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EPIDEMIOLOGY

New York's Lethal Virus Came From Middle East, DNA Suggests

FORT COLLINS, COLORADO—Scientists have finally agreed on the identity of a virus that caused an epidemic of brain inflammation in and around New York City this summer, sickening 60 mostly older people and killing seven. A group of public health researchers announced at a workshop held here last week that the virus's DNA sequence conclusively shows that it is the West Nile virus—an identification that was under debate until recently. They also reported that the virus's genome is almost identical to that of a West Nile strain found in Israel last year, suggesting that it originated in the Middle East. Many now agree it has a good chance of establishing itself and spreading in the Western Hemisphere.

West Nile is endemic in Africa and has made occasional forays into Europe and Asia. This summer, for example, there were over 800 cases and 40 deaths in the southern Russian city of Volgograd, said Alexandre Platonov of the Central Institute of Epidemiology in Moscow. But its appearance in the United States, where it had never been detected before, "was truly a watershed event," said James LeDuc, associate director for global health at the Centers for Disease Control and Prevention (CDC) in Atlanta.

Although the human epidemic in New York has died down, the West Nile virus is still lurking in birds, where it replicates, and in *Culex* mosquitoes, which can transfer it to humans. Researchers at the meeting said New York City's subway system could be a winter haven for infected mosquitoes. Migratory birds, meanwhile, may spread the virus south. Already, officials have found a sinister omen: A dead crow carrying the virus turned up in Baltimore, Maryland, last month, 300 kilometers southwest of New York.

"The worst case scenario is that it's going to spread all over the eastern U.S. and we face outbreaks every year," said David Morens of the National Institute of Allergy and Infectious Diseases in Bethesda, Maryland. But it's also possible the virus could subside into the background, like its cousin, St. Louis encephalitis (SLE) virus, which is endemic in the southern United States and causes occasional outbreaks.

The genetic analysis, carried out by a team from CDC's lab for arboviral diseases in Fort Collins, was welcomed in part because it put an end to several months of confusion. Shortly after the first encephalitis cases emerged, CDC concluded from antibody tests that SLE was the culprit. Alarmed by some odd observations—most notably a die-off of crows and zoo birds in New York—CDC changed its mind on 24 September. Genetic data had shown that another virus was involved, which the agency—very cautiously—referred to as "West Nile–like." Then a team led by molecular biologist Ian Lipkin at the University of California, Irvine, challenged the classification, saying the new virus most closely resembled another agent, the Australian Kunjin virus. In a *Lancet* paper, Lipkin dubbed it "Kunjin/West Nile–like" (*Science*, 8 October, p. 206).

The conflicting analyses, however, were based on small snippets of the genome. The full sequence resolves the issue, says the CDC team, which has submitted its results for publication. Indeed, the viral DNA is 99% identical to a West Nile strain found in a dead goose in Israel in 1998, which was partly sequenced by virologist Vincent Deubel of the Pasteur Institute in Paris. "It's essentially the same virus," says Robert Lanciotti, who presented the work. Lipkin now agrees, adding that the sequence also closely resembles a West Nile strain found earlier in Egypt.

The findings give researchers the first clear clues about where the virus came from, but they do not explain how it crossed the Atlantic. It probably rode in a natural host, researchers said—in an infected bird or mosquito, or a human traveler. "There's a lot of traffic between the Middle East and the New York area," says John Roehrig, who led the CDC study. "We may never know exactly what happened."

Trans-Atlantic leap. The West Nile virus, which caused encephalitis in New York this year, had not been seen before in the Americas. The virus (red) or antibodies to it (orange) have been found in many Eastern countries.

SOURCE: Z. HUBÁLEK AND J. HALOUZKA

Data presented at the meeting show that the virus has already spread way beyond what researchers now call the "hot zone"—the area in northern Queens where most of the patients live. Infected mosquitoes, for instance, were found in several counties north of New York City, in Long Island, and in New Jersey. Crows were the hardest hit bird species: According to one estimate, as many as two-thirds of them may have perished in and around New York City. But researchers have now found the virus in 20 other bird species, ranging from American robins and rock doves to broad-winged hawks. In the Bronx Zoo, one bald eagle died from a West Nile infection, and New York state wildlife pathologist Ward Stone warned that wild specimens of this American icon may succumb as well. Researchers don't know whether the virus will survive in birds until next summer, but if it does, migratory species may spread it to the southeastern United

States, the Caribbean, and even as far as South America, said John Rappole of the Smithsonian Institution's Conservation and Research Center in Front Royal, Virginia.

Health officials and researchers spent a lot of time at the meeting drawing up disease-prevention recommendations to be issued later this year. Participants concluded that mosquitoes and birds should be tested widely and that eastern U.S. states should be on the lookout for dead crows. Many also supported a more sophisticated way to track the virus: keeping flocks of chickens and testing their blood regularly. Two decades ago, most states kept such "sentinel flocks" to monitor impending outbreaks of SLE and several other types of mosquito-borne encephalitis. But most of them have disappeared in budget cutbacks, along with the expertise needed to maintain the flocks. It would be difficult to reinstate them on short notice. "The state infrastructures have crumbled to all-time lows," says Yale University medical entomologist Durland Fish. And even if flocks could be restored, they might not be welcome where they're most needed. As one participant noted, it would be hard to install a hen house on Wall Street.

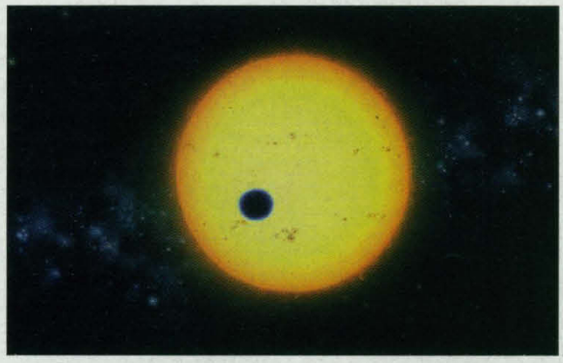
Looking back on the summer crisis, participants agreed that—at a minimum—communication between New York City and other government health agencies needs to be improved. "Perhaps that's the benefit of this outbreak," says virologist Harvey Artsob of the Canadian Science Centre for Human and Animal Health in Winnipeg. "It's tragic for the patients, but it is a reminder that we have to be prepared." **–MARTIN ENSERINK**

ASTRONOMY

Shadow of an Exoplanet Detected

Few doubted that they were out there, but astronomers are delighted to have confirmation: For the first time, a planet in another star system has been seen to cross the face of its parent star. The transit, as it is called, is the most direct glimpse yet of an extrasolar planet. It has also allowed astronomers to pin down the object's mass, size, and density—characteristics that could only be guessed before—which leave little room for doubt that it really is a planet.

"This is what we've been waiting for," says exoplanet hunter Geoffrey Marcy of the University of California, Berkeley. But with just one transit observed, some astronomers think it's too soon to rejoice. "It's an exciting observation," says David Black, director of the Lunar and Planetary Institute in Houston. "But I'd like to see a couple of full transits before drawing any conclusions."



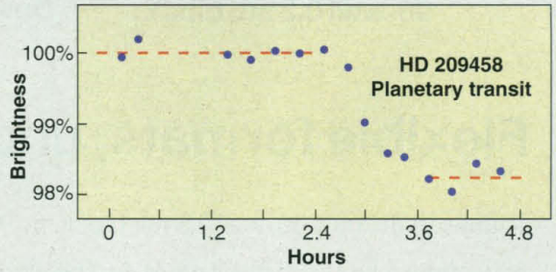
Dark passage. An artist's conception shows the planet crossing the face of its star; a light curve shows the resulting 1.7% brightness drop.

The new planet, closely orbiting a dim star in Pegasus, turns out to be less massive than Jupiter but larger, bloated by the heat of its parent star. According to Greg Henry of Tennessee State University in Nashville, who announced the discovery last week in an electronic circular of the International Astronomical Union, the low density suggests that it and the many other massive exoplanets orbiting close to their parent stars—so-called hot Jupiters—are gaseous. They must have formed farther out in gas-rich regions of a young solar system, then migrated inward.

Over the past 4 years, several teams, most notably Marcy's, have discovered more than two dozen exoplanets orbiting sunlike stars without actually seeing a single one. The astronomers inferred their existence from slight, periodic movements of the parent stars back and forth along the line of sight, presumably because of the tug of an orbiting planet. From the extent and timing of the wobbles, the size, shape, and period of the planet's orbit can be deduced, as well as a lower limit on its mass. The actual mass can't be pinned down as long as the inclination of the orbit is unknown.

On 5 November, Marcy, Paul Butler of the Carnegie Institution of Washington, D.C., and Steve Vogt of the University of California, Santa Cruz, reported that they had detected a new set of telltale wobbles. The team, which regularly uses the 10-meter Keck telescopes on Mauna Kea, Hawaii, to scrutinize likely sunlike stars, announced six new planets, with orbital periods ranging from 3.5 days to almost 3 years.

As always, Marcy passed the new data on to Henry, who uses small, automated telescopes at Fairborn Observatory in the Patagonia Mountains in Arizona to study sunlike stars for slight brightness variations that could be due to pulsations or star spots. He also looks for planetary transits. For a transit to occur, the planet's orbit must be seen more or less edge-on. Just by chance, about 10% of the hot Jupiters should produce transits, but no one had seen one. "I was becoming very worried," says Marcy.



Henry realized that one planet in the latest batch would be an especially good target for his transit search because its orbital period was just 3.5 days. "When I saw Marcy's data for the star HD 209458," he says, "I realized that a transit might occur in the night of November 7" if the orientation of the planet's orbit was favorable. "I quickly reprogrammed one of the automated telescopes before I went home and got to bed." The next day, when Henry looked at the brightness measurements recorded by the 0.8-meter Fairborn telescope, he hardly believed what he saw. Exactly at the predicted moment, the star showed a brightness drop of 1.7%.

"It took me a few more days to exclude the possibility that the brightness drop could be the result of star spot activity," he says. "But in the next 3 or 4 days, the star remained absolutely constant. Then I knew we had it." Black isn't so sure. "Henry only saw the beginning of the presumed transit," he says—the star had set before its brightness increased again. The announcement, Black

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