RANDOM SAMPLES

edited by CONSTANCE HOLDEN

AIDS Prevention Trial Seeks Answers

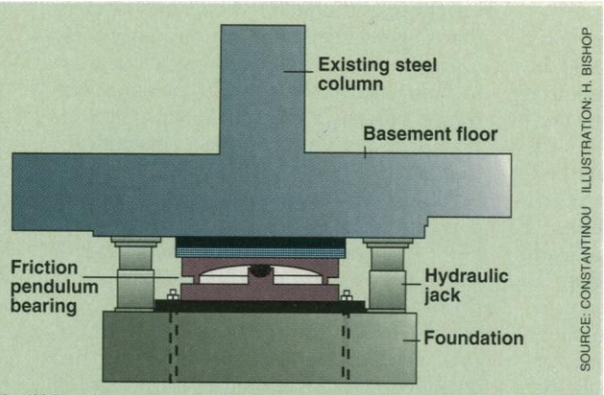
When should HIV-infected people start taking anti-HIV drugs? It's one of the biggest questions facing infected patients, and researchers hope the largest study yet to address the topic will provide an answer.

The U.S.-British Community Partnership in AIDS/HIV Clinical Trials (ComPACT-1) plans to enroll 10,000 people in the United States in a project to investigate whether healthy, HIV-infected people will live longer if they start taking anti-HIV drugs before their immune systems begin to fail.

"The horror is that after all this time we haven't a clue" whether early treatment with anti-HIV drugs is beneficial, says statistician Paul Meier of Columbia University, who is organizing the trial along with Richard Peto and Rory Collins from Oxford University, Donald Abrams of San Francisco General Hospital, and Tom Mitchell from San Francisco's Community Consortium. With AZT, for example—the drug that has been the most extensively studied for delaying AIDS onset—initial studies suggested that early treatment improved survival rates, and the Food and Drug Administration has approved the drug for such use. But a large Anglo-French study concluded last April that early use of AZT offered no benefits.

Meier, who expects ComPACT-1 to last at least 2 years, says earlier trials have failed to answer the prevention question because they have not been large enough and because many have focused on such "soft" endpoints as changes in the number of critical CD4 white blood cells—as opposed to "hard" endpoints of disease and death. "We're spending endless amounts of money on large studies and ending up with scarce amounts of information," says Meier. The new, simple study design will use the hard endpoints.

All HIV-infected, asymptomatic people in the United States are eligible for the trial, and participants can take any anti-HIV drug or drugs. Participating physicians have only to provide annual updates on their patients' status. For enrollment information, call Tom Mitchell at 415-476-5777.



Weight lifting. Two hydraulic jacks support the basement floor while the isolator is put in to replace the column base.

Pendulum Theory of Quake Protection

Most systems designed to protect buildings from earthquakes act like springs or shock absorbers to dissipate the temblor's energy. But a different and much cheaper system—based on pendulum physics—is now being tried out on the U.S. Court of Appeals building in San Francisco.

The historic 60,000-ton courthouse has been empty since it was damaged in the 1989 Loma Prieta earthquake. Now it's in the midst of one of the largest earthquake retrofitting projects ever. To install the new Friction Pendulum System (FPS), engineers will take the weight off the 256 steel columns that make up the framework of the building, one by one, by placing two hydraulic jacks next to each column between the basement floor and the foundation. The bottom of each column will be cut away and an upside down shallow bowl fitted onto it. A metal bearing sitting atop an extension from the foundation will be slipped underneath. During a quake, this "isolator" will behave like a marble rolling around inside a wok—only in this case, the marble stays still, while the wok moves around on top of it. Attached to the bowl, the base of the column can move in an arc up to 10 inches from the center point—the amount of movement expected in a powerful 7.5- to 8- scale earthquake. The isolators, in essence, turn the building's columns into pendulums that will all swing together, gently and safely, during an earthquake.

Developed by Victor Zayas with Earthquake Protection Systems in San Francisco, the system is costing $2.8 million, about $4 million less than the tab for a competing system. The FPS has been undergoing rigorous testing over the past 5 years at the National Center for Earthquake Engineering Research at the University of Buffalo in New York, but so far it has only been used on several storage tanks and one smaller building. When finished, the San Francisco courthouse will be the largest and heaviest building in the U.S. with any type of earthquake isolation system. In a big quake, the researchers hope, the pendulums will barely tilt the scales of justice.

Keeping Up With PETA

People for the Ethical Treatment of Animals (PETA), the scourge of animal researchers, appears to be riding high these days. The Rockville, Maryland–based group boasts a staff of 70, a $10 million annual budget, and it's now moving across the Atlantic, with offices to open this month in London, Amsterdam, and Hamburg, according to staffer Dan Mathews. Among the donations sustaining this growth is a $1 million bequest from tobacco heiress Doris Duke, an enthusiastic supporter who died last month. PETA plans to sink that money into its anti–fur-wearing campaign.

That doesn't mean PETA is slacking off in its efforts to impede the use of animals in research, says Mathews. Currently, the group is flushed with a "big victory"—the decision last month by the cosmetics giant l'Oréal to ban animal testing. And PETA's brand of anti-research activism—infiltration of labs as well as animal supply houses to look for violations of the Animal Welfare Act—is still alive and well, says Mathews.

A Clean Sweep in Space

For astronauts, the near-vacuum of space is usually a hindrance to be overcome, with pressurized capsules and life support systems. But Alex Ignatiev, a materials scientist at the University of Houston, sees the vacuum as a research opportunity.

Next 20 January, astronauts on the space shuttle Discovery plan to deploy Ignatiev's Wake Shield Facility, the first attempt to clean up space for manufacturing by getting rid of the sparse atoms of oxygen and other elements found at an altitude of 300 kilometers. The facility is an unmanned platform that looks something like a flying dinner plate but works more like a broom. Rushing face-forward at 28,000 kilometers an hour, the 4-meter-wide plate will sweep aside almost anything with mass, leaving behind a near-perfect vacuum—just the environment in which to build near-flawless films of the semiconductor gallium arsenide atom by atom, by a technique known as

molecular beam epitaxy (MBE).

Perfect films can't be made on Earth, where laboratory vacuum pumps can only create vacuums with pressures as low as about 10^{-12} torr (atmospheric pressure is 760 torr). The contaminant atoms infesting these vacuums create defects in the semiconductor, degrading its electronic properties. In space, however, the sweeping action of the plate, called a wake shield, should lower the pressure to 10^{-14} torr. To take advantage of this exquisite airlessness, Ignatiev and his partners at Space Industries, Inc., in Houston, which built the spacecraft, have mounted MBE equipment behind the wake shield. During its 52-hour sojourn in space, the equipment should produce 7 gallium arsenide wafers. Ignatiev hopes they will be of high enough quality to persuade electronics companies to finance a large-scale space manufacturing facility.

Banking a Cord Earns Interest

Ever wondered what hospitals do with used umbilical cords? Neither have we. One Pittsburgh hospital, however, has found a valuable use for the spent tethers: It has opened the first repository to allow couples to save their babies' umbilical cord blood.

In the last 5 years, physicians have found that transplants of cord blood stem cells into a patient's bone marrow offer a promising treatment for early childhood cases of leukemia, aplastic anemia, and severe combined immunodeficiency disease. About 30 such transplants have been performed, and they offer a promising alternative to bone marrow transplants from other donors, in which 25% of recipients die of graft-versus-host disease.

This promise has led Pittsburgh's Magee-Womens Hospital and the Biocyte Corporation of Stamford, Connecticut, to set up a bank for umbilical and placental blood. "It's the first in terms of autologous storage," meaning that the blood is for the donor's own use, says immunologist Hal Broxmeyer of the Indiana University School of Medicine and a Biocyte founder. The Pittsburgh center will complement other cord blood storage facilities being developed by the European Community and the National Institutes of Health (*Science*, 31 July 1992, p. 615).

The cord bank may be of particular interest to families with a high incidence of diseases that involve bone marrow transplants, says Broxmeyer. But it may not come cheap. Each deposit costs $1500 up front and $75 a year for maintenance. Another potential drawback: Experts are not certain how long the frozen blood cells will remain intact. So far, two families have joined the registry in its first week of operation.

Biodiversity: There's a Reason for It

New reasons for preserving biodiversity can be found in scientific facts emerging from a device that sounds like the stuff of science fiction: the Ecotron. Located west of London at Imperial College's Center for Population Biology at Silwood Park, the $1.5 million Ecotron consists of 16 climate- and atmosphere-controlled chambers in which researchers establish "mini-ecosystems" of plants and a range of invertebrate species.

In a just-completed 8-month experiment, Imperial College ecologists have produced what they say is the first experimental evidence showing that species-rich ecosystems consume carbon dioxide at a faster rate than less-diverse ecosystems—which suggests that loss of biodiversity may promote CO_2 buildup and thus help to speed up global warming.

CENTER FOR POPULATION BIOLOGY

Ecotron. Scientist monitors chamber.

The scientists admit to surprise at these results. "We thought biodiversity wouldn't affect ecosystem function," says project leader Shahid Naeem. Indeed, the Center's director, John Lawton, is co-inventor of the "species redundancy" hypothesis of biodiversity, which argues that most species present in a given ecosystem are not required for its normal functioning. To test that theory, the team set up several Ecotron chambers for each of three conditions, reflecting low, medium and high diversity. All contained species from each of four "trophic levels": Earthworms and springtails as decomposers; plants as primary producers; sap-sucking insects and snails as herbivores; and parasitic wasps to feed on the insects. The researchers found that—in flat contradiction of the species redundancy hypothesis—soil chemistry, water retention, and rate of decomposition were all affected by the degree of diversity. And while all the chambers started with the same number of organisms, those containing the most species produced more biomass and consumed more carbon dioxide.

The next step is a carefully controlled field experiment to confirm these findings. That will probably occur next year at the University of Minnesota, where Naeem will be joining a team assembled for the purpose by plant ecologist David Tilman.

Song of the Young Paleontologist

Now that we have received enough suggestions to last us a lifetime for new Y chromosome loci for male behaviors (*Science*, 6 August, p. 679), Random Samples would like to offer a new model for the channeling of excess scientific creativity, submitted by recent UCLA graduate Alexander Volokh, now an environmental policy analyst in Washington, D.C. (Sung to the tune of "My Favorite Things" from *The Sound of Music*.)

Trilobites, burrows, and Cephalopoda
Corals and worms and lamellibranchiata,
Echinoderm skeletons made out of rings—
These are a few of my favorite things.

Asteroid impact and classification,
Isotope dating and bioturbation;
In the Triassic the birds got their wings—
These are a few of my favorite things.

When the clams bite, when the shells sink,
When I'm feeling sad,
I simply remember that most are extinct
And then I don't feel so bad.

Darwin, Lamarck and genetic mutation,
Gradual changes and quick punctuation;
DNA bases all bound up in strings—
These are a few of my favorite things.

Protista and Ediacara fauna,
Eukaryota, Pangaea, Gondwana;
Vema, a monoplacophoran, clings—
These are a few of my favorite things.

When the sharks bite, when polyps sting,
When I'm feeling sad,
I simply remember that most are extinct
And then I don't feel so bad.