SCIENCE NEWS of the week

# Hepatitis B Mutants Hide in Blood

The first large-scale survey of healthy blood donors for hepatitis B DNA suggests a significant portion of the human population harbors mutant forms of the hepatitis B virus that can't be detected by current laboratory tests. Such forms may be responsible for as many as one-third of the cases now dubbed non-A, non-B hepatitis, says medical researcher and study coauthor Girish N. Vyas of the University of California, San Francisco.

About 4 to 5 percent of U.S. blood-transfusion recipients contract non-A, non-B hepatitis, a poorly defined ailment that is diagnosed when lab tests indicate biochemical signs of liver injury but no signs of hepatitis in the blood.

In a previous study on the Italian island of Sardinia – where hepatitis B infection is 30 times more common than in the United States and so is easier to study – Vyas and co-workers Eliana Lai and Annalena Figus found that one-third of chronic liver disease victims diagnosed as having non-A, non-B hepatitis carried mutant forms of hepatitis B undetectable by standard tests for the virus. But until their recent study, published in the January BLOOD, it was unknown how many apparently healthy individuals harbor such undetected mutant strains, which could contaminate blood supplies.

Lai and Figus screened 1,411 Sardinian donors who tested negative for hepatitis. The subjects fell into two categories: those with normal and those with abnormal levels of the liver enzyme alanine aminotransferase (ALT). High levels of ALT indicate liver injury and provide today's sole criterion for diagnosing non-A, non-B hepatitis, Vyas says. Using sensitive genetic probes, Vyas found that, of the 793 subjects with elevated ALT levels who originally tested negative for hepatitis B, 68 (9 percent) had hepatitis B DNA in their blood serum, indicating the presence of mutant forms of the virus.

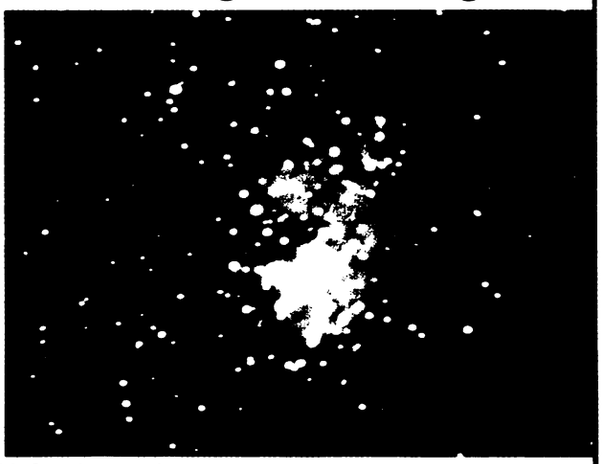
In the United States, in addition to using a single test for hepatitis A and two different tests for hepatitis B, blood banks test for and reject blood with elevated ALT. So, although these 68 individuals would have been misdiagnosed with non-A, non-B hepatitis, their blood would not have been transfused.

But two of the 618 subjects with normal ALT levels had no evidence of hepatitis B by standard measures, and yet had hepatitis B DNA that would have been passed on to transfusion recipients. Vyas theorizes that mutant strains escape detection in the standard test – which uses an antibody to detect viral surface proteins – either by producing a very different-looking surface protein or by producing very little of it.

Vyas says a similar study of the prevalence of mutant hepatitis B is warranted in the United States. Scientists have yet to prove the mutant DNA detected will cause liver disease when passed to recipients. But the findings highlight the need to develop easy-to-use genetic tests that screen blood for a variety of hepatitis strains, he says. The most sensitive genetic test available, called the polymerase chain reaction, now takes at least 12 hours to perform and costs $150.

Scientists have known for two decades that several agents can cause non-A, non-B hepatitis. In addition to those cases caused by mutant B forms, a significant proportion may be due to the so-called hepatitis C virus, first identified last May by researchers at the Emeryville, Calif.-based Chiron Corp. (SN: 5/14/88, p.308), Vyas says. Chiron has developed a screening test for the C strain that could go on the market as early as late 1989, says spokesman Larry Kurtz. – *I. Wickelgren*

## The Orion Nebula's bright new image



NASA Goddard

Long featured on astronomical posters and calendars, the Orion Nebula is one of the most familiar sights in astronomy. Barely visible to the naked eye, it appears as a small, fuzzy patch of light just below the three stars in the belt of the constellation Orion. Capturing the multicolored splendor of the nebula's glowing gases on film generally requires special photographic techniques. Now, astronomer Mark McCaughrean of the NASA Goddard Space Flight Center in Greenbelt, Md., and his collaborators, using a new electronic camera sensitive to infrared light, have penetrated the dust and gas responsible for obscuring the nebula's core. Their image of the nebula reveals a hitherto unseen, dense cluster of young stars.

The color illustration is a composite of three images taken at different infrared wavelengths. It reveals how the Orion Nebula might appear if the human eye were sensitive to infrared light. The hottest sources appear blue, whereas cooler and dust-obscured sources are red. The nebula, located 1,500 light-years from Earth, is the nearest and brightest of all galactic nebulas, in which recently formed stars are still surrounded by gases left over from the formation process. The image shows at least 500 stars, of which more than four-fifths are visible only in infrared light. All the stars in this cluster, the densest young cluster known, would lie within two-thirds of the distance between the sun and its nearest stellar neighbors.

## Recent decades saw wetter continents

Measurements from weather stations show that Earth's land areas have gotten wetter over the last few decades, say atmospheric scientists who have compiled a century's worth of global data. But they say it is not yet clear whether natural climate fluctuations or the predicted "greenhouse" warming have precipitated this change for the wetter.

Data from 2,201 stations for the period 1890-1986 indicate that the mean annual precipitation falling on land areas in the Southern Hemisphere has increased since the 1940s, while the Northern Hemisphere has seen no significant change, report Henry F. Diaz from the Environmental Research Laboratory of the National Oceanic and Atmospheric Administration (NOAA) in Boulder, Colo., and his colleagues in the Jan. 20 JOURNAL OF GEOPHYSICAL RESEARCH. South of the equator, precipitation has increased mostly within the last 15 years.

When the researchers reported the Northern Hemisphere data two years ago, they had not yet compiled precipitation records for the Southern Hemisphere. Now, for the first time, those data enable



Science Service, Inc. is collaborating with JSTOR to digitize, preserve, and extend access to *Science News*. www.jstor.org

scientists to estimate a worldwide total and make comparisons. The researchers used data from 1,545 northern and 656 southern weather stations, all of which have been recording since at least the mid 1920s. Observers have only recently begun recording precipitation over Antarctica, and the report includes no information from this continent.

Although the overall trend is toward more precipitation, many areas have become drier in recent years or experienced no overall change over the last century. South American stations, and to a lesser extent South Asian and Australian stations, report precipitation increases, but records from stations in southern Africa show no rise. Also, while the midlatitude regions on both sides of the equator have experienced more precipitation, the northern tropics have dried while the southern tropics have become wetter. The researchers say drought in Africa and the Caribbean accounts for recent dryness in the northern tropics.

Diaz and his colleagues say the changes in precipitation loosely match what is expected to occur during a greenhouse warming — a general heating of Earth's climate due to increasing atmospheric concentrations of certain gases. But, he cautions, "at this point I would certainly not want to say that we are seeing any sort of greenhouse signal."

Part of the problem with identifying such a signal, he says, is that precipitation fluctuates radically from year to year and from decade to decade. During the years 1899-1920, for instance, precipitation levels over South America were much lower than the mean annual amounts during a reference period of 1921-1960. However, in the years since 1970 the same continent has experienced precipitation levels above the mean measurements for the reference period.

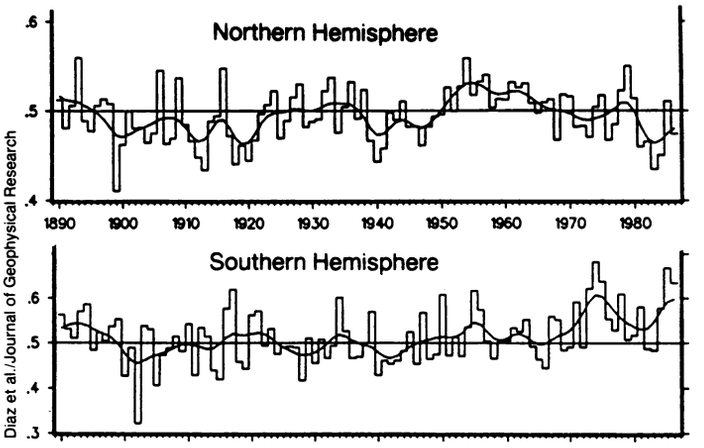
The researchers also say the record clearly shows large swings in precipitation caused by strong El Niño-Southern Oscillations. These seesaw shifts in the warm ocean water and high atmospheric pressures alter precipitation patterns across the Pacific and other areas.

If the expected climate warming has started to affect the levels of precipitation, this change would be superimposed on the large natural swings, making it difficult to detect the "fingerprint" of greenhouse warming in these historical records. "We have to be cautious when we try to ascribe a particular mechanism to the data," Diaz says.

The researchers also admit to other problems with the long-term precipitation records. Because certain portions of the continents have few or no weather stations, the researchers had to average the available measurements over large tracts of land. In many cases, a single station must cover hundreds or thousands of square kilometers. If such a station has measured a drop in precipitation, it is difficult to tell whether the entire area surrounding the station suffered a drought at that time or whether the rain simply shifted slightly, leaving the station drier than nearby areas.

Moreover, the researchers say changes in instruments or procedures may have introduced large biases into the measurements.

Because of these and other caveats, some scientists are skeptical about using the historical precipitation records to test for climate change signals. Says Chester Ropelewski at the NOAA Climate Analysis Center in Camp Springs, Md., "We may have to write off the historical records."

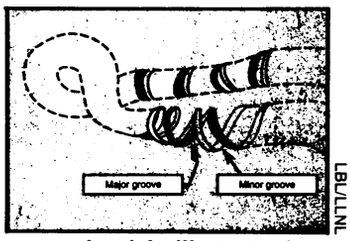



*Graphs indicate annual variations in precipitation over land in the Northern Hemisphere and Southern Hemisphere as represented by a percentile based on mean values for 1921-1960. Boxes show actual yearly percentiles.*

Yet the worldwide data for precipitation are among the most detailed of all weather records, and many experts say they will become quite important in the near future to those who work with climate models. Computer specialists are beginning to run detailed simulations of how greenhouse warming will slowly change the climate. According to computer modeler Michael Schlesinger at Oregon State University in Corvallis, matching these predictions against the historical records for precipitation and other variables will help determine how the climate is changing and whether greenhouse gases are at the root of the change. — *R. Monastersky*

# Scanning the winding coils of naked DNA

When James D. Watson and Francis H.C. Crick first worked out the double-helical structure of DNA, they relied on data in the form of patterns of spots created by X-rays diffracted from crystallized DNA and captured on film. Now, 36 years later, a team of researchers using a custom-built scanning tunneling microscope has produced the first direct images of chemically unaltered, uncoated, pure DNA. Magnified 1 million times by the microscope, a typical double-stranded DNA molecule clearly shows its helical structure, and researchers can directly measure the spacing between coils.




LBL/LLNL

When James D. Watson and Francis H.C. Crick first worked out the double-helical structure of DNA, they relied on data in the form of patterns of spots created by X-rays diffracted from crystallized DNA and captured on film. Now, 36 years later, a team of researchers using a custom-built scanning tunneling microscope has produced the first direct images of chemically unaltered, uncoated, pure DNA. Magnified 1 million times by the microscope, a typical double-stranded DNA molecule clearly shows its helical structure, and researchers can directly measure the spacing between coils. In the image shown on the left, a looped DNA strand, stretching across an area 400 angstroms wide, rises about 20 angstroms above the surface. A circular feature seen below the strand probably represents an unresolved DNA fragment. The diagram on the right illustrates how the bumps can be interpreted as coils. Measurements show that the distance between adjacent coils varies from 27 to 63 angstroms.

"It was not obvious that we would succeed," says Miquel B. Salmeron of the Lawrence Berkeley (Calif.) Laboratory (LBL). "The previous experience of other laboratories was a little bit discouraging, but we tried it anyway." Salmeron and his collaborators at LBL and the Lawrence Livermore (Calif.) National Laboratory describe their results in the Jan. 20 SCIENCE.

The researchers looked at calf thymus DNA, deposited from a potassium chloride solution onto a graphite surface. They used their scanning tunneling microscope to trace out a kind of topographic map of the deposited molecules.

"We have not yet pushed the instrument to its maximum potential," Salmeron says. The team plans to investigate whether its microscope can resolve differences among the four nucleotides that serve as the building blocks for a single DNA strand.

"DNA was the first molecule that we tried," Salmeron says. "Now we can imagine trying other biological molecules for which there is no other technique that we can utilize to study their structures." — *I. Peterson*