to the art of medicine, not science," Gale remarks. "We took all the bits of data and gave them weights based on our personal impression."

The physicians ended up performing 19 bone-marrow transplants, six of which were fetal liver transplants. All of those who received fetal liver transplants have died because they were so severely burned by the radiation. "We would have expected one to two to survive at best if they were average patients," Gale says. Because they died of the effects of the radiation, "we can't evaluate the success of the transplants."

Of the remaining 13 transplant patients, five are still alive and are now out of immediate danger. The Soviet physicians, who had done only about 20 bone-marrow transplants in all of Russia before the Chernobyl accident, got an education in the latest techniques for this procedure. For example, they had had no experience giving the antirejection drug cyclosporine intravenously, yet this drug of choice for bone-marrow transplant patients cannot be given orally because, says Gale, "you can't be sure of absorption in irradiated patients. Our mission was not only to do but to teach."

Gale plans to return to the Soviet Union on 20 July to continue following the Chernobyl victims. There can be major complications 3 months after a transplant, he notes.

For the future, Gale wants very much to see an international scientific effort to follow the 100,000 to 200,000 Soviets who received 15 to 30 times the background level of radiation when the radioactive plume from Chernobyl passed over Kiev. It is impossible to estimate the likelihood of cancer or birth defects in this population, he says. Moreover, he continues, "the actual danger to any individual is small and if an individual gets cancer, they can't know if it was caused by radiation or other factors."

"One of our jobs is to reassure," says Gale. "We don't want to cause more harm than Chernobyl. We don't want 100,000 people to live their lives in fear of cancer. Yet we want to follow them medically."

Gale signed an agreement with the Soviets committing both countries to cooperating in the long-term follow-up of this population. "Now we are focusing on what we can provide," he says. "We are calling on advice from radiation specialists and specialists in cancer, genetic disorders, and birth defects. There is a lot to be said for cooperation. And we lend an air of credibility to Soviet publications."

So the consequences of Chernobyl remain to be determined. But there is at least the hope that some scientific knowledge may be gained from all the suffering. ■

GINA KOLATA

Briefing:

NASA Terminates Centaur Development

Citing continued concern about flight safety in the space shuttle program, James C. Fletcher, administrator of the National Aeronautics and Space Administration (NASA), has terminated development of the Centaur upper stage for use aboard the shuttle. The Galileo mission to Jupiter and the Ulysses mission to the polar regions of the sun, both of which had been scheduled to be launched using the Centaur, may now be delayed into the 1990's. They were already facing at least a 2-year delay because of the Challenger explosion last January. Also affected are a number of classified Air Force payloads that depended on the Centaur.

Fletcher's decision came on 19 June, and was not unexpected. The Centaur being developed for the shuttle was a modified version of a booster that has long been used as an upper stage for conventional Atlas and Titan rockets. Its advantage was power: starting from the shuttle payload bay it could place a spacecraft on a trajectory to giant outer planets such as Jupiter and Saturn, or to a rendezvous with a fast-moving comet. The Centaur's disadvantage was the way it produced that power: its liquid hydrogen/liquid oxygen fuel made it an exceedingly hazardous and complex cargo. Because of the possibility of a launch abort, for example, the shuttle had to be equipped with emergency vents so that the Centaur's fuel could be dumped—in mid-air—before the pilot attempted a landing.

After 4 years of development and some $700 million of investment, NASA engineers were still struggling to make this system work in an acceptably safe manner. The agency intensified its safety reviews of the project in the wake of the Challenger disaster, and an independent study was carried out by the House appropriations subcommittee on HUD-independent agencies under Representative Edward P. Boland (D–MA). On 19 June, when it had become clear that the Centaur was not going to meet the safety criteria being applied to the rest of the shuttle system, Fletcher ordered the effort terminated.

Rear Admiral Richard H. Truly, head of the shuttle program, is in charge of NASA's efforts to find alternative ways to launch Galileo, Ulysses, and the other Centaur-dependent payloads. One alternative would be to launch the spacecraft on the shuttle as planned, but with the Centaur replaced by a less powerful solid-fueled booster such as the Air Force's Inertial Upper Stage. The flights could then take place as early as 1989. However, Galileo would then require some 4½ years to get to Jupiter, versus 2½ years with Centaur. Furthermore, the shuttle/Intertial Upper Stage combination offers very little capacity for doing planetary missions beyond Galileo and Ulysses.

The other major alternative is to use the shuttle-modified Centaurs as upper stages on the heavy-lift Titan 34D7's being developed for the Air Force. Such a Titan launch would technically be possible by 1990. Moreover, the Titan/Centaur combination seems adequate for doing all the planetary missions that NASA is currently considering. On the other hand, the new Titans will cost in the neighborhood of $150 million to $200 million apiece, not counting any modifications required for the Centaurs and the spacecraft themselves. At this point, however, agency officials say that they can do no more than guess at what any of the alternatives will cost. ■

M. MITCHELL WALDROP

House Appropriations Committee Kind to Physics

The Department of Energy's proposed 1987 budget for high-energy and nuclear physics has emerged from the House Appropriations Committee almost unscathed. Just a few months ago it seemed that the operations of upgraded accelerators at Fermi National Accelerator Laboratory and the Stanford Linear Accelerator Laboratory (SLAC) might be delayed because of budget restraints imposed by Congress. Both facilities require significant increases in funding to cover higher operating costs associated with the revamped particle colliders.

The Appropriations Committee approved a $213.4-million operating budget for physics facilities, exactly what the Administration requested. Physics research, at $111.6 million is up only $5.3 million, $7 million less than the department request. DOE officials say university-based research and international collaborations may be pinched as a result.

The committee also stripped away $20 million that DOE had identified as potentially available in 1987 for research on the Superconducting Super Collider if a decision is made to start constructing the facility in 1988. Stating that it was "concerned by the lack of commitment by the Administration," the committee directed DOE to submit a separate appropriations request for 1987 should it decide to go forward on the

project. With respect to the Continuous Electron Beam Accelerator Facility, the Appropriations Committee provided $17 million to initiate construction—$8 million less than the original request. Except for this shortfall, the committee endorsed the entire nuclear physics program as submitted by the Administration—$216.2 million, an overall increase of $51.7 million.

Both the magnetic and inertial confinement fusion energy programs received renewed support from the committee. In line with a National Academy of Sciences review of the inertial confinement program, the committee called for DOE to retain a separate budget category for the effort instead of drawing most of its funding from a larger nuclear "weapons activities" program. The committee appropriated a total of $154 million in funding, $35.5 million more than DOE had sought. The magnetic fusion program also received a funding boost, $25 million more than the $333 million proposed in February. The additional money is to be used to keep mirror concept research alive at DOE and within the universities.

The Appropriations Committee came down hard on DOE's effort to "privatize" or sell off portions of its uranium enrichment activities. Describing the effort as "counterproductive to maintenance of a stable program," the committee forbade the department from expending funds to institute, examine, or analyze any proposal for privatizing any facet of DOE enrichment activities. ■ MARK CRAWFORD

Florida Physician to Be Assistant Secretary for Health

Robert E. Windom, a Florida physician, is expected to become the next assistant secretary for health at the Department of Health and Human Services. The post has gone unfilled for a year and a half since the resignation of Edward Brandt, who became chancellor of the University of Maryland at Baltimore.

On 18 June the Senate Labor and Human Resources Committee approved Windom's nomination by voice vote, and the appointment is expected to be confirmed easily by the full Senate. As head of the Public Health Service, Windom will have a variety of biomedical research agencies, including the National Institutes of Health, under his purview.

Windom, 55, is an internist from Sarasota and has been an assistant professor at the University of Miami School of Medicine since 1973. According to his disclosure forms, he was chairman of a regional committee for physicians supporting the Reagan-Bush campaign, and gave $55,000 to the Republican Senatorial Trust between 1977 to 1986. ■ MARJORIE SUN

Drug Export Bill Torpedoed by Amendment

Legislation that would have allowed the export of drugs that have not been approved by the federal government has bitten the dust. Although the Senate passed an export bill in May, the Pharmaceutical Manufacturers Association (PMA) announced on 12 June that it will not support the measure because of two provisions that were tacked on unexpectedly during floor debate.

As originally passed by the Senate Labor and Human Resources Committee, the bill would have permitted the shipment of unapproved drugs to other Western countries. The drug industry has lobbied hard for the measure for several years, arguing that it will create new jobs for Americans and help the economy. More recently, biotechnology companies have urged its passage. Critics, however, say that unapproved drugs will be diverted to other countries where regulations governing their use are lax.

The legislation ran into problems on the Senate floor when Senator Howard Metzenbaum (D–OH) caught the bill's sponsor, Senator Orrin Hatch (R–UT), off guard and introduced a measure that would have placed tighter regulations on infant formula manufacturing. Then Senator John Glenn (D–OH) sponsored a provision that would have enlisted American embassies to help monitor labels on drugs shipped overseas. The bill with these amendments passed. One aide said, referring to the infant formula provision, "In an election year, it's hard to vote against babies."

The PMA board, which includes representatives of the three main infant formula manufacturers, then voted not to endorse the Senate bill. The decision, in effect, kills negotiations between PMA and the House side because health and environment subcommittee chairman Henry Waxman (D–CA) favors changes in drug export law that are even more unpalatable to industry.

The association and biotechnology companies say they still support the concept of exporting unapproved drugs. The bill could be resurrected in the next session, but legislative aides say that this Congress was probably the industry's best shot. ■

MARJORIE SUN

Data Problems Halt Work At Two Nuclear Waste Repository Sites

The Department of Energy has issued "stop work" orders to contractors collecting data at potential nuclear waste repository sites in Nevada and Washington. Behind the move is an effort by the department to correct deficiencies in paperwork supporting core drillings, water samples, and other data needed to analyze the suitability of the sites. DOE's action comes 13 months before the scheduled start of repository site characterization work, which will be subject to stringent Nuclear Regulatory Commission (NRC) quality assurance standards.

Department officials responsible for gathering geologic and hydrologic data at candidate sites at Yucca Mountain, Nevada, and Hanford, Washington, say there are no major deficiencies in their recordkeeping. Nevertheless, DOE officials in Washington admit privately that recent audits at these locations have revealed some problems that could produce legal challenges if left uncorrected. The purpose of the stop-work order, says Don Vieth, director of the Nevada Waste Management Project Office, is to bring DOE quality assurance procedures into line with guidelines published in March by the NRC. DOE's decision not to select a second site in the East has added to concerns about quality control, officials say.

At this point, Carl Johnson, chief of technical programs for Nevada's nuclear waste project office, is not alarmed by DOE's action. "I am not sure there really is much of a problem," says Johnson, who notes that DOE has yet to explain its action to state officials. Of concern, though, is whether 50,000 linear feet of geologic core samples from Yucca Mountain have adequate support documentation. Johnson also wants to be sure that there are strong procedures at the core library, which primarily serves the Nevada nuclear weapons test site, to assure that core samples do not get mixed up.

Faced with the prospect that the NRC could find fault with the database when the formal licensing process commences around 1991, Hanford officials also are trying to establish a sound paper trail to support core drilling data collected since 1976. Also subject to this quality assurance review are records related to hydrology. Rockwell International, DOE's contractor, is seeking to correct problems at Hanford by 1 November. Washington state officials, who are concerned about data recordkeeping prior to 1983, are planning to closely examine DOE's documentation. ■

MARK CRAWFORD