

# No Survival Bonus From Early AZT

Magic Johnson's performance in the National Basketball Association's All-Star game proved that people infected with the AIDS-causing virus, HIV, can compete — and compete spectacularly. This week, however, a new scientific study lessens some of the magic associated with zidovudine (AZT), the mainstay antiviral drug used to fight HIV.

Back in 1989, a study revealed that early zidovudine treatment slowed progression to AIDS in outwardly healthy people infected with HIV (SN: 8/26/89, p.135). That report and others held out the promise that HIV-infected people would live longer if they took the drug at the start of the disease process, well before the devastating symptoms of AIDS emerged.

A report in the Feb. 13 NEW ENGLAND JOURNAL OF MEDICINE confirms that AZT can slow progression to AIDS but dashes the hope that such early treatment can prolong life. "While AZT is clearly a benefit, it's not the ultimate answer," says principal investigator Michael S. Simberkoff of the Veterans Affairs Medical Center in New York City.

Simberkoff and his colleagues at VA Medical Centers across the country set out to study the benefits of early zidovudine therapy in 338 people who did not suffer full-blown AIDS but who did exhibit mild signs of HIV infection, such as night sweats, diarrhea and unexplained weight loss. The recruits also showed immune system damage by HIV: All had CD4-lymphocyte counts of between 200 and 500 cells per cubic millimeter of blood. Healthy people have CD4 counts of 800 to 1,200.

The VA team randomly assigned 170 people to a group that received zidovudine right away. The remaining 168 participants got placebo pills at the study's start but received the drug when AIDS developed or their CD4 counts dropped below 200.

After approximately two years of observation, the VA researchers discovered that early zidovudine therapy slowed the rate of development of AIDS by nearly half. Once AIDS appeared, however, the early therapy group developed multiple opportunistic infections and died quickly: The team reports 23 deaths in the early therapy group compared with 20 deaths in the later treatment group. Thus, the study revealed no survival bonus for those who got early treatment.

The VA researchers admit they don't know why zidovudine failed the long-term survival test. Simberkoff speculates that some people who take the drug early may develop resistance to it.

Many studies have shown that zidovu-

dine gives people with full-blown AIDS a survival edge, but up until now research has not focused on the question of whether zidovudine would prolong life if taken early in the disease process. The VA study provides desperately needed data on early zidovudine treatment.

For generally healthy HIV-infected people, a decision to hold off on zidovudine therapy can make sense, asserts John D. Hamilton of the VA Medical Center in Durham, N.C. Hamilton, also a principal investigator of the VA study, notes that early zidovudine provides no survival benefit, remains costly and can trigger severe side effects such as nausea and vomiting.

On the other hand, Lawrence Corey of the University of Washington in Seattle notes that early zidovudine therapy de-

lays progression to AIDS — a benefit that outweighs any later ill-effects of early treatment, he believes. Corey wrote an editorial accompanying the research report.

Simberkoff is also in favor of early treatment. "Our first job is to prevent the onset of illness," he says. Patients who show signs of resistance to zidovudine can switch to another antiviral drug such as dideoxyinosine, he adds. In his editorial, Corey adds that researchers need more information on whether this strategy actually will prolong life.

In February 1991, FDA heard preliminary results of the VA study and decided against any change in zidovudine availability, which is now approved for people with AIDS and for those with early HIV infection.

— K.A. Fackelmann

## Desert sands yield ancient trading center

An unlikely combination of ancient maps and spaceborne images has led to the discovery of a nearly 5,000-year-old city buried in the sands of the Arabian desert. Considerable evidence indicates that archaeologists have uncovered Ubar, a major hub of the frankincense trade that vanished beneath shifting desert dunes around two millennia ago, expedition leaders announced last week.

"Circumstantial evidence converges on the notion that this site is Ubar," says geologist Ronald Blom of NASA's Jet Propulsion Laboratory in Pasadena, Calif. "Even if it's not Ubar, we still have a very significant archaeological find."

Blom and his NASA colleagues initiated the search by examining sand-penetrating radar images of the Arabian desert — taken by the space shuttle Challenger in 1984 and by U.S. and French satellites more recently — to locate ancient, largely obscured tracks of caravan routes leading to the oasis city. Image analysis, as well as second century A.D. maps of the region, guided ground reconnaissance in 1990 and 1991.

Discovery of the city's ruins at a well site in southern Oman last year led to an excavation that started on Dec. 26. Since then, a research team directed by archaeologist Juris Zarins of Southwest Missouri State University in Springfield has uncovered the remnants of eight mud-brick towers, numerous rooms, thou-



A map from A.D. 150 (above) helped researchers find the Oman site where they unearthed ancient structures (right and next page).



Photos: G. Hedges/N. Clapp

sands of pieces of pottery and other artifacts, including frankincense burners.

Pottery styles at the site indicate it was inhabited from around 2800 B.C. to A.D. 100, according to Zarins.

The nature of the settlement and its great variety of artifacts suggest it served as an important trading center linked by a network of caravan routes to Mesopotamia (in modern-day Iraq) and the Mediterranean, Blom asserts.



Historical and religious documents describe Ubar — known as Iram in the Koran — as a thriving city that perished in some sort of disaster around A.D. 100. Evidence at the Oman site indicates that much of the settlement fell into a sinkhole created by the collapse of an underground limestone cavern.

If preliminary dates for the site hold up, the discovery provides evidence of urban development in the southern Arabian desert about 1,000 years earlier than scholars previously assumed. However, it remains unclear whether far-flung frankincense trade extended back to 2800 B.C., since scientists place the domestication of camels, relied on by desert traders, at about 1500 B.C.

Excavation at the Oman site will continue until April, when on-site investigators will decide how to proceed with the project, Blom says.

— *B. Bower*

### Nuclear waste plans blocked

A federal district judge last week issued a permanent injunction blocking the Department of Energy's (DOE's) plans to begin shipping nuclear waste to an underground storage facility in southeastern New Mexico. Judge John Garrett Penn ruled that DOE must obtain authorization from both Congress and the state of New Mexico before opening the \$1 billion Waste Isolation Pilot Plant (WIPP).

Last October, after years of delays, the department said it would start placing waste in WIPP, but New Mexico won a preliminary injunction preventing the waste shipments (SN: 1/18/92, p.44). In last week's decision, Judge Penn ruled that DOE had not properly assumed control of the WIPP site from the Interior Department. In effect, the decision requires that DOE seek a congressional land transfer. The judge also ruled that DOE must obtain a hazardous waste permit from New Mexico, because the waste contains both hazardous and radioactive materials generated during nuclear bomb production.

Such requirements would significantly delay WIPP's opening. New Mexico will require at least a year, and perhaps two years, to evaluate DOE's permit request, says Kay Roybal, a spokeswoman for New Mexico Attorney General Tom Udall. DOE plans to appeal the federal court's decision. □

## New evidence for black holes in Milky Way

Two teams of astronomers studying different regions of our galaxy have uncovered fresh evidence for the existence of black holes — collapsed stars that possess a gravitational field so strong that not even light can escape their grasp. One research group has found supporting evidence that a massive black hole lurks at the heart of the Milky Way. The other group, studying light emitted by a star orbiting an unseen, compact object some 6,000 light-years from Earth, has deduced that the hidden object is a black hole about the mass of a typical star.

Several researchers call the latter finding one of the most persuasive cases for a black hole in more than 20 years of hunting for these theoretical denizens of the astronomical zoo.

Since black holes by their nature remain hidden from view, astronomers must deduce their presence from their influence on nearby bodies. Consider the curious case of the two stars known as V404 Cygni. In 1989, the Japanese research satellite Ginga found that the stellar duo, consisting of a visible star and an unseen companion, sporadically emitted bursts of X-rays so intense that their luminosity exceeded a million times the total brightness of the sun at all wavelengths.

That observation sparked the interest of Philip A. Charles, based at the Royal Greenwich Observatory in the Canary Islands, Spain. He and his colleagues knew that according to established theory, the X-ray bursts could indicate a black hole: Such radiation is generated when surface material from the visible star succumbs to an unusually strong gravitational tug and falls rapidly onto a disk of matter surrounding its invisible, compact companion.

Last August, after the X-ray and associated optical-light fireworks from V404 Cygni had faded, Charles and his team used the 4.2-meter William Herschel Telescope at La Palma Observatory in the Canary Islands to study the light spectra normally produced by the visible member of the binary system. The motions of its spectral lines indicate that the visible star whips around its unseen companion with a velocity of 420 kilometers per second and has a period of 6.5 days. Such features indicate that the compact object must have a mass at least as large as 6.3 solar masses, bigger than any neutron star allowed by theory. (Neutron stars represent a class of compact stars with gravitational fields weaker than those of black holes.)

Barring speculation that the compact object in V404 Cygni might belong to a hypothetical, exotic group of burned-out stars held intact by the force that binds neutrons and protons together, a massive star must have collapsed to form the

pair's black hole, Charles and his colleagues assert in the Feb. 13 *NATURE*.

Charles calls the findings the most definitive case yet for a black hole, surpassing previous evidence that other X-ray-emitting binary stars in the Milky Way — Cygnus X-1 and A0620-00 — harbor black holes. His team's conservative lower limit for the black hole's mass in V404 Cygni, he says, assumes that the visible star has no mass and that its rotation axis is exactly perpendicular to the line of sight from Earth. Eliminating these extreme assumptions, the unseen object would more likely have a mass eight to 15 times that of the sun, strengthening the black-hole argument, Charles notes.

In contrast, he says, mass calculations for a candidate black hole in Cygnus X-1 are complicated by uncertainties about the mass of its visible member, which could be far lower than assumed.

In a commentary accompanying the *NATURE* article, Joseph F. Dolan of NASA's Goddard Space Flight Center in Greenbelt, Md., says the new work shows that V404 rivals Cygnus X-1 as the most likely black hole candidate so far known.

This summer, Dolan and his colleagues hope to survey several intriguing binary stars, including Cygnus X-1, with the Hubble Space Telescope's high-speed photometer. They plan to look for the swan song of matter as it plunges into a black hole: the emission of a series of light pulses that increases in frequency but grows ever fainter.

On a larger scale, astronomers using the European Southern Observatory's New Technology Telescope in La Serena, Chile, have found a faint infrared emission coming from the very center of our galaxy. Researchers already know the Milky Way's core contains a powerful radio source called Sagittarius A\*, an indicator that our galaxy's center may harbor a black hole 2 million times as massive as the sun. The infrared signal — which eluded detection for years — further supports that notion, says Reinhard Genzel of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany.

Genzel and his colleagues also examined in detail a previously known infrared source about one-tenth of a light-year from the center of the Milky Way. The team found that part of the signal represents a hot bubble of expanding gas, possibly driven by a high-velocity wind from the vicinity of the proposed black hole. Other components of the off-center infrared signal appear to be young, blue stars — making this the first time astronomers have detected such a youthful population near our galaxy's center. Genzel and his colleagues report their findings in the Feb. 6 *NATURE*

— *R. Cowen*