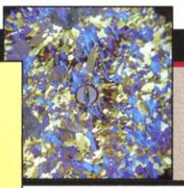
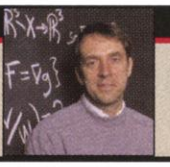
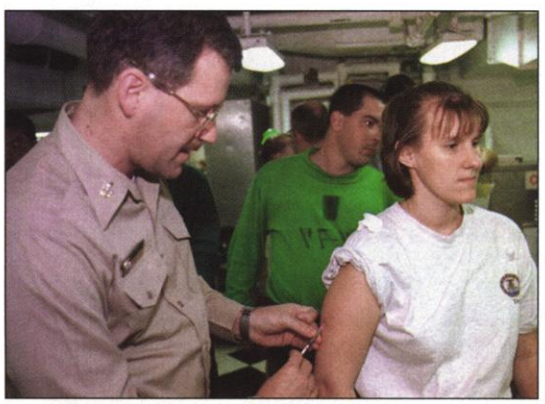




ANTHRAX

'Borrowed Immunity' May Save Future Victims

Government investigators want to have something more than antibiotics on hand should anthrax terrorists strike again. Of the 11 bioterrorism victims who came down with inhalation anthrax last fall, five died despite the powerful antibiotics they were given. Now investigators at the Centers for Disease Control and Prevention (CDC) and other federal agencies are seeking permission to treat future severe cases with an experimental therapy designed to confer instant immunity against the bacterium's deadly toxin: blood plasma from military personnel vaccinated against anthrax.



Arms supply. Plasma from vaccinated volunteers may provide an experimental anthrax treatment.

The proposal has passed CDC's internal ethics board and could be sent for approval as early as this week to the Food and Drug Administration (FDA), says Bradley Perkins, chief of CDC's Meningitis and Special Pathogens Branch. One question to be explored is whether the plasma batch CDC proposes to use complies with FDA regulations. Meanwhile, CDC, the National Institutes of Health (NIH), and the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) also plan to conduct a series of animal experiments to determine whether the therapy will work and how much plasma would be needed.

Antibiotics can fail, researchers say, because *Bacillus anthracis* churns out a toxin that continues to wreak havoc even after the bacteria have been killed. Scientists hope that the variety of antibodies in the injected plasma from vaccinated people will be able to eliminate the toxin. But in the long run, CDC plans to use antibodies, or immunoglobulin, that have been purified from the plasma.

The approach, called passive immunotherapy, has a long history: Plasma from vaccinated horses was the only available anthrax treatment in the preantibiotic era, and it's still used in Russia and China. Unfortunately, says USAMRIID anthrax researcher Arthur Friedlander, none of the reports about its efficacy in humans meets modern scientific standards. In animal studies, the strategy has been shown to work only when antibodies were given prior to anthrax exposure. Given this paucity of data, the proposed treatment would be given only as an adjunct to antibiotics, says Perkins, and only to failing patients who didn't improve on antibiotics alone.

The current plasma supply, which was collected from military personnel before the attacks, is far from ideal. Only 135 plasma units of about 600 milliliters each are available; part of that will be used for animal tests, and the remainder would suffice for a few dozen patients at most, says Perkins. And because the plasma was collected with scientific experiments in mind, not for use in humans, collection and storage procedures may raise eyebrows at the FDA. Some of the vaccinees were also enrolled in vaccine trials using live agents such as Venezuelan equine encephalitis virus and tularemia, making them less desirable donors. But a draft of the treatment protocol argues that this poses only a small risk, because the pathogens were attenuated and the trials took place at least 2 months before plasma was collected.

The investigators also want to collect a second, larger batch of plasma from vaccinated volunteers for use in both treatment and animal studies. But it would still be a fairly modest amount—perhaps three times what's available now. "Most [investigators] are not willing to stockpile this material in any serious quantity without much better data about its efficacy in animals," says Perkins. Even if the product is shown to work in animals and becomes an accepted treatment, he adds, "it would be an interim solution at best."

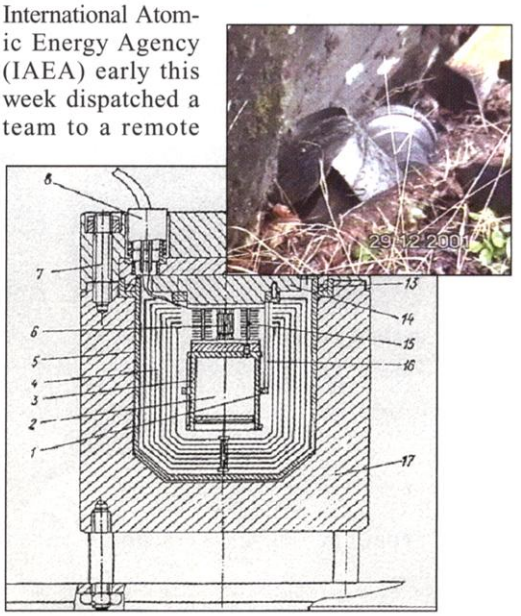
Researchers would prefer a treatment that does not rely on volunteers. That's why many anthrax researchers are following the work of a team led by Brent Iverson and George Georgiou of the University of Texas, Austin, who claim to have created so-called monoclonal antibodies that cling to the anthrax toxin much better than those produced by the human body. Georgiou and Iverson refuse to discuss the findings, which were presented at a meeting last summer, before publication. But Stephen Leppla, an anthrax researcher at NIH familiar with the results, says the antibodies have a 40-fold improved affinity, and they kept alive rats injected with the toxin. The next logical step, he says, would be to see whether the product can also save animals with a real anthrax infection.

The results should demonstrate whether one type of antibody, even if it's very good, can work as well as the broad mix produced by the immune system, says Friedlander. But, he says, the production of improved antibodies "is a good idea that certainly deserves to be evaluated." –MARTIN ENSERINK

NUCLEAR WASTE

'Hot' Legacy Raises Alarm in the Caucasus

VIENNA—Can a crack international team secure two tremendously radioactive objects in the mountains of a strife-torn former Soviet republic before they fall into the hands of nuclear terrorists? The question may sound like a trailer for a James Bond movie, but it's for real. *Science* has learned that the International Atomic Energy Agency (IAEA) early this week dispatched a team to a remote



Too hot to handle. A Soviet schematic shows that the Georgian radioactive canisters (*inset*) were at the heart of an unusual thermogenerator.

CREDITS: (TOP TO BOTTOM) MIKE LARSON/U.S. NAVY/AP PHOTO; IAEA

area near Georgia's breakaway Abkhazia region to help local officials grab the dangerous, portable devices.

Georgia is a hot spot for illicit trafficking of nuclear materials (*Science*, 1 June 2001, p. 1632). Although Western governments have worked hard to help Russia and other countries secure their fissile material, the 11 September attacks have heightened fears of terrorists using other radioactive materials, from discarded medical isotopes to uranium mining tailings, to make "dirty bombs" that could spread radioactivity over large areas. Feeding those fears is the fact that the materials are usually less secure than weapons-grade nuclear caches and often have been abandoned by former owners.

The crisis began with a fax on Christmas Eve from Georgian authorities. Three men gathering wood near Lja on 2 December 2001 had found two containers that appeared to have melted the nearby snow. Lugging the containers back to their campsite for warmth, the men soon became dizzy and nauseous and started vomiting. Within a week, radiation burns began to develop on their backs. On 4 January 2002, IAEA dispatched three investigators to Tbilisi, but heavy snows and rough terrain prevented them from reaching the objects.

This is not the first time such containers have been found. In 1998, not far from Lja, a fisherman found one in a riverbed. Physicists in Tbilisi later discovered that it was packed with strontium-90 emitting a whopping 40,000 curies of radiation, equivalent to the radiation from strontium-90 released during the 1986 Chornobyl explosion and fire. "My shock was so great when I was informed of this," says Abel Julio González, director of IAEA's division of radiation and waste safety. "I was convinced they had made a mistake." But an IAEA team confirmed the readings and whisked the object —along with a second one found soon after—to a guarded location in Tbilisi.

Western officials initially did not know what the containers were used for nor how many had been built. A request for information from Russia yielded sympathy but few answers, says an IAEA official, as Russian authorities insisted they were not liable for nuclear materials found in other former Soviet republics.

Slowly, however, González and his team began to piece together the puzzle. They obtained a schematic of a device that used the mystery containers to generate electricity from the strontium's heat, possibly to power remote radio transmitters. The units recovered so far are encased in a titanium-based ceramic. As the beta particles streaming from the strontium-90 slam into the metal shielding, part of the energy is converted into x-rays and part into heat. Soviet labs apparently produced several hundred of the generators, including some with radioactivity levels as high as 100,000 curies. None of these high-powered models have yet turned up, and only a handful of the 40,000-curie devices have been recovered in covert operations in four countries: Georgia, Belarus, Estonia, and Tajikistan.

Radiation injuries from orphaned sources are "a very real problem," says George Vargo of the U.S. Pacific Northwest National Laboratory in Richland, Washington. But the Georgian men being treated for severe x-ray burns are the first confirmed victims of the Soviet thermogenerators.

The IAEA team members had planned to wait until this month to assist in recovering the containers, but they decided to move more quickly after an urgent appeal last week from the Georgian government. They arrived in Tbilisi on 27 January. Officials from IAEA and Georgia, France, Russia, and the United States are expected to meet in Tbilisi on 4 February to review the recovery effort and discuss the lingering threat of other orphan sources. Although much of the strontium-90 will probably be stored as radioactive waste, the agency is also mulling a suggestion to sell some of it to hospitals as a source of the short-lived daughter isotope yttrium-90, an experimental treatment for cancer and arthritis. **–RICHARD STONE**

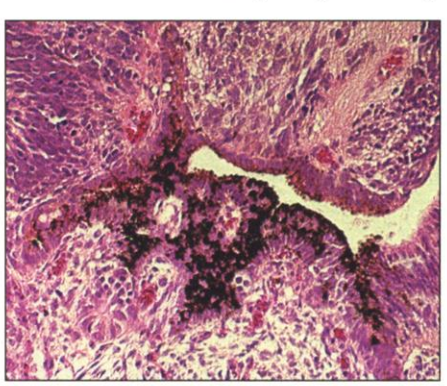
CREDITS: (TOP TO BOTTOM) DENIS DOYLE/AP; J. CIBELLI *ET AL.*

STEM CELL RESEARCH

Primate Parthenotes Yield Stem Cells

A reproductive quirk of some reptiles, insects, and other species may help stem cell researchers sidestep ethical debates over the use of human embryos. Researchers at Advanced Cell Technology (ACT) in Worcester, Massachusetts, report on page 819 that they have isolated the first stem cell lines from primate parthenotes, embryos grown from unfertilized eggs that, in mammals, are not capable of developing into viable fetuses.

In October, Yan-Ling Feng and Jerry



Virgin division. Nerve (pink) and pigment (black) cells grow from stem cells plucked from a parthenote.

ScienceScope

FMD Free It's official: The foot-and-mouth disease (FMD) epidemic that ravaged British farms in 2001 is over. Last week, the International Epizootic Office in Paris declared the U.K. free of the dreaded virus, clearing the way for resumed meat exports. The total number of animals slaughtered to subdue the virus, according to the Department for Environment, Food, and Rural Affairs: 6,131,440.

W.'s Other War The Bush Administration appears to be more sympathetic than the Clinton team to the cause of veterans with Gulf War illness, a mysterious set of symptoms plaguing some veterans of the 1991 conflict. Based on as-yet-unpublished research, the Department of Veterans Affairs announced in December that Gulf War vets face double the risk of Lou Gehrig's disease—marking the first time an Administration has acknowledged a direct link between the war and a specific disease. And last week, Secretary of Veterans Affairs Anthony J. Principi named several vocal critics of past government policy to a new research advisory committee. In contrast, a Clinton-era oversight panel was heavy on military brass and widely mistrusted by veterans (*Science*, 2 February 2001, p. 816). Epidemiologist Robert Haley of the University of Texas Southwestern Medical Center in Dallas, one of the Clinton-era critics and a member of the new panel, says, "We're seeing a complete reversal of policy."

Cloning Bills Blossom A looming Senate debate over cloning got a little more complicated last week. Senator Tom Harkin (D–IA) threw a third major proposal for banning human reproductive cloning onto the table, giving lawmakers preparing for an expected vote later this spring even more to think about.

The new bill (S. 1893) is similar to S. 1758, proposed last December by Senator Dianne Feinstein (D–CA). Her bill would keep the door open for research using cloned embryos but impose civil penalties on anyone who tries to clone a person. Harkin's bill adds criminal penalties to the mix.

More than 20 research organizations have endorsed Feinstein's bill over legislation backed by Senator Sam Brownback (R–KS) that would ban all uses of cloned embryos. The next step: March hearings on Brownback's bill (S. 790), with a full Senate vote coming sometime later.