abuse or sexual relations with intravenous drug users or bisexual men. Four of the women were prostitutes.

To make sure they were not looking at viruses from the blood, the researchers collected cervical secretions during the middle part of the menstrual cycle. They found the virus in four of the 14 women.

In the second study, University of California (UC) researchers in Berkeley and San Francisco grew low but measurable levels of virus from the vaginal and cervical secretions of four of eight antibody-positive women. One woman from whom the virus was cultured was menstruating at the time of collection; another initially cultured negative, but tested positive after self-induced orgasm.

Researchers from both groups note that despite the low virus levels and the relative infrequency of female-to-male transmissions, the studies indicate such transmission is plausible and emphasize the importance of safe sex practices. "Both men and women, heterosexual and homosexual, should be cautious about their choice of sexual partners and sexual technique," says Martin S. Hirsch of Harvard.

Says Constance B. Wofsy of UC San Francisco, "It confirms there is some virus there and therefore the vagina in a nonmenstruating woman could be a potential source of virus exposure to a man. But the factors that will allow a man to be susceptible to this small number of viral particles need to be determined. This just gives a little more emphasis to why people should use condoms."

Neither study identified the cellular residence of the virus, which is now known to infect not only white blood cells but also central nervous system cells (SN: 1/12/85, p. 22). In the February PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (Vol. 83), Morton J. Cowan of UCSF and his colleagues describe finding abnormally high levels of an enzyme in the red blood cells of AIDS patients. The abnormality may prove useful as a confirmatory AIDS test, he says, and also suggests that the virus may be infecting the precursor cells that develop into red blood cells. "It warrants further investigation," he says. — *J. Silberner*

Trickle-down theory of eastern quakes

In spite of the infamous seismic grumblings at the plate boundary in the West, some of the largest earthquakes in the United States have occurred in the East, far from any plate boundary (SN: 10/10/81, p. 232). Eastern U.S. intraplate earthquakes are particularly worrisome because no one has located the obvious surface faults along which such earthquakes are generated; rather than falling along clear fault lines, the quakes that dot eastern seismic maps are sprinkled about in a diffuse array. This has left scientists hard-pressed to explain how eastern earthquakes are created, let alone make forecasts of when, where and how much they will rattle the earth.

Now a group of researchers has used a number of old and new observations to construct a model for eastern quakes that, if borne out, could provide a key to earthquake forecasting. Seismologists John Costain and Gilbert Bollinger, along with petrologist J. Alex Speer, all at Virginia Polytechnic Institute in Blacksburg, suggest that changes in rainfall, which diffuses down an extensive network of fractures, can trigger earthquakes along faults buried to depths of about 20 kilometers. If this "hydroseismicity" hypothesis is correct, comments Archibald Johnston of Memphis (Tenn.) State University, "it will spark a great deal of additional work because not many people have been looking at this problem."

The idea that the movement of water in the earth's crust is linked to seismicity is not a new one. Scientists have long known that practices such as injecting fluids into the crust in drilling oil wells can trigger shallow earthquakes (SN: 5/4/85, p. 281). Many scientists have also noted some correlation between natural changes in the water table or river levels and increased seismicity. For example, the large earthquake that shook Charleston, S.C., in August 1886 was preceded by two years of unusually high rainfall and followed by a "dry spell" in both seismicity and rainfall. And Johnston, with co-worker Susan Nava, has recently found that six to nine months after the Mississippi River is at its highest level, seismic activity increases in the New Madrid, Mo., area — the region that hosted the nation's largest historic earthquakes in 1811 and 1812.

One past proposal suggests that water flow can trigger relatively shallow earthquakes by increasing the pore pressure in the rocks and lubricating an already stressed fault. This causes the normally locked blocks of rock on the sides of the fault to slip past one another, creating an earthquake. Costain now thinks that this mechanism is responsible for much deeper earthquakes as well. He notes that in the process of drilling the world's deepest hole, Soviet scientists have reportedly discovered fluids circulating through a fractured crust at depths of as much as 11 km. Previously, researchers had assumed that at such great depths all the joints and fractures normally open to water flow would be sealed by the weight of the overlying rocks.

In building its model of hydroseismicity for the eastern United States, Costain's group draws on seismic reflection profiles and other studies indicating that the eastern crust is riddled with a diffuse network of near-vertical fractures extending down to about 20 km. According to the researchers, this fractured fabric was created during two rifting periods, starting about 200 million years ago when the North American continent was pulled apart from Africa and the Atlantic Ocean basin opened. In their model the researchers envision groundwater traveling down to 20 km along a network of connected fractures and then flowing back up to fill the rivers and lakes; somewhere during that journey, they propose, earthquakes can be triggered.

Costain says that the diffuse distribution of earthquakes on seismic maps is consistent with the diffuse patterns of fractures that they envision. Moreover, the researchers note that the four major seismic regions in the southeastern United States are located within groundwater basins that are fed by waters originating at higher-than-average elevations.

Because the hydroseismicity hypothesis is relatively new, few seismologists have had a chance to scrutinize Costain's arguments. The group will present its hypothesis in April to the Seismological Society of America.

In the future, Costain's group would like to do more detailed statistical studies to test the relationships among rainfall, rivers and earthquakes in the eastern United States. They are also interested in applying their hydroseismicity idea to the Basin and Range Province in the West, which is now being actively extended and rifted. "Out there, you'd have all kinds of opportunity for getting fluids into a rifted fabric, much more so than you would in the East," remarks Costain, although he adds that the active rifting itself may be enough to explain all of the seismicity in this region.

If the hydroseismicity hypothesis is correct, says Costain, "then once we have data about the flow of groundwater in an area, we may be able to forecast earthquake activity following extended periods of rainfall." For the moment, the researchers are wondering what impact the floods that devastated parts of central and southwest Virginia last November will have on seismicity of that region. — *S. Weisburd*