Hepatitis C may spread heterosexually

Health officials have long recognized that sexual contact, especially between homosexual men, can spread hepatitis B. Now, for the first time, a study suggests heterosexual intercourse transmits hepatitis C.

Scientists last year identified hepatitis C – until then known only as non-A, non-B hepatitis – as a specific disease by isolating the virus responsible (SN: 5/14/88, p.308).

The new study, conducted by the Atlanta-based Centers for Disease Control (CDC) and described in the Sept. 1 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, also reinforces earlier evidence that heterosexual intercourse serves as a major transmission route of hepatitis B. Study director Miriam J. Alter says this has influenced the Public Health Service to develop a recommendation, scheduled for release later this year, that heterosexuals get vaccinated for hepatitis B if they have had more than one partner in the past six months. No vaccine exists for hepatitis C.

The CDC researchers compared matched controls with 218 hepatitis B patients and 140 patients diagnosed with non-A, non-B hepatitis. (At that time there was no diagnostic test for hepatitis C.) They found 14 percent of the hepatitis B patients had had multiple heterosexual partners in the past six months. In the group with hepatitis C, the researchers traced infection to intravenous drug abuse in 34 percent of the cases and to blood transfusions in 13 percent. In an additional 11 percent, infection apparently arose from heterosexual or household contact with a hepatitis carrier or from heterosexual contact with multiple partners of undetermined disease status.

No hepatitis C patient reported homosexual activity. Previous studies of this disease have consistently failed to uncover evidence of homosexual spread – a fact that puzzles researchers. The apparent lack of homosexual transmission seems to contradict the idea that hepatitis C spreads sexually, comments NIH researcher Jay H. Hoofnagle.

– D.E. Loupe

Multiplying computer memories into 3-D

A flat, optical memory chip the size of a postage stamp could theoretically store 350 million bits of information, or more than seven years' worth of SCIENCE NEWS. Two chemists now propose a strategy for making a three-dimensional, sugar-cube-sized memory box that might store more than 6 trillion bits, or about 130,000 years' worth of the magazine.

Squeezing voluminous memory into tiny packages will be crucial for keeping future generations of supercomputers small and cheap enough for routine use, suggest Peter M. Rentzepis and Dimitri A. Parthenopoulos of the University of California, Irvine, in the Aug. 25 SCIENCE. They propose embedding so-called photochromic chemicals, which change color when briefly illuminated, inside transparent plastic cubes and using lasers to record data as tiny colored and uncolored dots in the cube, creating a binary code. Conventional memory devices store such codes electronically, magnetically or as physical bumps or grooves.

"We have shown that the idea works," says Rentzepis. The scientists have made their first experimental memory cubes and recorded a few bits of data, which appear as tiny blue dots. "We are far, far away from being able to write" trillions of data bits, Rentzepis stresses.

"Three-dimensional memory devices are the Holy Grail of information storage," says computer scientist John P. Riganati of Washington, D.C., who serves on the supercomputer committee of the Institute of Electrical and Electronics Engineers. The highest-capacity experimental electronic memory chips, which are flat, store 16 million bits of data, he says.

To make the rudimentary memory cube and an easier-to-study strip of film, Rentzepis and Parthenopoulos embed photochromic molecules in a clear, rigid polymeric matrix. The chemists "write" data onto specific spots of the cube or film in as little as 20 trillionths of a second by beaming two perpendicularly arranged lasers into the material. To change into their blue, or written, form, the embedded molecules must simultaneously absorb a photon from each laser, a feat possible only at the tiny spot – about 1 cubic micron – where the beams intersect. "Reading" data from a spot involves a similar process but requires sensors to detect light emitted from the colored molecules several billionths of a second after stimulation by lasers tuned to longer wavelengths.

Rentzepis acknowledges that usable, three-dimensional, optical memory devices capable of storing trillions of data bits remain barely more than an idea at present. But he thinks the potential payoff makes the efforts worthwhile. At least a half-dozen other research groups are working on related projects, Riganati adds. "These devices are not available because it's a damn hard problem," Riganati says, "not because serious people haven't put the effort into them."

– I. Amato

Southeast waterways will face an acid test

Strengthened U.S. acid-rain controls proposed last June (SN: 6/17/89, p.375) may prevent further degradation of Northeast lakes and streams, but they appear unlikely to improve conditions significantly in the Northeast waterways now suffering most from acid rain, a new study suggests. Instead, the findings indicate such controls could offer the biggest benefit to Southeast waters currently headed for serious acidification.

EPA researchers in Corvallis, Ore., used three computer models to forecast changes in soil and water chemistry. All three models indicated that if current rates of sulfate emissions continue over the next 50 years, Northeast waterways – currently the most acidified by rain – will at most worsen slightly.

"This sort of surprised us," says chemist M. Robbins Church, who directed the study. It appears acid fallout has already stripped most Northeast soils of their beneficial capacity to sequester sulfates deposited by rain and snow, he explains. In effect, he says, much of the damage possible in this region "has apparently already occurred."

The damage may also prove difficult to reverse. When the computer models cut sulfate deposition rates 30 percent, surface-water sulfate levels fell about 36 percent. However, beneficial increases in the water's acid-neutralizing capacity – which is more closely related to their pH and their life-sustaining capacity – averaged only 7 percent area-wide, or about 10 microequivalents per liter. In the most acidic waters, the neutralizing capacity increased only half as much – about 5 microequivalents per liter.

In the Blue Ridge mountains of the Carolinas, Tennessee and Georgia, where soils today retain about 75 percent of sulfates deposited by rain, EPA data suggest no streams have yet become chronically acidic and only three are vulnerable to fleeting episodes of damaging acidity. But the study predicts that if sulfate deposition continues at today's levels, it will saturate area soils, diminishing their ability to protect the streams.

Within 50 years, according to the new predictions, aquatic sulfate concentrations in the southern Blue Ridge will double, the number of waterways qualifying as acidic could climb from zero to about 130 (or 10 percent of those deemed vulnerable), and the number of streams susceptible to periodic acidification could increase from three to 203. Though the researchers have not yet forecast the effects of decreasing sulfate depositions, Church says it appears that even 10 percent decreases in sulfate emissions will not halt the increasing acidification of these waters.

– J. Raloff