Biomedicine

AIDS vaccine trial gets go-ahead

For the first time, the U.S. Food and Drug Administration has cleared a private company to start injecting a large number of volunteers with a vaccine against AIDS. For its study, VaxGen of South San Francisco, a spin-off of Genentech, has begun to enroll 5,000 uninfected people, either homosexual men or heterosexual men and women who have an infected partner. Two-thirds of the volunteers will receive the vaccine at intervals of 1 month, 6 months, 1 year, and 2 years. The other one-third will receive inactive injections. All will be checked for HIV infection at the 3-year point. Volunteers will not be told which injection they are receiving.

In approving the trial, the FDA deemed the vaccine to be safe but not necessarily effective. A test with 2,500 volunteers is set to begin this fall in Thailand. Volunteers in both countries will be counseled on safe sex practices before the trial, but the researchers believe that many will still be exposed to HIV. —*N.S.*

Gene therapy for arthritis works in rats

Cytokines are proteins that mediate communication between cells. In an immune response, they rally the body's white blood cells to an injury or infection site. One cytokine, called transforming growth factor (TGF) beta, often acts as the level-headed protein of the group, encouraging the troops not to overpopulate a region and cause inflammation.

Scientists studying arthritis now find that injecting laboratory rats with genes that encode TGF-beta protein can reduce inflammation in the rodent's joints. In the rats' muscle cells, these strings of DNA spur the rats' own cells to manufacture the protein, slowing the animals' arthritis, the researchers report in the June 15 JOURNAL OF CLINICAL INVESTIGATION.

While such gene therapy for arthritis is still many years away from widespread use, scientists have pursued it in human and animal studies in the hope of replacing anti-inflammatory drugs that cause side effects. Most gene therapy researchers use one of two kinds of viruses, adenoviruses and retroviruses, as delivery vehicles carrying desirable DNA. Neither, however, is perfect. Adenoviruses, in fact, can themselves ignite inflammation, the very condition being treated in arthritis.

In this study, researchers left the viruses out, using DNA from *Escherichia coli* bacteria to transport human TGF-beta DNA. "We thought we would [use] the naked DNA, without the viral vector," says study coauthor Sharon M. Wahl, an immunologist at the National Institute of Dental Research in Bethesda, Md.

Wahl and her colleagues used fragments of streptococcal bacteria to give dozens of rats arthritis. Some rats were left untreated as a control group. Others received a single injection of the TGF-beta-encoding genes in a muscle away from the swollen joint 5 to 13 days after arthritis had set in. Researchers measured swelling in the rats' ankle and wrist joints daily for at least 4 weeks and in some animals for up to 3 months. The treatments largely eliminated any arthritic inflammation, and even suppressed erosion of bone and cartilage—indicating that cells were producing TGF-beta.

"I must admit, I didn't think it would work so well," Wahl says. Examination of the rats' muscle tissue showed the DNA had been incorporated into the cells, she says.

"Other studies have used naked DNA," says William P. Arend, a rheumatologist at the University of Colorado in Denver. "What's most interesting here [is that] the effect of a single injection was sustained for a long period of time."

Injections of the TGF-beta-encoding genes directly into the inflamed joints exacerbated swelling, indicating TGF-beta may recruit more immune cells to the site if placed there directly, Wahl says. Injecting the genes at a remote muscle site allowed TGF-beta to follow a normal circulatory course to arrive at the location of the arthritis and stabilize the immune process, she suggests. —*N.S.*

Earth Science

What was life's first sunblock?

Since the early Earth lacked a protective layer of atmospheric ozone, researchers have wondered what shielded the primordial building blocks of life from destruction by ultraviolet (UV) light. Two chemists now argue that tarlike organic polymers in the oceans could have provided an ancient sunscreen for the amino acids and nucleic acid bases forming there.

Biochemists Stanley L. Miller and H. James Cleaves at the University of California, San Diego used an experimental approach that Miller had pioneered 45 years ago. In that 1953 study, Miller showed how the organic building blocks of life could have developed in the primordial ocean.

In the new study, published in the June 23 issue of PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCE, Miller and Cleaves focused on a class of UV-screening polymers called tholins, which resemble kerogen, a gunky material in oil shale that yields petroleum. As in the 1953 experiment, they simulated organic reactions in the early oceans by heating a mixture of nitrogen, methane, and water. Tholins and other organic compounds resulted. Tholins, which absorb UV light well, may have given those seas a yellowish hue, Miller says.

Tholins in the top 2 millimeters of ocean water would have blocked all but 1 percent of a damaging wavelength of UV light, Miller says. He suggests that this screening would have been adequate for protecting newly formed organic building blocks.

Furthermore, the biochemists argue, a variety of ocean-based compounds, including dissolved salts, sulfur or iron, an ice cap, or a worldwide slick of naturally produced oil, could have supplemented this UV protection.

"This shows that there could have been a whole variety of shielding candidates in the early oceans, and that's good to know," said Christopher F. Chyba, a planetary scientist at the University of Arizona in Tucson. —*J.B.*

Signs of unstable ice in Antarctica

The icy blanket draped over Antarctica is so stark and primordial that it seems as permanent as rock. Indeed, glaciologists have traditionally considered the ice sheet to be a stable feature that has persisted for at least the last 6 million years in West Antarctica and much longer on the eastern side of the continent. New evidence, however, melts that solid image by suggesting that the ice cap of West Antarctica collapsed and then reformed quite recently in geologic time.

Reed P. Scherer, a paleontologist at Uppsala University in Sweden, first suggested this possibility in 1991. While studying the shells of algae drilled up from beneath the ice cap, he found modern diatom species that originated no earlier than 750,000 years ago. He concluded that the ice had melted at some time since then, allowing the ocean to flood this region, which lies below sea level. The current ice cap must have formed after that event, he argued.

At the time, critics attacked Scherer's study, but now he has additional evidence. In the July 3 SCIENCE, Scherer and his colleagues report finding young diatoms in several more drill cores pulled up from beneath the West Antarctic ice cap. Further support for a recent melting comes from analysis of radioactive beryllium-10 atoms, which are created in the atmosphere by incoming cosmic rays. The concentration of these atoms in the sediments below the ice cap indicates that the region was free of ice at some time much more recent than 6 million years ago.

Richard B. Alley, a glaciologist at Pennsylvania State University in State College, says Scherer's new work answers his past critics. The finding also raises questions about the long-term stability of West Antarctica. If the ice sheet collapses, global sea levels would rise by 6 meters, enough to flood many coastal cities. "Most of us think it becomes more likely if it happened in the past," says Alley. —*R.M.*